New Jersey Department of Environmental Protection
Division of Water Monitoring and Standards
Bureau of Environmental Analysis, Restoration and Standards

2016 New Jersey Integrated Water Quality Assessment Methods

REVISED DRAFT

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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 Assessment Report (Integrated Report) in 2002. New Jersey's 2016 Integrated Report will continue to follow the integrated report format to provide an effective tool for maintaining high quality waters where designated uses are fully supported and improving the quality of waters that do not fully support their designated uses.

The Integrated Report includes the "303(d) List of Water Quality Limited Waters" (303(d) List), which satisfies the Section 303(d) requirement to biennially 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) to restore water quality. The 303(d) 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 2016 303(d) List will include all assessment units (AUs) that do not fully support one or more of the applicable designated uses along with the specific pollutant(s) causing use non-support and the relative priority of the AU/pollutant combination for TMDL development. The Integrated Report also includes an "Integrated List of Waters" (Integrated List), which satisfies the Section 305(b) requirement to biennially submit a report that assesses overall water quality and support of designated uses of all principal waters, as well as strategies to maintain and improve water quality. The Integrated List depicts use assessment results for every applicable designated use in each AU as" fully supporting", "not supporting", or "insufficient information". The Department will be submitting the 2016 303(d) and Integrated Lists to USEPA Region 2 and will afford the public the opportunity to review and comment on the draft 303(d) List, in accordance with N.J.A.C. 7:15-6.2.

Prior to developing the 303(d) and Integrated Lists, states are required to publish, for USEPA and public review, the methods used to collect, analyze, and interpret data to determine compliance with applicable water quality standards and assess support of applicable designated uses. This Methods Document serves that function by providing an objective and scientifically sound assessment methodology, including:

- A description of the data the Department will use to assess support of the designated uses;
- The quality assurance aspects of the data and rationale for any decision to not use any existing and readily available data and information;
- A description of the methods used to evaluate compliance with the SWQS and determine placement on the 303(d) List;
- A description of the methods used to evaluate designated use support and determine placement on the Integrated List;
- Changes in assessment methodology since the last reporting cycle.

Some use assessments are based on indicators or translators of water quality data or conditions, in addition to comparing raw water quality data to numeric criteria. The methods for assessing use support based on these indicators or translators are explained in the Methods Document. These include: the assessment of recreational uses based on beach closure data (see Section 6.2); the assessment of the general aquatic life use based on indices of biological impairment (see Section 4.3); assessment of the fish consumption use based on fish tissue thresholds used for fish consumption advisories or water quality targets established in the Statewide Mercury TMDL (see Section 6.3); and assessment of the shellfish harvest for consumption use based on shellfish classifications (see Section 6.4).

The Delaware River Basin Commission (DRBC) assesses water quality and use support for the Delaware River mainstem, Estuary, and Bay. Their assessment results are reported in New Jersey's 303(d) and Integrated Lists. DRBC's *2016 Delaware River and Bay Integrated List Water Quality Assessment Report* and corresponding methods are available on DRBC's website at: http://www.state.nj.us/drbc/quality/reports/quality/.

1.2 Summary of Major Changes from the 2014 Methods Document

Biological Assessments for Aquatic Life Designated Use

The new listing methodology for biological assessment results based on benthic macroinvertebrate and/or fish data is expected to simplify the listing methodology for the Integrated and 303(d) Lists and more accurately represent biological conditions in our State's waterbodies. The new method lists all biological impairments based on macroinvertebrate and fish data on the Integrated List and 303(d) List which would be represented by "Cause Unknown – Impaired Biota". Whereas the previous listing methodology only listed biological impairments when there were no other aquatic life based chemical/physical impairments in an AU, the new method lists all biological impairments on the 303(d) List regardless of other aquatic life based chemical/physical impairments. This action clarifies the listing methodology in that it includes all known impairments that are causing aquatic life designated use non-support on the Integrated List/303(d) List. Additionally, this methodology proposal allows the Department to more accurately address biological impairments in waterbodies by identifying the issues, developing the proper management strategy, and implementing the most effective restoration actions to address the impairments.

Biological Assessment for Aquatic Life Designated Use in Barnegat Bay

In its on-going efforts to develop biological indices for estuary and ocean waters, the Department has adopted the Multivariable AZTI Marine Biotic Index (M-AMBI) to assess the health of the benthic community in the Barnegat Bay based on research conducted by Rutgers University. The scientifically proven and widely accepted index was originally developed in Europe, but has since been improved and modified to include waters in the Virginia Provence, which extends from Cape Cod to the Chesapeake Bay. The Rutgers' study has verified the applicability of the metric to Barnegat Bay, and proved its capability to incorporate the pronounced salinity gradient characteristic of the Bay to determine the health of the biotic communities**.**

Biological Assessment for Aquatic Life Designated Use in Headwater Streams

The Department has further improved the biological indices based on fish population data to evaluate biological conditions in freshwater streams. The Headwaters Index of Biotic Integrity (HIBI) was developed to assess streams less than 4 square miles in watershed area within the northern ecoregions. This new index monitors the assemblage of fish as well as crayfish, salamanders and frogs to assess aquatic life use in small headwater streams.

1.3 Overview of the Methods Document

The Department is required to use all existing and readily available data to assess water quality for the 303(d) and Integrated Lists. 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 representative, 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 support at the assessment unit level. The Department's vision for applying a tiered level of assessment, with a rotating regional focus, is outlined in Chapter 2. The overall assessment process used by the Department, beginning with the collection of raw data, through the assessment of designated use support, to the development of the 303(d) and Integrated Lists, is comprised of five steps, each of which is explained in detail in Chapters 3 through 7. Chapters 8, 9 and 10 describe TMDL prioritization, monitoring strategies and the public participation process. Below is a brief summary of each chapter/step in the assessment process.

Chapter 2: Regional Comprehensive Assessment

Chapter 2 describes the Regional Comprehensive Assessment approach that the Department uses to assess waterbodies throughout the State. Through this comprehensive assessment process, the Department aims to systematically enhance the process to identify water quality issues with improved confidence in listing decisions, using robust datasets and multiple lines of evidence, in a selected water region each listing cycle. The result is a better understanding of the appropriate restoration response to achieve improved water quality and prioritization of resources to achieve this objective.

Chapter 3: Use and Interpretation of Data

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 and 303(d) Lists. 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

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 and magnitude, duration, outliers, and censored data. Chapter 4 describes the procedures used to evaluate chemical parameters and determine if an individual parameter complies with the applicable SWQS (including policies and narrative criteria) at each station. This chapter also

describes how the Department evaluates pathogenic and biological indicators to assess water quality impairment at a station.

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

Chapter 5 defines the scale ("assessment unit") used by the Department to assess designated uses and explains the process used to identify all sampling stations associated with each assessment unit. Chapter 5 also explains the additional evaluations and policies that are applied when data for the same parameter is combined from different stations within an assessment unit, including assessment units with more than one stream classification or waterbody type, relative weight of datum, *de minimus* data results, contradictory data sets, and modeling results.

Chapter 6: Designated Use Assessment Methods

Chapter 6 identifies the uses designated for each SWQS classification, the type of data necessary to assess each use, the parameters associated with each designated use (Appendix A), and the minimum suite of parameters needed to determine full support of each use (Table 6.1). Chapter 6 also discusses the methods used to assess use support based on data sampled from multiple locations and/or for multiple parameters.

Chapter 7: Integrated Listing Guidance

Chapter 7 explains how use assessment results for each assessment unit/designated use combination are entered into ADB and depicted on the published 303(d) and Integrated Lists, taking into consideration causes and sources of non-support, the status of TMDLs, and reasons for removing assessment unit/pollutant combinations from the 303(d) List (i.e., "delisting").

Chapters 8, 9, and 10: Prioritizing, Monitoring, and Public Participation

Chapter 8 describes the methods used to rank and prioritize assessment unit/pollutant combinations for TMDL development pursuant to the requirements of the federal Clean Water Act and the New Jersey Water Quality Management Planning rules. Chapter 9 describes the State's approach to obtaining additional data to assess compliance with SWQS and use support in all New Jersey assessment units. Chapter 10 outlines the public participation requirements and process, regulatory and non-regulatory, employed in the development and finalization of the 303(d) and Integrated Lists, including the data solicitation and the public notification processes employed by the Department.

2.0 Regional Comprehensive Assessment

In 2010, the Department initiated the Barnegat Bay Ten-Point Action Plan as a model approach for water quality assessment and restoration on a regional basis, to be replicated throughout New Jersey. This model is being applied to the rest of New Jersey's waters through comprehensive water resource management (CWRM). Under CWRM, the Department has organized its water program operations to consider water resource issues on a regional, integrated and holistic basis. This approach will encourage development of measures to restore, maintain and enhance water quality uses that maximize effectiveness and efficiency in achieving positive environmental outcomes that are tailored to the unique circumstances of each region. This approach is also consistent with EPA's, "A Long-Term Vision for Assessment, Restoration and Protection under

the Clean Water Act 303(d) Program," which acknowledges there is not a "one size fits all" approach to restoring and protecting water resources. The Regional Comprehensive Assessment process developed for 2016 embodies the CWRM approach.

In 2012, the Integrated Assessment process expanded into a two-step assessment process. Step 1 used improved computer technology to apply the assessment protocols in the Methods Document to determine preliminary assessment decisions. In Step 2 there was an in-depth analysis, incorporating water quality data analysis along with other factors such as hydrology, geology, land use, biological habitat conditions, meteorology, restoration activities, point and nonpoint sources, use designation, stream classification, and other relevant environmental considerations to determine overall water quality. During Step 2, a team of analysts conducted a comprehensive assessment that included confirmation of water quality conditions based on the above factors through the application of Geographic Information Systems (GIS) tools, aerial and satellite-based photography, field observations, and visual assessments. The objective was to produce an in-depth analysis applying across-the-board watershed information to make assessment decisions with a high degree of confidence. This would allow the Department to address multiple water resource concerns based on an assessment of the specific environmental conditions affecting the targeted region.

Since the degree of rigor that could be applied in Step 2 of the 2012 Integrated Assessment was limited because it was applied on a statewide basis with limited resources and time; starting with the 2014 cycle, the comprehensive assessment was applied more thoroughly, with the focus on a selected region. This is consistent with the vision for the Barnegat Bay Initiative and comprehensive water resources management. Under this approach, the Department focuses on one of five water regions (Atlantic Coastal, Raritan, Lower Delaware, Northwest, and Northeast) during each Integrated Report cycle (see Figure 2.1). This approach is supported in EPA's listing guidance and is similar to other states such as New York's continuous rotating basin schedule for monitoring and assessment[1] under their Rotating Integrated Basin Studies program[2]. The rotating basin approach results in a comprehensive assessment of the entire state every 10 years. The Regional Comprehensive Assessment process will focus on the Raritan Water Region for the 2016 listing cycle.

> Although the more in-depth analysis is limited to the primary region in a given cycle, water quality data from sampling completed in other regions are also evaluated. Stations located outside the primary region must meet the target sample size identified in the section "Target and Minimum Number of Samples" in order to support a new or revised assessment decision. If clear, obvious confirmation is not evident for assessments outside of the primary region, the final assessment from previous cycles remains or the sampling station is identified as having insufficient data until a comprehensive assessment can be completed. An example of clear,

[1] See New York State Department of Environmental Protection's Consolidated Assessment and Listing Methodology, available on the NYDEC website at[this website isn't current – not sure what website to replace here]. Viewed on January 28, 2013.
[2] NYDEC's website at http://www.dec.ny.gov/chemical/30951.html. Viewed on January 28, 2013.

obvious confirmation includes stations that show no exceedances over the last 5 years within an assessment unit or stations that show frequently re-occurring exceedances over the last 5 years whose duration and magnitude of exceedance clearly shows impairment of the waterbody. If the number of samples at a particular station is insufficient (does not meet the target sample size), but the data indicate impairment, further intensive monitoring in conjunction with comprehensive assessment during the appropriate regional cycle will be conducted to verify the impairment before adding the pollutant to the 303(d) List (i.e., "new listing"). Likewise, if the number of samples at a particular station is insufficient but the data indicate that the applicable water quality standards are attained, further intensive monitoring in conjunction with comprehensive assessment during the appropriate regional cycle will be conducted to verify support of applicable designated use(s) before removing the pollutant from the 303(d) List (i.e., "delisting").

As part of the assessment process, the Department ensures data quality and relevance to increase confidence in assessment decisions to better guide current and future restoration efforts and evaluate effectiveness of those efforts. The Department will:

- Use more robust datasets and multiple lines of evidence to formulate an assessment decision;
- Evaluate use support by examining stations within an assessment unit, as well as neighboring assessment units, through a holistic watershed approach;
- Identify transient events such as droughts, flooding, spills, and snow storms that may cause temporary excursions of the criteria but do not affect overall use support;
- Verify biological indices to ensure the appropriate index has been applied;
- Identify outliers or flawed data caused by data entry, analytical, or collection errors;
- Identify where water quality is due to natural conditions;
- Confirm water quality improvement resulting from restoration projects and TMDL implementation;
- Identify pollutant sources to inform development of restoration responses including through enforcement or permitting programs, targeted funding and stewardship building efforts;
- Identify data gaps to guide future sampling strategies.

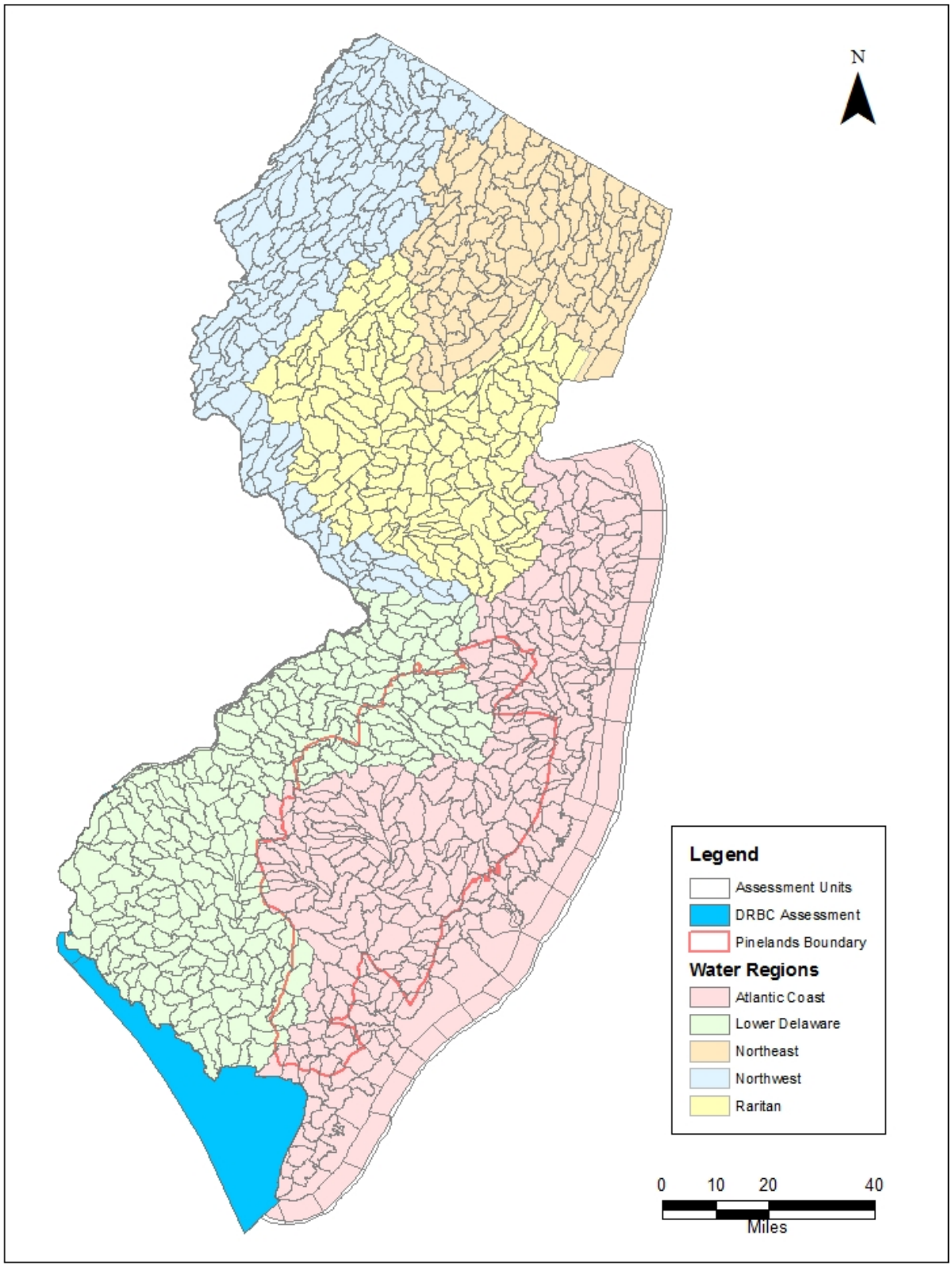
A comparison of the assessment for the primary region and the other regions is provided in Table 2.1. In each listing cycle, support of Shellfish Harvest for Consumption Use and Beach Closure information still undergo a comprehensive assessment in the coastal regions.

Table 2.1: Overview of the Regional Comprehensive Assessment Process

Primary Region	Other Regions
All data undergoes a comprehensive QA process	All data undergoes a comprehensive QA process
Evaluate all sampling stations with data that meet the minimum sample size[1]	Evaluate sampling stations that meet the new target sample size[1]; otherwise, use the final assessment from previous assessment
Complete a comprehensive assessment by incorporating all available lines of evidence for the entire region	Complete a comprehensive assessment on a case-by-case basis for a specific, geographically limited area where warranted
Update the assessment of designated use support for all uses	Update designated use support assessment only where there are new assessments

[1] See Section 4.1 'Evaluation of Physical and Chemical Data: Target and Minimum Number of Samples'

Figure 2.1: New Jersey's Water Regions and Assessment Units



3.0 Use and Interpretation of Data

The Department reviews all existing and readily available data in assessing water quality. With data originating from many diverse entities, the Department must ensure that the data used for assessment purposes is representative 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 includes a list of data sources, where the data can be accessed and identifies which sources were used, as well as provides an explanation for any data not used, to develop the 303(d) and Integrated Lists.

The 2016 303(d) List will be developed using all appropriate and readily available data collected prior to July 1, 2015 in accordance with a Quality Assurance Program Plan (QAPP) approved by the Department or EPA and uploaded into the Department's Water Quality Data Exchange (WQDE) system at http://www.nj.gov/dep/wms/wqde, USEPA's STORET data warehouse, or the USGS National Water Information System (NWIS) **by October 1, 2015.** Because WQDE, STORET and NWIS may not support all data types, other publically available databases may be used including databases that hold continuous water quality data, biological data, fish tissue data, or beach closure data. The Department requests that data submitters inform the Department which data system contains their data.

3.1 Data Quality

Data Age: The Department considers five years of readily available data collected during the reporting period to characterize current conditions. In the primary assessment water region, older data will also be used in conjunction with newer data to demonstrate water quality trends where appropriate analytical methods have been applied and results can easily be compared with more recent data and the older data enhances the Department's ability to assess current conditions.

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 100 feet. Only sampling stations that are spatially referenced are used to develop the 303(d) and Integrated Lists.

Quality Assurance: The Department maintains a strong commitment to the collection and use of high quality data to support environmental decisions and regulatory programs. Department policy mandates that all environmental data collection activities performed (or for use) by the Department comply with and be accompanied by an approved QAPP. QAPPs describe the procedures used to collect and analyze samples, along with, the procedures used to review and verify the results to assure high quality data. They must be approved by the Department, DRBC, USEPA, or the U.S. Geological Survey (USGS). The USEPA's QAPP guidance document is available at http://www2.epa.gov/sites/production/files/2015-06/documents/air_h20_qapp04.pdf. The Department also provides guidance for developing QAPPs for volunteer monitoring data

which is available at http://www.state.nj.us/dep/wms/bears/citizen_science.htm. Additional information about the Department's QAPP process is available on the Department's website at http://www.nj.gov/dep/oqa/. Entities responsible for generating 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 website 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

The Surface Water Quality Standards (SWQS) provide the foundation for the 303(d) and Integrated Lists. 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. Water quality data are assessed for compliance with the SWQS to determine impairment and designated use support.

Antidegradation Policy: The SWQS contain an antidegradation policy that applies to all surface waters of the State. Antidegradation is a requirement of 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 supported wherever these uses are not precluded by natural conditions. No irreversible changes may be made to existing water quality that would impair or preclude support 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, as well as certain land use permits. Additional information about the SWQS antidegradation policy is available on the Department's website at http://www.state.nj.us/dep/wms/bears/antidegradation.htm.

Assessment of Threatened Waters: Lists of Water Quality Limited Waters (303(d) Lists) are required to include all "threatened and impaired" waters. "Threatened waters" are waters that currently meet water quality standards but are likely to exceed standards by the time the next 303(d) List is generated. Assessing threatened waters requires sufficient existing and readily available data and information on adverse declining trends to predict future water quality. This means a dataset must be sufficiently robust to support the evaluation of short-and long-term statistical trends. The Department maintains a series of long-term monitoring locations, which support statistical trends assessments developed by the USGS. Assessments to determine if waters

are threatened are conducted by the Department wherever sufficient data and trends assessments are available to make such predictions.

Narrative Water Quality Criteria: Narrative water quality criteria are non-numeric descriptions of the conditions necessary for a waterbody to support its designated uses. To assess attainment of narrative criteria, which are 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, biological assessment, nutrients, and natural conditions.

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

1. Toxic substances, either alone or in combination with other substances, shall not be present 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 tissue concentrations used for consumption advisories (see Section 6.3, Fish Consumption Use Assessment) and shellfish closure data (see Section 6.4, Shellfish Use Designated Use Assessment).

Biological Assessments: Biological metrics (Tables 4.1-4.4) translate the observed biological conditions into quantitative scales delineating impaired and non-impaired status, which are then assessed along with chemical water quality data (where available) and habitat information to determine support of aquatic life uses and to help in identifying where impairment is due to pollutants versus pollution (see Section 4.3).

Nutrients: The SWQS include narrative nutrient criteria that apply to all waters of the State, in addition to the applicable numeric criteria for phosphorus for freshwaters. The narrative nutrient criteria prohibit nutrient concentrations that cause objectionable algal densities, nuisance aquatic vegetation, or render waters unsuitable for designated uses.

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." Examples of "natural causes" (i.e., natural conditions) include, but are not limited to: locations where underlying conditions (e.g., geology, hydrology) influence the water chemistry and there are no anthropogenic sources or potential anthropogenic sources are determined not to be sources of the pollutant in question. Data that do not meet applicable SWQS criteria potentially due to natural conditions are carefully evaluated and any excursions attributed to natural conditions are documented.

Numeric Water Quality Criteria: The surface water quality criteria established for each of the different surface water classifications in the SWQS are numeric limits 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 website at http://www.state.nj.us/dep/wms/bears/swqs.htm.

4.0 Evaluation of Data at the Station Level

4.1 Evaluation of Physical and Chemical Data

The Department assesses physical and chemical data for which criteria have been established in the SWQS. Once the data is reviewed and deemed of sufficient quality for use in generating the 303(d) and Integrated Lists (see Chapter 3), the data for each parameter sampled at a specific monitoring station are evaluated for compliance with the SWQS in accordance with the assessment protocols described below. If current data is not sufficient for an assessment decision, past assessments are considered valid until new data show that conditions have changed.

Target and Minimum Number of Samples: Small sample sets present challenges, including low confidence in decision making, that may result in failing to identify an exceedance of water quality criteria when a waterbody is impaired, or identifying a waterbody as impaired when a more robust dataset would show that overall water quality criteria is attained. The Department is addressing this issue by increasing the number of samples required for certain parameters, referred to as the target sample size, in order to build confidence in the assessment process. The new target sample size has been selected to more accurately characterize the existing water quality conditions by better capturing natural variability, seasonal changes, varying hydrologic conditions, as well as underlying natural conditions and the effects of anthropogenic activities. For all stations that meet the target sample size, the Department makes an assessment decision based upon the protocol described in this document.

Decisions may be made for datasets smaller than the target sample size if additional data and lines of evidence support an assessment decision. Examples include data from nearby chemical or biological sampling station(s) upstream or downstream that can adequately represent water quality within the subwatershed verify similar conditions, data collected prior to the last 5 years at the sampling station support the assessment decision, data from restoration efforts show improved water quality, data from confirmed pollutant sources verify impacts, trends corroborate with current water quality, hydrologic conditions signify water quality impacts, biological conditions concur with water quality data, or natural conditions validate the assessment decision.

The target sample size for conventional parameters is 20 samples collected over at least a 2-year period within the specified five-year reporting period. Assessment decisions may also be made based on a minimum of 8 samples at stations in the primary water region, over a 2-year period, if additional data and lines of evidence support an assessment decision. Conventional parameters include, but are not limited to, DO, pH, temperature, nutrients, TSS, turbidity, TDS, ammonia, chloride, and sulfate.

The target number of samples for metals and toxic pollutants is 8 samples collected over at least a 2-year period within the specified five-year reporting period. Smaller datasets with a minimum of 4 samples collected over a 2-year period may also be assessed at stations in the primary water region if additional data and lines of evidence support making an assessment decision. Metals/toxics include, but are not limited to, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, zinc, pesticides, and VOCs.

For lakes, the target sample size for conventional parameters, metals and toxics is 8 samples collected over at least a 2-year period within the specified five-year reporting period. Smaller datasets with a minimum of 4 samples collected over a 2-year period in the primary water region may also be assessed if other lines of evidence support water quality condition decisions, such as a Department-approved visual assessment.

The target sample size for pathogens remains as 5 samples over a 30-day period, to calculate a geomean, over at least a 2-year period. Pathogens include enterococcus, *Escherichia coli (E. coli)*, and fecal coliform. Additionally, biological sample requirements are based on the respective biological index for benthic macroinvertebrate and fin fish data (see Section 4.3 Biological Data). For continuous data requirements see the Continuous Monitoring section below.

The minimum sample size is the lowest threshold for making a sound assessment decision. The Department may consider a dataset that does not meet the minimum data requirements on a case-by-case basis to determine if the data adequately characterize the water quality conditions. For example, summer-only sampling for dissolved oxygen, pathogenic quality, and temperature data may be acceptable since such data sets generally represent the critical condition for uses associated with these parameters. Datasets with less than the minimum sample size require overwhelming evidence to support an assessment. Examples of overwhelming evidence include: multiple and frequent excursions are corroborated by nearby sampling stations, pollutant sources are confirmed as affecting the waterbody, or biological conditions verify water quality impacts. Datasets less than the minimum sample size are not sufficient evidence to delist from the 303(d) List.

Excursions: Any samples that do not comply with the applicable numeric SWQS criteria are considered excursions and are reviewed to determine if the excursion is within the margin of error of the analytical method (see next paragraph) or can be attributed to natural conditions, transient events, or flow conditions that do not represent design flows. An excursion may be attributed to **"natural conditions"** where water quality characteristics do not meet the promulgated water quality criteria as a result of natural causes (see Section 3.2). **"Transient events"** are water quality conditions that occur at very low frequencies over very brief timeframes and, as such, neither impair the designated use of the waterbody nor represent overall water quality conditions. For regulatory purposes, water quality criteria apply only where stream flow is maintained at or above the "**design flow**" specified for the applicable numeric SWQS criteria, which is usually the MA7CD10 (see N.J.A.C. 7:9B-1.5(c)). Flow conditions are evaluated (when available) for all excursions to determine if the data were collected under appropriate flow conditions. Excursions that can be attributed to any of these conditions are not considered as exceedances of the SWQS criteria for the purposes of making an assessment decision. These types of excursions are explained

and documented in the Integrated List Appendix D: 2014 Decisions to Not List Causes on the 2014 303(d) List/Sublist 5 (Waters Not Listed, with Reasons and Explanations).

Frequency and Magnitude of Exceedance: The Department has determined that a minimum of two exceedances of a SWQS criterion are necessary to indicate possible noncompliance with the criteria. For datasets that meet or exceed the minimum target sample size, the Department considers the relative frequency and magnitude of the exceedances within the dataset and uses available lines of evidence to determine non-support of the designated use. All such determinations are documented in the Integrated List supporting documents. Additionally, when assessing discrete grab sample data, exceedances must be 7 days apart to capture separate or extended events. For continuous and intensive sampling, see "Continuous Monitoring" below for a description of exceedance frequency.

Analytical Uncertainty: In making assessment decisions regarding exceedances, the Department takes into consideration the analytical uncertainty of the analytical method used to measure the data when an ambient measurement is compared to a numeric SWQS criterion. This uncertainty is a product of the methods used to sample, analyze, and report the data and defines the ability of the analysis to discriminate between minute differences in a measurement. For example, if the surface water quality criterion is "not to exceed 1.0 mg/l" and the margin of error for the instrument is "(+) or (-) 0.2 mg/l," the analysis is unable to discriminate between an ambient level of 0.8, 0.9, 1.0, 1.1 and 1.2 mg/l. The analytical uncertainty also applies to laboratory methods.

Computations Using Censored Data: Censored data are reported values that are less than the minimum reporting limit 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. Normally, censored values are set to one-half of the reporting limit; however, there are situations when censored values are handled differently. If a parameter's criterion is less than a reporting limit, the censored data is not used in the assessment since it cannot be determined if the value meets or exceeds the criteria. If a criterion is an average (annual, 70-year) and the criteria is less than a reporting limit: (1) when censored data represent less than 50 percent of the dataset, the Department calculates a *median* value of the non-censored data and compares that median to the applicable criterion; (2) when censored values exceed 50 percent of the dataset, the Department considers the dataset insufficient to determine if the criterion has been exceeded. In calculating geometric means for pathogenic data, New Jersey follows EPA's recommendations whereby the censored values are set to the reporting limit and the geometric mean is then calculated.

Estimated Data: Estimated data are reported values from a laboratory that are flagged with a comment that the data is "estimated" because the analytic method detected an amount less than the reporting limit, the analytic method detected an amount less than the method detection method or there was a situation during the analytical process that caused the uncertainty to be above the method's approved accuracy. Because of its high uncertainty, estimated data that appear to exceed a criterion are not considered as exceedances.

Continuous Monitoring: More and more frequently, instruments, such as datasondes, are being deployed to continuously monitor the water from as short as three days to very long time periods

(year round). Additionally, intensive monitoring events that collect numerous samples in a short time period are being used to complement discrete sampling datasets. The parameters most commonly measured in this fashion are dissolved oxygen (DO), pH, water temperature, and turbidity. The protocol for comparing continuous monitoring data, collected over a minimum of three days, to the SWQS criteria is as follows (see also "Duration (Exposure Periods)"):

- All Parameters: For SWQS criteria expressed as either a minimum or "not less than at any time", an excursion relative to the minimum criteria occurs when the concentration over a 24-hour period is below the criterion for at least a one-hour duration. For assessment purposes, a minimum of two such excursions at the same location during two or more 24-hour periods may be considered as an exceedance. For large continuous datasets, relative frequency and magnitude of the exceedances within the dataset are considered to determine non-support of the designated use.

- Dissolved Oxygen**:** The SWQS criteria for DO are expressed as either a minimum, "not less than…at any time" concentration or as a 24-hour average concentration. See description of "All Parameters" for exceedances of the minimum criteria. An excursion relative to the 24-hour average criterion occurs when the average concentration of all measurements recorded within a 24-hour period is below the criterion. A minimum of two such excursions occurring at the same location constitutes an exceedance of the criterion.

- Temperature: The SWQS criteria for temperature are expressed as either a daily maximum or as a rolling 7-day average of the daily maximum. See description of "All Parameters" for exceedances of the daily maximum. An exceedance of the rolling 7-day average criterion occurs when the average of the daily maximum of each 7-day period exceeds the criteria. Any exceedance of the rolling 7-day average constitutes non-compliance with the temperature criteria.

- Turbidity: The SWQS criteria for turbidity are expressed as either a maximum "not to exceed at any time" or as a 30-day average. See description of "All Parameters" for exceedances of the maximum "not to exceed at any time". Any exceedance of the 30-day average constitutes non-compliance with the turbidity criteria.

Duration (Exposure Periods): The SWQS include 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 example, chronic aquatic life criteria require a four-day exposure period; therefore, data collected under flow conditions that last less than four days (as is generally the case for high flow conditions) are not considered valid for assessment of chronic aquatic life criteria but such data may be used to assess acute aquatic life criteria, which do not have such duration constraints. For human health carcinogen criteria, which are based on a 70-year exposure rate, the Department calculates a long-term average of all data available for the most recent five-year period for comparison to the applicable criterion.

Total Recoverable and Dissolved Metal Data: 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, while AQLa and AQLc are based on the dissolved fraction to protect aquatic life. To the extent available, total recoverable (TR) and dissolved fraction (DF) data are 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 also compares the TR concentrations to the DF criterion. If the TR concentrations are below the DF criterion, the Department concludes the DF criterion is also met. TR concentrations above the DF criterion will trigger additional sampling for DF.

Criteria in the Pinelands: Current SWQS criteria in the Pinelands (PL) require these waters be maintained as to quality in their existing state or that quality necessary to attain or protect the designated uses, whichever is more stringent. This applies to all chemical, physical and biological elements except for nitrate and pH that have Pineland specific numeric criteria. Since existing data and sampling protocols for ambient data precludes the ability to use this narrative standard to effectively assess these waters, the Department has determined that it is appropriate to apply freshwater (FW2) numeric criteria to PL waters for some chemical and physical assessments to determine if they meet the minimum standards to support their designated use, unless and until appropriate concentration thresholds corresponding to existing state are determined (7:9B-1.14 (b) 1 in NJDEP's SWQS). For biological assessments, the Department developed a Pineland specific benthic macroinvertebrate index to assess biological conditions which is described in section 4.3 Biological Data. Because temperature and dissolved oxygen are primarily based on fish species to determine thresholds and fish species in the Pinelands are similar to other New Jersey fresh waters in the coastal plain, the Department applies the corresponding FW2 criterion as a surrogate for the criterion for PL waters when assessing the Aquatic Life and Trout Designated Uses. For other physical and chemical parameters such as *E. coli*, enterococcus, phosphorus, turbidity, TSS, and TDS, the corresponding FW2 criteria are used to determine if the associated designated use is supported. It is understood that the Pineland's unique ecosystem and natural conditions may have requirements that are not accounted for in the FW2 criteria. Therefore, the Department will explore future options to determine appropriate assessment methods that accurately reflect natural conditions in these waters. These options include collecting continuous data to cover a range of conditions to determine the background or existing natural conditions and evaluating if revised criteria are appropriate.

Naturally low pH: New Jersey currently has two surface water quality criteria for pH, one criterion (generally 3.5- 5.5) for the naturally acidic Pinelands waters, and another (6.5-8.5) for all other waters of the State. Pinelands waters (PL) were designated based on political boundaries that delineate the "Pinelands Area" of the State. The true extent of the low pH, low buffer capacity waters historically characteristic of the New Jersey Coastal Plain "Pinelands" lies well beyond this political boundary and is closely aligned with the underlying geology of the region. The Coastal Plain has hydrologic and geological conditions that are very similar to the Pinelands. Since surface water pH levels are locally influenced by soil type, and since soils do not follow a clear and concise pattern, the Department evaluates impairments attributed to low pH in Coastal Plain waters based on an assessment of natural conditions (also see "Natural Conditions" in Section 3.2 Criteria and Policies).

Outliers: Any datum that is identified as an outlier based on an accepted statistical methodology (such as ASTM E178, available on the American Society for Testing and Materials website at http://www.astm.org/Standards/E178.htm) is not considered a valid result and is not assessed unless supporting lines of evidence support the data.

4.2 Pathogenic Indicators

Pathogenic indicators are used to assess recreational and shellfish harvest for consumption uses. The type of pathogenic indicator sampled depends on the type of use assessed: *E. coli* is sampled to assess primary contact recreation in freshwaters; fecal coliform is sampled to assess secondary contact recreation in SE2 and SE3 waters; enterococcus is sampled to assess primary contact recreation in SE and SC waters; and fecal coliform is sampled to assess the shellfish harvest for consumption use in shellfish waters.

4.3 Biological Data

The Department has developed biological indicators (benthic macroinvertebrates and fin fish) to evaluate aquatic life use support.

Benthic Macroinvertebrate Data: The Department uses three biological indices based upon genus level taxonomy to evaluate biological conditions in freshwater streams. 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 that are representative of the Pinelands. For the 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 Outstanding National Resource Waters (ONRW) PL waters. Because FW2 waters are not expected to have the same biological conditions as ONRW waters, the fair category is regarded as fully attaining the aquatic life use. Additional information about these three metrics is available in the Standard Operating Procedures for Ambient Biological Monitoring Using Benthic Macroinvertebrates - Field, Lab, Assessment Methods (NJDEP, 2007), available on the Department's website at http://www.state.nj.us/dep/wms/bfbm/download/AMNET_SOP.pdf. A fourth Benthic Index of Biotic Integrity was developed for the New York/New Jersey Harbor Estuary based on USEPA Region 2's Regional Environmental Monitoring Assessment (REMAP) protocol and applied to all waters within the New York/New Jersey Harbor Estuary. This index was developed by scoring each metric in 3 categories, "5", "3", or "1". Additional information is available on USEPA's website at http://archive.epa.gov/emap/archive-emap/web/pdf/ny_njharbor98.pdf. The four regions applicable to each metric are shown in Figure 4.1. Assessment result scenarios for each metric are shown in Table 4.1.

Figure 4.1: Spatial Extent of Application for Each of the Benthic Macroinvertebrate Indices Applied in NJ

Region Assessed by High Gradient Macroinvertebrate Index (HGMI)

Region Assessed by Pinelands Macroinvertebrate Index (PMI)

Region Assessed by Coastal Plain Macroinvertebrate Index (CPMI)

Region Assessed by REMAP Estuarine Index

Table 4.1: Descriptive and Regulatory Thresholds for Biological Metrics

Macroinvertebrate Index for High Gradient Streams (HGMI Metric)
(Highlands, Ridge and Valley, Piedmont Physiographic Provinces)

Category	Metric Score	Assessment
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

Category	Metric Score	Assessment
Excellent	22 - 30	Not Impaired
Good	12 - < 22	Not Impaired
Fair	6 - < 12	Impaired
Poor	< 6	Impaired

Macroinvertebrate Index for Pinelands Waters (PMI Metric)

Category	Metric Score	Assessment Result
Excellent	63 - 100	Not Impaired
Good	56 - < 63	Not Impaired
Fair	34 - < 56	Impaired[1]
Poor	< 34	Impaired

Regional Monitoring and Assessment Program (REMAP) Assessments (Raritan & Newark Bay, Arthur Kill, Kill Van Kull)

Overall Metric Score	Assessment Result
≥3	Not Impaired
<3	Impaired

[1]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. PMI was developed specifically to reflect the unique conditions of Outstanding National Resource Waters (ONRW) PL waters. Because FW2 waters are not expected to have the same biological conditions as ONRW waters, the fair category is regarded as fully attaining the aquatic life use.

Barnegat Bay Benthic Macroinvertebrate Index

As part of the ongoing effort to develop a benthic biotic index as an ecological indicator for estuarine waters, the Department designated the Multivariate AZTI Marine Biotic Index (M-AMBI) to assess the health of the benthic community in the Barnegat Bay based on research conducted by Rutgers University. From 2012 to 2014, Rutgers University conducted a study to assess the ecological health of the benthic macroinvertebrate community in the Barnegat Bay-Little Egg Harbor complex as part of a comprehensive assessment of the bay sponsored by the Department. The study randomly selected 100 monitoring locations throughout the bay with sampling occurring during July of each of the three years. The analysis incorporated four benthic metrics to assess the bay for the first two years using the Benthic Index of Biotic Integrity (B-IBI),

Virginian Province Index (VPI), Benthic Quality Index (BQI) and Multivariate AZTI Maine Biotic Index (M-AMBI). In both assessments, there was generally good agreement among the indices regarding the health of the benthic community; however, of the four indices, the M-AMBI metric showed the most versatility. The Rutgers reports for Years One, Two, and Three may be viewed at http://nj.gov/dep/dsr/barnegat/final-reports/benthic-invertebrate-reports.htm**.**

The AMBI metric was originally developed in Europe in support of the European Union Water Directive Framework. The metric has been used for some 16 years and has undergone improvements since its inception including modifications for use in the Virginia Province, which extends from Cape Cod to the Chesapeake Bay, by the addition of taxa native to the Province. The AMBI is based on assigning benthic invertebrate taxa to one of five pollutant tolerance groups reflecting each taxa's relative presence along an anthropogenic disturbance gradient. For example, Group one is highly intolerant to pollution and quickly recedes from the community under moderate levels of pollution whereas group five is highly tolerant and can thrive in polluted conditions.

The process by which taxa are assigned to groups is based on a broad survey of benthic experts thereby providing the AMBI a strong, scientifically proven, flexible basis for benthic macroinvertebrate classification. Ultimately Rutgers selected a variant of the AMBI, the Multivariate-AZTI Marine Biotic Index (M-AMBI) (Borja, et al, 2012, Muxika et al, 2007) as the best index for assessing the biological data and determining the benthic macroinvertebrate health of the Bay. The M-AMBI represents a modification of the original AMBI with the addition of a multivariate and species diversity assessment that enhances the robustness of the index. Additionally, the M-AMBI proved its capability to incorporate the pronounced salinity gradient characteristic of the Bay to determine the health of the biotic communities**.**

The metric scores for the M-AMBI are allocated into 5 categories: High, Good, Moderate, Poor, and Bad (see Table 4.2). The assessment categories of "High" and "Good" meet the Framework's water quality objectives and are deemed to represent waters fully supporting the Aquatic Life Use. The "Poor" and "Bad" categories do not meet the Framework's water quality objectives and do not support Aquatic Life Use. The "Moderate" category represents transitional conditions that are undetermined for assessment purposes, but characterize situations that warrant further study.

Table 4.2: Descriptive and Regulatory Thresholds for Barnegat Bay Biological Metric

Category	Metric Score	Assessment
High	>0.77	Not Impaired
Good	0.53 - 0.77	Not Impaired
Moderate	0.39 - 0.53	Undetermined
Poor	0.2 - 0.39	Impaired
Bad	<0.2	Impaired

Volunteer Benthic Macroinvertebrate Data: Although the HGMI, CPMI, and PMI are the primary indices used to evaluate biological conditions in freshwater streams, additional indices have been developed for citizen scientists and volunteer organizations to use when identification of organisms to the genus/species level is cost-prohibitive. These volunteer indices are modeled

after the Department's three biological indices but use the less detailed order/family level taxonomy to evaluate biological conditions in freshwater streams instead of the genus level taxonomy.

The three volunteer indices apply to the State's waters using the same ecoregions as defined above, although the number of categories is reduced to three categories: Healthy, Stressed, and Undetermined. The category reduction was necessary to address the level of precision that is lost using order/family level data in lieu of genus level data, resulting in the reduction of the "Good" and "Fair" categories to "Undetermined" since the data precision does not allow an assessment decision to be made between non-impaired and impaired conditions within these categories. The indices only allow assessment decisions for streams that show very healthy or stressed biological conditions and are based on the concept that when a stream is very healthy the macroinvertebrates found in the sample show a diversity of organisms with high counts of organisms intolerant to pollution, while in an impaired stream the macroinvertebrates show a lack of diversity in organisms with a majority found to be tolerant to pollution. Table 4.3 shows the categories and metric scores. Additional information describing the development of the volunteer indices will be posted on the Bureau of Environmental Analysis, Restoration and Standards web page under "Citizen Science."

Table 4.3: Volunteer Benthic Macroinvertebrate Indices

Volunteer High Gradient Index (VHGMI)

Category	Metric Score	Assessment
Healthy	$\geq$ 65	Not Impaired
Undetermined	64 - 36	Not Assessed
Stressed	< 35	Impaired

Volunteer Coastal Plain Index (VCPMI)

Category	Metric Score	Assessment
Healthy	> 20	Not Impaired
Undetermined	19 - 13	Not Assessed
Stressed	< 12	Impaired

Volunteer Pineland Index (VPMI)

Category	Metric Score	Assessment Result
Healthy	$\geq$ 75	Not Impaired
Undetermined	74 - 46	Not Assessed
Stressed	< 45	Impaired

Fin Fish Data: The Department uses three biological indices based on fish population data to evaluate biological conditions in freshwater streams. Fin fish data are assessed using the Fish Index of Biotic Integrity (FIBI). The Department recently completed an update of the FIBI process to include the Headwaters IBI which is posted on the web site and integrated into the 2016 assessment.

The Headwaters IBI (HIBI), a multimetric index that assesses the overall condition of a headwater stream based on the biological assemblage present within and along the stream corridor, was developed by the Department along with the Academy of Natural Sciences of Drexel University (ANS). The new index incorporates amphibian and crayfish assemblages in addition to fish assemblages as indicators for overall biological conditions. The index was developed to address the distinctive conditions of headwaters streams including their small size, vulnerability to disturbances, and particular biological community.

There are three fish indices developed for different stream sizes and physiographic regions of the State: the Northern Fish IBI (NIBI), which applies to the streams greater than 4 square miles in watershed area within the northern ecoregions (Highlands, Ridge and Valley, and Piedmont); the Headwaters IBI (HIBI), which applies to streams less than 4 square miles in watershed area within the northern ecoregions (Highlands, Ridge and Valley, and Piedmont); and the Southern Fish IBI (SIBI), which applies to streams greater than 2 square miles in watershed area within the Inner Coastal Plain (excluding waters considered Pinelands waters). A more detailed description of the FIBI program, including sampling procedures, is available on the Department's website at http://www.state.nj.us/dep/wms/bfbm/ibipagemain.htm.

The NIBI, HIBI, and SIBI all have five assessment result categories: excellent, good, fair, poor, and very poor. Scores in the "excellent", "good", and "fair" categories indicate that biology is not impaired while scores in the "poor" and "very poor" categories indicate that the biology is impaired (see Table 4.3c).

Table 4.4: Descriptive and Regulatory Thresholds for Biological Metrics for Fin Fish

Northern Fish Index of Biotic Integrity (NIBI): Highlands, Ridge and Valley, Piedmont Physiographic Provinces		
Category	**Index Score**	**Assessment Result**
Excellent	79-100	Not Impaired
Good	60-78	Not Impaired
Fair	38-59	Not Impaired
Poor	19-37	Impaired
Very Poor	0-18	Impaired

Headwaters Index of Biotic Integrity (HIBI): Highlands, Ridge and Valley, Piedmont Physiographic Provinces		
Category	**Index Score**	**Assessment Result**

Excellent	81-100	Not Impaired
Good	61-80	Not Impaired
Fair	41-60	Not Impaired
Poor	21-40	Impaired
Very Poor	0-20	Impaired

Southern Fish Index of Biotic Integrity (SIBI): Inner Coastal Plain (Non Pineland)		
Category	**Metric Score**	**Assessment Result**
Excellent	81-100	Not Impaired
Good	61-80	Not Impaired
Fair	41-60	Not Impaired
Poor	21-40	Impaired
Very Poor	0-20	Impaired

Additional Considerations When Evaluating Biological Data

- In general, biological assessments are based on the most recent results. However, the Department takes into consideration the results from previous years' assessment results when making a final assessment decision.

- Because genus level indices provide significantly more accurate assessments of biological conditions than the order/family level indices, they are the primary means to assess benthic macroinvertebrate communities.

- Disturbed or impaired biota can result from drought conditions that result in reduced base flow or extreme storm events that cause very high flows. If biological communities are impaired due to drought-induced, low flow conditions or during very high flood conditions, the impairment is attributed to natural conditions and the data are not considered valid for assessment purposes (see "Natural Conditions" in Section 3.2).

- The Department has developed multiple biological indices based upon both fish and benthic macroinvertebrates that represent several tropic levels and each assessing significantly different spatial and temporal scales. Where multiple indices are employed on a waterbody, if one indicates impairment, the aquatic life use is listed as impaired.

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 and multiple waterbody types. Data from one or more monitoring stations located within a given assessment unit are used to evaluate water quality within that assessment unit's boundaries. 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 stations within an assessment unit yield different assessment results, generally the assessment decision is based on the worst case. Where there are numerous beach or shellfish harvest closures within an assessment unit, the spatial coverage of these impairments are evaluated in assessing support of the recreation and shellfish consumption uses for the respective assessment units. The final decision in the primary water region is based on the Regional Comprehensive Assessment process by completing a thorough, in-depth analysis incorporating water quality data along with other factors such as hydrology, geology, land use, biological habitat conditions, meteorology, restoration activities, point and nonpoint sources and other relevant scientific considerations to determine overall water quality in the assessment unit.

Assessment Units: The Integrated List presents the assessment results of 958 assessment units that include New Jersey's 950 assessment units, which are assessed by the Department, and 8 assessments units for the Delaware River and Bay, which are assessed by DRBC. The Delaware River assessment units were consolidated in Zone 5 to follow DRBC's consolidation from three zones (Zones 5A,5B,5C) to one (Zone 5). Generally, New Jersey's assessment units are delineated based on 14-digit Hydrologic Unit Code (HUC) boundaries. HUCs are geographic areas representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the USGS in cooperation with the Natural 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. In 2009, the Department revised the HUC 14 boundaries to be more consistent with the new federal HUC 12 boundaries, which are based on 1:24,000 base maps for elevation control and a new 1:2,400 hydrography coverage (see NJGS TM09-2 available on the Department's website at http://www.state.nj.us/dep/wms/bears/docs/tm09-2.pdf.

For the 2016 Integrated List, all of the assessment units are based on HUC 14 boundaries except within the Barnegat Bay. The Department revised the assessment units in the Barnegat Bay in 2014, based on hydrologic and water quality data, to more accurately reflect conditions within the bay. This resulted in replacing 11 assessment units that were based on HUC 14 boundaries with 9 new assessment units. These changes are reflected in Figure 5.1 and Table 5.1, which shows the new assessment units and their relationship to the HUC 14 boundaries. These changes only apply to the Integrated Report and do not affect the delineation of HUC 14 subwatersheds in Barnegat Bay.

Figure 5.1: Revised Assessment Units in the Barnegat Bay

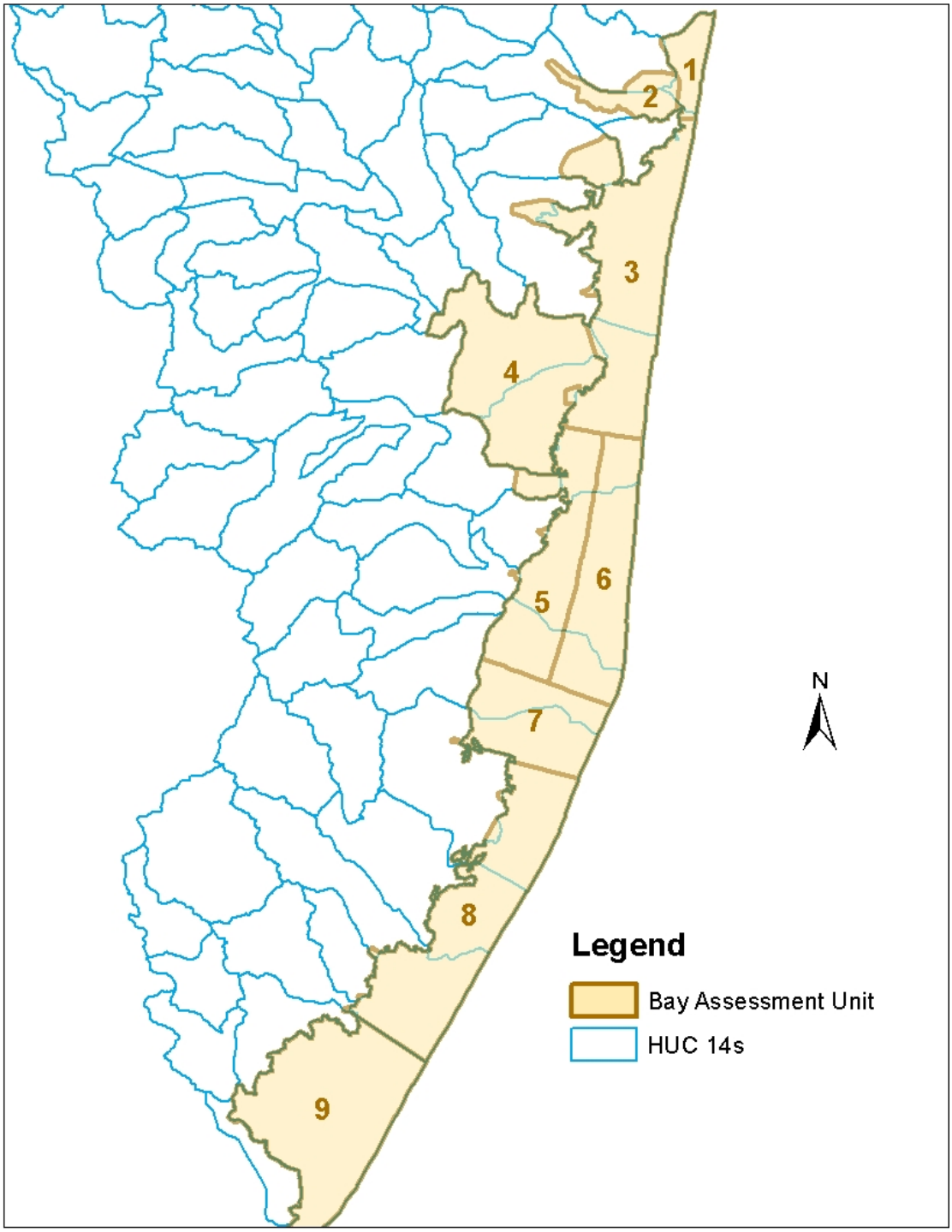


Table 5.1: Revised Assessment Units in the Barnegat Bay

ID	Assessment Name
BarnegatBay01	Point Pleasant Canal and Bay Head Harbor
BarnegatBay02	Metedeconk R Estuary
BarnegatBay03	Metedeconk and Lower Tribs - Bay
BarnegatBay04	Toms R Estuary
BarnegatBay05	Barnegat Bay Central West
BarnegatBay06	Barnegat Bay Central East
BarnegatBay07	Barnegat Bay Central Bottom
BarnegatBay08	Manahawkin Bay and Upper Little Egg Harbor
BarnegatBay09	Lower Little Egg Harbor Bay

Station Representation: Monitoring stations are associated with an assessment unit for the purpose of making water quality assessment decisions. Before assigning a monitoring station to an assessment unit, the Department reviews the monitoring station location to determine if it represents the water quality conditions of an assessment unit. Factors used to determine a monitoring station's spatial extent include the location of potential point and nonpoint sources, land use, stream classifications, significant tributaries, impoundments, or other hydrological alterations that could impact water quality. If there are no applicable monitoring stations for an assessment unit, the uses designated for that AU is assessed as "insufficient information".

De minimus: When evaluating data from multiple stations within an assessment unit, the Department may evaluate the spatial extent of impairment. If the Department determines that the station with impaired water quality represents a very small portion of the assessment unit, and water quality at the other stations is not impaired, then the impairment is considered "de minimus" and the entire assessment unit is assessed as "fully supporting" the applicable use. These decisions are documented in the Integrated List generated from USEPA's ADB.

Assessment Units: with More Than One Stream Classification: Data is compared to the SWQS for the stream classification where the station is located. Assessment units may contain both FW and SE waters, or a combination of Trout Production, Trout Maintenance, and Non-Trout waters. Where the assessment unit contains more than one classification and there is no data for the higher classification, then data from the station located in the lower classification is compared to the SWQS for higher classification. If the station meets the SWQS for higher classification, the data is used to assess both classifications. However, if the station located in the lower classification does not meet the SWQS for the higher classification, the higher classification cannot be assessed and the use associated with the higher classification is assessed as "insufficient information."

"Weighing Data": In circumstances where multiple sampling stations represent an AU, weighing data is necessary when evaluating numerous data sets that have different data collection and analysis methods, or have temporal or spatial sampling variability. Contradictory data sets are "weighed" as follows: newer data overrides older data; larger data sets with better temporal coverage override nominal data sets; sampling stations with a location that is more representative of the AU may override other stations that are poorly located or are "de minimus", and higher

quality data overrides data sets of lower quality based on sampling protocol, equipment, training and experience of samplers, quality control program, and lab and analytical procedures.

Where both grab samples and continuous monitoring data are available, the Department gives more weight to the continuous monitoring data where grab samples do not capture the most critical time period. For continuous monitoring, the location, duration, time period and data quality/reliability are considered when determining its significance in reflecting water quality conditions.

Assessing Lake Data: Lakes are assessed based upon in-lake chemistry data collected just below the surface. (For lake sites equal to or greater than 2 meters in depth, samples are taken at 1-meter depth. For lake sites less than 2 meters in depth, samples are taken at mid-depth.) Lakes may have multiple in-lake sampling locations, depending on their size. Each sampling location within a lake is considered a "subsample". Lake subsamples that do not comply with the applicable numeric SWQS criteria are considered exceedances; however, exceedances occurring at multiple locations or subsamples within a lake on the same date are considered a single exceedance. Data from lake monitoring stations are evaluated along with data from other monitoring stations associated with the assessment unit.

Modeling and Sampling Results: Water quality models are used to predict changes in water quality over time under different flow, weather, and temporal conditions. The Department may use the results obtained through a validated water quality or dynamic model to assess use support and/or place or remove an assessment unit/pollutant combination from the 303(d) List, if the Department determines that the model adequately predicts water quality in that assessment unit.

6.0 Designated 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;

The Department uses both numeric and narrative criteria and policies to protect designated uses. Numeric criteria are estimates of constituent concentrations that are protective of the designated uses. Narrative criteria and policies are non-numeric descriptions of conditions to be supported, maintained, or avoided. The Department has identified assessment approaches, also known as "translators", to quantitatively interpret narrative criteria/policies, which are qualitative in nature. This section outlines the methodologies used to assess support of each designated use based on the numeric and/or narrative criteria applicable to each use and the integration of data for multiple parameters at multiple stations for each assessment unit.

Appendix A of the Methods Document identifies the parameters associated with each designated use. The Department assesses designated use support by evaluating compliance of the water quality results with the applicable SWQS criteria or translators. However, data for every parameter associated with a particular use is not required to assess the use. The Department uses a conservative approach regarding use assessment that requires more extensive data for concluding that an assessment unit is "fully supporting" a designated use than is needed to conclude that the use is not supported. Specifically, an assessment unit is assessed as fully supporting the designated use only if data for the minimum suite of parameters are available and the data indicate that it meets the applicable criteria. If data for the minimum suite of parameters is not available, the applicable use is assessed as "insufficient information". If data for any one parameter associated with a designated use (Appendix A parameters) exceed the applicable criteria, the assessment unit is assessed as not supporting the designated use even if data for the minimum suite of parameters are not available. (Note that "insufficient information" can mean either that sufficient data are not available to assess the designated use (Table 6.1) or that no data are available (i.e., that use/assessment unit is not sampled).

Table 6.1: Minimum Suite of Parameters Needed to Determine Use Is "Fully Supporting"

Designated Use	Minimum Suite of Parameters
General Aquatic Life	Biological data
Aquatic Life - Trout	Biological data and Temperature and DO
Recreation	Pathogenic Indicator Bacteria
Shellfish Harvest for Consumption	Fecal Coliform
Public Water Supply	Nitrate
Fish Consumption	Fish tissue data

6.1 Aquatic Life Use Assessment Method

The aquatic life use in non-tidal freshwater rivers and streams is assessed by evaluating biotic communities using metrics developed for benthic macroinvertebrate data, in conjunction with Fin Fish Index of Biotic Integrity (FIBI) data. In estuarine waters, biotic indices have been developed only for application in the New York/New Jersey Harbor as well as the Barnegat Bay Estuary using benthic invertebrates. The regulatory thresholds applied to these bio indices are delineated in section 4.3 above. The Department is in the process of developing a biotic index for the near shore marine waters and other estuarine waters. The marine waters and lakes without biological indices currently only use biologically-relevant chemical parameters.

All of these waters use a broad suite of biologically-relevant physical/chemical data (e.g., nutrients, dissolved oxygen, pH, temperature, toxic pollutants, turbidity, TSS). The biological assessment integrates a full suite of environmental conditions over many months (for macroinvertebrates) to many years (for fish). Biological data is required to conclude that aquatic life uses are fully supported, however, chemical data alone is sufficient to determine that the use is not supported and to place the chemical parameter on the 303(d) List as the cause of non-support. The required minimum physical/chemical parameters differ for the two designated aquatic life uses, based on the criteria associated with their respective waterbody classifications. Specifically, both temperature and dissolved oxygen are required, in addition to biological data, to determine if the

trout aquatic life use is fully supported but only biological data is required to determine if the general aquatic life use is fully supported (see Table 6.1). Table 6.2 summarizes the possible outcomes of the aquatic life use assessment based upon various combinations of data and results.

Table 6.2: Aquatic Life Use Assessment Results

Results of Biological Assessment*	Results of Aquatic Life Use Assessment (General and Trout)
Biological Monitoring Data Available, No Chemical/Physical Data Available	
Biology is not impaired or threatened	• General aquatic life use is "Fully Supporting". • Trout aquatic life use is "Insufficient Information".
Biology is impaired or threatened	Both aquatic life uses are "Not Supporting"; biological impairment represented by "Cause Unknown-Impaired Biota" identified as the cause.
Both Biological and Chemical/Physical Data Available	
Biology is not impaired or threatened, there are no chemical exceedances, and water quality is not threatened	Both aquatic life uses are "Fully Supporting".
Biology is impaired or threatened AND chemical/physical data show exceedances of aquatic life criteria or are threatened	Both aquatic life uses are "Not Supporting"; biological impairment represented by "Cause Unknown-Impaired Biota" and chemical/physical parameters exceeding criteria identified as the cause.
Biology is impaired or threatened BUT chemical/physical data show NO exceedances of aquatic life criteria	Both aquatic life uses are "Not Supporting"; biological impairment represented by "Cause Unknown-Impaired Biota" identified as the cause.
Biology is not impaired or threatened BUT chemical/physical data show exceedances of aquatic life criteria or water quality is threatened	Both aquatic life uses are "Not Supporting"; chemical/physical parameter(s) exceeding criteria identified as the cause.
No Biological Data Available; Chemical/Physical Data Available	
No exceedances of aquatic life criteria	Insufficient data to assess both aquatic life uses.
Exceedance of any aquatic life criterion	Both aquatic life uses are "Not Supporting"; chemical/physical parameter(s) exceeding criteria identified as the cause.

* The methods for assessing biological data are explained in Section 4.3, "Biological Data".

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, PL, and FW2 waters. SWQS criteria have been promulgated for secondary contact recreation in SE2 and SE3 waters. Primary contact recreation in FW1 waters is assessed using the SWQS criteria for FW2 waters because numeric criteria for recreational uses have not been promulgated for FW1 waters.

Recreational use support is assessed primarily by comparing the geometric mean (geomean) of the water quality data for pathogenic indicators to the appropriate SWQS criterion (see Section 4.2). At least five samples collected within a 30-day period are required to calculate a geomean in accordance with the current SWQS, however, other sampling frequencies may be acceptable provided that the frequency supports the statistical method for calculating a seasonal geomean. Beach closure data is also considered in assessing recreation uses in assessment units that contain 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. Assessment units containing designated bathing beaches are assessed as fully supporting primary contact recreation if the seasonal pathogenic indicator geomean does not exceed the applicable SWQS and there are no beach closures lasting seven or more consecutive days in a given year, nor does the average number of beach closures exceed 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 NJ Department of Health's web site at http://www.state.nj.us/health/phss/documents/recbathing.pdf. In assessing designated bathing beaches, the Department reviews the beach closure data to confirm that the closures were due to water quality data showing exceedance of the SWQS. Beach closures for issues other than water quality (e.g., precautionary closure) are not considered in assessing recreational use support. Table 6.3 summarizes the possible outcomes of the recreational use assessment.

Table 6.3: Recreational Use Assessment Results

Data Assessment Results	Use Assessment Results*
a) Beach closure data does not identify impairment (Primary Contact), AND b) Applicable pathogenic indicator SWQS criteria are met	Use Is Fully Supported
a) Beach closure data identifies impairment* (Primary Contact), OR: b) Applicable pathogenic indicator SWQS criteria are not met	Use Is Not Supported
Neither beach closure nor pathogenic geomean data is available	Insufficient Information

*Note: 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. When impaired bathing beaches represent a minute portion of the total area of the assessment unit, generally less than 5% of the AU, the Department may regard the impairment as

de minimus and consider the recreational use fully supported for the entire assessment unit (see Section 5.0, "De Minimus").

6.3 Fish Consumption Use Assessment Method

The fish consumption use is assessed primarily by comparing fish tissue samples with the thresholds for fish tissue concentrations of specific bioaccumulative toxic pollutants that are used to develop fish consumption advisories (Table 6.4). 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 tissue thresholds. The toxic substances that are found in fish tissue, including mercury and chlorinated organic compounds (PCBs, dioxin, chlordane and DDT and its metabolites) are persistent bioaccumulative contaminants. This means that concentrations in fish tissue vary with the age (size) and trophic level (position in the food chain) of the fish. In addition, the persistent chlorinated organic compounds are stored in the lipids and are more likely to be found in fatty fish. Therefore, a top trophic level fish that is low in lipids would have significant levels of contamination with chlorinated organic compounds only if the levels of contamination in the waterway are very high. Therefore, the size, age and species of the fish are significant and need to be considered when assessing the data. Additionally, known migratory fish should not be used for use attainment decisions. If the migratory range of a species is known to extend beyond the state's jurisdictional waters, such as bluefish and striped bass, then data will not be used in view of the migratory nature of these fish, the distances they travel, and because it has not been established where along the eastern seaboard these fish acquired the contaminants. However, these migratory fish species will continue to be used for fish consumption advisories.

Mercury: The Department has established a threshold of 0.18 µg/g, for mercury in fish tissue, which reflects a "one meal per week" consumption restriction for high risk populations. This threshold is based on the water quality target concentration established in the Department's Statewide Mercury TMDL, which was approved by USEPA on September 25, 2009. (The TMDL report is available on the Department's website at: http://www.state.nj.us/dep/wms/bears/tmdls.html.) The mercury threshold for unlimited consumption for the high risk population cannot be attained, based upon the expected mercury concentration in fish tissue that is attributed solely to natural sources that cannot be reduced. Because of these natural sources, it is likely that fish consumption advisories for mercury will continue to be necessary to protect high risk populations even after all anthropogenic sources of mercury have been eliminated.

When evaluating the data for a listing for mercury, a fish tissue sample taken from a small or lower trophic level individual may not be representative of the degree of contamination of the waterway and the overall safety of consuming fish from that waterway. It is difficult to compare fish of different trophic levels and different sizes. The top tropic level species should be used and the fish should be of similar length. Generally, the best top trophic level freshwater fish for water assessment in NJ would be Largemouth Bass, *Micropterus salmoides* and Chain Pickerel, *Esox niger*. These two species are found throughout the New Jersey in almost all waterways and bioaccumulate chemical contaminants.

If tissue samples from top trophic level fish are not available, lower trophic level species can be used to list the waters as impaired for fish consumption if the contaminant levels exceed the advisory level because it can be expected that the top trophic level fish would have higher concentrations of contaminants. If the concentration of mercury in the lower trophic level fish is below the threshold value it cannot be assumed that the top trophic level fish would be below threshold values. Therefore, contaminant concentrations below the advisory concentrations in lower trophic level fish cannot be used to determine attainment.

PCBs, Dioxin, Chlordane, and DDT and its metabolites: Thresholds for fish tissue-based, PCBs, Dioxin, Chlordane, and DDT and its metabolites (Table 6.4) are intended to protect the high risk population which includes infants, children, pregnant women, nursing mothers, and women of childbearing age. Where fish tissue concentrations are below these thresholds, fish consumption is unrestricted.

Benthic omnivores that are very lipid rich species should be sampled for these contaminants. American Eel, *Anguilla rostrata,* and Carp, *Cyprinus carpio*, are the species that make the best indicators of contamination by chlorinated organic compounds, followed by Bullhead, *Ictalurus spp* and Channel Catfish, *Ictalurus punctatus* (where available). Channel Catfish are largely piscivorous but limited in distribution. Carp are very abundant everywhere and Bullhead (Brown and Yellow) are available but difficult to collect. American Eel are found in most lakes, rivers and streams throughout New Jersey and are the species that can be collected almost everywhere. They come into New Jersey from the ocean as elvers and travel past dams and obstructions to lakes far away from the ocean. They live for about 15 years in freshwater then emigrate out to the Sargasso Sea, spawn and die. While they are here, they stay within the confined waterway and, therefore, are a good indicator despite their complicated life cycle.

The same method as described above for mercury is applicable for assessment of data for PCBs, dioxin, chlordane, and DDT and its metabolites using the appropriate species of fish. As these compounds are also persistent and bioaccumulative the fish should be of similar length to be appropriately evaluated.

Table 6.4: Thresholds for Fish Tissue-based Toxics

Bioaccumulative Toxic Parameter	Tissue Concentration Threshold
Mercury	0.18 ppm(µg/g)
PCBs	8 ppb(µg/Kg)
Chlordane	11.0 ppb(µg/Kg)
Dioxin	0.19 pptr (ηg/Kg)
DDT and Metabolites (DDD and DDE)	86.0 ppb(µg/Kg)

In addition to fish tissue concentrations, the Department also evaluates water column data for certain toxic pollutants, where available, to determine compliance with applicable human health criteria. The Department utilizes the human health criteria for SE/SC waters, which are based on "fish consumption only" standards. Consequently, for all SE/SC waters that exceed the human health criteria, the fish consumption designated use is not supporting. These pollutants are

identified in Appendix A under "Fish Consumption". Table 6.5 summarizes the possible outcomes of the fish consumption use assessment.

Table 6.5: Fish Consumption Use Assessment Results

Data Assessment Results	Use Assessment Result
a) In all waters, fish tissue concentrations of appropriate top trophic level fish species are below the applicable thresholds for all parameters, AND b) In SE/SC waters only, there are no exceedances of the human health criteria for selected parameters in the water column	Use is Fully Supported
a) In all waters, fish tissue concentrations (any trophic level) exceed the applicable threshold for one or more parameters; OR b) In SE/SC waters only, one or more selected parameters in the water column exceed the applicable human health criteria	Use is Not Supported
Neither fish tissue of appropriate species nor water column data is available	Insufficient Information

6.4 Shellfish Harvest for Consumption Use Assessment Method

The shellfish harvest for consumption 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 website at http://www.fda.gov/food/guidanceregulation/federalstatefoodprograms/ucm2006754.htm. 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, special seasonal restricted, seasonally approved, or prohibited for harvest. The legal description of shellfish classification areas is updated annually in the Shellfish Growing Water Classification rules 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 of shellfish waters are established in restricted areas around potential pollution sources, such as sewage treatment plant outfalls, marinas, and outfalls as a preventive measure to avoid the harvest of shellfish that could become contaminated by sewage, boat wastes or stormwater runoff. Where shellfish harvest is prohibited due to an administrative closure, such prohibited areas are not included in the overall shellfish use assessment. Where shellfish harvest is special restricted or seasonal due to an administrative closure, such restricted areas are not based on water quality and are regarded as "insufficient information".

Only assessment units containing shellfish waters classified as unrestricted are assessed as fully supporting the shellfish harvest for consumption use. This assessment method is very conservative and should not be used to determine the status relative to harvesting of shellfish.
The official adopted Shellfish Classification maps should be referenced for the actual areas approved for shellfish harvest, unrestricted or with restrictions. All other shellfish waters are assessed as not supporting the shellfish harvest for consumption use and the pollutant causing the waters to be prohibited for harvest (fecal coliform) is identified on the 303(d) List. Table 6.6 summarizes the possible outcomes of the use assessment for the shellfish harvest use.

Table 6.6: Shellfish Harvest for Consumption Use Assessment Results

NSSP Classification	Assessment Results*
Unrestricted, Approved	Use Is Fully Supported
Prohibited, Special Restricted, or Seasonal classifications based on water quality	Use Is Not Supported
Sufficient fecal coliform data is not available. Any seasonal or special restrictions are based on administrative closures.	Insufficient Information

*Note: When the area classified as prohibited, special restricted or seasonal represents a minute portion of the total area of the assessment unit, generally less than 5% of the AU, the Department may regard the impairment as *de minimus* and consider the shellfish harvest for consumption use fully supported for the entire assessment unit (see Section 5.0, "De Minimus").

6.5 Public Water Supply Use Assessment Method

The public water supply use is defined as waters that are potable after conventional filtration treatment and disinfection, without additional treatment to remove other chemicals. All FW2 and PL waters 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. The public water supply use is assessed primarily by comparing concentrations of associated chemical parameters (see Appendix A) to the applicable SWQS criteria. Nitrate is the only parameter for which there must be data to assess the water supply use. However, other parameters (for example, arsenic, cadmium, chromium, copper, cyanide, lead, mercury, thallium, zinc, chloride, radioactivity, and volatile organic compounds) are also used to assess the water supply use when sufficient data for these parameters is available.

The Department also evaluates monitoring data from treated or finished water supplies, where available, to determine compliance with the Safe Drinking Water Act's National Primary Drinking Water Regulations (NPDWRs, or primary standards). 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 closures, contamination-based drinking water supply advisories, better than conventional treatment requirements, and increased monitoring requirements due to confirmed detection of one or more pollutants.

Water supply use restrictions established by the Department's Bureau of Safe Drinking Water in response to documented violations of the Safe Drinking Water Act (SDWA) may also be

considered in assessing drinking water supply use support. Only violations that can be attributed to surface water sources are considered. Violations for copper and lead, which may be attributed to the collection system, are not used in assessing source water unless the violations occur in ambient waters.

Table 6.7 summarizes the possible outcomes of the drinking water supply use assessment. Since human health concerns associated with bioaccumulative constituents are generally addressed through consumption advisories, the Department reviews exceedances of human health criteria for such constituents to determine which use is not supported: the drinking water supply use, the fish consumption use, or both.

Table 6.7: Public Water Supply Use Assessment Results

Assessment Outcomes	Assessment Results
SWQS criteria are met for all associated parameters, waters are not threatened, AND there are no SDWA closures or use restrictions,	Use is Fully Supported
SWQS are exceeded for one or more associated parameters, waters are threatened, OR there are one or more SDWA closures or use restrictions	Use is Not Supported
Sufficient nitrate data is not available	Insufficient Information

6.6 Agricultural Water Supply Use Assessment Method and Industrial Water Supply Use Assessment Method

The Department has determined that it will no longer assess support of Agricultural and Industrial Water Supply Uses separately from the Drinking Water Supply Use because the Department has not promulgated surface water quality criteria specific to Agricultural and Industrial Water Supply Uses. In prior years, non-promulgated, literature-based thresholds were used to assess these uses even though it is not appropriate to apply non-promulgated water quality criteria to implement regulatory, enforceable actions. These thresholds were less stringent than the promulgated criteria for the same parameters associated with the Aquatic Life and Public Water Supply Uses. Therefore, if the Aquatic Life and Public Water Supply Uses are fully supported, these other water supply uses are also fully supported.

This revised approach does not result in any delisting from the 303(d) list since the Aquatic Life criterion for TSS and pH are the same or more stringent, respectively, than those used for Industrial Water Supply Use. In addition, no waters were listed on the 303(d) List based on an exceedance of the TDS threshold used to assess the Agricultural Water Supply Use. Therefore, these parameters (TSS, pH, TDS) continue to remain on the 303(d) List for exceeding the criteria for Aquatic Life Use or Public Water Supply Use.

7.0 Integrated Listing Guidance

New Jersey assigns individual water quality assessments in five categories (1,2,3,4, and 5), based upon EPA guidance. For each assessment unit, available water quality data for each parameter are compared to the criteria for that parameter. 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. In addition, New Jersey has modified these categories to add subparts to Sublist 5 based on EPA guidance to help clarify the response strategy for impairments. The sublists used to identify an assessment unit on the Department's Integrated List are described below.

Sublist 1: An assessment unit is fully supporting all applicable designated uses and no uses are threatened. (The Department does not include the fish consumption use for determining placement on this sublist.)

Sublist 2: The assessment unit is fully supporting the designated use but is not supporting all applicable designated use(s).

Sublist 3: Insufficient data and information are available to determine if the designated use is fully supported.

Sublist 4: One or more designated uses are not supported or are threatened but TMDL development is not required because of one of the following reasons:

A. A TMDL has been completed for the parameter causing use non-support.

B. Other enforceable pollutant control measures are reasonably expected to result in fully supporting the designated use in the near future.

C. Non-support of the designated use is caused by something other than a pollutant.

In 2016 EPA clarified previous guidance about the assessment and categorization of waters into Category 4C. If data and/or information is available that shows that a water is impaired due to pollution not caused by a pollutant (e.g., aquatic life use is not supported due to hydrologic alteration or habitat alteration), those causes should be identified as such and that water should be assigned to Category 4C. Examples of hydrologic alteration may include the following: a perennial water is dry, no longer has flow, has low flow, has stand-alone pools, or extreme high flows or there is any other type of alteration of the frequency, magnitude, duration or rate-of-change of natural flows in a water. Other examples of alteration could include water withdrawals, impoundments, or extreme high flows that scour out stream beds, destabilize stream banks and cause a loss of habitat.

Sublist 5: One or more designated uses are not supported or are threatened by a pollutant(s), that requires development of a TMDL, according to the CWA. Nevertheless, TMDL development is not an effective means to advance water quality improvement in all circumstances. The subparts described below have been developed to make clear the Department's intention with respect to development of a TMDL.

A. Designated use is not supporting due to arsenic which is present at levels below that determined to be attributable to naturally occurring geology/ soil.

Explanation: Arsenic is present at levels that exceed the established human health criterion in several locations throughout the State. It is known that, in many locations, levels in excess of the human health criterion are present due to naturally occurring geology and soil. Since 2003, the Department has worked with the United States Geological Survey (USGS) to investigate arsenic levels that were expected to represent natural conditions based on geology, monitoring of ground water in aquifers, surface water, and soil samples, including speciation between arsenic (V) and arsenic (III). Based on these USGS studies (referenced in Section 11.1), it was determined that the natural range of arsenic is 0.24-0.61 µg/l in the Outer Coastal Plain and 0.36-0.70 µg/l for the Inner Coastal Plain. When determining if a sampling location in the Outer or Inner Coastal Plain exceeds natural conditions, the higher limit of the natural range is used. Because naturally occurring levels of As cannot be reduced, a TMDL is not appropriate. USGS is continuing to study other regions and when the naturally occurring levels of As are identified in other regions, these findings will be reflected when determining impairment status in subsequent 303(d) listing cycles.

L. Designated use is not supporting due to legacy pollutants.

Explanation: Impairments that are attributed to parameters that are banned from production or use are placed on this subpart. The cause of these impairments is historical in nature; these pollutants linger in the environment long after new anthropogenic sources have ceased. Thus, the TMDL/regulatory response path envisioned under the CWA is not an effective means to address these impairments. Instead, follow-through on site remediation plans, development/implementation of pollutant minimization plans for incidental introduction into regulated discharges and natural attenuation are the main mechanisms for reduction. Parameters such as PCBs, dioxins, DDT and metabolites would fall in this category.

R. Designated use is not supporting and restoration activities have been identified in an approved Watershed Based Plan to address the parameter for which water quality standards are not attained.

Explanation: The Department has approved Watershed Based Plans (WBPs) in several locations throughout the State. The focus of WBPs is sources that are nonpoint or regulated stormwater, where source control through implementation of best practices is the most effective means to reduce loads. Similar to a TMDL, a WBP identifies the sources of a pollutant, the relative contribution and the load reduction needed to attain SWQS. A WBP goes on to identify the specific actions that would need to be undertaken to reduce loads of the pollutant of concern to levels that comport with attaining SWQS. Implementation of these watershed restoration plans is expected to improve water quality without the need for a TMDL, if one has not yet been developed. The WBP load reduction

measures depend largely on actions that could be implemented using 319(h), Farm Bill and other funding sources and/or stewardship activities. Therefore, Sublist 4B is not applicable, as measures are largely not enforceable. Instead, in locations where the sources are nonpoint or stormwater in nature and nonregulatory measures are the primary means available to reduce the loads, the Department will opt to pursue restoration and stewardship actions directly as the preferred path to reduce loads and attain water quality standards.

The 2016 Integrated List shows the use assessment results for each applicable designated use in each assessment unit and, for each use that is not supported, the Integrated List identifies the parameter "cause" and TMDL status for that cause or causes. The Integrated List further distinguishes between pollutant causes that require a TMDL (Category 5) and pollutant causes for which TMDLs have already been approved (Category 4A). In some cases, a regulatory response outside of a TMDL is permissible and the waterbody/pollutant combination is assigned to Category 4B (TMDL alternative). Where TMDLs have been approved, the assessment unit/pollutant combination is removed from the 303(d) List (see Section 7.2) and reassigned from Category 5 to Category 4A. The Integrated List shows such assessment units as "not supporting" those uses and shows the date completed under TMDL status for the corresponding cause. Only assessment unit/pollutant combinations for which a TMDL is indicated in accordance with the CWA is placed on the 303(d) List (see Section 7.1). The assessment unit/pollutant combinations that meet this criterion are further differentiated in accordance with the Sublist 5 subparts to indicate whether a TMDL is an appropriate response, as described above. Assessment unit Sublist 5 subpart placement will be reconsidered in subsequent cycles to determine if implementation measures have not been effective, circumstances have changed and/or a regulatory response becomes necessary.

7.1 Identifying Causes and Sources of Non-Support (303(d) List)

The List of Water Quality Limited Segments (303(d) List) is comprised of assessment unit/pollutant combinations, of which the "pollutant" is the chemical parameter (i.e., "pollutant") causing non-support of the applicable designated use. A pollutant is considered to be the cause of use non-support if it is associated with the designated use (see Appendix A) and it exceeds the applicable SWQS criterion.

If chemical/physical data are unavailable or show no exceedance of applicable criteria, but biological data indicate impairment, the cause of Aquatic Life Use (general or trout) non-support is identified on the 303(d) List as "cause unknown – impaired biota". Where biological data indicate impairment and chemical/physical data show exceedance(s) of applicable criteria, the chemical parameter(s) and biological impairment are identified as pollutant causes and placed on the 303(d) List.

A source assessment is conducted for each pollutant identified on the 303(d) List as causing non-support. "Suspected" sources of pollutants causing impairment are identified using the Department's Geographic Information System (GIS). A more thorough investigative study will be conducted through the TMDL and/or WBP process to determine the specific sources, and relative contributions, of the pollutant(s) and nonpoint sources causing use non-support.

7.2 Delisting Assessment Unit/Pollutant Combinations

There are specific scenarios under which USEPA allows states to remove an assessment unit/pollutant combination from the List of Water Quality Limited Segments (303(d) List), a process commonly referred to as "delisting". Appendix C of the 2016 Integrated Report identifies all assessment unit/pollutant combinations delisted from the 2016 303(d) List and the corresponding reason for each delisting action. Table 7.1 displays the subset of delisting codes and associated reasons applied by New Jersey for the 2016 Integrated List.

Table 7.1: Delisting Codes and Associated Reasons

USEPA Delisting Code	Delisting Reason
2	Flaws in original listing
3	TMDL Alternative (4B)
4	Not caused by a pollutant (4C)
5	TMDL approved or established by EPA (4A)
8	Applicable WQS attained; due to restoration activities
9	Applicable WQS attained; due to change in WQS
10	Applicable WQS attained; according to new assessment method
11	Applicable WQS attained; original basis for listing was incorrect
12	Applicable WQS attained; threatened water no longer threatened
13	Applicable WQS attained; reason for recovery unspecified
14	Data and/or information lacking to determine water quality status; original basis for listing was incorrect

8.0 Method to Rank and Prioritize Assessment Units That Do Not Fully Support Designated Uses

Section 303(d) of the federal Clean Water Act requires states to rank and prioritize assessment units that require development of TMDLs. 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. All assessment unit/pollutant combinations associated with Subparts A, L or R of Sublist 5 are included in the low priority category for reasons described in Section 7.0. The Department prioritizes remaining assessment unit/pollutant combinations identified on the 303(d) List and schedules them for TMDL development based on the following factors:

- TMDL complexity regarding data or modeling needs;
- Severity and/or spatial extent of the actual or threatened exceedance/impairment;

- Nature of the designated uses not being supported (i.e., aquatic life, recreational, economic, cultural, historic, and aesthetic importance);
- Efficiencies that could result from grouping TMDLs by drainage basin or parameter or leveraging other ongoing water quality studies, including in shared waters;
- Status of TMDLs currently under development;
- Degree of public interest and support for addressing particular assessment units.

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 assessment units, and 2) support development of TMDLs for all assessment unit/pollutant combinations identified as not attaining designated uses.

In 2004, New Jersey prepared its initial Long Term Monitoring and Assessment Strategy, under the EPA Guidance for Long Term Monitoring and Assessment Strategy development. That 10-year document, which articulated both the current monitoring and assessment capabilities of the Department's water monitoring programs as well as monitoring and assessment gaps, expired in December 2014. The Department is updating the Long Term Monitoring and Assessment Strategy to reflect its plans to implement its mission and achieve its goals under the Federal Clean Water Act for the period 2015-2025. The strategy document outlines the Department's plan to:

1. Continue to document the State of New Jersey's implementation of EPA's recommended elements of a State water monitoring program, in accordance with the regulations addressing water management plans under Section 106(e) of the Clean Water Act (33 USC 1256(e). All states are expected to provide and carry out a water quality monitoring program for use in compiling the 305(b) report as a condition of the Administrator making Section 106 grants to the State, and
2. Provide a framework for the State to articulate its programmatic and resource needs to implement the elements above, and
3. Serve as a tool to help EPA and the State determine whether NJ's water quality monitoring program meets the prerequisites of CWA Section 106(e)(1).
4. Allow the state to describe the who, what, when, where and why of water monitoring in NJ, and
5. Allow the NJDEP DWM&S to present its goals, objectives and approaches for the protection and management of NJ's water resources and
6. Provide a forum for dialogue with monitoring partners to allow for opportunities for collaboration and/or information dissemination through leveraging of resources.

The Department's goal for water monitoring and assessment is to make assessment decisions using high quality datasets that accurately reflect ambient water quality conditions on a region-wide basis. By using comprehensive, high quality datasets and multiple lines of evidence such as ambient water quality data, biological data, habitat data, and hydrological data as well as other relevant lines of evidence, the Department is able to make assessment decisions with a high degree of confidence that assists in identifying and addressing water resource concerns affecting targeted

regions. It is important to recognize that monitoring and assessing the different regions of the state requires significant effort and can only be accomplished over the long term.

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 and comment on the proposed assessment methods; and 3) review 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.

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 303(d) List component of the Report, which satisfies the reporting requirements of Section 303(d), includes the assessment units identified as not supporting one or more designated uses, the pollutants causing non-support 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 uses, entering the results into USEPA's ADB, and publishing those results as reports out of ADB that represent the Integrated List and 303(d) 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 Methods Document has been finalized and 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, publication on the Department's website and email to interested individuals and organizations. The time period for submitting data is specified in the public notice. The data

solicitation notice for the 2016 Integrated Report established a data collection deadline of July 1, 2015 and a data submission deadline of October 1, 2015. 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 and submission of the Integrated List and 303(d) List to USEPA by April 1 of even-numbered years. Data collected or submitted after the respective deadlines may be considered for subsequent 303(d) Lists and/or other water quality assessments conducted by the Department.

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 proposes the 303(d) List of Water Quality Limited Waters as an amendment to the Statewide Water Quality Management Plan, providing an opportunity for public comment, and adopts 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 and on the Department's website. The public notice shall include a description of the procedures for comment; and the name, address, and website of the Department office or agent from which the proposed document may be obtained and to which comments may be submitted. The public notice for the draft 2016 303(d) List also notifies the public that the Department has finalized the 2016 Methods Document. The final Methods Document, including agency responses to public comments, is included as an Appendix to the 2016 Integrated Report.

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 is published promptly on the Department's website.

Final Action: After the close of the public comment period for the Methods Document, the Department addresses the comments and publishes the final Methods Document on the Department's website along with the Response to Comments. After the close of the public comment period for the proposed 303(d) List, the Department addresses the public comments, makes any necessary revisions, and prepares a final 303(d) List. The Department submits the final 303(d) List 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 adopts the final 303(d) List as an amendment to the Statewide Water Quality Management Plan by placing a notice in the New Jersey Register and on the Department's website. However, the Department may re-propose the 303(d) List 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 includes the Integrated List, monitoring needs and schedules, TMDL needs and schedules, and any other information usually included in the 305(b) Report, is submitted to the USEPA Region 2 as required by Section 305(b) of the federal Clean Water Act. The Department posts the availability of the final Integrated Report and the 303(d) List on its website after receipt of approval from the USEPA.

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Appendix A: Parameters Associated with Each Designated Use

Parameter	Aquatic Life (general and trout)	Recreation	Public Water Supply	Shellfish Harvest for Consumption	Fish Consumption
Ammonia, un-ionized	X				
Acenaphthene			X		X
Acrolein			X		X
Acrylonitrile			X		X
Aldrin	X		X		X
Anthracene			X		X
Antimony			X		X
Arsenic			X		X
Asbestos			X		
Barium			X		
Beach Closure Data		X			
Benz(a)anthracene			X		X
Benzene			X		X
Benzidine			X		X
3,4-Benzofluoranthene (Benzo(b)fluoranthene)			X		X
Benzo(k)fluoranthene			X		X
Benzo(a)pyrene (BaP)			X		X
Beryllium			X		X
alpha-BHC (alpha-HCH)			X		X
beta-BHC (beta-HCH)			X		X
gamma-BHC (gamma-HCH/Lindane)	X		X		X
Biological Community Data	X				
Bis(2-chloroethyl) ether			X		X
Bis(2-chloroisopropyl) ether			X		X
Bis(2-ethylhexyl) phthalate			X		X
Bromodichloromethane (Dichlorobromomethane)			X		X
Bromoform			X		X
Butyl benzyl phthalate			X		X
Cadmium	X		X		X
Carbon tetrachloride			X		X
Chlordane in Water Column	X		X		
Chlordane in Fish Tissue					X
Chloride			X		
Chlorine Produced Oxidants (CPO)	X				

Parameter	Aquatic Life (general and trout)	Recreation	Public Water Supply	Shellfish Harvest for Consumption	Fish Consumption
Chlorobenzene			X		X
Chloroform			X		X
2-Chloronaphthalene			X		X
2-Chlorophenol			X		X
Chlorpyrifos	X				
Chromium			X		X
Chromium+3	X				
Chromium+6	X				
Chrysene			X		X
Copper	X		X		
Cyanide (Total)	X		X		X
4,4'-DDD (p,p'-TDE)			X		X
4,4'-DDE			X		X
4,4'-DDT	X		X		X
Demeton	X				
Dibenz(a,h)anthracene			X		X
1,2-Dichlorobenzene			X		X
1,3-Dichlorobenzene			X		X
1,4-Dichlorobenzene			X		X
3,3'-Dichlorobenzidine			X		X
1,2-Dichloroethane			X		X
1,1-Dichloroethylene			X		X
trans-1,2-Dichloroethylene			X		X
2,4-Dichlorophenol			X		X
1,2-Dichloropropane			X		X
1,3-Dichloropropene (cis and trans)			X		X
Dieldrin	X		X		X
Diethyl phthalate			X		X
2,4-Dimethyl phenol			X		X
4,6-Dinitro-o-cresol			X		X
2,4-Dinitrophenol			X		X
2,4-Dinitrotoluene			X		X
1,2-Diphenylhydrazine			X		X
Dissolved Oxygen	X				
E. Coli (freshwater)		X			
Endosulfans (alpha and beta)	X		X		X
Endosulfan sulfate			X		X
Endrin	X		X		X

Endrin aldehyde			X		X
Parameter	**Aquatic Life (general and trout)**	**Recreation**	**Public Water Supply**	**Shellfish Harvest for Consumption**	**Fish Consumption**
Enterococci (saline)		X			
Ethylbenzene			X		X
Fecal Coliform (saline)		X*		X	
Fluoranthene			X		X
Fluorene			X		X
Guthion	X				
Heptachlor	X		X		X
Heptachlor epoxide	X		X		X
Hexachlorobenzene			X		
Hexachlorobutadiene			X		X
Hexachlorocyclopentadiene			X		X
Hexachloroethane			X		X
Indeno(1,2,3-cd)pyrene			X		X
Isophorone			X		X
Lead	X		X		
Malathion	X				
Manganese					X
Mercury in Water Column	X		X		
Mercury in Fish Tissue					X
Methoxychlor	X		X		
Methyl bromide (bromomethane)			X		X
Methyl t-butyl ether (MTBE)			X		
Methylene chloride			X		X
Mirex	X				
Nickel	X		X		X
Nitrate (as N)			X		
Nitrobenzene			X		X
N-Nitrosodi-n-butylamine			X		X
N-Nitrosodiethylamine			X		X
N-Nitrosodimethylamine			X		X
N-Nitrosodiphenylamine			X		X
N-Nitrosodi-n-propylamine (Di-n-propylnitrosamine)			X		X
N-Nitrosopyrrolidine			X		X
Parathion	X				
Pentachlorobenzene			X		X
Pentachlorophenol	X		X		X

Parameter	Aquatic Life (general and trout)	Recreation	Public Water Supply	Shellfish Harvest for Consumption	Fish Consumption
pH (Standard Units)	X		X		
Phenol			X		X
Phosphorus, Total	X				
Polychlorinated biphenyls (PCBs) in Water Column	X		X		
PCBs in Fish Tissue					X
Pyrene			X		X
Radioactivity			X		
Salinity					
Selenium	X		X		X
Shellfish Closures				X	
Silver	X		X		X
Solids, Suspended (TSS)	X				
Solids, Total Dissolved (TDS)	X+		X		
Sulfate			X		
Sulfide-hydrogen sulfide (undissociated)	X				
Temperature	X				
1,2,4,5-Tetrachlorobenzene			X		X
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)			X		X
1,1,2,2-Tetrachloroethane			X		X
Tetrachloroethylene			X		X
Thallium			X		X
Toluene			X		X
Toxaphene	X		X		X
1,2,4-Trichlorobenzene			X		X
1,1,1-Trichloroethane			X		X
1,1,2-Trichloroethane			X		X
Trichloroethylene			X		X
2,4,5-Trichlorophenol			X		X
2,4,6-Trichlorophenol			X		X
Turbidity	X				
Vinyl chloride			X		X
Zinc	X		X		X

* secondary contact recreation only

+ Pineland waters only

Appendix B: Comments and Agency Responses on the Draft 2016 Methods Document

This constitutes the New Jersey Department of Environmental Protection's (Department) response to comments submitted during the public comment period for the document entitled "2016 Integrated Water Quality Monitoring and Assessment Methods" (Methods Document), which was published on the Department's website at http://www.state.nj.us/dep/wms/bears/docs/2016_draft_methods.pdf on February 16, 2016. A public notice seeking comments on the draft Methods Document was also published in the New Jersey Register on that date. The draft Methods Document was also made available upon request by mail.

The following organizations (listed alphabetically) submitted written comments on the draft 2016 Methods Document:

1. Thomas Amidon, Kleinfelder (on behalf of Montgomery Township, Rockaway Valley Regional Sewerage Authority (RVRSA), Somerset Raritan Valley Sewerage Authority (SRVSA), and Stony Brook Regional Sewerage Authority (SBRSA)), Research Park, 321 Wall Street, Princeton, NJ 08540 (**K**)
2. Peggy Gallos, Association of Environmental Authorities, 2333 Whitehorse-Mercerville Road Suite 2 Mercerville, NJ 08619-1946 (**AEA**)
3. Brent Gaylord, U.S. Environmental Protection Agency, Region 2, 290 Broadway, New York, NY 10007 (**EPA**)
4. William Kibler, Raritan Headwaters Association, P.O. Box 273, Gladstone, NJ 07934 (**RHA**)
5. Jeff Tittel, Sierra Club, New Jersey Chapter, 145 West Hanover St., Trenton, NJ 08618 (**SC**)

A summary of comments on the Methods Document and the Department's responses to those comments follows. The initials in parentheses at the end of each comment correspond to the commenters listed above.

General Comments

Comment Period

1. Comment: Commenter requests longer public comment periods. DEP must ensure that the 2016 Integrated Water Quality Report process allows for adequate public review and comment, which means a minimum of 90 days to review the draft report when it is prepared. When the 2018 draft Methods Document is prepared, DEP should allow at least 90 days for review and comment. (RHA)

Response: The Department believes that, since all the relevant information is now available on the Department's website in various formats that are both searchable and sortable, thirty calendar days is sufficient time to review and comment on the draft Methods Document and the draft 303(d) List. Extending the public comment period to 90 days would require publication of another notice in the New Jersey Register Office of Administrative Law and would further delay the 2016 303(d) List.

New Jersey's Water Quality Management Programs - Protecting and Restoring Water Quality

2. **Comment**: New Jersey has not been doing what it should be to manage waterways using the most up-to-date science. The Drinking Water Quality Institute has not met for more than five years and New Jersey hasn't updated their Water Supply Master Plan for 20 years. When you don't do a proper characterization of our watersheds and waterways, then you can't meet the standards of the Clean Water Act to make all of our Rivers and Streams, swimmable, fishable and drinkable. By denying science and not using the right criteria, you're denying the change of the people of New Jersey to have clean water. (SC)

3. **Comment**: This report is only a snapshot of our water but does not include the impacts from current policy rollbacks. These weakenings of regulations such as the Flood Hazard Rules and Water Quality Planning Rules will mean further impairments and more pollution in our waterways. The proposed Water Quality Planning Rules will allow for the extension of sewers and more development in environmentally sensitive areas. This will lead to impairment and water quality issues. The proposed Flood Hazard Rules will eliminate important buffers and critical headwater protections for C1 streams as well as Special Water Protection Areas (SWRPA). Eliminating buffers, especially the 300-foot ones on C1 streams, violates the anti-degradation criteria of the Clean Water Act because it will add more pollution to high quality streams. We should be strengthening our water protections across the state, not weakening them. (SC)

4. **Comment**: Many of our Rivers, such as the Raritan, have yet to have an approved, let alone implemented, TMDL. High quality water conditions are getting worse. We believe that this violates the Surface Water Quality Standards. This is also a violation of the anti-backsliding criteria of the Clean Water Act. Today only 205 miles, or 2.5%, of New Jersey's stream segments meets all designated uses. When you look at the 958 watersheds, only 14, or 1.46% are designated to meet all uses. The only one watershed in the entire state to do so is the Flat Brook. The rest are segments of certain streams. The drop in the quality of our waterways is precipitous and indicative of continuing degradation. (SC)

   Response to Comments 2 through 4: These comments are beyond the scope of the Methods and Integrated Reports. The Methods and Integrated Reports are prepared to meet the federal Clean Water Act requirements of assessing the health of the State's waters, identifying waters that are impaired and the causes of impairment, and prioritizing impaired waters for development of TMDLs or other restoration measures. Implementation of water quality protection and restoration falls under the purview of other Department programs in accordance with other state and federal mandates, including sections of the Clean Water Act as well as the New Jersey Water Pollution Control Act and the New Jersey Water Quality Planning Act. A complete description of these programs and how they work together to meet federal and state goals of protecting, enhancing and restoring waters of the State is provided in the New Jersey Continuing Planning Process document, which is posted on the Department's website at http://www.nj.gov/dep/wrm/docs/cpp.pdf.

   The Department is committed to protect, restore and enhance the water quality of the State's waters and is continuously striving to improve its effectiveness. This includes employing all

available tools to effectively and efficiently implement required TMDL reductions to restore impaired water bodies. A number of regulations, plans, and programs exist to protect water quality such as the Department's Nonpoint Pollution Control Program, which is administered by the Division of Water Quality and includes municipal stormwater regulation, industrial stormwater permitting, combined sewer overflow long-range plans, green infrastructure implementation, and stormwater best management practices. The Department's Land Use Management Programs implement state land use regulations, regional land use planning, coastal resource management, and funding to protect and maintain the state's natural resources. In the course of its continuous goal to become more responsive, efficient and effective, the Department is dedicated to ensure uncompromised environmental protection through regulations that are balanced, scientifically based, flexible, and take into consideration potential impacts through cost-benefit analyses**.**

1.0 Introduction

1.2 Summary of Major Changes from the 2014 Methods Document

5. **Comment**: Section 1.2 on page 2 states: "The new method lists all biological impairments based on macroinvertebrate and fish data on the Integrated List and 303(d) List which would be represented by "Cause Unknown – Impaired Biota." Whereas the previous listing methodology only listed biological impairments when there was no other aquatic life based chemical/physical impairments in an AU, the new method lists all biological impairments on the 303(d) List regardless of other aquatic life based chemical/physical impairments." This is a sensible improvement, since it is not technically justified to assume that any impairment to the macroinvertebrate community is caused by the co-occurrence of a chemical impairment. (K)

   Response: The Department appreciates the commenters' support.

6. **Comment**: Changing the testing methodology makes it hard to compare the data from year to year. We have been able to chart the decline of our water quality over the past 40 years but these changes will make future data harder to compare. With this data, we were able to show that during the 1990's the sprawl line moved further west threatening the Highlands. Because of that we were able to secure more protections like Category one stream upgrades, stream buffers, and the Highlands Act. By changing these standards, we are rolling back protections. (SC)

7. **Comment**: We believe that the 2014 Integrated Report 303(d)/305(b) list does not truly represent the danger that New Jersey's waterways face from pollution. The drop in the quality of our waterways is precipitous and indicative of continuing degradation. We should not be delisting waterbodies that are still impaired due to a change in listing criteria. Now is not the time to be weakening standards for protecting our waterways and addressing the pollution that impacts them. We urge the DEP to reevaluate the criteria used for waterway assessment as a means to better reflect the quality of our waterways. (SC)

8. **Comment**: The commenter believes that the 2014 Integrated Water Quality Assessment 303(d) list does not properly reflect the conditions of New Jersey's waterways. In many parts of the

state, water pollution is getting worse and water quality is deteriorating. By changing the criteria for listing waterways, this leads to a misrepresentation of the data and can be harmful to our waterways. Waterbodies were removed, not because they are no longer impaired, but because the criteria changed. Changes include removing a waterway that a TMDL is being written for, even if it is not being implemented and excluding pollution from unknown and natural sources, such as arsenic. The commenter urges a reevaluation of methodology because the newest change in criteria does not give an accurate characterization of our waterways. This creates difficulties in protecting and managing our waterways. This is a major rollback to clean water protections and can have significant impacts on public health. (SC)

Response: Changes to the water quality standards included at N.J.A.C. 7:9B are based on the most up-to-date, scientific information and are accomplished through formal rulemaking. These changes must go through a formal public comment period as well as to EPA for approval (see USEPA's website at http://water.epa.gov/scitech/swguidance/standards/cwa303faq.cfm). Once new/revised criteria are adopted, water quality data are re-assessed based on the adopted criteria. Waterbodies that meet the new criteria are not impaired and should not be included on the 303(d) list. Although it is recognized that the changes to standards can complicate the ability to detect trends, it is the Department's goal to determine water quality conditions as accurately and precisely as possible with current water quality data, information, tools, and standards.

2.0 Regional Comprehensive Assessment

9. **Comment**: The new Regional Comprehensive Assessment described in Section 2, in which the Department will focus more intensive evaluation on the Raritan Water Region for the 2016 assessment, is ambitious and promising. The Barnegat Bay Ten-Point Action Plan provided a template for the Atlantic Coastal Region. No such plan is offered for the Raritan Water Region assessment. Will the Department be developing and implementing a Comprehensive Assessment Plan for the Raritan Water Region? (K)

   Response: The Department shifted to the Regional Comprehensive Assessment approach in the 2014 assessment cycle. The Department's prioritization of the Atlantic Coastal Region for the 2014 Integrated Report was based, in part, to take advantage of the significant efforts dedicated to the Barnegat Bay under Governor Christie's Action Plan and the large amount of data generated by the intensive monitoring conducted by the Department and the Barnegat Bay Partnership. The Department's prioritization of the Raritan Water Region for the 2016 Integrated Report was similarly based on the efforts already underway and the data generated for development of the Raritan TMDL. Although the Barnegat Bay Action Plan can serve as a template for future approaches to restore, protect and maintain water quality in the other regions of the State, it is not expected that the same level of resources will be available. For the Raritan Region, the Department has initiated plans to collaborate with stakeholders within the region to synchronize plans and efforts throughout the Raritan to effectively restore, protect, and maintain water quality.

10. **Comment**: Page 3: "Through this comprehensive assessment process, the Department aims to systematically enhance the process to identify water quality issues with improved confidence in listing decisions, using robust datasets and multiple lines of evidence, in a selected water

region each listing cycle." Has any decision been made on the *order* of the five regions that will be studied intensively, one region per two-year cycle? (EPA)

Response: Under the Regional Comprehensive Assessment approach, the Department will conduct a streamlined assessment of statewide water quality along with a more comprehensive, detailed assessment of water quality rotating through New Jersey's five water regions. The focus regions are listed in order in Section 2.0 of the Methods Document, i.e., Atlantic Coastal (2014), Raritan (2016), Lower Delaware (2018), Upper Delaware (2020) and Northeast (2022).

11. **Comment**: Although only one region will be studied intensively each cycle, monitoring will still be performed throughout the state (Page 6). Can it be assumed that the proportion of monitoring done by *NJDEP* will be minimal in AUs outside the selected region compared with its monitoring within the selected region? Will *any* monitoring be done by DEP outside the selected region? (EPA)

    Response: Although monitoring efforts will focus on the selected region, the Department will continue to maintain a strong monitoring effort throughout the state through its co-operative statewide monitoring network, probability networks, biological networks, and coastal networks. Additionally, it is expected that other stakeholder monitoring groups will continue to monitor water quality in their respective areas of interest outside of the selected region.

12. **Comment**: Probability-based Data: NJDEP operates several probability-based (statistical) monitoring networks. The use of these data in the assessment and reporting process should be discussed. The stream statistical network should have been sampled for the 5-year period that its design required. Areal estimates from state-wide probability networks also are useful to provide a statistical "reality check" the percentages of impaired and not impaired waters derived from non-probability networks. (EPA)

    Response: All data from the probability-based monitoring networks are included in the assessment process and are identified in Appendix B: Data Sources as statewide networks for NJDEP. As stated in our Methods Document, the data from probabilistic networks are incorporated with all other data for the statewide assessment process. The Department does not distinguish probabilistic and targeted ambient monitoring for the Integrated Report. The Department considers the water quality data used for the Integrated Report provide a robust and comprehensive data set to evaluate the waters of the state. Additionally, data from the probabilistic monitoring networks are used to generate statistical estimates of statewide water quality conditions necessary to populate USEPA's statistical surveys of national water quality. The results of the statistical surveys for New Jersey waters can be found on the USEPA ATTAINS website at https://ofmpub.epa.gov/waters10/attains_state.control?p_state=NJ. This information was added to 2014 Integrated Report Section 1.1: Overview of New Jersey's Surface Water Quality Standards, Monitoring, and Assessment.

3.0 Use and Interpretation of Data

13. **Comment:** The Raritan Headwaters Association—like its two predecessor organizations, the South Branch Watershed Association (SBWA) and the Upper Raritan Watershed Association (URA)—collects data from its stream monitoring sites annually. The draft 2016 Integrated Report will rely on data from 2010 to 2014. With RHA (or, Prior to 2011, SWA and URA)

data from every year from 2010 to 2014 be used? If not, why not? The monitoring network established by RHA is extensive, currently including 62 monitoring sites. Will data from all RHA monitoring sits be used, or only select data? If only select data will be used, why? And what data will be excluded, if any? (RHA)

Response: The Department has used the SBWA and URWA macroinvertebrate data for many years for the Integrated Report. In anticipation of the 2016 Integrated Report where the Raritan Region is the focus, the Department will use all RHA macroinvertebrate data from 2010 to 2015.

3.1 Data Quality

14. Comment: Section 3.1 of Methods states, "Accurate locational data are required to ensure comparison to appropriate Surface Water Quality Standards (SWQS), as well as confirming that sampling stations are located outside of regulatory mixing zones." What does "regulatory mixing zones" refer to? (EPA)

Response: As defined in N.J.A.C. 7:9B, "'Regulatory mixing zones' means areas of surface waters established pursuant to this chapter for the purpose of initial mixing, dispersion, or dissipation of wastewater effluent at or near the discharge point. Regulatory mixing zones may be established for applicable criteria." In addition, "Water quality criteria may be exceeded within the regulatory mixing zone; however, surface water quality criteria must be met at the edge of the regulatory mixing zone."

15. Comment: Testing should be done below roadway crossing to determine the amount of runoff pollution that is impacting the stream. Testing above roadway crossings will exclude that data. Further, testing should not be done outside the mixing zone as this allows the discharge to fully merge into the main body, resulting in diluted readings. (SC)

Response: It is the objective of the Integrated Report to determine ambient water quality and not to deliberately focus on pollution sources that can be accomplished through source trackdown studies and/or targeted monitoring. Also see Comment 14 to address the monitoring outside of regulatory mixing zones.

16. Comment: Page 10, 1st paragraph: The volunteer monitoring data link takes reader to a page that hasn't been populated yet ("coming soon"). (EPA)

Response: The volunteer monitoring web page link has not been developed yet and the completion data is unknown at this point, therefore the link has been deleted from the Methods Document.

3.2 Criteria and Policies

17. Comment: Section 3.2, page 10 – "Antidegradation Policy" states that, "Designated uses shall be maintained or, as soon as technically and economically feasible, be supported wherever these uses are not precluded by natural conditions." How are technical and economical feasibilities determined? (EPA)

Response: The Department's Division of Water Quality uses the technical and economical feasibilities determination outlined in the EPA's 1995 Interim Economic Guidance for WQS, https://www.epa.gov/sites/production/files/2016-03/documents/econworkbook-complete.pdf.

18. Comment: Page 10 states, "Lists of Water Quality Limited Waters (303(d) Lists) are required to include all "threatened and impaired" waters. "Threatened waters" are waters that currently meet water quality standards but are likely to exceed standards by the time the next 303(d) List is generated." Is it correct to say that a "threatened" water body is one where the anti-degradation policy is soon to be violated? (EPA)

Response (from 2014 IR response 16): The purpose of "threatened waters" is to identify waterbodies that are violating the anti-degradation policy. As explained in Section 3.2 of the Methods Document, the Department is required to identify all "threatened and impaired" waters on the 303(d) List.

> "Threatened waters" are defined as waters that currently meet water quality standards but are likely to exceed standards by the time the next 303(d) List is generated. Assessing threatened waters requires sufficient existing and readily available data and information on adverse declining trends to predict future water quality. This means a dataset must be sufficiently robust to support the evaluation of short-and long-term statistical trends. The Department maintains a series of long-term monitoring locations, which support statistical trends assessments developed by the USGS. Assessments to determine if waters are threatened are conducted by the Department wherever sufficient data and trends assessments are available to make such predictions.

To date, there has been insufficient data to support an assessment of any waters of the State as "threatened"; however, the Department is developing an assessment tool to help detect trends that may support listing waters as threatened on future 303(d) Lists. Any identified "threatened waters" are considered to be violating the anti-degradation policy.

19. Comment: The proposed section of Sublist 1, called "Stressed" was not included in the Methods Document. Did NJDEP decide to not add this to the methods for the 2016 reporting cycle? (EPA)

Response: The Department considered proposing a "Stressed" subpart of Sublist 1 for waters that show declining water quality but are not expected to exceed applicable water quality criteria in the next listing cycle. This concept was discussed with USEPA; however, we did not include it in the draft 2016 Methods. The Department will continue to explore this option and may propose it in a future Methods Document.

Narrative Water Quality Criteria: Toxics

20. Comment: Section 3.2, page 11 – "Narrative Water Quality Criteria" – According to the second narrative criteria for toxics, "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." In addition to fish, should this statement be applicable to other aquatic organisms used as a food source (shellfish, crabs ….)? Is there a potential for these other species to contain enough toxic substances to be a cause of concern? (EPA)

21. Comment: Section 6.0, page 26 – Table 6.0: "Minimum suite of parameters needed to determine use is fully supporting" – should potential for toxics be monitored for shellfish consumption in addition to monitoring for pathogens? (EPA)

Response to 20 and 21: The narrative criteria for toxics does apply to other aquatic organisms besides fish such as shellfish and crabs. A shellfish study for metals, pesticides and PAHs from 2005 to 2009 showed no violations of FDA criteria for human consumption. This study covered the marine waters in the state at 125 monitoring locations and included oysters and hard clams. It is believed that because of the very low lipid content in shellfish, metals and toxics do not tend to bioaccumulate. It was recommended that future routine sampling include metals and the Department has identified it as a data gap. For crabs, the Department does sample for metals and toxics and issues consumption advisories. These advisories can be found at http://www.state.nj.us/dep/dsr/njmainfish.htm.

Narrative Water Quality Criteria: Nutrients

22. Comment: Page 11 of the Methods Document states: "To assess attainment of narrative criteria, which are 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, biological assessment, nutrients, and natural conditions." While "translators" are provided for toxics and biological assessment, the Methods Document does not include any translator section for narrative nutrient criteria. Assessment of Nutrient Impacts (Section 4.4) was added to the Methods Document in 2010, utilized during the 2010 and 2012 assessment cycles, and proposed for use again in 2014 before being removed from the final version. Since 2002, the Department has made substantial technical improvements to the manner in which it applies its nutrient criteria, and to the criteria themselves, as documented in the Department's *Technical Manual for Phosphorus Evaluations* (2008); Passaic River Basin and Raritan River Basin TMDLs; Proposed SWQS Amendments, December 21, 2009; Adoption of SWQS Amendments, December 21, 2010; 2010 Methods Document; *Nutrient Criteria Enhancement Plan – 2010 Progress Report*; and *NJ Nutrient Criteria Enhancement Plan*, 2013. The removal of the Assessment of Nutrient Impacts reverses more than a decade of progress the Department has made in enhancing the application of its nutrient criteria. The Department leaves itself with no mechanism to evaluate whether the instream total phosphorus (TP) criterion applies to a given waterbody. A translator for narrative nutrient criteria is critical because the numerical nutrient criteria are conditional, and in fact do not apply if narrative criteria are satisfied. Given all that has been learned from more than a decade of phosphorus evaluation studies and nutrient TMDL studies, it is premature and lacking in scientific basis to designate a waterbody as impaired for aquatic life based solely on instream TP concentration, without any other indication of impairment. The commenters believe sufficient diurnal DO data exists to identify locations where the instream TP criterion does not apply and to provide a more realistic assessment of waters that may be impaired by nutrients. The Department should improve the nutrient impact assessment translator rather than eliminating it. This is a

subject about which the NJDEP's Science Advisory Board and its Nutrient Work Group Committee could provide useful advice to the Department. (K, AEA)

23. Comment: Section 3.2, page 11 – Nutrients are listed as one of the narrative water quality criteria, applicable to all waters of the state. While other narrative parameters are being discussed in the document, there is no section addressing the assessment of nutrients in this draft document. (EPA)

24. Comment: Throughout New Jersey, many important waterbodies and streams are impaired by nutrients such as nitrogen and phosphorus. For example, at least 65% of our waterways are impaired for phosphorus. Since we don't have enough testing, that number could be much higher. These waters suffer eutrophication because of too many nutrients. This causes algae blooms and oxygen reduction causing hypoxia. This can lead to fish kills and a decrease in biodiversity. (SC)

Response to Comments 22 through 24: The method for assessing impacts of nutrients on water quality and identifying where the aquatic life use was impaired due to nutrients, Section 4.4 Assessment of Nutrient Impacts was first introduced in the 2010 Methods Document. However, in attempting to implement this new method over the subsequent assessment cycles, the Department determined that sufficient information was rarely available to apply this method. The Department also concluded that the nutrient assessment methodology within the context of the Integrated Report assessment process represented an over-simplification of highly complex processes. Furthermore, both the Department and USEPA determined that this methodology was not adequately protective of downstream receiving waters exposed to long-term nutrient enrichment.

The Department has since concluded that the in-depth analysis required to assess nutrient impacts on a specific waterbody cannot be conducted as part of a statewide or regional water quality assessment but rather should be conducted as part of the TMDL process. A waterbody- or watershed-specific TMDL study would generate sufficient data and targeted analysis to evaluate impacts on an extended time-series (accounting for various flow/temperature scenarios) through modeling. The removal of Section 4.4 (Assessment of Nutrient Impacts) from the Methods Document is consistent with the Department's current approach to determining nutrient impacts through water quality modeling, sampling and detailed analysis conducted for TMDL development, which will enable an improved understanding of nutrient impacts on water quality in specific waterbodies. The Department has established nutrient TMDLs for the Passaic River Basin and the Raritan River Basin as well as numerous rivers and lakes throughout the State (see "Table of New Jersey TMDLs and Approval Status" on the Department's website at http://www.state.nj.us/dep/wms/bears/tmdls.html).

The 2013 New Jersey Nutrient Criteria Enhancement Plan (NCEP) provides a detailed description of the Department's strategy for enhancing the existing nutrient criteria for freshwaters and developing new nutrient criteria for coastal waters through an assessment of the complex relationships. Nutrient criteria, which may include numeric criteria and numeric translators of narrative criteria, will be developed to address existing and future nutrient-related impairment in New Jersey waters. The 2013 NCEP is located on the Department's website at http://www.state.nj.us/dep/wms/bears/nutrient_criteria.htm.

Narrative Water Quality Criteria: Natural Conditions

25. Comment: On page 6, the Department commits to a number of steps in order to ensure "data quality and relevance to increase confidence in assessment decisions." Among these steps, the Methods Document states that the Department will "identify where water quality is due to natural conditions." Despite this assurance, no methodology for making this determination is provided. Without a methodology to account for natural occurrence, the Methods Document will result in a significant number of false positive assessments of impaired waters for arsenic, pH, dissolved oxygen, and temperature. (K)

26. Comment: Given the likelihood that criteria excursions for low pH, low dissolved oxygen, arsenic, and temperature might be due to natural conditions, the Department should utilize List 3 (Insufficient Data) for assessment of these parameters until a determination of natural condition can be made. (K)

27. Comment: Limestone geology is also being used inappropriately to delist contaminated waterbodies in Warren County. (SC)

28. Comment: Section 3.2, page 10 – "Antidegradation Policy" states that, "Designated uses shall be maintained or, as soon as technically and economically feasible, be supported wherever these uses are not precluded by natural conditions." Is there a mechanism in place to determine "natural conditions"? (EPA)

29. Comment: While the Methods Document sets forth steps designed to "… identify where water quality is due to natural conditions," (Page 6) the Methods Document lacks any methodology for determining that a pollutant is due to naturally occurring conditions. Without a methodology to account for natural occurrences of pollutants, utilization of the Methods Document will result in a significant number of waters being designated as impaired, when these water merely reflect natural conditions. Parameters typically subject to being misidentified as "impairments" from sources, that are actually the artifact of naturally occurring conditions, are arsenic; pH; dissolved oxygen; and temperature. (AEA)

Response to Comments 25 through 29: The Surface Water Quality Standards (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." Section 3.2 of the Methods Document provides examples of "natural causes" (i.e., natural conditions) as locations where underlying conditions (e.g., geology, hydrology) influence the water chemistry and there are no anthropogenic sources or potential anthropogenic sources are determined not to be sources of the pollutant in question. The Methods Document also explains that data that do not meet applicable SWQS criteria potentially due to natural conditions will be carefully evaluated and any excursions attributed to natural conditions will be documented. This evaluation has been conducted on a case-by-case basis based on the weight of evidence and best professional judgment. The Department takes a conservative approach when determining if natural conditions are causing impairments. Conclusive data and information must verify that anthropogenic sources are not contributing or causing the impairment of a waterbody. If

any anthropogenic sources impact a waterbody, then the Department must have data to confirm that the pollutant is totally from a natural source. If data is not available to conclude a criteria exceedance is natural, the Department will continue to place the impairment on the 303(d) List.

It is not clear that anticipating hypothetical circumstances and creating a procedure for each parameter in advance of a need is an efficient use of resources. As warranted, for example, where multiple determinations of a similar type would be made, the Department will consider developing a template, checklist or other suitable format to structure the decision process re: natural conditions. The Integrated Report will include documentation of all "Decisions to Not List Assessment Unit/Pollutant Combinations on the 303(d) List of Water Quality Limited Waters" based on natural conditions in Appendix D.

30. Comment: Low dissolved oxygen is often naturally occurring due to mucky stream bottoms in sediment accumulation areas as well as natural wetland complexes; the lower Millstone River provides an example of the former, while the wetland complexes in the upper Passaic River basin (i.e., Great Swamp, Troy Brook meadows, Pine Brook meadows, and the Great Piece meadows) provide examples of the latter. The Methods Document provides no means of assessing whether a low dissolved oxygen occurrence is naturally occurring or not. (K)

Response: The NJDEP water quality assessment and rotating comprehensive assessment process frequently attempts to discriminate between natural and anthropogenic causes of impairment. Both natural and anthropogenic (e.g., sedimentation, wetlands), along with other causes, could lead to low DO in the waterbody. Therefore, a full assessment of natural causes may not be possible without additional TMDL or Watershed Restoration Plan evaluations. USEPA guidance establishes a very high threshold for confirming naturally occurring causes of impairment, including ambient water quality data, effluent data from any NJPDES-permitted facilities, and nonpoint anthropogenic source impacts within the assessment unit. Thus, there are many cases were the Department suspects naturally occurring causes to be the source of use impairment but is unable to support delisting the pollutant without additional sampling and/or further detailed analysis. The Department may reevaluate such assessments based on additional data or more detailed analysis conducted through a TMDL or Watershed Restoration Plan when it is developed to address the impairment.

31. Comment: In the case of temperature, many of the temperature "impairments" may actually reflect natural conditions, as acknowledged by the Department in its draft 2014 Integrated Report. We recommend the Department include temperature impairments in segments without any thermal discharge on List 3 until an in-depth analysis of natural conditions is performed. (K)

Response: The Department is reviewing approaches to address natural temperature impairment. As part of the Department's initiative to better understand natural conditions in the Pinelands, continuous temperature monitoring has been initiated in pristine watersheds throughout the Pinelands to determine natural conditions. Nine temperature probes were deployed in June 2015 and will be deployed for at least two years year-round except December to February, to prevent damage from freezing. Detailed information will be provided after the Department has collected, analyzed and determined the appropriate natural condition range for Pineland waters. For other regions of the state, the Department is looking at ways to apply

temperatures from background monitoring stations that have minimal anthropogenic impacts to other nearby monitoring stations.

32. Comment: While the issue of false positive assessment of pH impairments was partially addressed by the revised pH criteria for freshwaters in the Atlantic Coast, Lower Delaware, and Lower Raritan regions, there remain many impairment designations based on low pH that are very likely naturally occurring. Areas of the Lower Raritan exhibit naturally occurring pH levels well below the minimum 4.5 s.u., such as Pine Brook and Barclays Brook in the Matchaponix Brook watershed. Data were collected by Kleinfelder (and its predecessor Omni Environmental) on behalf of Western Monmouth Utilities Authority (*Pine Brook / Matchaponix Brook Phosphorus Evaluation Study*, 2005) and the NJDEP (*The Raritan River Basin TMDL: Phase I Data Summary and Analysis Report*, 2005); both studies identified the low pH as naturally occurring based on its occurrence at headwater locations throughout the watershed. Although the Millstone River lies within the Upper Raritan and is not assigned the lower pH criteria range that is assigned to the Lower Raritan watersheds, the headwaters of the Millstone River are underlain by many of the same formations that result in low pH conditions in the Matchaponix watershed. In fact, the Millstone River basin exhibits pH levels below 6.5 s.u. at many locations and under a variety of conditions. Any impairment designations based on low pH, particularly in the Millstone River Basin, should be carefully evaluated to determine whether they are merely reflective of natural conditions. (K)

Response: It is known that the headwaters of the Millstone have a lower pH range and therefore are assigned the South Jersey pH criteria of 4.5 to 7.5. This natural condition can impact the watersheds downstream in the Millstone River where pH criteria is 6.5 to 8.5. The complicated situation in the Millstone River is that there are numerous anthropogenic sources that may impact pH such as wastewater treatment point sources, urban development, agricultural activities, high nutrient loads, quarry activity, and riparian buffer degradation. These activities make it very difficult to determine natural conditions as the cause of pH violations. It is expected that most anthropogenic activities would cause pH to increase therefore the Department will review all pH violations of the low criteria very carefully. If low pH exceedances can be attributed to natural conditions, these decisions will be fully explained in Appendix D: Decisions to Not List Assessment Unit/Pollutant Combinations on the 303(d) List of Water Quality Limited Waters. See also response to Comments 25 through 29.

Narrative Water Quality Criteria: Arsenic

33. Comment: Arsenic was the predominant (82%) cause of water supply use impairment designations in the Draft 2014 303(d) List. The reason is that the human health criterion is 0.017 µg/L, well below levels of analytical detection, while arsenic is found at levels well in excess of the 0.017 µg/L criterion at many locations throughout the state. The Methods Document attempts to address this issue through the creation of a new sublist 5A for waters where, "Designated use is not supporting due to arsenic which is present at levels below that determined to be attributable to naturally occurring geology/soil." Unfortunately, the effort falls short for various reasons: 1) Only watersheds in the Inner and Outer Coastal Plains were

assessed for whether the arsenic concentration is due to natural occurrence; 2) The range of arsenic concentrations considered natural (0.24-0.70 µg/L) is much too narrow for surface waters in New Jersey; and 3) The research referenced in the Methods Document provides many examples of total arsenic levels observed in the range of 1-4 µg/L and this is due to natural geologic sources. It is possible that dissolved carbon, some of which may be anthropogenic in origin, may release additional natural arsenic into surface waters. Finally, legacy sources of arsenic from historic agricultural pesticide application may also impact arsenic concentrations in some surface waters. Given the uncertainties with regard to natural occurrence of arsenic, we recommend that the Department apply the drinking water MCL of 5 µg/L for arsenic as a basis for impairment designation. (K, AEA)

34. Comment: Sublist 5A does not belong under sublist 5 at all. List 5 is reserved for impaired waters, and exceedance of criteria due to natural occurrence is not impairment (N.J.A.C. 7:9B-1.5(c)1). This issue matters because wastewater treatment plants could end up having end-of-pipe limits for arsenic imposed because they discharge to a receiving water that is inappropriately designated as "impaired." Until the Department improves its methodology for assessing arsenic concentrations relative to natural levels, waters with arsenic concentrations above the 0.017 µg/L criterion should be assigned to List 3 (insufficient data) so that inappropriate effluent limits are not imposed on wastewater dischargers to these waters. We suggest a sublist category of 3A for waters with arsenic concentrations that might be due to natural conditions. (K)

Response to Comments 33 and 34: Section 303(d) of the federal Clean Water Act requires states to identify water quality-limited waters that require development of TMDLs because they are not meeting applicable Surface Water Quality Standards (SWQS). The promulgated SWQS for arsenic is 0.017 µg/L (see N.J.A.C. 7:9B-1.14(f)7). This standard was derived based on the potential risk to human health from exposure to arsenic in drinking water; however, in accordance with the federal Clean Water Act and the New Jersey Water Pollution Control Act, this standard is applied to ambient water quality – without consideration of cost or availability of treatment technology. The maximum contaminant level (MCL) for arsenic was also derived based on the potential risk to human health from exposure to arsenic in drinking water; however, in accordance with the federal and state Safe Drinking Water Acts, the final MCL is less stringent than the health-based MCL and is based on the availability of treatment technology as well as the federally promulgated MCL for arsenic. Therefore, the Department cannot assess arsenic based on compliance with the arsenic MCL and must assess arsenic based on the promulgated SWQS of 0.017 µg/L until/unless the arsenic SWQS is amended.

USEPA's national policy does not allow human health-based criteria to be modified based on natural conditions. Currently, USEPA Region 2 is working with the Department to explore an alternative approach (other than TMDLs) to address water quality impairments caused by naturally-occurring arsenic while USEPA develops national guidance or standards for arsenic. This alternative approach would include issuance and implementation of long-term variances to the Water Quality Standards for arsenic, pursuant to the recently adopted amendments to the federal WQS rules (see 40 CFR 131). Since USEPA has the final authority to approve, remand or disapprove state 303(d) Lists under the Section 303(d) of the federal Clean Water Act, the Department cannot simply "refuse to accept EPA's policy", as suggested by some of the commenters, without risking USEPA disapproval or remand of the 2014 303(d) List and

the potential withholding of funds authorized under New Jersey's Performance Partnership Agreement with USEPA Region 2. For the time being, the Department has created a new subpart of Sublist 5 for AUs that are impaired by arsenic that is naturally occurring. AUs on Sublist 5A are considered a very low priority for TMDL development and are instead intended to be addressed by an alternative approach such as the variances mentioned earlier.

35. **Comment**: Waterbodies impacted by naturally occurring toxins should also be counted as impaired. Arsenic in our waterways will go unreported under this loophole even though this naturally-occurring toxin is also the result of human actions such as pesticide use or industrial operations. Although natural, arsenic is worse in areas of overdevelopment as high nitrate levels push the arsenic out of the soil. (SC)

36. **Comment:** The draft 2014 Integrated Report identifies arsenic as a significant cause of impairment and a primary cause of water bodies not meeting the water supply designated use (draft 2014 Integrated Report, at pages iv, 12, and 21-22). The Report ascribes this arsenic "to naturally-occurring concentrations of arsenic" (draft 2014 Integrated Report at page iv). Although there have been studies to determine a range of naturally occurring arsenic from geology and soil in the Inner and Outer Coastal plains, the Methods Document does not provide a range of parameters for "naturally occurring" levels of arsenic in the Piedmont and Highlands. How are TMDLs being addressed for arsenic in the Highlands and Piedmont? (RHA)

37. **Comment:** Recent reports suggest that historical use of arsenical pesticides may be a significant contributor of arsenic in surface water, especially outside the Piedmont physiographic region (see, "Distribution of Arsenic in the Environment in New Jersey", Vowinkel, et al.). How does DEP determine whether arsenic in surface water is naturally occurring or from anthropogenic sources? (RHA)

38. **Comment:** Even if arsenic is naturally present in the bedrock and soils, that does not mean that the concentrations in ground and surface water do not change due to potential changes in chemistry from anthropogenic activities, especially urbanization or changing agricultural practices. Our long-term data on groundwater in the Piedmont suggest that arsenic concentrations are increasing. Although naturally-occurring deposits of arsenic may be contributing to arsenic impairments, an increase in arsenic concentrations would not be explained by "natural causes". Has DEP examined potential mechanisms causing arsenic to be mobilized from deposits in the Piedmont or Highlands? If so, what were the findings? Does increasing rate of release of arsenic due to human influences constitute a "naturally occurring" source of arsenic by current NJDEP definitions? (RHA)

39. **Comment:** Appendix F: Private Well Testing Act Results identifies arsenic as a significant contaminant for drinking water wells. As in the main body of the Report, DEP here identifies arsenic as a "naturally occurring contaminant" (Appendix F, at page 1). Has DEP examined long-term trends in arsenic concentrations in groundwater? If concentrations of arsenic are increasing over time, has DEP identified the mechanism or mechanisms causing additional mobilization of arsenic from rock? Has DEP studied arsenic as a significant contaminant in regions other than just the Piedmont? (RHA)

Response to Comments 35 through 39: The Department recognizes the impacts that arsenic has had on surface and ground water quality and has completed studies contracted with the USGS to determine natural levels of arsenic in the Coastal Plain. These studies have concluded that although arsenic is found naturally in the ground and surface water, anthropogenic sources have increased levels in many areas. Additionally, the Department hopes to continue further studies involving the other regions of the state including the important topics suggested by the commenters. Although the Integrated Report has shown the number of impairments has increased over the years it may not be indicative of a trend but the result of improved laboratory detection at lower concentrations that exceed the criteria of 0.017 µg/l and the increased sampling for arsenic throughout the state. In situations where it is known that the anti-degradation standards are being violated, the Department will take enforcement action primarily through the permitting and enforcement programs. Additionally, the Department and USEPA are collaborating to explore an alternative approach (other than TMDLs) to address water quality impairments caused by naturally-occurring arsenic.

4.0 Evaluation of Data at the Station Level

4.1 Evaluation of Physical and Chemical Data

40. Comment: Page 12: Shouldn't the required sample size be related to the length of the stream within the assessment unit and not fixed at a certain value? (EPA)

Response: The Department is building confidence in the assessment process by increasing the number of samples required for parameters to more accurately characterize the existing water quality conditions by better capturing natural variability, seasonal changes, varying hydrologic conditions, as well as underlying natural conditions and the effects of anthropogenic activities. The sample size is based on increasing temporal coverage to capture more events that characterize water quality and does not relate to stream length or size.

41. Comment: Page 13 states: "The target sample size for pathogens remains as 5 samples over a 30-day period, to calculate a geomean, over at least a 2-year period." It is not clear to me what this means. How can five samples within 30 days be "over a 2-year period?" (K)

Response: The current methods requires 5 samples over a 30-day period to calculate a geomean. The geomean must be done at least once a year during the swimming season for 2 years to meet the requirements for the target sample size.

42. Comment: The definition of "Excursions" on page 13 does not define "natural conditions" or "transient conditions" in sufficient detail to be meaningful for assessment. How exactly will the Department determine whether a particular excursion is due to natural or transient conditions? Transient conditions are defined on page 13 as "water quality conditions that occur at very low frequencies over very brief timeframes and, as such, neither impair the designated use of the waterbody nor represent overall water quality conditions." This is an excellent definition, but a methodology is not presented to determine when such transient conditions occur. Without the methodology, how will the Department determine whether an excursion is transient? (K)

Response: The methodology for determining a transient condition is unique for each pollutant and situation. Because there are many ways to determine transient conditions, the Methods Document does not include a set methodology. For example, total dissolved solids excursions have occurred during or after winter storms caused by salt application to the roads. Winter storm data along with data exceedances were collated to determine if these were transient events or not. This methodology would not work for other parameters who have their own transient impacts not related to winter storms. All transient excursions must be fully explained in Appendix D: 2014 Decisions to Not List Causes on the 2014 303(d) List/Sublist 5 (Waters Not Listed, with Reasons and Explanations) to justify not listing on the 303(d) List.

43. Comment: Analytical Uncertainty on page 14 focuses only on instrument uncertainty, which is relevant for in-situ measurements using a handheld instrument. What about laboratory measurements? Uncertainty with regard to laboratory analytes is generally captured in a quantitation limit; we recommend therefore that the Department define the margin of error for laboratory analytes to be the criterion plus or minus the quantitation limit. (K)

Response: The definition of the quantification limit is the lowest amount of analyte in a sample which can be quantitatively determined with suitable precision and accuracy. The Department does consider the precision and accuracy of laboratory methods for analytical uncertainty and has indicated it in this section of the Methods Document.

44. Comment: Page 15, Continuous Monitoring: This section appears to focus on stationary continuous monitoring but data obtained from mobile continuous monitoring, such as conducted by the NJDEP ocean glider, should be discussed. Progress on incorporation of the ocean glider data into NJ's water quality assessment process should be included. (EPA)

Response: To study the ocean waters, the Department purchased and deployed a Slocum Glider during the summer of 2011. The Slocum Glider is fitted with continuous monitors to measure water quality conditions for water temperature, salinity, dissolved oxygen, CDOM and depth. It has been deployed on a routine basis, running from Sandy Hook to Cape May, multiple times each summer since 2011, and provides a 3-D view of the water column. In 2013, a chlorophyll a sensor was added. The Department's Science advisory board (SAB) was tasked to suggest ways of assessing and interpreting this data set. The SAB recommended development of spatial decorrelation models to separate the temporal and spatial components of the glider data in addition to data from deployment of fixed-location sensors. The Department more recently has also sought EPA's contractor assist with interpreting the glider data. The glider data is displayed on the Rutgers University website (https://marine.rutgers.edu/cool/auvs/index.php?year=2016). Since additional analysis needs to be performed on this data set, detailed discussion of the data set is not included under the "Continuous Monitoring" section.

4.3 Biological Data

45. Comment: Section 4.3, pages 17 – Biological Data" - Benthic Macroinvertebrate and Fin Fish Data are being used for the assessment of freshwater streams. In addition, Benthic Index of Biotic Integrity was also developed for the NY/NJ Harbor Estuary. The document states that, "Additionally, the Department is carrying out research on developing macroinvertebrate

indices for estuary and ocean waters." What is the tentative timeframe for completion of this work? Also, how is the aquatic life use presently being assessed in the state's lakes (in addition to "in-lake chemistry data")? (EPA)

46. Comment: Page 17, last paragraph on page, Benthic Macroinvertebrate Data: The 2012 Integrated Report (IR) described work to develop an ocean benthic index. The status of this effort should be updated and its assessment application should be included in the Methods document. (EPA)

Response to Comments 45 and 46: At the time of the 2014 assessment, neither the estuary or nearshore ocean indices were completed. The Benthic Macroinvertebrate Index for Barnegat Bay was recently finalized during the summer of 2016 and will be included in the 2016 Integrated Report. The description and justification of the Barnegat Bay Index has been included in the 2016 Methods Document. The ocean index, in contrast, has not yet been validated and will require additional monitoring data that encompasses a full disturbance gradient. It is currently on hold as the Department finalizes the aquatic life designated use in Barnegat Bay. In order to finalize the ocean index, the Department expects to work with EPA's Office of Research and Development to explore options to validate the index. For lakes, currently there is no biological index for aquatic life use.

47. Comment: Page 17, Benthic Macroinvertebrate Data: The reference given for the REMAP BIBI shows how the index was applied to 1998 NY/NJ Harbor data. It appears from the text that a reference was needed for the development of the index. That can be found in appendix C at the following location: https://archive.epa.gov/emap/archive-emap/web/html/nynjharbor.html (EPA)

Response: The reference was added to the Methods Document.

5.0 Evaluating Data from Multiple Stations within an Assessment Unit

48. Comment: The section on Assessing Lake Data on page 25 states that in-lake chemistry data should be collected just below the surface, defined as "a one-meter depth if the lake is sufficiently deep." Given that the vast majority of lakes in New Jersey are less than 6 feet deep, I suggest this definition: "one foot to one meter, depending on the depth of the lake." Also, to clarify intent, I suggest adding "within the epilimnion if vertically stratified" after "collected just below the surface." (K)

Response: The lake sampling protocols have been modified to the following: "For lake sites equal to or greater than 2 meters in depth - all nutrient samples are taken at 1-meter depth. For lake sites less than 2 meters in depth - samples are taken at mid-depth." This renders the Methods Document consistent with the Department's own sampling protocol for lakes.

6.0 Designated Use Assessment Methods

49. Comment: Exceedance of human health criteria alone should not automatically result in an impairment designation for freshwaters based solely upon the policy that all waters of the State are drinkable, fishable and swimmable. This goal is not intended to apply to waters that cannot, due to natural conditions, attain these uses. Water supply use attainment assessment should only be evaluated with respect to water with existing or planned water supply intakes. Further, since potable water is by definition water supplied after conventional filtration treatment (N.J.A.C. 7:9B-1.12(c)4), elements with a significant particulate fraction, such as arsenic, will be reduced by conventional filtration treatment, and therefore should be evaluated accordingly. (AEA, K)

Response: Conventional treatment is defined in the Surface Water Quality Standards (SWQS) rules at N.J.A.C. 7:9B-1.12 (b)3 as, "… a series of processes including filtration, flocculation, coagulation, and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituent(s) or disinfection." Data analysis indicates that the dissolved fraction in total arsenic can be more prevalent than the particulate fraction although the fractions change depending upon site conditions. Conventional filtration treatment capability to remove arsenic is not accepted as a means to treat for elevated arsenic levels**.** Additional treatment technologies such as reverse osmosis, ion exchange, and adsorptive media have proven through studies and application to be effective means to remove arsenic from the water column.

6.1 Aquatic Life Use Assessment Method

50. Comment: Table 6.1: "Aquatic Life Use Assessment Results" – in cases where biology is impaired and chemical data show exceedances, both aquatic life uses are "not supporting". Why is biological impairment represented by "cause unknown – impaired biota" if the chemical parameters exceeding criteria are identified as a cause? (EPA)

Response: The Department deems it is not scientifically justified to assume that the chemical aquatic life pollutant listed on the 303(d) List is the sole cause of the aquatic life use impairment if biology is impaired. There are many factors that usually impact biological communities and source track downs conducted for TMDLs or watershed plans would be the appropriate action to address the biological impairment. The new proposal would return all biological impairments based on macroinvertebrate and fish data to the 303(d) List which would be represented by "Cause Unknown – Impaired Biota". This action clarifies the listing methodology in that it includes all known impairments that are causing aquatic life designated use non-attainment on the Integrated List/303(d) List. Additionally, this methodology proposal allows the Department to more accurately address biological impairments in waterbodies by identifying the issues, developing the proper management strategy, and implementing the most effective restoration actions to address the impairments.

51. Comment: Section 6.1 should include a brief paragraph summarizing how the assessment of aquatic life use is presently done for lakes, estuaries (other than NJ-NY Harbor) and marine waters. (EPA)

Response: Section 6.1 in the Methods Document has been edited to reflect how aquatic life assessments are done for lakes, estuaries and marine waters, as follows:

The aquatic life use in non-tidal freshwater rivers and streams is assessed by evaluating biotic communities using metrics developed for benthic macroinvertebrate data, in conjunction with Fin Fish Index of Biotic Integrity (FIBI) data. In estuarine waters, biotic indices have been developed only for application in the New York/New Jersey Harbor as well as the Barnegat Bay Estuary using benthic invertebrates. The regulatory thresholds applied to these bio indices are delineated in section 4.3. The Department is in the process of developing a biotic index for the near shore marine waters. The marine waters and lakes without biological indices currently only use biologically-relevant chemical parameters.

All of these waters use a broad suite of biologically-relevant physical/chemical data (e.g., nutrients, dissolved oxygen, pH, temperature, toxic pollutants, turbidity, TSS). The biological assessment integrates a full suite of environmental conditions over many months (for macroinvertebrates) to many years (for fish). Biological data is required to conclude that aquatic life uses are fully supported, however, chemical data alone is sufficient to determine that the use is not supported and to place the chemical parameter on the 303(d) List as the cause of non-support. The required minimum physical/chemical parameters differ for the two designated aquatic life uses, general and trout, based on the criteria associated with their respective waterbody classifications. Specifically, both temperature and dissolved oxygen are required, in addition to biological data, to determine if the trout aquatic life use is fully supported, but only biological data is required to determine if the general aquatic life use is fully supported (see Table 6.1). Table 6.2 summarizes the possible outcomes of the aquatic life use assessment based upon various combinations of data and results.

6.5 Public Water Supply Use Assessment Method

52. Comment: Monitoring for the Drinking Water Supply designated use: It's interesting that *E. coli* is not one of the parameters that is associated with the designated use (Appendix A). Is there any particular reason why it's not? (EPA)

Response: The New Jersey water quality standards for E.coli are based on recreation designated uses only because E.coli is associated with recreational activity where direct contact and ingestion is highly probable. This bacterial indicator is not associated with drinking water since conventional treatment and disinfection would eliminate or reduce levels to meet drinking water standards. In accordance with N.J.A.C 7:9B-1.12, public water supply designated use is "…water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation, and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection."

53. Comment: If nitrate is the only parameter required to determine whether the water is or is not supportive of drinking water use, what incentive is there to monitor for anything else? But suppose someone *did* monitor for a whole suite of VOCs, heavy metals and other parameters under the drinking water use column in Appendix A and found some MCL exceedances—and suppose nitrate did *not* exceed the MCL. Would the water be considered *supportive* of the drinking water use? If several parameters *and* nitrate exceeded MCLs, it would be helpful if DEP had a designation category of "VERY non-supportive of drinking water." (EPA)

Response: Maximum contaminant levels (MCLs) are established by the Department to regulate the amount of contaminants in potable water "at the tap" pursuant to the federal and state Safe Drinking Water Quality statutes and regulations. MCLs do not serve as a basis for assessing designated use support or water quality impairment in New Jersey since such assessment is based on the New Jersey Surface Water Quality Standards promulgated pursuant to the federal Clean Water Act as well as the New Jersey Water Pollution Control Act and Water Quality Planning Act. While the surface water quality criterion of 10.0 ug/L Nitrate is based on protection of human health from consumption of nitrate in drinking water, it is not an MCL and is applied as an ambient water quality criterion in all freshwaters of the State to support the designation of such waters for the Water Supply Use.

The Methods Document identifies Nitrate as the minimum parameter required to conclude that an assessment unit is "fully supporting" that designated use. It does not mean that an exceedance of another parameter associated with that use will not result in an assessment of "not supporting". Rather, it means that if there is insufficient data to assess compliance with the nitrate criterion (e.g., insufficient number of samples), then there is insufficient data to determine that the use is being fully supported. As the Methods Document explains, the Department uses a conservative approach in assessing use support and allows, under certain circumstances, less data to determine non-support of a designated use than is required to determine that the use is being fully supported. If nitrate and/or other parameters are exceeding their respective criteria, then the use would be assessed as "not supporting" and all of those pollutants would be placed on the 303(d) List.

54. Comment: Water supply use attainment should be performed only on waters with existing or planned water supply intakes. (K)

Response: The State of New Jersey has regulated that all freshwaters of the state must meet requirements for water supply. As defined in N.J.A.C. 7:9B-1.12 all freshwaters (PL and FW2) have public water supply designated uses. Since all AUs with freshwater have either FW2 or PL classified waters within their watershed, all freshwater AUs have a requirement to meet their water supply designated uses.

7.0 Integrated Listing Guidance

55. Comment: When preparing the 303(d) list of Water Quality Limited Waters, it would be helpful to group listed waters by Watershed Management Area (WMA) and list those waters alphabetically within each WMA. The draft 2014 List of Water Quality Limited Waters is difficult to search and use effectively because it includes every listed water in the state alphabetically. (RHA)

56. Comment: When drafting the 303(d) List of Water Quality Limited Waters, it would be helpful to address all designated uses for each water body. For example, the current Appendix B for the draft 2014 Integrated Report often addresses a single designated use for which a water is listed. From that list it is not clear whether the water meets all other applicable designated use, or other designated uses were not assessed, or there was insufficient data to assess other uses. Adding a column for each designated use and indicating in that column whether that

water body met or failed to meet that designation, and why, would make a water's status more clear. (RHA)

Response to 55 and 56: The files in the Integrated Report are provided in Excel format so that users can organize, sort, and merge the data according to the user needs. However, assessment results are reported in accordance with the corresponding USEPA guidance and recommended format, which has changed over the years. This format is expected to change again for either the 2016 or the 2018 Integrated Report to conform with the redesigned Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS) platform, once it has been fully implemented by USEPA.

57. Comment: Where such monitoring clearly shows an impairment, that assessment unit will be placed on the 303(d) list. On that 303(d) list, will the assessment unit that is *outside* the selected region be differentiated in some way from AUs that are within that region--perhaps with an asterisk or with a different font? (EPA)

Response: The Integrated Report does not distinguish assessment units on the 303(d) List based on the selected region for the respective cycles. If needed, the WMA number can be filtered to identify listings within or outside the selected region. Additionally, the listing date indicates during which Integrated Report cycle a listing was placed on the 303(d) List to determine if it is a historical listing.

58. Comment: We suggest the Department create a Sublist 4P for impairment due to pathogen indicators, which are better managed through track-down studies than TMDLs. (K)

Response: The Department continues to conduct track down studies to determine the sources of pathogen contamination. However, since the studies only identify potential sources and do not have any requirement or regulatory ability to impose reductions, these impairments will still require TMDLs, other regulatory enforcement, or watershed plans and will remain on the 303(d) list without a sublist designation until water quality standards are met.

59. Comment: It is unclear whether insufficient data is an acceptable rationale for delisting a previously listed water. Once a water is listed as impaired or not meeting a designated use, DEP should be required to provide data that demonstrate the water is no longer impaired or meets all designated uses before delisting it. (RHA)

60. Comment: Waterways must not be delisted based on a lack of updated information, especially if the waterway was listed as impaired in the past. We already have one third fewer monitoring stations then we are supposed to have and now this will be used as an excuse to exclude waterways. Also testing standards must not be weakened by allowing data to be rounded down and including the margin of error so that streams exceeding limits would not be listed. (SC)

Response for Comments 59 and 60: As stated in Section 4.1 of the 2016 Methods Document, "If current data is not sufficient for an assessment decision, past assessments are considered valid until new data show that conditions have changed." Additionally, the Department's approach to accurately reflect water quality conditions incorporates a margin of error based on

instrument and/or laboratory uncertainties as well as including the standard practice of rounding significant digits based on the water quality criteria.

An example where an impaired waterbody was delisted because of insufficient data occurred in the 2014 Integrated List where 37 AUs were proposed for delisting from Sublist 4A for insufficient fecal coliform data based on administrative corrections. In the early 2000's, when TMDLs were developed to address fecal coliform on the 303(d) List, the Department's practice was to place all AUs upstream of an impaired AU on Sublist 4A although some AUs had no fecal coliform data and were not covered by the downstream fecal coliform TMDL. This practice has since been refined to list only AUs with sufficient data to confirm impairment and to only place such AUs on Sublist 4A when they are explicitly covered by a USEPA-approved TMDL. Since there was insufficient or no data to confirm fecal coliform impairment in these AUs and they were not covered by a TMDL, these AU/pollutant combinations were removed from Sublist 4A and moved to Sublist 3. These AUs have also been prioritized for future sampling to generate sufficient data to determine recreational use attainment. Any AUs that are covered by a USEPA-approved TMDL remained on Sublist 4A.

61. Comment: What steps is the Department taking to close data gaps by collecting data in AUs with insufficient information? Does the Department anticipate increased federal or state funding and support for citizen science initiatives to collet water quality data? (RHA)

Response: Previous Integrated Reports contained a chapter on Next Steps that discussed future needs and actions to support water quality monitoring and assessment, including strategies to fill data gaps such as waters on Sublist 3 of the Integrated List. Such strategies are being incorporated into the Department's pending update to the Long Term Monitoring and Assessment Strategy prepared pursuant to CWA Section 106(e)(1) and in accordance with USEPA in its "Elements of a State Water Monitoring and Assessment Program" (March 2003). Funding and support for citizen science initiatives is beyond the scope of the Integrated Report.

62. Comment: Sublist 5R and any other alternative approach to addressing impaired water bodies are not appropriate or adequate substitutes for developing and implementing TMDLs. Alternative approaches to improving water quality, including 319(h) funded projects, best management practices, and other strategies, may be incorporated in TMDLs but do not negate DEP's obligation to prepare and implement TMDLs and monitor their effectiveness. (RHA)

63. Comment: Sublist 5R should be moved to 4R, since the impairment is being addressed through a watershed plan (a mechanism other than a TMDL). (K)

Response for Comment 62 and 63: The Department acknowledges the comment that impairments listed on Sublist 5R do not negate the obligation to develop and implement TMDLs if Watershed Based Plans are not effective. However, because these impairments were identified in locations where the sources are nonpoint or stormwater in nature and non-regulatory measures are the primary means available to reduce the loads, the Department will opt to pursue restoration and stewardship actions directly as the preferred path to reduce loads and attain water quality standards.

64. Comment: The Department's designations of sublists 5L ("Legacy" impairment) and 5R (NPS impairment addressed by a Plan) make a great deal of sense, and prevent the Department from having to develop TMDLs that may not be the most appropriate management solution. (K)

Response: The Department appreciates the commenters' support.

65. Comment: Sublist 5L should be moved to 4L, since the Department is relying on mechanisms other than TMDLs, namely site remediation plans and pollutant minimization plans. (K)

Response: Impairments on Sublist 5L are banned from production or use and the causes are historical in nature. The main mechanisms for reduction are follow-through on site remediation plans, development/implementation of pollutant minimization plans for incidental introduction into regulated discharges and natural attenuation. Since the approach for restoration include nonregulatory measures, these impairments can not be placed in Sublist 4 that requires enforceable control measures.

66. Comment: Waters high in arsenic concentration that can be attributed to historical pesticide application should be included on sublist 5L, which we recommend be moved to 4L. (K)

Response: Since arsenic is not banned from production or use, the placement on Sublist 5L is not appropriate. See Comment # 65 for moving to Sublist 4L.

7.2 Delisting Assessment Unit/Pollutant Combinations

67. Comment: Waterways with unknown sources of pollution must continue to be included on the impaired list. Local residents and recreational users will continue to be impacted by the pollution and should be notified the waterbody is impaired. This is alarming as the Integrated Report found one of the top three sources of pollution in our waterways is non-point source pollution. For example, the Elizabeth River is the most polluted river for non-point source pollution in the country and it has been delisted. (SC)

Response: All waterbodies impaired by pollutants are placed on the 303(d) List regardless of sources and causes. If a TMDL is developed, the listing are placed on Sublist 4 but are still considered as "not supporting" until water quality data confirms that the water quality criteria are not exceeded. Although there were no delisting for the Elizabeth River in the 2014 Integrated Report, previous delistings for fecal coliform were based on the development of a TMDL and placed on Sublist 4.

8.0 Method to Rank and Prioritize Assessment Units That Do Not Fully Support Designated Uses

68. Comment: The methodology used to sample the dissolved oxygen levels in the Barnegat Bay was also flawed. The DEP should relist the northern half of Bay for being impaired for dissolved oxygen based on previous data and the previous 2010 listing for dissolved oxygen. The southern half of the Bay is in serious decline as well. The findings of the Rutgers Institute

of Marine and Coastal Sciences (IMCS) on the declining ecological indicators in the Barnegat Bay should be used to declare the entire Bay as impaired on the 303(d) list and begin the TMDL process. This Rutgers report contains the needed data to justify such an impairment designation for the Bay. (SC)

Response: The Department recognizes that observed effects in the Bay, such as seagrass declines, algal blooms, high macroalgal densities, shellfish declines, and sea nettle population rises are well documented; however, current research does not conclusively establish that these observed effects are caused by nutrient over-enrichment rather than other causes or sources. In addition to nutrients, such as nitrogen, other stressors that can cause similar effects include reduced light penetration from boat traffic, circulation patterns, temperature and salinity levels, sediment contamination, over-harvesting of shellfish, and habitat changes. Although excessive nitrogen has been reported throughout the media as the cause for Barnegat Bay's degraded condition, no scientific studies have concluded that nitrogen is the only cause for current conditions in the Bay.

The Department has sponsored studies of the Barnegat Bay that will help us better understand the physical, chemical, and biological processes in the estuary in order to understand the role played by nutrients and other factors in manifesting the observed conditions in the Bay. These studies will investigate various biotic trophic levels and communities for condition and relationship to stressors, including diatoms, phytoplankton, zooplankton, benthic organisms, clams, crabs, and fish. There are also studies underway to evaluate the possible causes for increased abundance of sea nettles, the role of marshes and wetlands, and the effect of conservation zones. More details about these and other studies in the Barnegat Bay sponsored by the Department can be found on the Department's website at http://www.nj.gov/dep/barnegatbay/plan-research.htm. Through these studies, the Department is working to develop thresholds and indicators for various biological communities as well as establishing cause/response relationships so that the means to interpret and apply the narrative nutrient criteria in estuarine waters can be determined. The Department is also conducting comprehensive monitoring and modeling work, which will be used to establish linkages between pollutant loadings, water quality, and biotic community response, using information from the research projects, where feasible. More details about this work can be found on the Department's website at http://www.nj.gov/dep/barnegatbay/plan-wqstandards.htm. The Department will continue to integrate the information acquired from the biologic community studies along with monitoring and modeling work to assess the degree to which the Bay meets numeric and narrative water quality criteria and supports designated uses.

As stated above, studies are currently underway that should verify correlations between suspected sources and observed conditions and help us understand the various stressors and their relative importance in to water quality in the Bay. The Department's work to understand the causes of observed conditions is important so that the most effective restoration actions can be implemented. Nevertheless, the Department is not waiting until nutrient thresholds, biological indexes and cause/response relationships are established to begin working on improving conditions in Barnegat Bay. Actions that will advance the overall objective of restoring the Bay have already been undertaken. These include establishing a statewide fertilizer law, retrofitting stormwater basins to promote recharge and reduce nutrients, and acquiring open space. The Water Quality Monitoring Project for Barnegat Bay will be used

to develop and calibrate a model that can then be used to simulate future conditions. Once the model is available, the Department will be able to evaluate various actions and, if the cause/response relationships are clearly defined, we should be able to determine the success of the selected actions.

Agency-Initiated Changes

1. Section 4.3 – Biological Data was revised to include two new biological indices. A new biological index to assess support of the general aquatic life use in Barnegat Bay was added to Section 4.3 – Biological Data. The draft Methods Document stated that the Department was carrying out research on developing benthic macroinvertebrate indices for estuary and ocean waters, including a new estuary benthic macroinvertebrate index for Barnegat Bay and (see p. 17). However, that section of the Methods Document has been revised to reflect the completed development and application of a new benthic macroinvertebrate index for marine waters, Multivariable AZTI Marine Biotic Index (M-AMBI), which will be used to assess support of the general aquatic life use in saline waters of the Barnegat Bay.

2. Another new biological index was also added to Section 4.3. This new index of biotic integrity, Headwaters Index of Biotic Integrity (HIBI), will be used to assess biological conditions in small headwater streams in Northern New Jersey. This new index was developed to assess streams less than 4 square miles in watershed area within the northern ecoregions and will monitor the assemblage of fish as well as crayfish, salamanders and frogs to assess support of the general aquatic life use in small headwater streams.

3. Section 6.3 – Fish Consumption Use Assessment Method was revised to explain the current practice regarding migratory fish is assessing support of the Fish Consumption Use. If the migratory range of a species is known to extend beyond the State's jurisdictional waters, such as bluefish and striped bass, then fish tissue data from such fish will not be used to assess the fish consumption use. This is because, due to the migratory nature of these fish, the distances they travel, and because it is not known where along the eastern seaboard these fish acquired any contaminants present in their tissues, there is insufficient data on the source of such contamination to support placing New Jersey waters on the 303(d) List. The Department will continue to use fish tissue data from such fish to develop fish consumption advisories since consumption of such fish may still pose a threat to human health, regardless of the source of the contamination.