

State of Rhode Island and Providence Plantations
2010
Consolidated Assessment and Listing Methodology
For Section 305(b) and 303(d)
Integrated Water Quality Monitoring and Assessment Reporting

DRAFT

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LIST OF ACRONYMS AND TERMS

305(b) = Section 305(b) of the Federal Clean Water Act requires states to assess the health of their surface waters and submit biennial reports describing the water quality conditions. In Rhode Island, this was known as the State of the State's Waters Report. As of 2008, the 305(b) Report was integrated with the 303(d) List of Impaired Waters and published as the *Integrated Water Quality Monitoring and Assessment Report*.

303(d) = Section 303(d) of the Federal Clean Water Act requires that each state identify waters for which existing required pollution controls are not stringent enough to achieve State water quality standards. Any waterbody or waterbody segment that is assessed as not meeting its water quality standards under the 305(b) assessment process, is placed on the 303(d) List of Impaired Waters.

Acute = Refers to a stimulus severe enough to rapidly induce an effect; in aquatic toxicity tests, an effect observed in 96 hours or less is typically considered acute. When referring to aquatic toxicology or human health, an acute effect is not always measured in terms of lethality.

ADB = Assessment Database

Aquatic Life Criteria = The highest concentration of a pollutant in a water that is not expected to cause toxicity to aquatic life.

AQLUS = Aquatic Life Use Support

Antidegradation = The third component of water quality standards are the antidegradation rules that contain provisions designed to preserve and protect the existing beneficial uses and to minimize degradation of water quality.

AU = Assessment Unit – a waterbody or waterbody segment.

BPJ = Best professional judgment, means a determination, based on best engineering and/or scientific practices and best management practices, involving any pollutant, combination of pollutants or practice(s), on a case-by-case basis, which is determined by the Director to be necessary to carry out the provisions of the Clean Water Act and any applicable chapters of the General Laws of Rhode Island.

CALM = Consolidated Assessment and Listing Methodology, provides a description of the assessment and listing methodology used to develop the Section 305(b) water quality assessments and Section 303(d) impaired waters list.

Chronic = Defines a stimulus that lingers or continues for a relatively long period of time. The measurement of a chronic effect can be reduced growth, reduced reproduction, etc., in addition to lethality.

CWA = Clean Water Act, refers to the Federal Water Pollution Control Act (33 U.S.C. § 1251) et seq. And all amendments thereto.

DEM or RIDEM = Rhode Island Department of Environmental Management

Designated uses = Those uses specified in water quality standards for each waterbody or segment whether or not they are being attained. In no case shall assimilation or transport of pollutants be considered a designated use.

DO = Dissolved oxygen

DQA = Data quality assurance

DQO = Data quality objective

Ecoregion = Relatively homogeneous areas with respect to ecological systems and the interrelationships among organisms and their environment.

EPA = United States Environmental Protection Agency

FDA = United States Food and Drug Administration

HEALTH = Rhode Island Department of Health

Human health criteria = the highest concentration of a pollutant in water that is not expected to pose a significant risk to human health.

IR = Integrated Water Quality Monitoring and Assessment Report. New format for reporting 305(b) water quality assessments and 303(d) Impaired Waters listings.

Macroinvertebrates = Aquatic invertebrate organisms that are used to assess water quality conditions.

MCLs = Maximum contaminant levels, maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

MDL = Method Detection Limit/Detection Limit - the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

NSSP = National Shellfish Sanitation Program

OWR = Office of Water Resource, Rhode Island Department of Environmental Management

Probabilistic Sampling = Monitoring design where the site selection is random.

QA = Quality assurance

QAPP = Quality Assurance Project Plan

QC = Quality control

QL = Quantitation Level – also known as the minimum level or minimum reporting level, is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. In general this is the minimum concentration of an analyte that can be measured and reported with an acceptable degree of confidence.

RBP = Rapid bioassessment protocol

RIGIS = Rhode Island Geographic Information System

RIPDES = Rhode Island Pollution Discharge Elimination System

SDWA = Safe Drinking Water Act

TMDL = Total maximum daily load, the amount of a pollutant that may be discharged into a waterbody without violating water quality standards. The TMDL is the sum of wasteload allocations for point sources, load allocations for nonpoint sources, and natural background. Also included is a margin of safety.

USGS = United States Geological Survey

Water Quality Criteria = Elements of the State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use.

Water Quality Standards = define the goals for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions to protect water quality from pollution (antidegradation).

WET = Whole Effluent Toxicity

WQUAL = Access database used by RIDEM/OWR to store water quality data.

Rhode Island Consolidated Assessment and Listing Methodology

For 2010 305(b) and 303(d) Integrated Water Quality Monitoring and Assessment Reporting

1.0 INTRODUCTION

Rhode Island enjoys an abundance of water resources that support vital uses such as drinking water, recreation, habitat, and fish and shellfish consumption. With 1,420 miles of streams and rivers, 20,749 acres of lakes and ponds, 158 square miles of estuarine waters, and 420 miles of coastal shoreline, the state is faced with a tremendous challenge to monitor and accurately report on the condition of its surface waters.

Sections 305(b) and 303(d) of the federal Clean Water Act direct states to monitor and report the condition of their water resources. Since 2001, the United States Environmental Protection Agency (USEPA) has recommended that states integrate their 305(b) water quality assessment report with their 303(d) List of Impaired Waters, into an Integrated Water Quality Monitoring and Assessment Report (Integrated Report). EPA's guidance for the Integrated Reporting and Listing Decisions provides recommendations on the delineation of waterbodies, reporting the status and progress towards comprehensive assessment of state waters, attainment of state water quality standards and the basis for making attainment decisions. For the 2010 submissions, EPA recommends that States prepare their Integrated Report consistent with previous guidance (<http://www.epa.gov/owow/tmdl/guidance/final52009.html>) including EPA's 2006 Integrated Reporting Guidance (<http://www.epa.gov/owow/tmdl/2006IRG/>) and EPA's information for the 2008 reporting cycle (http://www.epa.gov/owow/tmdl/2008_ir_memorandum.html).

In accordance with these CWA requirements and recent federal guidance, the *Rhode Island Consolidated Assessment and Listing Methodology* (RI CALM) documents the decision-making process for assessing and reporting on the quality of the State's surface waters following the Integrated Reporting format. This process is the basis for a majority of water pollution abatement actions undertaken in RI, and is fundamental to watershed-based environmental protection.

1.1 Background

Section 305(b) of the CWA requires each state to assess the health of their surface waters and submit biennial reports describing the water quality conditions. Prior to 2008, the 305(b), *State of the State's Waters Report* provided information on the quality of all assessed waters in the state relative to their designated uses and the water quality criteria established in the Rhode Island Water Quality Regulations.

Section 303(d) of the CWA requires that each state identify waters for which existing required pollution controls are not stringent enough to achieve State water quality standards (water quality uses and criteria). These waters are referred to as "water quality limited" or "impaired". DEM develops this list of impaired waters from the 305(b) water quality assessments. Any waterbody or waterbody segment that is assessed as not meeting its water quality standards under the 305(b) process, is placed on the 303(d) List. The 303(d) list provides an inventory of these waterbodies and the water quality impairment, and prioritizes them for restoration. Once a waterbody is identified as impaired, Section 303(d) requires that a Total Maximum Daily Load (TMDL) be developed. TMDLs describe the amount of a given pollutant that a waterbody can receive and

still meet water quality standards. The so-called allowable load is allocated among point and non-point sources of pollution, with consideration to a margin of safety. The TMDL process provides an analysis of the sources causing the impairment and where possible, the specific actions necessary to achieve the required pollutant reductions needed to meet allocations set by the TMDL.

1.2 New Integrated 305(b)/303(d) Report

The 305(b) water quality assessment report and the 303(d) impaired waters list must be submitted to the US Environmental Protection Agency (EPA) every even year. Prior to 2008, DEM submitted the 305(b) Report and 303(d) List as separate documents. In 2008, following EPA guidance, DEM integrated the 305(b) assessment information and 303(d) impaired waters list into a single document called the Integrated Water Quality Monitoring and Assessment Report (Integrated Report). RIDEM's 2010 Integrated Report continues to follow the integrated format to provide an effective tool for assessing and reporting on the quality of the state's waters.

The federal guidance results in a fundamentally different scope, organization, and options for communicating about water quality than previous guidance for these individual reports. This approach offers several significant improvements over the traditionally separate assessment report and impaired waters list. The Integrate Report allows for a more thorough evaluation of water quality for all designated uses thereby facilitating implementation of the recommendations for comprehensive monitoring detailed in the [RI Water Monitoring Strategy](#). Furthermore, the integrated approach emphasizes the importance of quality data and science-based decision making in both monitoring and assessment for implementing an effective water quality management program.

The new integrated format provides five new categories of assessment determination replacing the old 305(b) assessment terminology (fully supporting, threatened, partially supporting, not supporting) and the 303(d) List Group format previously utilized by DEM. The Integrated Report categories are summarized below and further discussed in Section 6. Based on the assessment and listing methodology described in this document, each surface waterbody of the state will be placed into one of the following five assessment categories:

- Category 1** - Attaining all designated uses and no use is threatened (waters are considered to be “fully supporting” all uses).
- Category 2** - Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened (i.e., some uses are fully supporting however more data is needed to assess other uses).
- Category 3** - Insufficient or no data and information are available to determine if any designated use is attained, threatened, or impaired (i.e., more monitoring is needed to assess any use; associated waters are considered to have insufficient data or to be not assessed).
- Category 4** - Impaired or threatened for one or more designated uses but does not require development of a TMDL because;
 - A. TMDL has been completed (and when implemented are expected to result in attainment of the water quality standard), or

- B. Other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future, or
- C. Impairment is not caused by a pollutant.

Category 5 - Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL (this is the 303(d) Impaired Waters List).

The Integrated Report format emphasizes the importance of monitoring and assessing waterbodies in each category to obtain the information needed to evaluate progress toward attainment of water quality standards, to address data gaps, and to ensure that waterbodies which currently meet water quality standards, continue to do so. While each waterbody will be placed into only one of the 5 reporting categories, the attainment status of each designated use for each waterbody can be tracked to assist in addressing data gaps and directing monitoring.

The Integrated Report combines the non-regulatory requirements of the 305(b) water quality assessments with the regulation-based 303(d) List of Impaired Waters which mandates TMDL development. While all five Categories represent assessment status under Section 305(b), Category 5 represents reporting requirements under Section 303(d). Therefore, the regulatory requirements (ie., USEPA approval, public participation, etc) only apply to Category 5 of the Integrated Report.

1.3 Assessment and Listing Methodology

This Consolidated Assessment and Listing Methodology (CALM or Methodology) document describes in detail the decision making process for assessing the quality of surface waters in accordance with requirements of Section 305(b) and for generating the list of impaired waters in accordance with requirements of Section 303(d). The Methodology describes the quality of data necessary to be used in the assessment and listing process, and how that data and information are then interpreted to arrive at an assessment of water quality for placement in one of the 5 Integrated Report Categories. The assessment and listing methodology is based on the following documents:

- *Consolidated Assessment and Listing Methodology, Toward a Compendium of Best Practices*, USEPA, First Edition, July 2002. USEPA 2002.
- *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates: Report Contents*, USEPA 1997a.
- *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates: Supplement*, USEPA 1997b.
- *Rhode Island Water Quality Regulations, July 2006*. RIDEM 2006.
- *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act, July 29, 2005*. USEPA 2005a.
- *Information Concerning 2008 Clean Water Act (CWA) Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions. Memorandum from Diane Regas, Director, Office of Wetlands, Oceans and Watersheds, USEPA 2006*.
- *Information Concerning 2010 Clean Water Act sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions. Memorandum from John Goodin, Chief, Watershed Branch, Office of Wetlands, Oceans and Watersheds, USEPA 2009*.

The Assessment and Listing Methodology is envisioned to be a dynamic process that will evolve as the state's Monitoring Strategy (RIDEM 2005a) (Section 8.0) is implemented. The Methodology will be modified, as appropriate, to accompany subsequent Integrated Reports.

1.4 **Summary of Major Changes from the 2008 CALM**

Macroinvertebrate Data: The addition of a freshwater biologist to conduct bioassessments has allowed for a refinement in the protocol for evaluation of macroinvertebrate data for use in Aquatic Life Use Support determinations (Section 5.4.3). RIDEM collects benthic macroinvertebrates following USEPA's Rapid Bioassessment Protocol (RBP). Review of the historical practices associated with locating RBP sampling stations has resulted in a determination that conditions at some historically located stations may not be appropriate for data evaluation following the RBP reference station approach. Specifically, stations located immediately downstream of impoundments, located within extremely small watersheds, or on streams suspected to be intermittent, are not representative of conditions found at the reference sites to which they are being compared and scored. Therefore, for the 2010 bioassessments, these conditions are more thoroughly scrutinized to determine the usability and qualifications of data collected at such sites for an overall determination of the biological condition status. In addition, habitat data collected during RBP sampling will be more thoroughly evaluated using the USEPA Habitat Assessment Categories. The assignment of a station to one of these habitat categories will be integrated with the Biological Condition Category classification and best professional judgment (BPJ) to determine the final biological assessment.

Shellfish Harvesting for controlled relay and depuration: All Class SB waters are designated for shellfish harvesting for controlled relay and depuration. A discussion of this Class SB designated use was inadvertently not included in the 2008 CALM. RIDEM's Management of these waters for shellfish harvesting for controlled relay and ambient depuration is in accordance with requirements established in the Food and Drug Association's National Shellfish Sanitation Program and implemented by RIDEM. However, there are no water quality criteria established by FDA to evaluate this use for the water quality assessment process. As discussed in Section 5.4.7, the Department has determined that, for assessment purposes, all Class SB waters are fully supporting this designated use.

2.0 WATER QUALITY STANDARDS

As noted above, a major aspect of the CALM is to document the decision making processes used to assess attainment with the water quality standards. To understand this process it is important to be familiar with the Rhode Island water quality standards. Water quality standards serve as the foundation for the state's water quality management program. Standards drive 305(b) water quality assessments, 303(d) lists of impaired waters, TMDLs, RIPDES permits, and nonpoint-source management measures. Water quality standards define the *goals* for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions to protect water quality from pollutants. A water quality standard consists of three basic elements:

- (1) *designated uses* of the water body (e.g., recreation, water supply, aquatic life, etc.),
- (2) *water quality criteria* to protect designated uses (numeric pollutant concentrations and narrative requirements), and
- (3) an *antidegradation policy* to maintain and protect existing uses and high quality waters.

The Rhode Island water quality standards have been developed to restore, preserve, and enhance the water quality of Rhode Island waters, and to maintain existing uses. These standards provide for the protection of the waters from pollutants so that the waters shall, where attainable, be fishable and swimmable, and be available for all designated uses and thus assure protection for the public health, welfare, and the environment. These objectives are implemented through the water quality standards, which are a fundamental element of the state's Water Quality Regulations.

Within the Water Quality Regulations are numeric water quality criteria that represent parameter-specific thresholds for acceptable levels of substances in waters of the state. For other parameters, the standard is more descriptive (narrative) in nature (e.g. "no toxics in toxic amounts"). The Water Quality Regulations also contain antidegradation rules and policies. The provisions of the State Antidegradation Regulations have as their objective the maintenance and protection of various levels of water quality and uses.

As described in the Water Quality Regulations, all surface waters of the state are assigned to one of four freshwater (Class AA, A, B, B1), or one of three saltwater (Class SA, SB, SB1), classifications. Each class is defined by the designated uses (see Section 2.1) which are the most sensitive and, therefore, governing water use(s) which it is intended to protect. Surface waters may be suitable for other beneficial uses, but are regulated to protect and enhance the designated uses. Another classification, Class C or SC, is available should it be proven through a Use Attainability Analysis (UAA) that this classification is appropriate. This C or SC classification is not, however, currently designated to any waterbodies because it does not meet the "swimmable" goals of the CWA.

In addition, the state has incorporated partial use classifications into the Water Quality Regulations. Partial use denotes specific restrictions of use assigned to a waterbody or waterbody segment that may affect the application of criteria. Partial use designations have been adopted in the Water Quality Regulations for waters which will likely be impacted by activities such as combined sewer overflows (CSOs) and concentrations of vessels (marinas and/or mooring fields). Partial use designation for waters impacted by CSOs are denoted by "{a}"

following the classification. Partial use designation for waters with concentration of vessels are denoted by “{b}” following the classification.

2.1 Designated Uses

In accordance with Section 305(b) of the CWA, states are required to survey their water quality for attainment of the “fishable/swimmable” goals of the Act. The attainment of the CWA goals is measured by determining how well waters support their designated uses. Six designated uses are evaluated for the purposes of the 305(b) water quality assessment process. There are slight differences in the wording for designated uses as they are stated in the Water Quality Regulations and as they are described in 305(b)/303(d) assessments. Table 1 lists the designated uses as they appear in the 305(b)/303(d) assessment process and the comparable designated use as described in the Water Quality Regulations.

Table 1 Designated uses for surface waters as described in RI Water Quality Regulations and 305(b)/303(d) assessments.

305(b) Designated Use	RI WQ Regulations Designated Use	Applicable Classification of Water	Designated Use Definition
Drinking Water Supply	Public Drinking Water Supply	AA	The waterbody can supply safe drinking water with conventional treatment.
Swimming/ Recreation	Primary Contact Recreation	AA*, A, B, B1, B{a}, B1{a}, SA, SA{b}, SB, SB{a}, SB1, SB1{a} (all surface waters)	Swimming, water skiing, surfing or other recreational activities in which there is prolonged and intimate contact by the human body with the water.
Swimming/ Recreation	Secondary Contact Recreation	AA*, A, B, B1, B{a}, B1{a}, SA, SA{b}, SB, SB{a}, SB1, SB1{a}, SC (all surface waters)	Boating, canoeing, fishing, kayaking or other recreational activities in which there is minimal contact by the human body with the water and the probability of ingestion of the water is minimal.
Aquatic Life Support/ Fish, other Aquatic Life, and Wildlife	Fish and Wildlife Habitat	AA, A, B, B1, B{a}, B1{a}, SA, SA{b}, SB, SB{a}, SB1, SB1{a}, SC (all surface waters)	Waters suitable for the protection, maintenance, and propagation of a viable community of aquatic life and wildlife.
Shellfishing/ Shellfish Consumption	Shellfish harvesting for direct human consumption.	SA, SA{b}	The waterbody supports a population of shellfish and is free from pathogens that could pose a human health risk to consumers
Shellfish Controlled Relay and Depuration	Shellfish harvesting for controlled relay and depuration	SB, SB{a}	Waters are suitable for the transplant of shellfish to Class SA waters for ambient depuration and controlled harvest.
Fish Consumption	No specific analogous use, but implicit in “Fish and Wildlife Habitat”.	AA, A, B, B1, B{a}, B1{a}, SA, SA{b}, SB, SB{a}, SB1, SB1{a}, SC (all surface waters)	The waterbody supports fish free from contamination that could pose a human health risk to consumers.

* - Class AA waters may be subject to restricted recreational use by State and local authorities.

2.2 Numeric Water Quality Criteria

Pursuant to the CWA requirements, Rhode Island has adopted water quality criteria for the protection of aquatic life and human health, in the Water Quality Regulations. The criteria consist of numeric values that represent parameter-specific thresholds for acceptable levels of substances in the waters of the state. The State has adopted numeric aquatic life criteria for conventional (dissolved oxygen, pH, temperature, etc.) parameters that are class-specific values. In other words, the criteria may vary depending on the water quality classification of the waterbody. The criteria for these chemical and physical parameters appear in Tables 1 and 2 of the Water Quality Regulations.

The State has also adopted aquatic life criteria for toxic parameters (metals, organics, chlorine and ammonia) that apply to *all* water classifications. The criteria for these parameters can be found in Appendix B of the Water Quality Regulations.

The Water Quality Regulations also contain water column criteria for the protection of human health from water and aquatic life consumption. These human health water quality criteria can be found in Appendix B of the Water Quality Regulations.

2.3 Narrative Water Quality Criteria

The state has adopted narrative criteria to supplement the numeric criteria. Narrative criteria are descriptions of the conditions necessary for a waterbody to attain its designated use. The narrative criteria are contained within the Water Quality Regulations. The state uses these descriptive criteria to evaluate water quality indicators such as toxicity, nutrients, excess algal growth, noxious aquatic plants, aesthetics, habitat and biological condition. In general, the state's narrative criteria indicate that waters should be free from substances that:

- Cause injury to, are toxic to, or produce adverse physiological responses in humans, animals, or plants;
- Settle to form objectionable deposits;
- Float as debris, scum, oil, or other material in concentrations that form nuisances;
- Produce objectionable color, odor, taste, or turbidity; or
- Produce undesirable aquatic life or result in the dominance of nuisance species.

2.4 Antidegradation

The third component of water quality standards are the antidegradation rules that contain provisions designed to preserve and protect the existing beneficial uses and to minimize degradation of the state's water quality. The antidegradation provisions consist of four tiers of water quality protection as defined in the Water Quality Regulations.

2.5 Assessment Indicators

Under the assessment process, the term “indicators” refers to a wide range of measures of water quality (e.g., physical, chemical, biological, etc.). For any designated use, there are often many parameters/indicators that can be evaluated to determine the use attainment status. Table 2 shows the designated uses and associated parameters/indicators utilized to assess attainment of each designated use for RI waters. Many of the indicators can be easily linked to enforceable water quality standards. Accordingly, data collected to support measuring these indicators are an integral part of the RI water quality assessment process. In other cases, the data collected for an indicator may not be easily compared to a standard or threshold. Such data may not be directly used in the water quality assessment process, but are needed to understand the functioning of aquatic ecosystems for purposes of effective protection and management.

For several uses there is a hierarchy of indicators used to assess attainment with the water quality standards. The core indicators, shown in bold in Table 2, represent the most direct measures of the use and are considered the primary data needed to support water quality standards attainment decisions and to identify impaired waters. Table 2 also notes several indirect measures of designated use attainment. These supplemental indicators may be evaluated for waters where there is a reasonable potential for specific pollutants to cause or contribute to water quality impairments based on evaluation of watershed conditions, including land use and source assessments.

The protocol for determining attainment of the criteria and uses (standards) is described in Section 5, Assessment Evaluation Methodology.

Table 2 Designated Uses and Indicators for Attainment Evaluations.

Designated Use	Indicators Evaluated For Attainment Of This Use *
Drinking Water Supply	<ul style="list-style-type: none"> • Compliance with SDWA standards (MCLs) in the finished drinking water (HEALTH) • Finished Drinking Water Restrictions – use advisories associated with source water contamination (HEALTH) • Treatment Requirements – contaminants in source water that requires more than conventional treatment (HEALTH) • Fecal coliform bacteria (terminal reservoir) (RI WQRegs)
Swimming/Primary and Secondary Recreation	<ul style="list-style-type: none"> • Enterococci (RI WQRegs); • Fecal coliform bacteria (RI WQRegs); • Beach closure information for designated beach waters (HEALTH) • Minimum water quality general criteria and aesthetics (narrative criteria) (RI WQRegs)
Fish, other Aquatic Life, and Wildlife	<ul style="list-style-type: none"> • Biological (macroinvertebrate) data including physical habitat information (RI WQRegs) • Conventional parameters (RI WQRegs) • Toxic parameters in water column (RI WQRegs) • Toxicity data (RI WQRegs) • Minimum water quality general criteria and aesthetics (narrative criteria) (RI WQRegs)
Shellfish Consumption	<ul style="list-style-type: none"> • Fecal coliform bacteria (RI WQRegs) • RI Shellfish Growing Area Monitoring Program classifications • Minimum water quality general criteria and aesthetics (narrative criteria) (RI WQRegs)
Shellfish Controlled Relay and Depuration	<ul style="list-style-type: none"> • See Section 5.4.7
Fish Consumption	<ul style="list-style-type: none"> • Fish consumption advisories for specific waterbodies (HEALTH)

* Core indicators are represented in **bold** lettering.

3.0 ASSESSMENT UNITS

The waters of the state have been assigned to an assessment unit (AU), which refers to a waterbody or waterbody segment. Each assessment unit has been assigned an identifying number, referred to as a waterbody ID number. These identifying numbers are unique to the waterbody to allow for tracking of assessment information and indexing in RIGIS (Rhode Island Geographic Information System) for mapping purposes. The state tracks and assesses surface waterbodies visible on a 1:24,000 scale map (USGS topographic map). In some cases the entire waterbody is considered as one AU, which is generally the case for lakes in the state. In other cases, the waterbody is segmented into several AUs. This is the situation for most rivers and estuarine waters. Waters are segmented to reflect classification changes, hydrologic drainage basin, assessment changes, land use changes, and shellfish growing area status. Waters are also segmented to differentiate among waterbody types (lake vs. river vs. estuarine). There are, however, AUs for river segments that include run-of-the-river lakes (impoundments/reservoirs) along the course of the river segment. The length or size of each AU is estimated by RIGIS. Due to refinements in software, estimates of AU size may vary slightly from year to year. Assessments are conducted on each individual assessment unit. Water quality data collected within an AU is considered to be representative of the entire AU unless and until more recent data or information indicate otherwise.

The unique identifying number for each AU is based upon the Basin and Subbasin within which each AU is located. For this purpose, the state has been divided into 10 major Basins: Blackstone, Woonasquatucket, Moshassuck, Ten Mile, Thames, Pawtuxet, Narragansett, Pawcatuck, Westport, and Coastal. Each ID number begins with “RI” to indicate that this waterbody is located in Rhode Island. The next four digits indicate which Basin the waterbody is located within. The next three digits indicate which subbasin the waterbody is located within. The next letter is an indication of the waterbody type where an “R” is for river, “E” is for estuarine, “L” is for lake, and “C” is for coastal shoreline. The last two digits represent the unique number for the waterbody. There may be a letter following the last two digits which represent the segment of that waterbody. For example, RI0008040R-03A represents the Pawcatuck River Basin (RI0008), Wood River Subbasin (040), a river waterbody type (R), Brushy Brook (03), segment A of the brook. A listing of the waterbodies/AUs and their waterbody ID numbers can be found in Appendix A of the RI Water Quality Regulations.

While assessments are determined on an individual AU basis, to comply with federal EPA reporting requirements, DEM will compile assessment results on the basis of 12 digit HUC watershed sub-basins. Performance measures associated with EPA’s Strategic Plan, are intended to track improvements of these sub-basins over time.

For the 2010 cycle, DEM is tracking the following number of AUs by waterbody type:

Waterbody Type	Total Size in the State at 1:24,000	Total Size Tracked	Total Number of Assessment Units Tracked
Rivers and Streams	1,420 Miles	1,377.47 Miles	510
Lakes and Ponds	20,749 Acres	18,845.77 Acres	238
Estuarine	158.53 Sq. Miles	158.53 Sq. Miles	128
Coastal Shoreline	78.62 Miles	78.62 Miles	1
		Total	877

4.0 **GENERAL DATA REQUIREMENTS**

As stated in RIDEM's Quality Management Plan (RIDEM 2008a), it is the policy of the RIDEM that all environmental data generated and compiled shall be of known quality and adequate for its intended use, well documented, and be verifiable and defensible. RIDEM's OWR staff review all readily available data for consistency with data quality assurances (DQA) and data quality objectives (DQO) described below, to be used in the assessment and listing determinations for the Integrated Report.

4.1 **Data Sources**

DEM strives to consider all readily available water quality data and related information in developing the 305(b) water quality assessments and 303(d) impaired waters listing. In determining if data are appropriate, DEM considers quality assurance/quality control, data quality objectives, monitoring design, age of data, accuracy of sampling location information, data documentation and data format (hard copy versus electronic).

The primary source of data generated for assessments is developed from programs consistent with the RI Water Monitoring Strategy and the Strategy has as a goal to comprehensively assess the state's waters over a specified number of years. As the Monitoring Strategy is beginning to be implemented, there continues to be gaps that have to be addressed with additional investments of resources. Data generated from implementation of the Monitoring Strategy are used in multiple programs but one of the primary purposes is to support the assessment process.

There is a variety of data generated in programs outside of the Water Monitoring Strategy framework. This includes data generated by special projects, research, volunteer efforts, and the federal government. DEM is interested in all such data and gives it consideration but the applicability to the assessment process may be limited by the sampling design and data quality objectives of those projects. That data, because it generally has not been collected for assessment purposes, may be limited for application in assessments due to the frequency of sampling, indicators collected, number of samples, etc. The DQOs outlined below are used to allow DEM to determine, in a consistent manner, whether this data can be used to make decisions about the water quality attainment status.

Prior to initiating data review, DEM solicits water quality data through verbal requests at meetings and workshops, postings on the DEM website, and through written/email requests to organizations, individuals, and agencies that potentially collect water quality data. DQA and DQO preferences for use in assessments and a time schedule by which data must be submitted for consideration in developing the next Integrated Report assessments, are noted in the data request. A cutoff date is necessary to ensure adequate time for staff to process, assess, and report the information by the EPA mandated deadlines. DEM will accept hard copy and/or electronic data and information from all projects. However, electronic data are preferred, and considered more readily available, due to the significant effort that may be needed to analyze large hard copy datasets.

Data must be submitted to DEM with the required quality assurance and quality objective documentation as noted below. If the data collection and analysis does not include appropriate

DQA and DQO, the data may still be considered for the water quality assessments following a qualitative approach as discussed in Sections 4.3, 4.4 and 5. DEM is committed to using only data that meets the DQOs and DQAs as outlined below, to develop the impaired waters list (Category 5 of the Integrated Report).

4.2 **Data Management**

Both ambient water quality data and water quality assessment and listing information are stored in databases maintained by staff of DEM's Office of Water Resources (OWR).

4.2.1 **Water Quality Database**

Ambient (instream) chemical monitoring data are managed by means of a Microsoft Access database, WQUAL, that was developed by OWR staff. WQUAL has been developed to compare most water quality data to the appropriate RI water quality criteria and to indicate exceedances. Baseline or routine monitoring projects funded by DEM are required to submit water quality data in both hard copy and electronic format (preferably Microsoft Excel). The data collected by most of the projects funded by DEM are currently maintained in WQUAL.

DEM/OWR in coordination with a contractor (Tetra Tech) developed a Microsoft Access database, BioQual, that stores, retrieves, and analyzes data relating to benthic macroinvertebrate and fish communities, instream habitat, and site physical characteristics. This database is currently used to maintain macroinvertebrate data.

4.2.2 **Assessment Database**

Assessment information generated for the Integrated Reports is maintained in a Microsoft Access database, called the Assessment Database (ADB), that was developed by EPA and their contractors. The ADB is a data management tool designed to store assessment information in a way that is consistent with EPA's guidance on generating the Integrated Report, including listing the 5 categories of waterbodies. EPA developed the ADB to ease the burden of state reporting, encourage standardization of reporting among states, as well as to facilitate the generation of the National Assessment Database and the National Water Quality Inventory.

4.3 **Data Quality Objectives**

Data Quality Objectives (DQOs) describe the intended use of the data and some of the requirements that must be attained (quality and quantity) to meet the intended use. For purposes of water quality assessments and impaired waters listings, data must be of a certain quantity and quality to adequately meet environmental management and regulatory decision-making needs. DQOs for the water quality assessment and listing process ensure that the majority of data relied upon for assessment and listing decisions is of high quality. To meet the assessment and listing objectives, certain data quality, frequency, duration, dataset size, type of data, etc, are required. While DEM will consider all available data, in some cases data may not meet these DQOs. Use of datasets that do not meet the DQOs described below, is discussed in Section 5.3.

4.3.1 Core parameters

The RI Water Monitoring Strategy has identified indicators to monitor ecological health of the water resources. The current listing in the Strategy is expected to be refined over time as an adaptive management approach. For the purposes of water quality assessments, core and supplemental indicators used to evaluate each use are shown in Table 2. For swimming (recreation), shellfish consumption, fish consumption and aquatic life use, the core indicators required for assessments have been established and are noted in Table 2. For aquatic life use assessments, the current practice is to use one biological assemblage however the goal is to incorporate a second (ie., fish or periphyton). Table 2 also notes several indirect measures of designated use attainment. These supplemental indicators may be added for waters where there is a reasonable potential for specific pollutants to cause or contribute to water quality impairments based on evaluation of waterbody and watershed conditions, including land use and source assessments.

For drinking water use assessments the analysis is complex, covering a broader range of parameters/indicators. HEALTH regulations require terminal reservoirs to be sampled in accordance with drinking water program requirements. Samples are usually collected from one location near the intake to the drinking water treatment plant. In these terminal reservoirs, the analyses entail a list of over 100 parameters that reflect the compounds for which MCLs have been established for *finished* drinking water. HEALTH uses this data to determine drinking water use attainment for the terminal reservoirs. In many water supply districts, upgradient reservoirs and tributaries are not routinely sampled by the water suppliers. Volunteers participating in the URI Watershed Watch Program currently collect data from one drinking water reservoir. In the programs noted above, the range of parameters analyzed is significantly less than the over 100 parameters that correspond to HEALTH's MCL's. DEM and HEALTH plan to work toward defining the core parameters/indicators required to assess drinking water use attainment for these other reservoirs and tributaries within drinking water supply systems.

4.3.2 Frequency of sampling and sample/dataset size

The number of samples needed to make a use support decision plays a large role in how defensible and rigorous the assessment is. Due to variability of chemical (toxics and conventional parameters excluding DO) data, to support as an acceptable, statistically valid analysis, a dataset based on a minimum of 10 data points is recommended. A smaller dataset may be utilized following the modified assessment method as described in Section 5.3. As discussed in RI's Water Monitoring Strategy, chemical data is collected in support of biological and physical information but under the new Rotating Basin monitoring design, is not intended to be used alone for aquatic life use support assessments.

Aside from the total phosphorus criteria for lakes and tributaries at the point where they enter lakes, the state does not have nutrient criteria. However, DEM is working towards development of nutrient criteria and will refine the minimum dataset size and frequency of sampling in the future.

A seasonal sampling index period for lakes trophic monitoring data is considered sufficient for use in conducting lakes assessments. Given the biological response of lakes to variations in the

weather, one year of data is not always considered representative of the general condition of the lake. Assessment decisions are enhanced when based on several years of data. Because the state currently obtains all lake water quality data from an agreement with the URI Watershed Watch Program (URIWW), the lake sampling index period is defined as April to November to be consistent with the URIWW's sampling schedule. Samples are collected on a monthly or twice-monthly basis depending on the parameter, during the sampling period.

For rivers and streams, a seasonal sampling index period that extends from August through September, is required for biological data. Sampling following DEM's macroinvertebrate monitoring protocol for wadeable rivers (Section 5.4.3), includes one sample per site during the sampling index period. The sampling protocol for deep, non-wadeable rivers requires 3 samples per site during the sampling index period. In accordance with the current biological (macroinvertebrate) monitoring protocol for rivers, the state's identified reference sites must also be sampled for data evaluation.

Grab samples for freshwater dissolved oxygen analyses should be collected in the early morning hours over the course of the growing season in an effort to capture the critical period for this aquatic life use indicator.

RI's saltwater DO criteria evaluates cumulative exposures of low DO with established minimum standards. Therefore RI is moving to a reliance on continuously collected saltwater DO data or data that can correlate to continuous data. Grab samples or similar DO data may still be considered if it can be correlated to continuous data or is representative of a longer time period. The new saltwater DO criteria evaluates cumulative exposures of low DO observed during May to October.

4.3.3 Sampling conditions

Currently, RIDEM will accept data collected under any sampling conditions such as low or high tide, dry or wet weather. The Department requests that the sampling conditions and other metadata about sample collection, are documented within the data report. Useful sampling condition information includes date and time of sampling, tide conditions, depth sampled, flow, date, and amount of last rainfall event. This information will be examined during the determination of usability of the data for assessment purposes.

4.3.4 Probabilistic sampling data

DEM expects data to be made available via probabilistic surveys conducted by EPA and possibly others. By design, these surveys are targeted to populations of waterbodies rather than individual waterbodies. In most probabilistic surveys the design results in collection of samples from a single point on a single day. With respect to RIDEM's assessment process for individual waterbodies, biological data collected by probabilistic monitoring is likely to have the most fitting applicability to the assessment process but may be constrained by the applicability of the field methods employed. Chemical data limited to a single sampling event will have less applicability given the DQOs of the assessment program. Single sample information may be used

to direct additional targeted monitoring to those areas that indicate potential water quality degradation.

4.3.5 Spatial Extent of Assessment

Assessments are based on one or more stations the Department deems representative of an AU for a distance upstream and downstream where no significant influences (landuse, point source discharges, etc.) exist that might tend to change water quality or biological and habitat conditions. For lakes, a single sampling station (usually located at the deepest point of the lake) is generally considered representative for the entire lake. Future refinement to the monitoring strategy for lakes is to add additional sampling in larger lakes with geomorphologically unique areas. As described in Section 3, for rivers and estuarine waters, the boundaries of the AUs were defined taking into account landuse changes, pollution sources, classification changes and assessment changes. Depending upon the consistency of the watershed conditions (landuse, discharges, etc.), monitoring data from a sampling location in one AU may be considered applicable to upstream and/or downstream AUs as well. In general, for wadeable streams, a single monitoring station should only be considered representative of no more than 10 miles of stream length unless circumstances (eg., change in watershed and landuse characteristics) suggest otherwise.

4.3.6 Analytical Techniques

Clean sampling and analytical techniques will be implemented as needed to meet DQOs for use of the data. In addition, adequately sensitive analytical methods will be implemented to achieve necessary detection limits and quantitation levels for intended use of the data.

4.4 Data Quality Assurance

Quality assurance (QA) is an important component of the major monitoring programs relied upon by state water protection programs. It is important to ensure that the data generated by monitoring and used to support decision-making in water protection programs is valid and appropriate. DEM maintains a goal of generating and compiling data of acceptable quality for use in the water quality assessment program. To achieve this goal, certain data quality assurance and quality control procedures must be met. QA is defined as the overall management system of a project including the organization, planning, data collection, quality control, documentation, evaluation, and reporting activities. QA provides the information needed to determine the data's quality and whether it meets the project's requirements. Quality control (QC) is defined as the routine technical activities intended primarily to control errors. Since errors can occur in either the field, the laboratory, or in the office, QC must be a part of each of these activities.

To comply with EPA regulations, monitoring projects funded by federal money are required to develop, submit, and implement an EPA approved Quality Assurance Project Plan (QAPP). QAPPs define the scope of work for the project, including the DQOs, and QA/QC. Not all monitoring programs, however, operate with QAPPs oriented to EPA guidance. DEM may receive and use data from such programs, but is obligated to document quality assurance if the

data is relied upon for making decisions in the assessment of water quality, most notably, for development of the category 5 list of impaired waters. Water quality monitoring data and information must follow EPA's Quality Assurance/Quality Control (QA/QC) guidelines as documented in EPA New England's *Quality Assurance Project Plan Program Guidance* (USEPA 2005b), to be utilized in the development of RI's Impaired Waters List (category 5). Where quality assurance can not be documented or has not met minimum requirements, the data will be given less weight and may be used to assess waters into one of the other four categories of the Integrated Report but will most likely be considered as insufficient data. Use of datasets that do not meet these QA/QC protocols is discussed further in Section 5.

5. **ASSESSMENT AND EVALUATION METHODOLOGY**

Once data is evaluated for attainment of the DQO and DQA requirements described above, an assessment is conducted where the water quality data are compared to the narrative and numeric criteria to evaluate attainment of the designated uses defined for each waterbody. This section describes the assessment methodology for interpreting compliance with the water quality standards (uses and criteria) and determination of use support attainment for placement in one of the five Integrated Report Categories.

5.1 **Use Support Attainment Options**

In conducting water quality assessments, each designated use of a waterbody or waterbody segment is assigned a level of use support that characterizes the degree to which the water is attaining that use. In accordance with the requirements associated with the development of an Integrated Report and Lists, the use support categories have changed slightly from the previous 305(b) use support categories (fully supporting, fully supporting but threatened, partially supporting, not supporting). One of the following use support attainment categories is assigned to each designated use for each AU:

- Fully Supporting – The use is fully supporting if, in accordance with this document, there is sufficient data or information to demonstrate that the water quality standards are being attained.
- Threatened – This category is applied where the data or information indicate that the use is currently fully supporting, in accordance with this document, but non-attainment is predicted by the next Integrated Reporting cycle.
- Not Supporting – The use is not supporting if, in accordance with this document, there is sufficient data or information to indicate an impairment or non-attainment of the water quality standards.
- Insufficient Data/Information – This category is applied where the data or information available to support an attainment determination for any use, is not sufficient to make a final assessment determination, in accordance with this document.
- Not Assessed – This category is applied where there is no data or information available to conduct an assessment for any use, in accordance with this document.

5.2 **Assessment Quality/Confidence**

Data used to make assessment decisions, especially for listing a waterbody into Category 5, must be defensible. Therefore, the quality of the data used to determine an assessment must be documented to define the basis of the final assessment determination. The ADB requires documentation of the confidence of the assessment, or the confidence of the data quality used to make assessment determinations. Four levels of descriptive information, that represent a

hierarchy of data quality, are available within the ADB from which to choose. The four levels of information and a description of the data quality associated with each level, are as follows:

- Level 1 = Low: Level 1 represents data with a greater degree of uncertainty. Level 1/Low quality data or information does not have a Scope of Work (SOW) or QA/QC Plan or QAPP or one is not available or documented; and/or the plans were not followed; and/or the plans do not meet requirements noted in this document; and/or samplers had no training. This data may be 10 years old or older; considered evaluated (not monitored) or qualitative based upon landuse, citizen complaints or observations. This information is not considered sufficient for use in conducting an assessment and without other data would lead the waterbody to be considered unassessed or not assessed. The information would be used to help guide future monitoring activities under the Monitoring Strategy.
- Level 2 = Fair: Level 2/Fair quality data or information is collected following a basic QA/QC plan or QAPP that is documented and available. The QA/QC Plan or QAPP meet some of the requirements noted in this document. Samplers had minor training. The age of this data may be between 5 and 10 years old. This data or information may include some evaluated or qualitative observations from qualified professionals. This information would be used to conduct a water quality assessment but would most likely be considered “insufficient data” (Category 3). The quality of this data may be questionable for an impairment determination.
- Level 3 = Good: Level 3/Good quality data or information is collected following an adequate QA/QC plan or QAPP that is documented and available. The QA/QC Plan or QAPP meet most of the requirements noted in this document. Samplers had moderate training. This includes actual water quality data that has been collected during the past 5 years. This information is considered sufficient for an impairment determination and subsequent listing in Category 5.
- Level 4 = Excellent: Level 4/Excellent quality data are of the highest quality and provide relatively high level of certainty. Data in this level are collected following an acceptable QAPP or QA/QC plan that is documented and available and samplers were well trained. This includes actual water quality data that has been collected during the past 5 years. This information and data is considered sufficient for an impairment determination and subsequent listing in Category 5.

5.3 **General Assessment Protocol**

This section describes the general rules followed for data evaluation and assessment and listing determinations. Some of these general rules have been discussed previously in this document. In addition, more information about the listing methodology can be found in Section 6.

- Depending on the waterbody, a number of types of acceptable data may be available for consideration of water quality assessments and listings. It is not uncommon to have inconsistent water quality data, therefore some interpretation is required in making the final assessment. In general, for purposes of determining attainment status, DEM employs a weight of evidence approach that considers the amount of each type of data, the quality of

each set of data, the variability of each set of data, and the strength of the linkage of each set of data to protection of the water quality standards. For example, DEM weighs biological data more heavily than toxics data when making aquatic life use assessments. This is because the biological data provide a direct measure of the status of the aquatic biota and detect the cumulative impact of multiple stressors on the aquatic community. Furthermore, it is difficult to conclude that aquatic life is impaired based solely on low level exceedances of numeric water quality criteria for the protection of aquatic life due to metals since the Department has observed incidences of low level exceedances co-occurring with fully supporting biological communities. This is due to potential questions of site specific applicability of the numeric metals aquatic life criteria. Table 3 outlines the general protocol for determining aquatic life use support (AQLUS) status for AUs with biological and/or toxics data:

Table 3 Protocol for Determining AQLUS Status for AUs with Biological and/or Toxics Data

Biological Data	Toxics Data	Pollution Source Present?	Aquatic Life Use Support Status
Fully Supporting	Fully Supporting	Yes or No	Fully Supporting
Fully Supporting	Impaired	Yes	Insufficient Data
Fully Supporting	Impaired	No	Fully Supporting
Impaired	Fully Supporting or Impaired or No data	Yes or No	Impaired
No data	Fully Supporting	No	Fully Supporting
No data	Impaired	Yes	Impaired
No data	Impaired	No	Insufficient Data
Fully Supporting	No data	Yes or No	Fully Supporting
Impaired	No data	Yes or No	Impaired

- Best professional judgment (BPJ) may be utilized to interpret water quality data for the purposes of determining use attainment status. This is often the case where waters in their natural hydraulic condition may fail to meet their assigned water quality criteria from time to time due to natural causes, without necessitating the modification of the assigned water quality standard. Such waters will not be considered to be violating their water quality standards if violations of criteria are due solely to naturally occurring conditions unrelated to human activities.
- In general, qualitative information provided by qualified professionals that indicates a degraded condition may exist will be considered insufficient data upon which to conduct a use attainment determination. Sites with insufficient data that indicate a degraded condition will be given a higher priority for future monitoring under the Monitoring Strategy.
- Evaluated or qualitative data representing Level 1 quality data are considered useful information but not defensible or sufficient for use in conducting an assessment. This information will be useful in making decisions about where to target monitoring efforts.

- Monitoring data that followed adequate DQO and DQA but which is more than five years old may be used, or continue to be used for assessments, on a case-by-case basis if conditions in the waterbody and the watershed have not changed. Data that is more than five years old that had previously been used to list a waterbody as impaired, will not be excluded due to age.
- Use support (assessment) determinations made from water quality data collected in one AU, may be extrapolated to another AU. Only fully supporting assessment determinations may be extrapolated to another AU and only if the watershed conditions support the accuracy of that assessment extrapolation.
- Actual monitored water quality data collected following the DQO and DQA requirements as detailed in this document, will be given the greatest weight and will serve as the primary basis for determining impairments and listing waters into Category 5.
- AUs assessed as threatened for any designated use, will be listed in Category 5.
- AUs assessed with a biological impairment where the cause of the impairment is unknown, will be listed in Category 5. AUs assessed with a biological impairment where the cause is determined not to be due to a pollutant, will be listed in Category 4C, pending no other pollutant-caused impairments.
- A modified assessment method will be used for data sets that do meet the QA/QC requirements describe in Section 4.4, but do not meet the preferred data quality objectives (DQOs) requirements described in Section 4.3. These types of data sets include adequate QA/QC protocol however, may include fewer than the required number of data points, and/or sampling less than the required frequency and duration. These data sets may still have value in assessing water quality and will be evaluated on a case-by-case basis to determine if they adequately represent existing water quality conditions. If it is determined that the data do not adequately represent existing water quality conditions, the information will result in an assessment of insufficient data. If it is determined that these data sets do adequately represent existing water quality, BPJ will be used to determine if an impairment exists and the factors used in the BPJ decision will be documented.
- Determinations of impairment made by RIDEM's Office of Waste Management for site remediation projects, are considered sufficient information to list an AU in Category 5.

5.4 **Assessment Methodology By Designated Use**

This section describes the assessment methodology followed for each of the six individual use designations. Ambient water quality data are compared to the water quality standards and/or guidelines associated with the indicators noted in Table 2, to assess each designated use. One of the use support attainment categories listed in Section 5.1 is then assigned to each designated use.

5.4.1 Applicable Flow Conditions

The water quality standards apply under the most adverse conditions, as determined by the Director according to sound engineering and scientific practices as defined below. For non-flowing waters, most adverse conditions will be defined on a case-by-case basis. The ambient water quality criteria are applicable at or in excess of the following flow conditions:

- Aquatic Life Criteria – the acute and chronic aquatic life criteria for freshwaters shall not be exceeded at or above the lowest average 7 consecutive day low flow with an average recurrence frequency of once in 10 years (7Q10).
- Human Health Criteria – The freshwater human health criteria for non-carcinogens and carcinogens are applicable at or in excess of the harmonic mean flow, which is a long-term mean flow value calculated by dividing the number of daily flows analyzed by the sum of the reciprocals of those daily flows. For seawaters, the ambient human health water quality criteria are applicable when the most adverse hydrographic and pollution conditions occur at the particular point of evaluation.

5.4.2 Mixing Zones

The Water Quality Regulations allow for the establishment of a mixing zone. Mixing zones are defined as a limited area or volume in the immediate vicinity of a discharge where mixing occurs and the receiving surface water quality is not required to meet applicable standards or criteria, provided the minimum conditions described in Rule 8.D.1.e and 8.D.1.f of the Water Quality Regulations are attained. Consistent with the Water Quality Regulations, water quality data used to conduct assessment determinations are based on samples taken outside of DEM designated mixing zones.

5.4.3 Aquatic Life Use Support (AQLUS) Assessment

As noted in Table 2, the core indicators that aquatic life use assessments are based upon, include biological, physical habitat, and conventional parameters. Samples are collected for core indicators to assess the attainment/impairment status of waters. In addition to core indicators, several supplemental indicators may be useful in the aquatic life use assessment process to further define potential stressors or sources of biological impairment. Available water chemistry data are compared to applicable water quality standards and/or guidelines as described below to assist in the evaluation of the AQLUS status. Section 5.3 General Assessment Protocol, describes the process for AQLUS determinations for AUs with biological and toxics data.

- Biology – Biological data directly measure actual effects of pollutants on an aquatic community. The state's Water Quality Regulations do not currently list numeric values for biocriteria to describe expected biological conditions. Instead the Water Quality Regulations contain narrative descriptions that should be attained. These narrative criteria are utilized to evaluate the biological condition of the state's waters. Biological assessments (bioassessments) of aquatic communities are conducted by considering the

difference between reference or expected conditions, and those found at a specific station. Biological and habitat conditions in streams/ivers are measured against conditions observed at a state reference station. For wadeable rivers/streams, reference stations have been chosen within each of the two level-IV ecoregions in the state. A station located on the Wood River serves as the reference for the majority of the state classified as the Southern New England Coastal Plains and Hills ecoregion. A station located on Adamsville Brook serves as the reference in the coastal areas of Narragansett Bay, the islands, and eastern portion of the state characterized as the Narragansett/Bristol Lowland ecoregion. For deeper, non-wadeable rivers, a reference station is located on the Wood River. Comparisons of the habitat and biological conditions against these reference stations are conducted according to the following general guidance:

Habitat information collected concurrently with biological sampling, are used as supplemental information in the determination of biological assessments. Habitat evaluations are based on visual observations of the stream/river using *EPA's Rapid Bioassessment Protocols (RBP) for Use in Wadeable Streams and Rivers, July 1999, (EPA/841-B-99-002)*. Ten specific habitat parameters are rated using the best professional judgment of a qualified professional. Habitat parameters are assessed separately for high gradient versus low gradient streams. Each parameter is rated with a value that increases with habitat quality. The values from each parameter are totaled for each station to create a habitat score. The habitat score for each station is compared to the habitat score of the reference station to provide a final habitat ranking, given as a percent of the reference score. Each station is grouped into one of the habitat assessment categories shown below based on its percent comparability to the reference station, (as taken from *EPA's Rapid Bioassessment Protocols for Use in Streams and Rivers, May 1989; EPA/444/4-89-001*). Where habitat score percentage values are intermediate to the ranges below, best professional judgment is used for placement in the appropriate Habitat Assessment Category.

USEPA Habitat Assessment Category	Percentage Comparability of Reference Score
Comparable to Reference	>90 %
Supporting	75-88 %
Partially supporting	60-73 %
Non-supporting	< 58%

Biological data (benthic macroinvertebrate) are collected in riffle areas of perennial, wadeable streams/ivers, using the single habitat approach in accordance with EPA's 1999 RBP method, for use in evaluating the biological condition. In the field, macroinvertebrate kick samples are collected over a 3-minute duration in the riffle/run areas using D-frame nets. In the laboratory, samples are sub-sampled until 100 organisms are picked, and then identified to genus/species, or the lowest practical taxonomic level by a qualified professional. Taxonomic data are analyzed using 8 selected measures of the macroinvertebrate community (metrics). These eight metrics (taxa richness, Hilsenhoff Biotic Index, ratio of scrapers/filtering-collectors, ratio of EPT/chironomids, % contribution of dominant taxa, EPT index, community loss index, ratio of shredders/total) are combined into an index score. Each station is then classified into one of the biological condition categories shown below based on a comparison of its

index score to the index score from the reference station in the appropriate ecoregion. Where index score percentage values are intermediate to the ranges below, best professional judgment is used for placement in the appropriate Biological Condition Category.

Biological Condition Category	Approximate Index Score Ranges (as % reference station score)
Non-impaired	>83 %
Slightly impaired	54-79 %
Moderately impaired	21-50 %
Severely impaired	< 17 %

For deeper, non-wadeable rivers, biological condition is determined from multi-plate artificial substrate sampling of the macroinvertebrate community, and habitat information which may be collected using a habitat assessment data sheet for low gradient streams. The macroinvertebrates collected at each station are identified and sorted into three pollution tolerant categories (tolerant; facultative or intermediate; and intolerant or sensitive). The stations are classified based on the percentage of macroinvertebrates in each pollution tolerance category. Beck's Biotic Index (BI) is determined for each station and compared to the deep-river Wood River reference station. Information on river flow or other supplemental information may be incorporated with the biotic index score and percent tolerance classifications to help determine the final biological condition and aquatic life use attainment status.

Where available, general temporal trends in biological and habitat category assignments observed at each station over the course of several years are also used in the final bioassessment evaluation. Individual habitat parameters, physical site characteristics (e.g. drainage area size), photographic logs and all other available physical or geomorphic information are evaluated to ensure macroinvertebrate sampling stations were located in appropriate perennial, riffle habitats similar to the reference station. Where habitat or station characteristics are dissimilar to those of the reference site, the index score ranges may naturally differ. Macroinvertebrate communities and index scores that are different from the reference station may reflect expected variability due to differences in habitat and physical stream characteristics, rather than impairment due to water quality. Therefore, data collected during water chemistry and biological monitoring (various metrics, species' presence, individual habitat parameters, water quality parameters, and physical site characteristics) as well as all other available physical or geomorphic information (e.g. sampled downstream of an impoundment, drainage area, flow) are taken into account with BPJ to determine the appropriate biological condition status. For example, extended drought conditions or impoundments immediately upstream of a sampling station will have a significant effect on aquatic macroinvertebrate populations. Therefore, available information on river flow or precipitation for the year, to document wet or drought conditions, may be incorporated with station information, habitat scores, physical data and macroinvertebrate metrics for the overall evaluation of the biological condition assessment. Although the qualifications noted above, including the amount of data available, must be taken into account, in

general, the following protocol are followed in the determination of the biological condition status:

Stations classified as non- or slightly impaired in the Biological Condition Category *and* supporting or comparable to reference in the USEPA Habitat Assessment Category, generally are considered fully supporting the biological assessment.

When the Biological Condition Category indicates moderate or severe impairment, the available station information suggests the sample was appropriately sited and collected in a perennial, riffle habitat, *and* habitat scores indicate partially or non-supporting habitat, the biological conditions generally are considered impaired.

Properly sited and sampled stations where the Biological Condition Category indicates moderate or severe impairment *and* Habitat Assessment Category is classified as supporting, generally are considered impaired for the bioassessment.

Properly sited and sampled stations classified as non- or slightly impaired Biological Condition *and* classified as partially or non-supporting Habitat Assessment, generally are considered fully supporting the biological assessment. In these properly sited stations where biological data reflect a healthy community but habitat scores are low, while not considered a water quality impairment, the sites may benefit from voluntary and preventive proactive habitat enhancement or restoration actions.

Should the habitat information suggest an improperly located station (not a riffle/run habitat, downstream of an impoundment, etc.), resulting in a misleading Biological Condition Categorization due to expected variability, the data collected at the station may be classified as insufficient until enough data is appropriately collected for the AU to confidently be assessed.

- **Conventionals:** Conventional parameters include the following physical water characteristics: dissolved oxygen, turbidity, total phosphorus, pH and temperature. Except as stated within the individual criteria for these parameters in tables 1 and 2 of the Water Quality Regulations or as noted below, for any one conventional parameter, the water quality standard is not attained whenever more than 10% of the measurements exceed the criteria. For small datasets (4 data points or less) however, there must be two exceedances of the criterion for the use to be considered impaired. The reasoning for this decision is to attempt to identify chronic or recurring exceedances that do justify listing in Category 5 and targeting with limited resources.

Dissolved Oxygen (DO): Freshwater criteria for DO are listed in tables 1 and 2 of the Water Quality Regulations. Freshwater DO criteria are based upon cold water and warm water fish habitat. Daily averages and instantaneous (grab) measurements of DO should not exceed the criteria except as naturally occurs. To capture potential diurnal fluctuations in DO, grab samples should be collected in the early morning hours. DO levels in bottom waters may be naturally low, especially in lakes, therefore, BPJ of qualified professionals will be used to interpret low DO levels in these situations.

Determinations of naturally low DO will be made by evaluating current and historical loadings, data collected over an entire season, and characteristics of the watershed.

Saltwater DO criteria, listed in table 3 of the Water Quality Regulations, are based upon waters above or below a seasonal pycnocline, or for waters without a seasonal pycnocline. These criteria evaluate cumulative exposures of low DO with established minimum standards. Therefore RI is moving to a reliance on continuously collected DO data or data that can correlate to continuous data. Grab samples or similar DO data may still be considered if it can be correlated to continuous data or is representative of a longer time period. The saltwater DO criteria evaluates cumulative exposures of low DO observed during May to October. The OWR has completed a project to develop software which will be utilized to evaluate continuous DO data relative to the new criteria.

Nutrients: The Water Quality Regulations contain a numeric criteria for total phosphorus (TP) in lakes and tributaries at the point they enter lakes. The seasonal index period average TP concentration shall not exceed 25 ppb in any lake, pond, kettlehole or reservoir, except as naturally occurs, and the average TP in tributaries at the point where they enter lakes shall not cause an exceedance of this TP criteria, except as naturally occurs. RI's narrative nutrient criteria preclude nutrient concentrations associated with cultural eutrophication that cause undesirable or nuisance aquatic vegetation, or render waters unsuitable for the designated uses. Although the regulations do not contain numeric criteria for nutrients in rivers or estuarine waters, in accordance with the narrative nutrient standard, evaluations of persistent, severe eutrophication and/or low DO may result in a determination of impairment for the waterbody with total phosphorus listed as the suspected cause in freshwaters and nitrogen listed as the suspected cause in saltwaters. The Department has completed an initial nutrient criteria development project for rivers and streams and anticipates initiating additional work to further evaluate and refine nutrient criteria for lakes and ponds in the near future.

- **Toxics** – Toxicants include metals, organics, chlorine and ammonia. Chemical data provides direct information about whether specific pollutants are present in amounts that are causing, or are likely to cause adverse impacts to aquatic organisms. Water quality criteria for these parameters can be found in Appendix B of the Water Quality Regulations. The water quality standards include duration considerations for average concentrations over 1 hour for acute aquatic life criteria and 4 days for chronic aquatic life criteria. In general, based on the current monitoring protocols (grab samples), it is not possible to consider these durations of exceedance. Therefore, with limited datasets, individual exceedances are considered to extend over the applicable duration, providing a more conservative assessment. These criteria should not be exceeded more than once every three years on average.
- **Observed Effects** – Excess algal growth, chlorophyll a, secchi depth, noxious aquatic plants, color, taste and odor, siltation/sedimentation, and fish kills may under certain circumstances be measures of water quality problems. These monitoring observations that indicate a decline in water quality, typically result from elevated pollutant levels and are considered observed effects. Based on an evaluation of a waterbody and watershed conditions, including land use and source assessments, AUs may be listed as impaired for the pollutant

generally associated with the observed effect. The listed pollutant would be incorporated into the monitoring strategy for the waterbody.

- **Toxicity** – Ambient water column and sediment toxicity tests are useful for examining the effects of unknown mixtures of chemicals in surface waters. Toxicity thresholds are expressed in terms of “toxic units” that cause toxic effects to aquatic organisms. Toxicity levels are determined by exposing aquatic organisms to ambient samples. Even unknown toxicants are addressed during testing. RI has narrative toxicity criteria established as “no toxics in toxic amounts”. RI requires whole effluent toxicity (WET) testing of all major facilities under the RIPDES Program. Such effluent tests are screening tools to indicate the potential for ambient water quality impacts. In RI, toxicity testing of ambient waters and sediment are currently only conducted in accordance with site remediation projects to assess if there are toxic impacts at the site. Toxicity is determined by comparing toxicity test results from the site in question with tests conducted at unimpacted sites. Determinations of toxic impacts in ambient waters and sediments at site remediation locations are made in conjunction with the RIDEM Office of Waste Management and are listed as impaired for assessment purposes.

5.4.4 Recreational/Swimming Use Assessment

Enterococci has recently been adopted into the RI standards as the primary bacteria indicator for assessing swimming use attainment. During the transition to this new indicator, the water quality standards have maintained fecal coliform criteria for use in evaluating swimming when adequate enterococci data are not available. The assessment of recreational/swimming use is based on enterococci and fecal coliform bacteria data and bathing beach closure information. Currently the state’s bacteria criteria apply to both primary (e.g., swimming and surfing) and secondary (e.g., boating and fishing) recreational uses. Therefore, the term recreational use is frequently interchanged with swimming use. The water is considered fully supporting recreational/swimming use when the data do not exceed the geometric mean of the bacteria criteria. The waterbody is considered impaired for swimming use when the data exceed the geometric mean of the bacteria criteria.

Beach closure information is also evaluated for recreational use assessments. The Rhode Island Department of Health (HEALTH) Beach Monitoring Program uses bacteriological (enterococci) data to issue beach advisories and make opening and closure decisions for designated bathing beaches (<http://www.ribeaches.org/index.cfm>). The use of bacteriological data by the water quality assessment and beach monitoring programs may differ slightly to account for some of the inherent differences between the two programs. HEALTH’s Beach program makes beach management decisions based on real time water quality data on a given day or weekend therefore focusing on more recently collected information to determine whether a swimming advisory should be issued. HEALTH utilizes both the single sample maximum and geometric mean criteria for determining swimming advisories at designated beaches. This contrasts with the use of monitoring data for making a water quality assessment determination where data collected over a longer period of time is considered. For assessment purposes, the geometric mean is more relevant because it is a more reliable measure of long term water quality, being less subject to

random variation. The disruption of recreational activities at designated bathing beaches is taken seriously by the state and investigated by HEALTH. It is, however, the state's experience that most beach closures are temporary, lasting only a few days and frequently related to transient sources. For recreational use attainment decisions, beach closures as issued by the DOH, are not considered an impairment of the recreational use unless the closure is recurrent throughout a substantial part of the swimming season for several consecutive years.

The state's narrative criteria, that all waters shall be free from pollutants in concentrations or combinations that may adversely affect human health, shall be applied to the presence of potentially hazardous chemicals in water and bottom sediment as an indicator of swimming impairment.

5.4.5 Fish Consumption Use Assessment

Fish consumption use support is determined by consumption advisories issued by the Rhode Island Department of Health's (HEALTH) Office of Environmental Health Risk Assessment. Consumption advisories are based on risk assessments conducted by HEALTH using fish tissue contaminant data collected from fish in RI waters (<http://www.health.ri.gov/environment/risk/fish.php>). Availability of fish tissue data is limited due to the historical lack of a program. Using limited federal funds, DEM has initiated a program to begin addressing this gap.

The AU is considered fully supporting fish consumption use when fish tissue data collected in that AU, do not result in consumption advisories for any fish species or any consumer group. The AU is considered impaired for fish consumption use when there is a consumption advisory for some fish species or for consumer groups as determined from fish tissue data collected within that AU. Because the statewide freshwater advisory against consumption of fish species known to contain the most mercury, and the statewide saltwater advisory against consumption of fish species known to contain mercury and PCBs are precautionary, region-wide advisories, and not based on any actual contaminant monitoring data collected within RI waters, these advisories are not reflected in the assessment of Fish Consumption use. Consistent with the Monitoring Strategy, DEM may limit the number of streams considered for fish consumption use assessments.

5.4.6 Shellfish Harvesting/Consumption Use Assessment

Shellfish harvesting use assessments are evaluated for attainment with the Approved Status classification (i.e., no shellfishing restrictions) in accordance with the State's FDA NSSP-approved Shellfish Growing Area Monitoring Program. The protocol for shellfish use classification determinations is based upon the NSSP (National Shellfish Sanitation Program) requirements. These requirements include conducting routine bacteriological monitoring at NSSP-approved stations and shoreline surveys within the state's waters where shellfish are intended for direct human consumption. Bacteriological samples for use in shellfish classification determinations must be analyzed at a FDA certified laboratory. Results are

analyzed and classification status is determined in accordance with the Shellfish Growing Area Monitoring Program's Standard Operating Procedures (RIDEM 2008b).

The AU is considered fully supporting shellfishing use when there are no water quality related shellfishing restrictions in effect (Approved Status). The AU is considered impaired for shellfishing use when the waterbody has a Conditional or Prohibited closure status for shellfishing. There are two types of waters where further evaluation is required for water quality assessment purposes. Several Class SA estuarine areas are permanently closed to shellfishing strictly due to safety concerns. The boundaries of these closed safety zones have been defined by modeling complete failure of treatment at nearby wastewater treatment facilities. Other estuarine areas are seasonally closed to shellfishing under the partial use classification SA{b}. By definition of the SA{b} classification, these areas are in the vicinity of marinas and/or mooring fields and in accordance with NSSP requirements, are closed primarily in the summer months when anchorages or mooring fields are being used by boats. In these SA and SA{b} areas, following the same NSSP-approved methods for evaluation of data as described above, if the actual water quality data attains the applicable fecal coliform criteria, the shellfishing use is considered fully supporting for assessment purposes.

The state's narrative criteria, that all waters shall be free from pollutants in concentrations or combinations that may adversely affect human health, shall be applied to the presence of potentially hazardous chemicals in the water column and bottom sediment as an indicator of shellfish consumption impairment.

5.4.7 Shellfish Controlled Relay and Depuration Assessment

Class SB waters are designated for shellfish harvesting for controlled relay and depuration. RIDEM's Division of Fish and Wildlife implements the state's only relay and depuration operation in cooperation with the Narragansett Bay Commission, the RI commercial shellfishing industry, and the RI Department of Health. The Shellfish Relay Transplant Program involves the transplant of shellfish from Class SB waters to Class SA waters suitable for shellfish harvesting under the coordination and authority of RIDEM for the purpose of ambient depuration and controlled harvest. Water quality criteria have not been established by FDA to evaluate this use. However, the NSSP requires that the harvested shellfish will be made safe for human consumption by the ambient depuration treatment process. The specific SB waters currently managed for controlled relay have been determined to be safe for existing relay operations. Although the safety evaluation has not been completed for all SB waters, for assessment purposes all SB waters are considered fully supporting the shellfish harvesting for controlled relay and depuration use. Shellfish will not be harvested from any additional SB waters until an analysis has been completed confirming that the level of contamination in shellstock can be reduced to levels safe for human consumption.

5.4.8 Drinking Water Use Assessment

HEALTH's Office of Drinking Water Quality (DWQ) implements the federal Safe Drinking Water Act (SDWA) in Rhode Island (<http://www.health.ri.gov/environment/dwq/index.php>). Drinking water use assessments of public surface water systems are conducted by, and based upon data compiled by, DWQ staff. DWQ primarily monitors waters within the distribution system to evaluate for compliance. The larger public drinking water suppliers monitor some of the source waters for several parameters to adjust treatment levels as necessary for compliance. HEALTH regulations require terminal reservoirs to be sampled in accordance with drinking water program requirements. Samples are usually collected from one location near the intake to the drinking water treatment plant. In these terminal reservoirs, the monitoring entails a list of over 100 parameters that reflect the compounds for which MCLs have been established for *finished* drinking water. HEALTH uses this data to determine drinking water use attainment for the terminal reservoirs. In many water supply districts, upgradient reservoirs and tributaries are not routinely sampled by the water suppliers. Volunteers participating in the URI Watershed Watch Program currently collect data from one drinking water reservoir. In the upgradient waters, the range of parameters sampled by the programs noted above, is significantly less than the over 100 parameters that correspond to HEALTH's MCL's. DEM and HEALTH plan to work toward defining the core parameters/indicators required to assess drinking water use attainment for these upgradient reservoirs and tributaries within drinking water supply systems.

The data utilized by DWQ to determine the drinking water use attainment status for the terminal reservoirs consists of ambient (source) water quality data, information about the level of treatment required, and finished water quality data. The use support status is based on violations of the Maximum Contaminant Levels (MCLs), use restrictions, and/or best professional judgment by the DWQ staff. Waters are considered fully supporting drinking water use when there are no violations of MCLs and no restrictions or advisories, and no requirement of more than conventional treatment. Waters are considered impaired for drinking water use when there are violations of the MCLs, and/or requirements of more than conventional treatment, and/or, frequent taste and odor problems, and/or contamination-based closures of the source water. While DEM and HEALTH work to define the core parameters needed to evaluate upgradient waters within the water supply system, these waterbodies will continue to be considered unassessed for drinking water use.

5.5 Causes and Sources of Impairments

For those AUs that are not fully supporting their designated uses, the identity of the pollutants causing, or threatening to cause, water quality impairments and the sources of those pollutants, are reported where possible.

5.5.1 Causes

Causes of impairment are pollutants or stressors that prevent or threaten water quality from meeting numeric or narrative criteria. Causes of actual or threatened impairments may include chemical contaminants, physical parameters, and biological parameters. For the purposes of

Section 303(d) impaired waters listing requirements, it is important to distinguish if the impairment is due to pollution or a pollutant. Pollutant, as defined in the Water Quality Regulations, generally refers to a chemical and/or physical parameter which will likely alter the physical, chemical, biological or radiological characteristics and/or integrity of water. Pollution is defined in the Water Quality Regulations as the human-made or human-induced alteration of the physical, chemical, biological or radiological characteristics and/or integrity of water. This broad term may encompass many types of changes to a waterbody, including alterations to the character of the water (eg., exotic, non-native, or invasive species; habitat degradation; flow alteration) that do not result from the introduction of a specific pollutant or presence of pollutants in a waterbody at a level that causes an impairment. Not all pollution-causing activities must be analyzed and allocated in a TMDL. Section 303(d) is a mechanism that requires an accounting and allocation of pollutants introduced into impaired waters. In some cases, the pollution is caused by the presence of a pollutant, and a TMDL is required. In other cases, pollution is caused by activities other than the introduction of a pollutant. Therefore, waters impaired by pollution are listed in category 4C where they are flagged to be addressed by a more appropriate program.

Degradation of the biological community is considered a cause of impairment even though the actual cause (pollutant) may be unknown. When data for an AU indicates a biological impairment, even though the actual cause of the biological impairment is unknown, the AU will be listed in Category 5. However, when biological data and information indicate that the impairment is not caused by a pollutant, the AU will be placed in Category 4C, pending there are no other pollutant impairments on the AU that would cause the AU to remain in Category 5.

5.5.2 Sources

Sources are the facilities or activities that contribute pollutants or stressors, resulting in impairment of designated uses in a waterbody. Sources of impairments may include both point sources and nonpoint sources of pollution. Point sources discharge pollutants directly into surface waters from a conveyance. Point sources include but are not limited to industrial facilities, municipal sewage treatment facilities, combined sewer overflows, and storm sewers. Nonpoint sources deliver pollutants to surface waters from diffuse origins. Nonpoint sources include urban runoff that is not captured in a storm sewer, agricultural runoff, leaking septic tanks, and landfills. In general, the actual sources of impairment are not determined until a TMDL or similar analysis is conducted on the waterbody. As such, most of the sources noted in water quality assessments are just potential sources. The ADB allows for documentation of confidence in source identification. The source may be listed as *suspected* for those situations where the information is based on BPJ and/or landuse information. The source may be listed as *confirmed* for those situations where the source causing the impairment has been identified and verified.

6.0 INTEGRATED REPORT CATEGORIES AND LISTING METHODOLOGY

The Integrated Report category format is organized around individual AUs. EPA's guidance for developing Integrated Reports of water quality and listings of impaired waters allows states to either list each AU only once according to the AU's worst designated use assessment or to categorize each designated use for each AU. DEM has chosen to list each AU into only one of the five new assessment categories where the 5th category is the list of impaired waters needing a TMDL. The attainment status of each designated use for each AU can, however, be tracked and reported by ADB to assist in addressing data gaps and directing monitoring.

As described in Section 5, assessments may result in different use support attainment status for the different designated uses on one AU. For example, an AU may be fully supporting swimming use, but there may be insufficient data to develop an aquatic life use support status. The Integrated Report Categories are described below with a description of how the results of the individual assessments for each designated use on an AU are integrated to determine the final Integrated Report category for each AU. In general, the integration of assessment determinations follows a hierarchical approach where a determination of impairment for any cause (pollutant), for any designated use on an AU will result in placement of the AU in Category 5. The five categories are as follows:

Category 1: Attaining all designated uses and no use is threatened. AUs will be placed in this category if the available data and information meet the requirements of this assessment and listing methodology and are sufficient to assess each designated use of the AU and the assessment results indicate that the AU is attaining all water quality standards for all designated uses.

Category 2: Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened. AUs will be placed in this category if there are data and information, which meet the requirements of this assessment and listing methodology, to support a determination that some, but not all, uses are attained and none are threatened. Attainment status of the remaining uses is unknown because there is insufficient or no data or information.

Category 3: Insufficient or no data and information are available to determine if any designated use is attained, impaired, or threatened. AUs will be placed in this category where the data or information to support an attainment determination for any use are not sufficient and/or consistent with the requirements of this assessment and listing methodology.

Category 4: Impaired or threatened for one or more designated uses but does not require development of a TMDL. (Three subcategories)

- A. TMDL has been completed.** AUs will be placed in this subcategory once all TMDL(s) for the AU have been developed and approved by EPA that, when implemented, are expected to result in full attainment of the standard. Where

more than one pollutant is associated with the impairment of an AU, the AU will remain in Category 5 until all TMDLs for each pollutant have been completed and approved by EPA.

B. Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future. Consistent with the regulation under 130.7(b)(I),(ii), and (iii), AUs will be placed in this subcategory where other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard applicable to such waters. These requirements must be specifically applicable to the particular water quality problem.

C. Impairment is not caused by a pollutant. AUs will be placed in this subcategory if pollution (e.g., flow, presence of invasive species, etc.) rather than a pollutant causes the impairment.

Category 5: Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL. This category constitutes the **Section 303(d) List** of waters impaired or threatened by a pollutant(s) for which one or more TMDL(s) are needed. AUs will be placed in this category if it is determined, in accordance with this assessment and listing methodology, that a pollutant has caused, is suspected of causing, or is projected to cause an impairment. Where more than one pollutant is associated with the impairment of a single AU, the AU will remain in Category 5 until TMDLs for all pollutants have been completed and approved by EPA.

6.1 Method to Rank and Prioritize Impaired Waterbodies

Section 303(d) of the CWA requires that waters on the 303(d) List be ranked in order of priority that the TMDLs will be developed. The RI 303(d) List identifies impaired waterbodies and a scheduled time frame for development of TMDLs. As such, the 303(d) List is used to help prioritize the State's water quality monitoring and restoration planning activities. Scheduling is not necessarily representative of the severity of water quality impacts, but rather reflects the priority given for TMDL development with consideration to shellfishing waters, drinking water supplies and other areas identified by the public as high priority areas. It is important to note that TMDL schedules are dynamic and subject to revisions due to resources, public interest and support, and technical factors.

7.0 DELISTING METHODOLOGY

Delisting is the term used to describe the process of removing a waterbody from the 303(d) List. The existing federal regulations require states to demonstrate good cause for not including waterbodies on the 303(d) list that were included on previous 303(d) lists. Good cause has been defined as including, but not being limited to, more recent and accurate data, more sophisticated water quality modeling, flaws in the original analysis that led to the waterbody being listed, changes in conditions, e.g. new control equipment, or elimination of discharges.

As noted in Section 5.3, an AU may not be removed from an impaired category based solely on the age of the data. Although the data that was used to determine an original impairment may no longer meet data age requirements, the AU cannot be shifted to another category for this reason alone. Some reasons AUs may be removed from the 303(d) list include the following:

1. A determination that the AU is meeting water quality standards due to:
 - An error that was made in the initial assessment and listing; and/or,
 - More recent data or information that meets the requirements of this assessment and listing methodology, demonstrates that water quality standards are being attained; and/or,
 - Revisions to the RI water quality standards may cause a determination of compliance with the standards.
2. Reassessment of available information or data – AUs previously on the 303(d) list based upon data that is insufficient to meet current data quality and quantity requirements may be moved to Category 3 and scheduled for further monitoring.
3. TMDL has been completed – AUs with more than one pollutant associated with the impairment, will remain in Category 5 until TMDLs for each pollutant have been completed and approved by EPA. AUs will be removed from Category 5 and placed in Category 4A once all TMDLs for that AU have been developed and approved by EPA.
4. Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future – Consistent with the regulation under 130.7(b)(I),(ii), and (iii), AUs will be placed in Category 4B where other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard applicable to such waters.
5. Impairment is not caused by a pollutant – AUs will be placed in Category 4C if the impairment is caused by pollution and not a pollutant.
6. New spatial extent – When sufficient data warrants, waterbodies previously identified (numbered) and listed on a large scale may be broken into smaller assessment units (AUs) and placed in other categories, if appropriate.

8.0 WATER QUALITY MONITORING

The Integrated Report guidance emphasizes the importance of monitoring to obtain data and information necessary to characterize the attainment status of all AUs. The guidance notes that Section 106(e)(1) of the CWA, requires States to develop a comprehensive monitoring and assessment strategy that provides a description of the sampling approach, a list of parameters to be tested, and a schedule for collecting data and information. RIDEM, in cooperation with the RI Environmental Monitoring Collaborative, accomplished this by preparing the Rhode Island Water Monitoring Strategy (RIDEM 2005a; http://www.ci.uri.edu/Projects/RI-Monitoring/Docs/DEM_WQ_Oct_14_05.pdf). The strategy describes existing efforts as well as new monitoring initiatives that need to be implemented in order to meet the state's data needs regarding water resources for the period 2005-2010. The monitoring framework reflects the partnerships and collaborations that occur among state, local and federal agencies, universities, colleges, other organizations and volunteers regarding monitoring activities. Specific monitoring activities for Rhode Island's coastal waters, rivers, streams, lakes and ponds are recommended. When fully implemented, the strategy will yield data to support a statewide assessment of water quality conditions, allow measurements of key environmental indicators and provide important information to support management decision-making at both the state and local level. While the strategy has not yet been fully implemented, there has been progress, in part via strategic investments by the RI Bays, Rivers and Watersheds Coordination Team. Specifically, the fixed-site monitoring network has been expanded, monthly monitoring of the state's largest rivers via a partnership with USGS was resumed, the rotating basin approach for wadeable streams has been utilized and the state's streamflow gage network was expanded. For more detail, see the 2008 Annual Report of the Rhode Island Environmental Monitoring Collaborative <http://www.ci.uri.edu/Projects/RI-Monitoring/Docs/2008RIEMCReport.pdf>. There are still certain gaps in data collection that need to be addressed. RIDEM will be evaluating these and other issues as part of updating and refining the strategy during 2009. RIDEM, as part of the Coordination Team, will be continuing to seek the resources needed to support full implementation of the updated strategy.

9.0 **PUBLIC PARTICIPATION**

As noted previously, the Department will solicit submittal of data and information for use in developing the Integrated Report. This request for data will be posted on the Department's website, mailed to stakeholders and announced during meetings and workgroup functions. In addition, the Department will involve researchers or other water quality experts, in the assessment and listing determinations.

Under 40 CFR 130.7(b)(6), the Department is required to provide a description of the methodology used to develop the Impaired Waters 303(d) list. This Consolidated Assessment and Listing Methodology (CALM) document describes the framework for assessing data and determining which of the five categories an AU will be assigned to in fulfillment of that requirement. DEM will be coordinating with the Rhode Island Environmental Monitoring Collaborative, and the Rhode Island Bays, Rivers and Watersheds Coordination Team and its Science Advisory Committee as part of the public review of the draft CALM. On its website, DEM will also inform the general public about the draft CALM review process. DEM expects to solicit and receive comments from and will respond to the comments, before finalizing the document. As needed, the process may involve a public workshop.

The Integrated Report combines the non-regulatory Section 305(b) water quality assessment reporting with the more regulation-driven aspects of the Section 303(d) impaired waters listing requirements. The public participation requirements of these programs are different. In general, Category 5 of the Integrated Report is considered reporting under Section 303(d) for impaired waters. Regulatory requirements regarding public participation, EPA approval, and adoption of the Impaired Waters List apply only to Category 5 waters.

The Department will publish notice of the availability of the draft 2010 Category 5, Impaired Waters 303(d) List upon its completion. The notice will provide for an informational workshop and solicit comments on the draft 2010 Category 5, 303(d) Impaired Waters List. The Department maintains a comprehensive mailing list for the notification of the draft 303(d) Impaired Waters List that includes designated watershed councils, interested stakeholders, municipal contacts, and state, local, and federal government among others. While comments will be solicited only on the Category 5, 303(d) Impaired Waters List, the entire Integrated Lists (Categories 1 through 5) will be provided during the public notice for informational purposes.

REFERENCES

- Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross, and R.M. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: Benthic macroinvertebrates and fish. U.S. Environmental Protection Agency, Office of Water Regulations and Standards, Washington, D.C. EPA 440-4-89-001.
- RIDEM 2005a. Water Monitoring Strategy: 2005-2010. September 30, 2005. Department of Environmental Management, Office of Water Resources. (http://www.ci.uri.edu/Projects/RI-Monitoring/Docs/DEM_WQ_Oct_14_05.pdf)
- RIDEM 2006. Water Quality Regulations, July 2006. Rhode Island Department of Environmental Management, Office of Water Resources. (<http://www.dem.ri.gov/pubs/regs/regs/water/h20q06.pdf>)
- RIDEM 2008a. Quality Management Plan, December 3, 2008. Rhode Island Department of Environmental Management. (<http://www.dem.ri.gov/pubs/qmp2007.pdf>)
- RIDEM 2008b. Shellfish Growing Area Monitoring Program Standard Operating Procedures. RIDEM Office of Water Resources. Revised January 2008. (<http://www.dem.ri.gov/pubs/sops/shellgro.pdf>)
- USEPA 1997a. Guidelines for the Preparation of the Comprehensive State Water Quality assessments (305(b) Reports) and Electronic Updates: Report Contents. EPA 841-B-97-002A, September, 1997. United States Environmental Protection Agency. Washington, D.C., U.S. EPA Office of Water. (<http://www.epa.gov/owow/monitoring/guidelines.html>)
- USEPA 1997b. Guidelines for the Preparation of the Comprehensive State Water Quality assessments (305(b) Reports) and Electronic Updates: Supplement. EPA 841-B-97-002B, September, 1997. United States Environmental Protection Agency. Washington, D.C., U.S. EPA Office of Water. (<http://www.epa.gov/owow/monitoring/guidelines.html>)
- USEPA 1999a. Rapid Bioassessment Protocols for use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates and Fish. Second Edition. USEPA Office of Water. July 1999. EPA 841-B-99-002. (<http://www.epa.gov/owow/monitoring/rbp/>)
- USEPA 2001. Memorandum from Robert H. Wayland III to EPA Regional Water Management Directors, Science and Technology Directors and State, Territory and Authorized Tribe Water Quality Program Directors. RE: 2002 Integrated Water Quality Monitoring and Assessment Report Guidance. November 19, 2001. (<http://www.epa.gov/owow/tmdl/2002wqma.pdf>)
- USEPA 2002. Consolidated Assessment and Listing Methodology, Toward a Compendium of Best Practices, First Edition. July, 2002. United States Environmental Protection Agency. Office of Wetlands, Oceans, and Watersheds (<http://www.epa.gov/owow/monitoring/calm.html>)
- USEPA 2003. Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Section 303(d) and 305(b) of the Clean Water Act. July 21, 2003. U.S. Environmental

Protection Agency. Office of Wetlands, Oceans, and Watersheds. Assessment and Watershed Protection Branch. (http://www.epa.gov/owow/tmdl/tmdl0103/2004rpt_guidance.pdf)

USEPA 2005a. Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Section 303(d) and 305(b) of the Clean Water Act. July 29, 2005. U.S. Environmental Protection Agency. Office of Wetlands, Oceans, and Watersheds. Assessment and Watershed Protection Branch. (<http://www.epa.gov/owow/tmdl/2006IRG/>)

USEPA 2005b. EPA New England Quality Assurance Project Plan Program Guidance. U.S. EPA New England Quality Assurance Unit Staff, Office of Environmental Measurement and Evaluation. April 2005. (<http://www.epa.gov/region1/lab/qa/pdfs/QAPPProgram.pdf>)

USEPA 2006. Memorandum from Diane Regas. Information Concerning 2008 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions. October 12, 2006. (http://www.epa.gov/owow/tmdl/2008_ir_memorandum.html)

USEPA 2009. Memorandum from Suzanne Schwartz. Information Concerning 2010 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions. May 5, 2009. (<http://www.epa.gov/owow/tmdl/guidance/final52009.html>)