

Delaware River Basin Commission

2010 Delaware River and Bay Integrated List Water Quality Assessment



June 2010



This report provides an assessment of waters in the Delaware River and Bay for support of various designated uses in accordance with Section 305(b) of the Clean Water Act and identifies impaired waters, which consist of waters that do not meet Delaware River Basin Commission's (DRBC) Water Quality Regulations (18 CFR 410). It assesses data compiled from October 1, 2004 through September 30, 2009 (a five-year data window) into the 2010 Delaware River and Bay Integrated List Water Quality Assessment (2010 Assessment). The assessment methodology used to develop the 2010 Assessment was noticed in the Federal Register on June 24, 2009 and published on DRBC's web site.

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1 Abbreviations and Standard Terms

2010 Assessment	2010 Delaware River and Bay Integrated List Water Quality Assessment
2008 Assessment	2008 Delaware River and Bay Integrated List Water Quality Assessment
AU	Assessment Unit
Basin Plan	Water Resources Plan for the Delaware River Basin
Boat Run	Delaware Estuary Boat Run Monitoring Program
CBOD	Carbonaceous Biological Oxygen Demand
CWA	Clean Water Act
DNREC	Delaware Department of Natural Resources and Environmental Control
DO	Dissolved Oxygen
DRBC	Delaware River Basin Commission
DxF	Dioxins/Furans
EPA	United States Environmental Protection Agency
EWQ	Existing Water Quality
FDA	United States Food and Drug Administration
ICP	Interstate Control Points
IRP	Integrated Resource Plan
LDMP	Lower Delaware River Monitoring Program
MCL	Maximum Contaminant Level
Na	Sodium
NAWQA	National Water Quality Assessment Program
NJDEP	New Jersey Department of Environmental Protection
NJDHSS	New Jersey Department of Health and Senior Services
NOAA	National Oceanic Atmospheric Administration
NPS	National Park Service
NSSP	National Shellfish Sanitation Program
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
PADEP	Pennsylvania Department of Environmental Protection
PCB	Polychlorinated Biphenyls

PORTS	Physical Oceanographic Real-Time System
PMP	Pollutant Minimization Plans
RM	River Mile
SPGWA	Southeast Pennsylvania Ground Water Protected Area
SPW	Special Protection Waters
SRMP	Scenic Rivers Monitoring Program
STORET	STORage and RETrieval
TDS	Total Dissolved Solids
TEF	Toxic Equivalency Factor
TEQ	Toxic Equivalency
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
WHO	World Health Organization
WQAC	Water Quality Advisory Committee
WQM	Water Quality Management
WQN	Water Quality Network
WQR	Water Quality Regulations

2 Overview

The 2010 Delaware River and Bay Integrated List Water Quality Assessment (2010 Assessment) reports the extent to which waters of the Delaware River and Bay are attaining designated uses in accordance with Delaware River Basin Commission's Water Quality Regulations (18 CFR 410, DRBC WQR), or the federal Clean Water Act (CWA) section 305(b) (40 CFR 130.8) for the period October 1, 2004 through September 30, 2009. The designated water uses to be protected within the Delaware Basin are as follows:

- 1) Agricultural, industrial, and public water supplies after reasonable treatment, except where natural salinity precludes such uses;
- 2) Wildlife, fish and other aquatic life;
- 3) Recreation;
- 4) Navigation;
- 5) Controlled and regulated waste assimilation to the extent that such use is compatible with other uses; and
- 6) Such other uses as may be provided by the Commission's Comprehensive Plan (2001).

The assessment involves comparison of several key water quality parameters with applicable DRBC water quality criteria. DRBC WQR designate drinking water, agricultural, and industrial uses for the Delaware River. Since drinking water use is assessed and protective of the other uses, agricultural and industrial uses are not assessed separately for this report. The assessment for drinking water requires more stringent water quality criteria than the other uses. For each designated use in each assessment unit, a number of water quality parameters, relevant to the use, are compared to the existing, applicable water quality criteria.

Table 3-1 summarizes the designated uses that are supported in the main stem Delaware River (AUs 1A-1E and 2-5). Table 3-2 provides a summary of the extent of use support for the designated uses, in the different assessment units of the Delaware Bay (AU 6).

3 Introduction

3.1 Background

The 2010 Assessment primarily reflects the format and methodology described in the Draft Methodology for the 2010 Delaware River and Bay Integrated List Water Quality Assessment Report, available on the DRBC web site at:

<http://www.nj.gov/drbc/10IntegratedList/index.htm>

Only the main stem of the Delaware River is assessed in this report. Intrastate streams (tributaries) feeding the Delaware River are included in the Basin States integrated assessments.

Table 3-1. Extent of Use Support for the Delaware River

AU	Aquatic Life	Drinking Water	Recreation	Fish Consumption
1A	NS	S	S	NS
1B	NS	S	S	NS
1C	NS	NS	S	NS
1D	NS	S	S	NS
1E	NS	NS	S	NS
2	NS	S	S	NS
3	NS	S	S	NS
4	NS	NA	ID/S	NS
5	NS	NA	S	NS
6	NS	NA	S	NS

S: The assessment unit supports the designated use.

SS: The assessment unit supports the designated use, but with special conditions.

NS: The assessment does not support the designated use.

NA: DRBC WQR does not contain applicable criteria for a parameter in the AU.

ID: Insufficient or unreliable data is present.

NS for Zone 1 is considered tentative due to uncertainties associated with comparison to EPA recommended toxics criteria in the absence of DRBC numerical criteria.

Table 3-2. Extent of Shellfish Use Support for the Delaware Bay

State	Sub-Assessment Unit within Zone 6	Area (mi ²)	DE / NJ Shellfish Classification	2010 Assessment	2008 Assessment
Delaware	6de1	306	Approved	S	S
	6de2	6	Prohibited	NS	NS
	6de3	5	Prohibited	NS	ID
	6de4	5	Prohibited	NS	ID
	6de5	1	Prohibited	NS	ID
	6de6	4	Prohibited	NS	NS / ID
	6de7	17	Prohibited	NS	NS
New Jersey	6nj1	331	Approved	S	S
	6nj2	1	Prohibited	NS	NS
	6nj3	1	Prohibited	NS	NS
	6nj4	3	Seasonal (Nov-Apr)	SS	SS
	6nj5	4	Seasonal (Nov-Apr)	SS	SS
	6nj6	3	Special Restricted	SS	SS
	6nj7	1	Seasonal (Nov-Apr)	SS	SS
	6nj8	1	Seasonal (Nov-Apr)	SS	SS
	6nj9	1	Special Restricted	SS	SS
	6nj10	3	Seasonal (Nov-Apr)	SS	SS
	6nj11	0.2	Seasonal (Nov-Apr)	SS	S
	6nj12	2	Special Restricted	SS	SS
	6nj13	0.2	Seasonal (Nov-Apr)	SS	S
	6nj14	15	Special Restricted	SS	SS

S = "Supports": The assessment unit supports the designated use

SS = "Supports – Special": The assessment unit supports the designated use, but with special conditions

NS = "Not Supporting": The assessment unit does not support the designated use

ID = "Insufficient Data": Insufficient or unreliable data is present

3.2 Delaware River Basin

The Delaware River is the longest un-dammed river east of the Mississippi, extending from the confluence of its East and West branches at Hancock, N.Y. to the mouth of the Delaware Bay. The Delaware River is fed by 216 tributaries, the largest being the Schuylkill and Lehigh Rivers in Pennsylvania. In all, the basin contains approximately 13,500 square miles, draining parts of Pennsylvania (50.3 percent of the basin's total land area); New Jersey (23.3%); New York (18.5%); and Delaware (7.9%) (Figure 3-1).

Approximately 15 million people, or about 5% of the U.S. population, rely on the waters of the Delaware River Basin for drinking and industrial use, and the Delaware Bay is only a one to two hour drive away for about 20% of the people living in the United States. Yet, the basin drains only four-tenths of one percent of the total continental U.S. land area. The population of the Delaware River Basin in 2000 stood at approximately 7.8 million people. Table 3-3 provides additional geographical statistics for the Delaware River Basin. The Delaware Bay and tidal reach of the Delaware River have been included in the National Estuary Program, a project set up to protect estuarine systems of national significance.

Three reaches of the Delaware River have been included in the National Wild and Scenic Rivers System. One section extends 73 miles from the confluence of the river's East and West branches at Hancock, NY, downstream to Milrift, PA; the second is a 40-mile stretch from just south of Port Jervis, NY, downstream to the Delaware Water Gap near Stroudsburg, PA. The Lower Delaware Wild and Scenic Rivers Act, signed into law on November 1, 2000, adds about 65 miles of the Delaware and selected tributaries to the national system, linking the Delaware Water Gap and Washington Crossing, PA, just upstream of Trenton, N.J. Almost the entire non-tidal Delaware River (the portion north of the "fall line" at Trenton, NJ) is included in the National Wild and Scenic Rivers System. In addition, 35.4 miles of the Maurice River and its tributaries in New Jersey and approximately 190 miles of the White Clay Creek and its tributaries in Pennsylvania and Delaware have been included in the national system. Most recently, on December 22, 2006, President George W. Bush signed into law the Musconetcong Wild and Scenic Rivers Act, which designates 24.2 miles of the Musconetcong River (a tributary of the Delaware River located in New Jersey) as a component of the National Wild and Scenic Rivers System.

There are other economic benefits from the river. According to the Coast Guard, the Delaware River Port Complex generates \$19 billion in business revenue annually, is home to the third largest east coast petrochemical port and five of the largest east coast refineries, and receives over 65% of fruit imported to the U.S. from South America. It is also the largest North American port complex for steel, paper, and meat imports.

Figure 3-1. Delaware River Basin

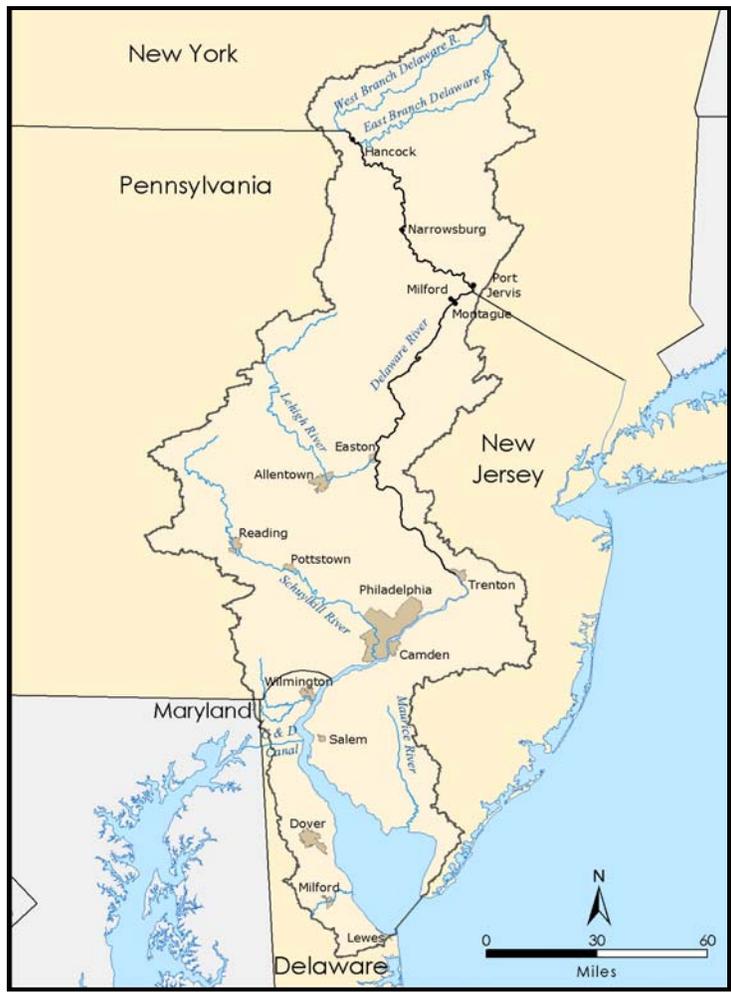


Table 3-3. Approximate Geographical Statistics for the Delaware River Basin

Total Basin Land Area (mi ²) ^{a,b}	12,700
Population (2000)	7.8 million
Major River Basins (HUC 8) ^c	13
River Miles (Named) ^a	9,080
Border (Shared) River Miles ^a	339
Square Miles of Public Lakes and Reservoirs ^c	140
Square Miles of Estuary/Bay ^c	783
Square Miles of Wetlands ^c	480

^aDRBC GIS files

^bTotal Basin area minus area of Estuary and Bay

^cNational Hydrographic Dataset

3.3 Water Pollution Control Programs

DRBC’s water pollution control program is carried out through a series of interdependent steps and provides a rational approach to protecting and restoring water quality in the basin. The waters of the Basin are protected for designated uses with water quality criteria (WQC) that specify what levels of individual parameters are appropriate, based upon a review of the current scientific understanding about the needs of those uses. DRBC’s monitoring programs provide a mechanism to evaluate how those WQC are being met, and assessment of those monitored data provide the link to how well the designated uses are being protected. The identified impairment of interstate waters in the Basin leads to the development of total maximum daily loads (TMDLs), issuing of permits and other mechanisms to reduce loading of pollutants in order to improve water quality to levels that meet the criteria. In addition, DRBC has other layers of protection (i.e., Special Protection Waters) that aim to maintain existing water quality where it is better than the water quality criteria. The following are examples of how the Commission takes a multi-faceted approach to water quality regulation.

3.3.1 Special Protection Waters

Currently, portions of the Delaware River are designated by DRBC as “Special Protection Waters” (SPW) and have associated with them a variety of specific pollution prevention and reduction requirements driven by a “no measurable change” policy toward water quality. Designated reaches of SPW fall into two categories:

- (1) Outstanding Basin Waters
 - The Upper Delaware Scenic and Recreational River from Hancock, NY, to Milrift, NY (Delaware River between RM 330.7 and 258.4)
 - Portions of intrastate tributaries located within the established boundary of the Upper Delaware Scenic and Recreational River Corridor

- The Middle Delaware Scenic and Recreational River from Milrift, NY, to the Delaware Water Gap (Delaware River between RM 250.1 and 209.5)
- Portions of tributaries located within the established boundaries of the Delaware Water Gap National Recreation Area

(2) Significant Resource Waters

- The Delaware River from Milrift, NY, to Milford, PA (RM 258.4 to 250.1)
- The Delaware River from the Delaware Water Gap to Trenton, NJ (RM 209.5 to 133.4).

SPW regulations take a watershed approach to antidegradation of water quality. The regulations apply to the drainage area of the designated waters. Policies provide an up-front approach to reducing or eliminating new pollutant loadings, through requirements made in the docket (permit) review process, for the purpose of maintaining “Existing Water Quality” (EWQ) in designated waters. This is accomplished, in part, by looking at the cumulative impacts of point and non-point sources as they may affect the designated waters, either through direct discharge or through tributary loading. EWQ is defined in the regulations by numerical tables (DRBC WQR 2008). Numerical criteria for SPW EWQ are defined as (a) an annual or seasonal mean of the available water quality data, (b) two-tailed upper and lower 95 percent confidence limits around the mean, and (c) the 10th and 90th percentiles of the dataset from which the mean was calculated.

3.3.2 Estuary CBOD Allocations

The Commission determined that the 1964 carbonaceous biochemical oxygen demand (CBOD₂₀) of the effluent load to Zones 2, 3, 4, and 5 exceeded the waste assimilative capacity of those Zones to meet the stream quality objectives based upon numerical modeling study conducted in the late 1960s. In accordance with the regulations, the assimilative capacity of each Delaware Estuary Zone minus a reserve was originally allocated in 1968 among the individual dischargers based upon the concept of uniform reduction of raw waste in a Zone (Zones 2, 3, 4, and 5). Since 1968, the wasteload allocations for individual dischargers have been updated and documented by the Commission.

3.3.3 Pollutant Minimization Plans

In 2005, DRBC established requirements for the development of Pollutant Minimization Plans (http://www.state.nj.us/drbc/PMP_info.htm) (PMP) for selected toxic pollutants including polychlorinated biphenyls (PCBs). These plans are currently being required for selected point and non-point discharges of PCBs in the Delaware Estuary. The goal of this program is to work toward meeting water quality standards and to eliminate fish consumption advisories due to PCBs. Because of the limited ability of dischargers to reduce their PCB loadings quickly enough to fully comply in the short term with the

numeric limits that are based on water quality standards, this non-numeric approach allows the Commission to require dischargers to take actions in reducing PCB loadings to the Estuary. Pollutant Minimization Plans require biennial PCB sampling and submission of an annual report summarizing PCB loading reduction efforts. The Commission in cooperation with the states of New Jersey, Delaware and Pennsylvania has established a workgroup to include supplementary monitoring requirements via NPDES permits in order to better evaluate these efforts. Additionally, dischargers who were not initially required to develop a PMP have been required as part of their NPDES renewal or at the direction of the Commission to develop a PMP, perform monitoring and submit annual reports. The DRBC also has the authority to require PMPs for contaminated sites to further reduce non-point sources of PCB loadings to the Estuary.

3.3.4 Water Quality Standards Program

Water quality standards provide a description of water body uses to be protected, as well as water quality criteria necessary to protect those uses. DRBC's water quality standards program derives its authority from Section 3.2 of the Delaware River Basin Compact (1961) which directs the Commission to adopt "a comprehensive plan...for the immediate and long range development and uses of the water resources of the basin" and to adopt "a water resources program, based upon the comprehensive plan, which shall include a systematic presentation of the quantity and quality of water resources needs of the area..."; and Section 5.2 which allows the Commission to "assume jurisdiction to control future pollution and abate existing pollution in the waters of the basin, whenever it determines...that the effectuation of the comprehensive plan so requires."

3.3.4.1 Designated Uses

Water uses are paramount in determining stream quality criteria, which, in turn, are the basis for determining discharge effluent quality requirements. Water quality standards require that all surface waters of the Basin be maintained in a safe and satisfactory condition for the following six (6) uses:

- 1) Agricultural, industrial and public water supplies after reasonable treatment, except where natural salinity precludes such uses;
- 2) Wildlife, fish and other aquatic life;
- 3) Recreation;
- 4) Navigation;
- 5) Controlled and regulated waste assimilation to the extent that such use is compatible with other uses; and
- 6) Such other uses as may be provided by the Commission's Comprehensive Plan.

The Delaware River and Bay consists of a non-tidal and tidal Zone. Zones C1-8 and intrastate streams (Zones E, W1, W2, N1 and N2) are not assessed in this report as they are assessed in the Integrated Reports of the Basin States. The non-tidal main stem consists of five Water Quality Management (WQM) Zones: 1A, 1B, 1C, 1D, and 1E (Figure 3-2). These Zones form the boundaries for the DRBC's assessment units (AUs) in the non-tidal Zone. The Zones as defined by river mile (RM) are included in Table 3-4. The designated uses applicable to the non-tidal AUs include aquatic life, fish consumption, primary contact recreation, and drinking water (Table 3-5).

The tidal Delaware River consists of AU 2, 3, 4, and 5 (Figure 3-2) and extends from RM 133.4 to RM 48.2 (Table 3-4). Assessment unit 6 (Delaware Bay) includes multiple units that are defined in part by shellfish management areas issued by the states of Delaware and New Jersey (Figure 3-3). The uses designated in the estuary and bay are indicated in Table 3-5. Shellfish consumption only applies to WQM Zone 6.

Figure 3-2. Delaware River Water Quality Management Zones/Assessment Units

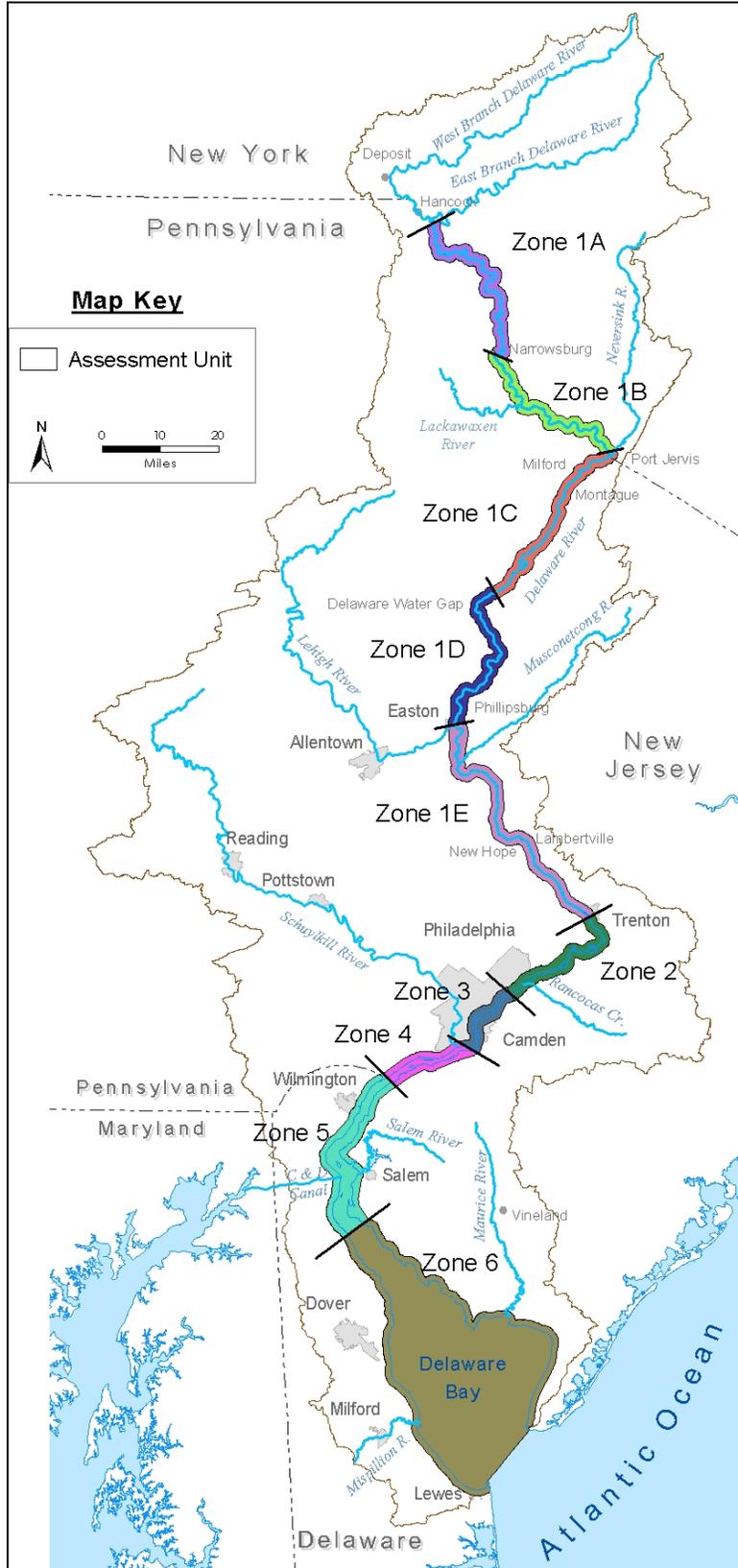


Table 3-4. Delaware River Water Quality Management (WQM) Zones

WQM Zone	Location (as River Mile)
1A	330.7 – 289.9
1B	289.9 – 254.75
1C	254.75 – 217.0
1D	217.0 – 183.66
1E	183.66 – 133.4
2	133.4 – 108.4
3	108.4 – 95.0
4	95.0 – 78.8
5	78.8 – 48.2
6	48.2 – 0.0

Figure 3-3. Zone 6 Shellfish Management Assessment Units



Table 3-5. Designated Uses by DRBC Water Quality Management Zones

Designated Water Use	Water Quality Management Zone									
	1A	1B	1C	1D	1E	2	3	4 ^A	5	6
Aquatic Life	X	X	X	X	X	X	X	X	X	X
Drinking Water	X	X	X	X	X	X	X			
Recreation										
Primary & Secondary	X	X	X	X	X	X		X	X	X
Secondary only							X	X		
Fish Consumption	X	X	X	X	X	X	X	X	X	X
Shellfish Consumption										X

^A Primary recreation below RM 81.8; Secondary recreation above RM 81.8

3.3.4.2 Ambient Water Quality Standards

Sections 3.20, 3.30, and 3.40 of DRBC’s Water Quality Regulations define the “Water Quality Objectives.” From this point on, the objectives will be referred to as “Water Quality Criteria” (WQC) for the non-tidal river, tidal river, and basin ground water. Criteria are Zone-based and define the water quality necessary to protect the designated uses in those Zones. For the water quality assessments, monitored data are compared against the Zone standards for determining use attainment.

3.3.4.3 Ambient Standards for Drinking Water Sources

Zones 1, 2 and 3 of the Delaware River are given the designated use of “public water supplies after reasonable treatment.” It is the general policy of DRBC that all ground water of the Basin, as well as surface sources of drinking water, should not exceed maximum contaminant levels (MCL) given in the National Primary Drinking Water Standards. In Zones 2 and 3, there is additional definition of the permissible levels of specific toxicants in waters designated for both drinking water and fish consumption (due to the bioaccumulation of certain substances even at very low ambient levels).

3.3.4.4 Changes to Water Quality Standards

The last broad scale update of water quality criteria in DRBC Water Quality Regulations (WQR) occurred in 1996. Currently, DRBC, through its Water Quality Advisory Committee, is developing recommendations to revise its standards under authority of Section 5.2 of the Compact which states that the Commission “may adopt and from time to time amend and repeal rules, regulations and standards” to control future pollution and abate existing pollution. A final, approved version of those rules, amended with any proposed changes, is available on the DRBC website with amendments through September 26, 2007. All water quality assessments presented here are based upon the Final Assessment Methodology and the WQR, as they existed at the time of the assessment.

3.3.4.5 Progress Toward Implementing Biocriteria

The DRBC initiated biological monitoring of the Delaware River above the head-of-tide in 2001 using benthic macroinvertebrate collections. Through work with the Biological Advisory Subcommittee to the WQAC, the DRBC has developed an interim methodology (Silldorff and Limbeck 2009; see www.state.nj.us/drbc/Bioassessment-draft-July2009rev.pdf) that uses benthic macroinvertebrate data as a direct assessment of the condition of the aquatic life use in the non-tidal Delaware River (Zones 1A to 1E). This interim methodology is based on a multi-metric index (termed Index of Biotic Integrity or IBI) that averages the standardized scores of 6 individual metrics (taxa richness, EPT richness, Shannon-Wiener diversity, biotic index, intolerant percent richness, and scraper richness). The multi-metric IBI scores can range from 0 up to 100, with higher values indicating improved aquatic life use condition. Under the current methodology, the DRBC has identified an IBI score of 75.6 units as the threshold between attainment ($IBI > 75.6$) and non-attainment ($IBI < 75.6$) for aquatic life use. Based on input from and discussion with the Biological Advisory Subcommittee, the DRBC will limit the application of this interim methodology in the 2010 Integrated Assessment to preliminary assessment of “not supporting” conditions. For Zones not meeting the attainment threshold using the methodology identified in Table 3, the biological assessment will note a “not supporting” condition but will indicate that additional follow-up work is needed to determine the extent and cause of depressed conditions. As a result, no recommendation for a TMDL will result from the 2010 biocriteria assessment. The DRBC continues to work with the Biological Advisory Subcommittee on revisions to the data analysis and assessment, with the goal of finalizing biocriteria development before the 2012 Integrated Assessment cycle.

3.3.5 Point Source Control Program

DRBC uses a variety of programs to regulate point source pollutant loadings that would impact the Delaware River. These consist of docket review, pollutant allocations

(including Pollutant Minimization Plans, PMPs), SPW regulations, and basin-wide minimum treatment standards and interstate cooperative agreements.

Section 3.8 of the compact states that “No project having substantial effect on the water resources of the Basin shall hereafter be undertaken by any person, corporation or governmental authority unless it shall have been first submitted to and approved by the Commission”. Projects are reviewed for potential impacts to the waters of the basin and for consistency with the Comprehensive Plan (http://www.state.nj.us/drbc/cp_wo_2.pdf), which consists of the statements of policies and programs that the commission determines are necessary to govern the proper development and use of the Delaware River Basin (DRBC Rules of Practice and Procedure (<http://www.state.nj.us/drbc/regs/rules.pdf>), 2002/).

In addition, it is the policy of the Commission that there be no measurable change in existing water quality except towards natural conditions in Special Protection Waters (SPW). The DRBC implements both point source and non-point source controls through its SPW regulations. All new or expanding wastewater treatment projects must demonstrate that the new or incremental increase in the facility’s load will not cause a measurable change in existing water quality at the relevant water quality control point for several parameters.

Article 4 of DRBC’s Water Quality Regulations (http://www.state.nj.us/drbc/regs/WQRegs_092607.pdf) identifies basin-wide minimum treatment standards for wastewater discharges. These include:

- Removal of total suspended solids;
- Minimum secondary treatment for biodegradable wastes;
- BOD treatment requirements;
- Disinfection requirements;
- Color standards; Dissolved substance standards;
- pH standards;
- Ammonia standards;
- Temperature standards

DRBC maintains cooperative agreements with all four Basin states, which provide that all NPDES permits for projects that lie within the Basin must comply with DRBC standards as well as state standards.

3.3.6 Nonpoint Source Control Program

DRBC regulates non-point pollution as part of the anti-degradation requirements of SPW. Under DRBC SPW regulations, the service areas of all new or expanding wastewater discharge or water withdrawal project sponsors located in the drainage areas of SPW must submit for approval a Non-point Source Pollution Control Plan with their application. The plan must control the new or increased non-point source loads generated within the portion of the project sponsor’s service area that is also located within the

drainage area of SPW. The plans must document the Best Management Practices to be applied to the project site and/or service area. Non-point source pollution from runoff of developed areas in SPW may not be subject to antidegradation constraints if they are associated with an existing, non-expanding facility, such as a wastewater treatment plant that is not expanding its service area.

Non-point sources of PCBs may also be regulated, on a project-specific basis, by PMPs that the DRBC has begun requiring assistance in reducing PCB loadings into the Delaware River.

3.3.7 Coordination with Other Agencies

The nature of DRBC's water quality management activities relies on interstate coordination and cooperation. For instance, the agency maintains agreements with all four Basin states regarding permit review. Additionally, all new or amended DRBC regulations are ruled on by the Commission, which has representation by the four states and federal government. The Scenic Rivers Monitoring Program (SRMP) and Estuary Boat Run also rely on cooperation between DRBC and other agencies. The SRMP is a partnership between DRBC and the National Park Service (NPS), while the Boat Run is a partnership between DRBC and the Delaware Department of Natural Resources and Environmental Conservation (DNREC).

3.3.8 Integrated Resource Plans

In 1998, DRBC amended its Southeastern Pennsylvania Ground Water Protected Area Regulations to include watershed-based ground water withdrawal limits for sub-basins that lie entirely or partially within the protected area. As required by the Regulations, those withdrawal limits may be revised by the Commission to be more protective of streams designated by the State of Pennsylvania as either "high quality" or "exceptional value," or "wild," "scenic," or "pastoral," or to correspond to more stringent requirements in "integrated resource plans" adopted and implemented by all municipalities in the sub-basin. Integrated Resource Plans (IRPs) must assess water resources and existing uses of water; estimate future water demands and resource requirements; evaluate supply-side and demand-side alternatives to meet water withdrawal needs; assess options for wastewater discharge to subsurface formations and streams; consider storm water and floodplain management; assess the capacity of the sub-basin to meet present and future demands for withdrawal and non-withdrawal uses such as instream flows; identify potential conflicts and problems; incorporate public participation; and outline plans and programs including land use ordinances to resolve conflicts and meet needs. The development of IRPs helps focus and coordinate planning tools to consider the multiple uses of water resources and the interrelationships of water quality and quantity to meet various needs.

3.3.9 Integrated Resource Management

In 2001, DRBC began a multi-stakeholder process to develop a “forward-looking” Water Resources Plan for the Delaware River Basin (Basin Plan). In September 2004, the Governors of the Basin States and representatives of six federal agencies, signed a resolution showing their support for the Basin Plan. The Basin Plan is a unified framework of desired outcomes, goals, objectives, and milestones for protecting, preserving, and enhancing water resources. The central theme of the Basin Plan is a watershed-based approach to the achievement of integrated resource management. The Basin Plan sets a direction for water resource policy and management through 2030 and calls for the active involvement of a broad range of governmental and non-governmental entities in addition to DRBC.

Among the concepts included in the Basin Plan are the integration of water resources considerations into land use planning and management, the development of analytical tools to evaluate water resources impacts of municipal land use plans, the implementation of TMDLs to meet water quality standards for the protection of designated uses, and the use of regulatory and non-regulatory approaches to maintaining and improving water quality where it is better than criteria.

3.4 Special Concerns and Recommendations

After each assessment cycle, DRBC evaluates potential changes to assessment methodologies and criteria identified through the integrated assessment process. After the completion of the 2008 assessment, DRBC coordinated with its state and federal partners on several changes to the assessment methodology. As documented in the Methodology for the 2010 Assessment, several important changes to the assessment approach were incorporated in this assessment cycle including but not limited to the following:

- Expansion of the data window to a 5 year period;
- Toxics assessments in Zones 1 and 6;
- Refinement of the approach to assessment of hardness based criteria;
- Revision of the threshold of exceedences from 10% to 1 violation and 1 confirmatory violation for most criteria, based on EPA comments; and
- Incorporation of biological monitoring for aquatic life designated uses in Zone 1.

Upon completion of the current assessment, DRBC will again coordinate possible changes to criteria, monitoring, and assessment, to improve our ability to assess and manage water quality in the Delaware River and Bay. These changes could include:

- Revisions to criteria to provide:
 - Statistically relevant comparisons to continuous real time data sets;
 - Recognition of data uncertainty;

- More explicit descriptions of central tendency, minimum, maximum values;
- Improved data quality filtering and editing protocols for emerging data streams, such as NOAA PORTS monitors;
- Closer alignment between monitoring programs and criteria;
- Further development of biological monitoring and assessment;
- Meaningful action on noted water quality violations.

4 Surface Water Monitoring and Assessment

DRBC collects a variety of water quality data from its own monitoring programs and solicits available data from the Basin states in order to assess the water quality in the Delaware River and Bay. The compiled data for the 2010 Assessment covers a five-year period from October 2004 through September 2009. Those data are used to assess attainment of designated uses as described in Section 2.

4.1 Monitoring Programs

The surface water quality monitoring program utilized by the DRBC consists of the following programs:

- The upper and middle non-tidal portions of the River (RM 330.7 to 209.5) are monitored through the *Scenic Rivers Monitoring Program*, a joint NPS and DRBC effort;
- The lower non-tidal portions (RM 209.5 to 133.4) are monitored through the *Lower Delaware Monitoring Program*;
- The Estuary, or tidal portion of the Delaware River (RM 133.4 to the mouth of the Delaware Bay), is monitored through the *Delaware River Boat Run Monitoring Program*, a joint effort between the DNREC and DRBC; and
- DRBC Ambient Water Monitoring of the Delaware River for Chronic Toxicity, which is included as an additional study under the Boat Run Monitoring Program.
- The *Biological Monitoring Program* collects macroinvertebrate samples throughout the non-tidal River (RM 300.7 to 133.4) for assessment of Aquatic Life Use

In addition, data obtained from other agencies' monitoring efforts are used to supplement data obtained through the DRBC sampling efforts. The other data sources include:

- DNREC Dioxins and Furans in Fish from the Delaware River Study,
- Pennsylvania Department of Environmental Protection (PADEP) Water Quality Network (WQN),

- New Jersey Department of Environmental Protection (NJDEP) Ambient Surface Water Monitoring Network (from STORET),
- New York State Department of Environmental Conservation (NYSDEC) Ambient Water Quality Monitoring Program (from STORET),
- United States Geological Survey (USGS) National Water Information System (NWIS),
- DRBC/USGS Cooperative Monitoring Program (continuous monitors),
- National Oceanic Atmospheric Administration (NOAA) Physical Oceanographic Real-Time System (PORTS) data, and
- EPA National Coastal Assessment Programs.

The DRBC water quality monitoring programs and the DNREC dioxin and furan study are described below. For information on quality objectives and criteria and sample design, refer to the following DRBC Quality Assurance Project Plans (QAPPs):

- Scenic Rivers Monitoring Program QAPP, Revision 1 (2006)
- Ambient Water Monitoring of the Delaware River for Chronic Toxicity QAPP, June 13, 2006
- Lower Delaware Water Quality Monitoring Program QAPP (2004)
- Delaware River Boat Run Monitoring Program QAPP (2004)
- Delaware River Biomonitoring Program QAPP (2007)

4.1.1 Scenic Rivers Monitoring Program (SRMP)

In 1984, the SRMP began monitoring approximately a 121-mile reach of the Delaware River, from RM 330.7 to RM 209.5, which contains two portions of the National Wild and Scenic Rivers System and numerous high quality tributaries that drain portions of New York, New Jersey, and Pennsylvania. The DRBC and NPS collect water quality measurements for the following purposes:

1. To convert reach-wide EWQ targets to ICP and/or BCP targets;
2. To support water quality models for SPW implementation; and
3. To gather sufficient water quality information to implement DRBC SPW regulations using a site-specific statistical approach to define and assess possible changes to existing water quality.

There are 47 sampling locations; however, for the 2010 Assessment, only data from Interstate Control Points (ICP) along the main stem Delaware River are utilized. Tributary boundary sites are not used.

4.1.2 Lower Delaware Monitoring Program (LDMP)

In 1999, DRBC began monitoring to characterize the existing water quality of the Lower Non-tidal Delaware River, the reach extending from Trenton, NJ, (RM 134) to the

Delaware Water Gap (RM 210). This monitoring network was established because little data existed to characterize water quality in this reach, portions of which have been included in the National Wild and Scenic Rivers System. In 2004, DRBC completed a five-year effort to define existing water quality and to develop a water quality management strategy that protects and improves the water quality of the Lower Delaware region. Based on LDMP monitoring results, the Lower Delaware was declared by DRBC in 2005 as “Significant Resource Waters.”

Program objectives include:

- Establishing EWQ for future comparison;
- Assessing attainment of water quality standards;
- Setting geographic and water quality priorities to maintain or improve EWQ; and
- Long-term monitoring so that DRBC can consistently perform its 305b assessment, evaluate trends, prioritize agency management activities, and assess effectiveness of strategy implementation.

Sampling is conducted at 9 Delaware River ICP sites and 15 tributary sites. Only the results for the ICP sites are used in the assessment.

4.1.3 Estuary Boat Run Program (Boat Run)

The Boat Run consists of monitoring of the tidal portion of the Delaware River from the head of tide at Trenton, NJ, (RM 133.4) to the mouth of the Delaware Bay, delineated as a line from Cape May, NJ, to Lewes, DE. The goals of the program are to provide accurate, precise, and defensible estimates of the surface water quality of the Delaware Estuary and to allow assessment of water quality standards compliance.

Sampling occurs 8 to 12 times per year at up to 22 locations, depending on funding. The samples are analyzed for routine and bacterial parameters, nutrients, heavy metals, sodium and biotic ligand model parameters, chlorophyll-a, dissolved silica, productivity, and volatile organics.

4.1.4 Delaware River Chronic Toxicity Study

The Toxic Advisory Committee (TAC) for the DRBC recommended and the DRBC Commissioners asked the DRBC staff to study and characterize the nature and extent of ambient chronic toxicity in the Delaware Estuary (Zone 2 through 5). As part of that ongoing effort, ambient toxicity surveys were conducted in 2007 and 2008. The surveys used ambient water to measure potential chronic toxicity in the tidal Delaware River (RM 50 to RM 131). The objective was to assess if chronic lethal or sublethal toxicity, as measured in laboratory experiments, was present in river water samples. Ambient toxicity at sixteen fixed stations in the main-stem of the tidal Delaware River with salinities from 0 to 15 parts per thousand (ppt) was assessed using six species: *Pimephales promelas*,

Americamysis bahia, and *Menidia beryllina* in 7-day tests; *Ceriodaphnia dubia* in a test conducted for a maximum of 8-days; *Pseudokirchneriella subcapitata* in a 96-hour test; and *Hyalella azteca* in a 10-day water-only test. Survival, growth, and when possible, reproduction were measured in the toxicity tests. Sampling in two different years indicated, based on the measured endpoints, that the ambient samples from the mainstem of the Delaware River were not chronically toxic to the tested species. The sampling was not designed to characterize any potential near-field toxicity issues immediately surrounding point source discharges or contaminated sites. The surveys did identify tributaries that warrant further assessment for potential impairment from chronic lethal or sublethal toxicity.

4.1.5 Biological Monitoring Program

DRBC's biological monitoring of the non-tidal Delaware River (RM 330.7 to 133.4) began in 2001 using benthic macroinvertebrates as the monitoring endpoint. For many years, DRBC has assessed the Aquatic Life Use of the non-tidal river using physical and chemical parameters. The biological monitoring program seeks to complement this physical/chemical monitoring with measurements of the diversity and health of the aquatic life community itself.

The initial years of data collection were designed to characterize the spatial and temporal variation in invertebrate communities at 25 fixed monitoring stations within riffle habitats (see Appendix A-1 for station locations; see Biomonitoring QAPP and Silldorff and Limbeck 2009 for details of the monitoring design). Using these initial data, DRBC has worked with the Biological Advisory Subcommittee to the WQAC in the analysis of the data and in the development of an interim assessment methodology based on these macroinvertebrate collections. Data from macroinvertebrate collections during 2007 and 2008 were then interpreted relative to the newly developed interim assessment methodology for the 2010 Integrated Assessment.

4.2 Assessment Methodologies

Because DRBC's role is to assess shared waters in the Basin, coordination with the Basin States is important. The Integrated Listing process defines a list of waters for which TMDLs must be prepared (i.e., 303(d) list). However, the regulatory responsibility for preparing a 303(d) list, represented in the Integrated List by category 5, rests with the States. The DRBC did public notice the methodology for the 2010 Delaware River and Bay Integrated List assessment in the Federal Register on June 24, 2009.

4.2.1 Assessment Units

As noted in Section 3.3, the non-tidal assessment units include WQM Zones 1A, 1B, 1C, 1D, and 1E (Figure 3-2). The designated uses assessed in Zones 1A through 1E include

aquatic life, drinking water, primary recreation, and fish consumption (Table 3-5). WQM Zones 2, 3, 4, and 5 make up the tidal portion of the Delaware River Basin. Fish consumption, aquatic life, and recreation apply to all the tidal Zones. Drinking water use is only applicable to WQM Zones 2 and 3. The Delaware Bay consists of WQM Zone 6. The assessed designated uses for the Bay include aquatic life, primary recreation, fish consumption, and shellfish consumption.

4.2.2 Data Requirements

This section looks at the general approach for each designated use assessed relative to DRBC water quality standards and other supporting evidence. The tables below also describe the parameter-specific data requirements. It should be noted, however, that assessments might also be made using less robust data than indicated by the objectives, when the weight of evidence is compelling.

Listed below are cases where insufficient data (ID) are available and the uses can not be assessed against DRBC criteria. Such data would fail to support the designated use, but the assessment may be identified as “ID” rather than “not supported” when the following conditions exist:

- a) The number of samples per AU over an assessment period or season was below data requirements
- b) Background level was not specified in DRBC WQR and can not reasonably be determined for a particular AU
- c) The parameter was not monitored in an AU
- d) The parameter was analyzed in a matrix other than surface water

4.2.2.1 Aquatic Life

Aquatic life is to be protected in all DRBC WQM Zones (Table 3-5). The assessment is based upon these water quality parameters: dissolved oxygen (DO), pH, turbidity, temperature, total dissolved solids (TDS), alkalinity, and in Zone 1, biological monitoring results (Table 4-1). In addition, toxic pollutants with criteria based on chronic and freshwater conditions are used to support aquatic life in Zones 2 through 5. For protection of aquatic life, Zone 6 was assessed as a whole unit.

Table 4-1. Aquatic Life data requirements and assessment criteria

Parameter	AU	Criteria	Assessment Method	Data Requirements
DO	All	Meet all Zone specific instantaneous minimum, minimum 24-hour average, spawning, and seasonal criteria listed in DRBC Water Quality Regulations, Sections 3.20 and 3.30	For instantaneous minimums, less than 1 observation plus 1 confirmatory observation per AU fail the criteria. For 24-hour averages, less than one 24-hour average plus one confirmatory 24-hour average fail the criteria.	For instantaneous minimums, at least 20 measurements over the assessment period. For 24-hour averages, at least 20 daily averages over the assessment period.
Temperature	1A-1E	Not to exceed Zone specific increases above ambient temperature	Estimate ambient temperature using data or models. Less than 1 observation plus 1 confirmatory observation per AU fail the criteria, considered in conjunction with the ambient temperature variability or model standard error.	At least 20 samples per AU over the assessment period
	2-6	Not to exceed Zone specific maximum temperatures listed in DRBC Water Quality Regulations, Sections 3.30 and 4.30	Less than 1 daily average plus 1 confirmatory daily average per AU fail the criteria	At least 20 samples per AU over the assessment period
pH	All	Meet Zone specific pH criteria range listed in DRBC Water Quality Regulations, Sections 3.20 and 3.30	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria, unless evidence shows that pH violation are the result of natural conditions and biological communities are not impaired	At least 20 samples per AU over the assessment period
TDS	1A-1E, 2-4	Not to exceed Zone specific TDS criteria listed in the DRBC Water Quality Regulations, Sections 3.20, 3.30 and 4.20.2	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria	At least 20 samples per AU over the assessment period
Alkalinity	1E, 2-6	Meet Zone specific criteria range in DRBC Water Quality Regulations, Sections 3.20 and 3.30	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria	At least 20 samples per AU over the assessment period
Toxic Pollutants	2-5	Not to exceed criteria noted in DRBC Water Quality Regulations, Table 5	No more than one (1) exceedence in an AU over a three year window	Available data
	1, 6	Not to exceed EPA recommended CCC criteria	No more than one (1) exceedence in an AU over a three year window	Available data
Biological Monitoring	1A – 1E	6-metric IBI not to fall below 75.6 unit threshold	No more than 30% of samples per AU below the threshold in the assessment period	At least 2 years of data with multiple sites per AU

Water quality data were insufficient to assess turbidity in Zones 1A and 1B against the DRBC WQC. The instrument used for monitoring turbidity in these Zones was suspect. Temperature data could not be assessed for Zones 1A through 1E since the DRBC WQC references ambient waters and “ambient” and “natural” temperatures are not defined in the regulations and could not be determined from the data. TDS in Zone 4 could not be assessed against the 133% of the background criteria because DRBC WQR Article 4 does not indicate a background level for TDS in Zone 4.

4.2.2.2 Drinking Water

Drinking water use is designated for WQM Zones 1A through 1E, 2, and 3. The parameters used for determining drinking water use support are:

- TDS;
- chlorides;
- toxic substances (human health criteria for systemic toxicants and carcinogens in Zones 2 and 3 only);
- hardness;
- odor;
- phenol;
- sodium (Na); and
- turbidity.

Since this particular use relates to human health, the assessment also takes into account information on actual impacts to the use such as frequent or extended closures of drinking water facilities due to recurring or chronic water quality concerns.

4.2.2.3 Contact Recreation

In the DRBC Water Quality Regulations, the "Recreation" designated use includes all water-contact sports, and thus corresponds to “primary contact” recreation. Some waters, however, are designated as "Recreation - secondary contact" which restricts activities to where the probability of significant contact or water ingestion is minimal, encompassing but not limited to:

1. boating,
2. fishing,
3. those other activities involving limited contact with surface waters incident to shoreline recreation.

Criteria protective of the primary contact designated use are also protective of secondary contact uses. Criteria protective of secondary contact uses are not protective of primary contact uses.

4.2.2.3.1 Primary

Primary contact recreation applies to Zones 1A-1E, 2, 4 below RM 81.8, and 5 and 6. The parameter used for determining primary contact recreation in Zones 1A-1E is fecal coliform. In addition to fecal coliform, enterococcus bacteria is used to assess primary contact recreation in the tidal Zones 2, 4, 5, and 6. Zone 4 is only assessed against primary contact standards below RM 81.8. The criteria are based on a geometric mean, with samples taken at a certain frequency and location as to permit valid interpretation.

4.2.2.3.2 Secondary

DRBC WQM Zones 3 and 4 above RM 81.8 are restricted to secondary contact recreation. Fecal coliform and enterococcus bacteria are used to assess secondary contact recreation (Tables 4-3 and 4-4). Zone 4 is assessed against secondary contact standards above RM 81.8. The criteria are based on a geometric mean, with samples taken at a certain frequency and location as to permit valid interpretation.

Table 4-2. Drinking Water data requirements and assessment criteria

Parameter	AU	Criteria	Assessment Method	Data Requirements
TDS	1A-1E, 2-3	Not to exceed Zone specific TDS criteria listed in the DRBC Water Quality Regulations, Sections 3.20, 3.30 and 4.20.2	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria	At least 20 samples per AU over the assessment period
Hardness	2-3	Not to exceed Zone specific 30-day average criteria listed in DRBC Water Quality Regulations, Section 3.30.2 and 3.30.3	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria	At least three samples in a 30-day period At least 20 samples per AU over the assessment period
Chlorides	2-3	Not to exceed Zone specific criteria listed in DRBC Water Quality Regulations, Section 3.30.2 and 3.30.3	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria	At least two samples in a 15-day period (AU 2) At least three samples in a 30-day period (AU 3) At least 20 samples per AU over the assessment period
Odor	1A-1E, 2-3	Not to exceed Zone specific criteria listed in DRBC Water Quality Regulations, Sections 3.20 and 3.30	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria	Available data
Phenols	1A-1E, 2-3	Not to exceed Zone specific criteria listed in DRBC Water Quality Regulations, Section 3.20 and 3.30	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria	At least 20 samples per AU over the assessment period
Na	3 at or above RM 98	Not to exceed 30-day average criteria listed in DRBC Water Quality Regulations, Section 3.30.3	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria	At least three samples in a 30-day period (AU 3) At least 20 samples per AU over the assessment period
Turbidity	1A-1E, 2-3	Not to exceed Zone specific criteria listed in DRBC Water Quality Regulations, Sections 3.20 and 3.30	Less than 1 observation plus 1 confirmatory observation per AU fail the criteria	At least three samples in a 30-day period (AU 3) At least 20 samples per AU over the assessment period
Systemic Toxicants	2-3	Not to exceed criteria listed in DRBC Water Quality Regulations, Section 3.30, Table 7	No more than one (1) exceedence in an AU over a three year window	Available data
Carcinogens	2-3	Not to exceed criteria listed in DRBC Water Quality Regulations, Section 3.30, Table 6	No more than one (1) exceedence in an AU over a three year window	Available data
Drinking Water Closures	1A-1E, 2-3	No frequent or extended closures of drinking water facilities due to recurring or chronic water quality concerns	No closures affecting an AU over over the assessment period	Administrative closures for drinking water supply over the assessment period. Information from one or more drinking water intake facility per AU.

Table 4-3. Primary Contact Recreation data requirements and assessment criteria

Parameter	AU ^A	Criteria	Assessment Method	Data Requirements
Fecal coliform	1A-1E,2,4 (below RM 81.8),5,6	Not to exceed Zone specific Fecal coliform criteria listed in the DRBC Water Quality Regulations, Sections 3.20 and 3.30	Geometric mean of samples per AU during each assessment year	At least 5 samples per AU during each assessment year
Enterococcus	2,4 (below RM 81.8)	Not to exceed Zone and sub-Zone specific Enterococcus criteria listed in the DRBC Water Quality Regulations, Section 3.30	Geometric mean of samples per AU during each assessment year	At least 5 samples per AU during each assessment year
	5,6	Not to exceed Zone and sub-Zone specific Enterococcus criteria listed in the DRBC Water Quality Regulations, Section 3.30	Geometric mean of samples per AU during each assessment year	At least 5 samples per AU during each assessment year

^AWQM Zone 4 is assessed for the parameters below RM 81.8.

Table 4-4. Secondary Contact Recreation data requirements and assessment criteria

Parameter	AU ^A	Criteria	Assessment Method	Data Requirements
Fecal coliform	3,4 (above RM 81.8)	Not a single geometric mean to exceed 770 / 100 ml	Geometric mean of samples per AU during each assessment year	At least 5 samples per AU during each assessment year
Enterococcus	3,4 (above RM 81.8)	Not a single geometric mean to exceed 88 / 100 ml	Geometric mean of samples per AU during each assessment year	At least 5 samples per AU during each assessment year

^AWQM Zone 4 is assessed for the parameters above RM 81.8.

4.2.2.4 Fish Consumption

Fish consumption designated use applies to all DRBC WQM Zones. An assessment of “not supporting” the designated use is primarily based upon the presence of the Basin states’ fish consumption advisories in the main stem Delaware River and Estuary. For the purposes of this assessment, advisories related to the general population only are used, rather than advisories for more sensitive subpopulations.

The following fish advisory reports are used:

- 2009 Fish Smart, Eat Smart, A Guide to Health Advisories for eating Fish and Crabs Caught in New Jersey Waters (NJDEP/NJDHSS 2009)
- Delaware Fish Consumption Advisories (DNREC 2009)
- Fish Consumption Advisories - 2010 (PADEP 2010)
- 2009-2010 Health Advisories: Chemicals in Sportfish and Game (NYSDOH, 2009)

Monitoring data is also used to support listed fish consumption advisories. A recent study (January 25, 2008) by DNREC on DxF in fish from the Delaware River is used to support fish consumption advisories throughout the tidal river.

Table 4-5. Fish Consumption Data requirements and assessment criteria

Parameter	AU	Criteria	Assessment Method	Data Requirements
Fish Consumption Advisory	1A-1E, 2-6	Not a single fish advisory listed for an AU	Count of the number of fish consumption advisories per AU listed over the assessment period	NY, NJ, DE, and PA fish consumption advisories for the general population based upon the Basin states' water quality or fish tissue data

4.2.2.5 Shellfish Consumption

Shellfish consumption designated use only applies to DRBC WQM zone 6 (RM 48.2 to the mouth of the Delaware Bay). New Jersey and Delaware assess this use in their coastal waters, using procedures developed by the FDA National Shellfish Sanitation Program (NSSP). Both states use total coliform (as most probable number) as the assessment tool and compare it against federal shellfish standards.

In both states, waters classified for shellfishing may be opened for that use all year round. In some cases, the AU is opened seasonally (typically in winter). In other cases, harvesting may be prohibited due to administrative closures based upon proximity to sewer outfalls. In still other cases, waters may be open to harvesting, but with special treatment of the shellfish, such as transplantation to cleaner waters for a period of time prior to the harvesting. Finally, some waters are closed to shellfish harvesting due to existing water quality concerns.

Table 4-6. Shellfish Consumption data requirements and assessment criteria

Parameter	AU^A	Criterion	Assessment Method	Data Requirements
Shellfish Consumption Classifications	6	No prohibitions and/or year-round closures in an AU. Shellfish waters with special conditions and temporal windows are assessed as supporting but with conditions	Determine the number of shellfish harvesting prohibitions, year-round closures, and limiting conditions per AU listed over the assessment period	DE and NJ shellfish consumption and harvesting advisories, prohibitions, closures, and limiting conditions per AU over the assessment period

^A WQM zone 6 is subdivided into multiple units based on Shellfish Management Directives.

4.3 Assessment Results

After an AU is assessed against the relevant criteria for a designated use, the AU is then determined to be “Supporting” or “Not Supporting” for that designated use. In some cases, the AU can not be classified as supporting or non-supporting because there is insufficient data to compare a parameter to current DRBC WQC.

The assessment results are presented in tabular format by designated use. A plus sign (+) indicates that the parameter meets DRBC current water quality criteria. A minus sign (-) signifies that the parameter does not meet DRBC’s current water quality criteria. In order for a designated use to be supported (S) in a Zone, it must meet these conditions:

- 1.) All applicable parameters in that row must be assessed and labeled with a + sign.
- 2.) Available data is sufficient to make an assessment for each parameter.

For a Zone to be not supported (NS) for a particular use, it must contain at least one minus sign for an applicable parameter, regardless of insufficient data for other parameters. If there is insufficient data present for a parameter that is a primary surrogate for a designated use in a Zone, then the AU assessment for the Zone is identified as insufficient (ID). The tables follow below. For comparison purposes, the 2008 Assessment results are included.

4.3.1 Aquatic Life

The Aquatic Life Assessment results are presented in Table 4-7 below.

Table 4-7. Aquatic Life Designated Use Assessment Results

AU	DO	pH	Turbidity	Temperature ^A	TDS	Alkalinity	Toxic Pollutants	Biological Assessment	2010 Assessment	2008 Assessment
1A	+	-	+	ID	+	NC	- ^G	+	NS	NS
1B	+ ^c	- ^D	+	ID	+	NC	- ^G	+	NS ^F	ID
1C	+	+	+	ID	+	NC	ID ^G	+	ID ^F	ID
1D	+	+	+	ID	+	NC	- ^G	+	NS ^F	ID
1E	+	-	ID	ID	+	- ^D	- ^G	- ^I	NS	NS
2	- ^D	+	- ^D	-	+	- ^D	+ ^B	NC	NS	NS
3	- ^D	- ^D	+	- ^D	+	- ^D	+ ^B	NC	NS ^F	S
4	+	+	ID	- ^D	E	- ^D	+ ^B	NC	NS ^F	NS
5	- ^D	+	+	- ^D	NC	+	- ^H	NC	NS ^{F,H}	NS
6	- ^D	- ^D	+	- ^D	NC	+	- ^G	NC	NS ^F	S

+ (-): The parameter meets (does not meet) DRBC current water quality criteria.

S: The assessment unit supports the designated use.

NS: The assessment does not support the designated use.

NC: DRBC WQR does not contain applicable criteria for a parameter in the AU to be assessed.

ID: Insufficient or unreliable data is present. The parameter could not be assessed against DRBC current water quality criteria.

^A DRBC WQR do not define “ambient” and “natural” for Zones 1A-1E.

^B Assessed against parameters and criteria listed in DRBC WQR Table 5 Freshwater Objectives, Chronic.

^C In Zone 1B, NY Department of Environmental Conservation, Division of Water, reported in STORET DO values of 0 mg/L on 9/12/2006 and 10/23/2006. The two reported 0 values are highly suspect and inconsistent with the remaining data.

^D Exceeded EPA’s currently required threshold of 1 violation and 1 confirmation, but is below the previously utilized threshold of 10%. Therefore, the segment is indicated as not meeting criteria, but will be flagged pending criteria revisions and / or development of a statistical methodology for reconciling higher quantity multiple measurements with criteria.

^E TDS criteria expressed only as not to exceed 133% of background for Zones 4, but background is not defined.

^F NS for this Zone is considered tentative due to uncertainties associated with comparison to EPA recommended toxics criteria in the absence of DRBC numerical criteria and/or observations that exceeded EPA’s currently required threshold of 1 violation and 1 confirmation, but not the previously utilized threshold of 10%.

^G Assessed against EPA’s 2006 National Recommended Water Quality Criteria

^H Assessment against copper criteria in Zone 5 was inconclusive. See description in Section 4.3.1.6.

^I Biological assessment as “not supporting” is preliminary at this time and DRBC recommends a classification of Zone 1E in DRBC’s Category 3A “Waters of Concern” until the Biological Assessment protocols are refined and the extent of change in Zone 1E is evaluated.

4.3.1.1 DO

- In Zone 2, all seasonal mean criteria were met for the assessment period. However, 12 days with a 24-hour mean DO below DRBC's criteria of 5 mg/L were identified out of a total of 590 observations (or 2%).
- In Zone 3, all seasonal mean criteria were met for the assessment period. However, 6 days with a 24-hour mean DO below DRBC's criteria of 3.5 mg/L were identified out of a total of 1,199 observations (or 0.5%).
- In Zone 5, all seasonal mean criteria were met for the assessment period. However, 143 days with a 24-hour mean DO below DRBC's criteria of 6 mg/L were identified out of a total of 1,622 observations (or 8.8%).
- In Zone 6, six discrete observations, from a total of 404 (1.5%), were below the DRBC instantaneous DO criteria of 5 mg/L.

4.3.1.2 pH

DRBC's pH criteria is under review. DRBC expects to propose revised criteria within the next year.

- In Zone 1E, daily maximum pH exceeded DRBC's criteria of 8.5 on 419 out of 1,692 days (or 24.8%). This exceeds both EPA's required threshold of 1 violation and 1 confirmation and the threshold of 10% identified in the methodology for a definitive non-achievement of criteria.
- In Zone 3, daily maximum pH exceeded DRBC's criteria of 8.5 on 40 out of 1,218 days (or 3.3%).
- From a total of 204 pH observations in Zone 6, one was below DRBC's minimum criteria of 6.5 and 6 were above DRBC's maximum criteria of 8.5 (for a total of 3.4% violations).
- From a total of 283 pH observations in Zone 1A, 5 were below DRBC's minimum criteria of 6 and 26 were above DRBC's maximum criteria of 8.5 (for a total of 11% violations). This exceeds both EPA's required threshold of 1 violation and 1 confirmation and the threshold of 10% identified in the methodology for a definitive non-achievement of criteria.
- From a total of 302 pH observations in Zone 1B, 4 were below DRBC's minimum criteria of 6 and 5 were above DRBC's maximum criteria of 8.5 (for a total of 3% violations).

4.3.1.3 Turbidity

Where real time water quality meters are not present (Zones 1A, 1B, 1C, 1D, and 6), discrete turbidity measurements are generally not collected at a frequency that would allow assessment against a 30-day average criteria. In these instances, only the instantaneous maximum criterion was considered.

- In Zone 1E, the USGS continuous water quality monitor at Trenton measures turbidity, along with other parameters. Data is stored as daily minimum, maximum, and mean values. Of the 1,624 days for which data is available, 25 violations of DRBC's instantaneous maximum criteria of 150 NTU were noted, and 54 violations of DRBC's 30-day mean criteria of 30 NTU were noted, for a total of 73 violation days (or 4.5%). Turbidity exceeding the numerical criteria indicate a violation unless due to natural conditions. We reviewed the daily flows on apparent criteria exceedance day, to determine if high flows (a natural condition) caused the exceedance. In most instances, flows in excess of the 95th percentile of flow coincided with high turbidities, indicating natural conditions. In several instances, however, this was not the case. On August 21 and 22, 2007, daily maximum turbidities of 230 and 410 NTU respectively were observed at Trenton. Flows on these days were below the median flow. Again, on June 5, 2008, USGS observed a maximum daily turbidity of 220 NTU under flows just higher than median flow. Again on July 27, 2008, and May 7, 2009, turbidities exceeded DRBC instantaneous maximum criteria under flows below the 80th percentile. While these flows were high, they did not approach flood conditions and all other turbidity measurements at comparable flows were well below 150 NTU. Therefore, we conclude that on 5 days, elevated turbidities were observed that may not be explained by natural conditions.
- Zone 2 turbidity discrete data from boat run monitoring showed no violations of the instantaneous maximum criteria of 150 NTU. However, the continuous monitor at Delran showed a total of 9 exceedances of the 150 NTU criteria. Of these, 5 occurred on days when the flow exceeded the 95th percentile of flow, and were considered to have been caused by natural conditions, as allowed for in the regulations. The remaining 4 observations in excess of 150 NTU (out of 565 observations, or 0.7%) did not occur at high flow, however, and are considered to be violations.
- Zone 3 turbidity discrete data from boat run monitoring showed two violations of the instantaneous maximum criteria of 150 NTU, but these observations were on the same day at two different locations. We did not consider this to be a demonstration of EPA's required one violation plus one confirmatory violation.
- Zone 4 discrete turbidity measurements showed violations at different locations on 2 different days for a total of 5 violations in 190 observations (or 2.6%). This exceeds EPA's required threshold of 1 violation and 1 confirmation, but is below the threshold of 10% identified in the methodology for a definitive non-achievement of criteria. Therefore, this segment is indicated as "ID" for turbidity.

4.3.1.4 Temperature

- DRBC’s surface water quality criteria for temperature in Zones 1A through 1E are expressed as limits on the allowable water temperature rise above background. However, the regulations do not define background. In the Assessment Methodology, DRBC indicated that longitudinal comparisons would be made from monitoring point to next downstream monitoring point to determine if temperature increases beyond the allowable threshold were indicated. DRBC completed this comparison, but substantial uncertainties remain. In comparing all continuous real time temperature data, we do observe increases in daily maximum temperature from upstream to downstream monitors in approximately 11% of all paired daily maximum data. If no increases in temperature beyond the criteria thresholds were observed, we could have concluded that no violations existed. However, since increases were observed, we are unable to determine if the increases in temperature were due to natural warming associated with the river transitioning from an artificially cold reservoir tailwater dominated system to a more natural system, or the result of anthropogenic heat loads.
- Temperature models that would relate “ambient” temperature to meteorological influences were not run in time for this assessment.
- DRBC is in the process of revising its temperature criteria for the non-tidal river and expects to have new criteria in place before the next assessment.
- In Zone 2, temperatures exceeded the daily limit at the Delran water quality monitor on 26 out 745 days (or 3.5%). Similarly, the NOAA PORTS monitor at Burlington showed violations of the daily maximum temperature criteria on 4.8% of the days where temperature was measured, and the Newbold NOAA PORTS monitor showed violations of the daily maximum temperature on 10.5% of days where temperature was measured.
- In Zone 3, the NOAA PORTS monitor at Philadelphia showed violations of the daily maximum temperature on 3.6% of days where temperature was measured. The USGS monitor at the Ben Franklin Bridge showed violations daily maximum temperature on 2.8% of days where temperature was measured.
- In Zone 4, the USGS monitor at Chester showed violations daily maximum temperature on 8.9% of days where temperature was measured.
- In Zone 5, the NOAA PORTS monitors at Reedy Point, Delaware City, and Marcus Hook all showed violations of the daily maximum temperature criteria of fewer than 1% of days where temperature was measured. Violations, however, still exceeded 1 violation and 1 confirmatory violation, and thus are indicated as not supporting.
- In Zone 6, no violations were observed at the NOAA PORTS monitor at Brandywine Shoals, but violations were observed at Lewes on fewer than 1% of days where temperature was measured.

4.3.1.5 Alkalinity

- In Zone 1E, Alkalinity less than 20 mg/L was measured on March 11, 2008 and March 12, 2009, for a total of 2 violations in 122 observations (or 1.6%).
- In Zone 2, violations of the minimum alkalinity standard of 20 mg/L occurred in 6 out of 316 observations, and violations of the maximum alkalinity standard of 100 mg/L occurred in 1 out of 316 observations, for a total of 7 violations out of 316 observations (or 2.2%).
- In Zone 3, violations of the minimum alkalinity standard of 20 mg/L occurred in 6 out of 133 observations (or 4.5%).
- In Zone 4, violations of the minimum alkalinity standard of 20 mg/L occurred in 4 out of 220 observations (or 1.8%).
- In Zone 5, violations of the minimum alkalinity standard of 20 mg/L occurred in 3 out of 439 observations (or 0.7%), however, all violations occurred on the same sampling day at different locations. Therefore, this is counted as 1 violation, and the criteria is determined to have been met during the assessment period.

4.3.1.6 Toxic Pollutants

- As indicated in the methodology, DRBC compared observations in Zones 1A through 1E (where DRBC has not adopted numerical criteria) to EPA proposed criteria, as a method of implementing DRBC's narrative standard. Data showed exceedances of the acute and chronic standards for Aluminum in Zones 1A, 1B, 1D and 1E. Monitoring data for aluminum was not available for Zone 1C.
- As indicated in the methodology, DRBC compared observations in Zone 6 (where DRBC has not adopted numerical criteria) to EPA proposed criteria, as a method of implementing DRBC's narrative standard. Data showed exceedances of the acute standard for Copper in Zone 6.
- Copper concentrations continue to be near water quality criteria with several potential, but inconclusive, exceedances of the marine criteria in the vicinity of Pea Patch Island (RM 60.6). The potential exceedances are low in both frequency and magnitude. Assessment is complicated by factors such as field sampling and analytical issues with contamination, the applicability of DRBC's freshwater or marine criteria, a need to assess revisions to the current freshwater and marine criteria, and the influence of other water quality attributes that influence the partitioning and toxicity of copper. Therefore, copper levels in Zone 5 should be considered of concern warranting additional monitoring and assessment. Suggested studies include additional synoptic sampling surveys targeted to copper and other metals with finer spatial and temporal scales, and further assessment including the development of water quality models to assess the frequency of criteria exceedances and the factors contributing to those exceedances. Coordination among basin states and agencies should continue to ensure the use of the most appropriate methods and procedures for the conduct of monitoring

studies in the Basin, and the harmonization of water quality criteria and assessment methodologies.

- In some instances, violations of toxics criteria were observed in multiple samples on a single day at different locations, but not observed on multiple days. We interpreted that this did not fit the description of 1 violation and 1 confirmatory violation, as the samples were essentially re-measuring the same single violation.

4.3.1.7 Biological Assessment

Biological assessment results indicate reference-quality invertebrate communities in Zones 1A, 1B, 1C, and 1D. This includes “attaining” scores in the thermally altered upper mainstem Delaware River between Hancock and Callicoon (i.e., the upper portion of Zone 1A). Only a single sample in Zone 1C fell below the impairment threshold; such rarity of low scores in these Zones is consistent with the definition of this threshold (i.e., 10th percentile of the reference distribution defined by 2001 to 2006 data). Below the Lehigh River in Zone 1E, however, 41% of the invertebrate samples fell below the impairment threshold (7 of 17 samples). For the interim methodology, DRBC has defined “impairment” as greater than 30% of sampling falling below the threshold (see Table 4-1). Therefore, Zone 1E is listed as not meeting the biocriteria for the assessment period. Because of the preliminary nature of the current Biological Assessment protocol, however, DRBC recommends placing Zone 1E into a Category 3A “Waters of Concern” until the Biological Assessment protocols are refined and the extent of change in Zone 1E is evaluated.

Table 4-8. Summary of Biological Assessment Results

Zone	Years of Data	Stations per Assessment Unit	% of samples in time window w/ 6-metric IBI < 75.6
1A	2 (2007 - 2008)	4	0%
1B		3	0%
1C		4	12.5%
1D		5	0%
1E		7	41%

4.3.2 Drinking Water

Results of the Drinking Water Assessment are presented in Table 4-9 below.

Table 4-9. Drinking Water Designated Use Assessment Results

AU	TDS	Hardness	Chlorides	Odor	Phenols	Sodium (Na)	Turbidity	Systemic Toxicants	Carcinogens	Drinking Water Closures	2010 Assessment	2008 Assessment
1A	+	NA	NA	ID	ID	NA	+	+	+	+	S	S
1B	+	NA	NA	ID	ID	NA	+	+	+	+	S	S
1C	+	NA	NA	ID	ID	NA	+	+	-	+	NS	S
1D	+	NA	NA	ID	ID	NA	+	+	+	+	S	S
1E	+	NA	NA	ID	ID	NA	ID	+	-	+	NS	S
2	+	+	+	ID	ID	NA	+	+	+	+	S	S
3	+	+	+	ID	ID	+	+	+	+	+	S	S

Drinking water is supported in Zones 1A, 1B, 1D, 2, and 3 (Table 4-9). Zone 1C and 1E did not meet EPA’s recommended human health criteria for arsenic. The arsenic criteria causing the non-supporting assessment is under review by the EPA. The use does not apply to Zones 4, 5, and 6.

As indicated in the methodology, DRBC compared observations in Zones 1A through 1E (where DRBC has not adopted numerical criteria) to EPA proposed criteria, as a method of implementing DRBC’s narrative standard.

4.3.3 Contact Recreation

Primary contact recreation is supported in all applicable Zones, except Zone 4 below RM 81.8 (Table 4-10), where there is insufficient data. Secondary contact recreation is supported in Zones 3 and 4.

Table 4-10. Contact Recreation Designated Use Assessment Results

AU ^A	Fecal Coliform		Enterococcus		2010 Assessment	2008 Assessment
	Primary	Secondary	Primary	Secondary		
1A	+	+	NA	NA	S	S
1B	+	+	NA	NA	S	S
1C	+	+	NA	NA	S	S
1D	+	+	NA	NA	S	S
1E	+	+	NA	NA	S	S
2	+	+	+	+	S	S
3	NA	+	NA	+	S	S
4	NA/ID	+/ID	NA/ID	+/ID	ID/S	ID/S
5	+	+	+	+	S	S
6	+	+	+	+	S	S

^A Zones 1E and 6 were assessed as whole units for this use.

+ (-): The parameter meets (does not meet) DRBC current water quality criteria.

S: The assessment unit supports the designated use.

NS: The assessment does not support the designated use.

NA: Designated use is not applicable to the assessment unit.

ID: Insufficient or unreliable data is present. The parameter could not be assessed against DRBC current water quality criteria. In Zone 4 below RM 81.8, data was not available for that portion of the river.

4.3.4 Fish Consumption

The assessment of fish consumption is based upon the presence of fish consumption advisories for the main stem Delaware River and Bay. Table 4-11 shows the advisories issued by the Basin states as they apply DRBC WQM Zones. The Basin states, with the exception of NJ, indicate the contaminant contributing to the advisory. In most instances, the contaminants are PCBs and mercury. New York did not issue any fish advisories for the Delaware River. However, fish advisories due to mercury are listed for the reservoirs feeding the Delaware River.

Fish consumption is not supported in any WQM Zone in the Delaware River and Bay (4-11). Recently compiled DxF data from fish tissue collected in 2006 and 2007 also support fish advisories in the tidal river (DRBC, 2009). PCBs remain the primary cancer risk driver, followed by dioxin and dioxin-like chemicals (DxF TEQs). Mercury levels in striped bass in Zones 5 and 6, and in American eel in Zone 1 (A-E) are moderately elevated, and contribute to non-cancer health risks.

Table 4-11. Fish Consumption Advisories for General Population for the Delaware River and Bay

Fish Species	Contaminant	Fish Consumption Advisory – General Population										
		1A	1B	1C	1D	1E	2	3	4	5	6	
DELAWARE												
Finfish	PCBs, Dioxins, Mercury, Chlorinated Pesticides										No consumption (state line to C&D canal)	
Weakfish (all sizes), Bluefish (<14 in)	PCBs										1 meal/month (C&D Canal to head of Bay)	1 meal/month
White Perch, American Eel, Channel Catfish, White Catfish, Bluefish (>14 in)	PCBs, Mercury										1 meal/year (C&D Canal to head of Bay)	1 meal/year
Striped Bass	PCBs, Mercury										2 meals/year (C&D Canal to head of Bay)	2 meals/year
NEW JERSEY												
Smallmouth Bass	Not listed			1 meal/week ^b		1 meal/week						
White Sucker				1 meal/month		1 meal/month						
American Eel						1 meal/month	1 meal/year	1 meal/year	1 meal/year			
Channel Catfish							4 meals/year	1 meal/year	1 meal/year	1 meal/year		
White Catfish					1 meal/week ^a		1 meal/month	1 meal/month	1 meal/month			
Striped Bass							4 meals/year	4 meals/year	4 meals/year	4 meals/year		
White Perch								4 meals/year	4 meals/year	4 meals/year		
All Finfish											No consumption (state line to C&D canal)	
Bluefish - larger than 24 inches or 6 lbs.												No consumption
Bluefish - smaller than 24 inches or 6 lbs.												1 meal/year
Striped Bass, White Perch, American Eel, Channel Catfish, White Catfish												1 meal/year
Weakfish												1 meal/week
American Eel (Zone 6 tributaries)											1 meal/month	
NEW YORK^c												
Brown Trout (>24 in), Smallmouth Bass (>15 in)	Mercury											
Brown Trout (>24 in), Smallmouth Bass	Mercury											
Smallmouth Bass (>15 in), Yellow Perch	Mercury											
PENNSYLVANIA												
American Eel	Mercury	2 meals/ month	2 meals/ month	2 meals/ month	2 meals/ month	2 meals/ month						
	PCBs						No consumption	No consumption	No consumption			
White Perch, Channel Catfish, Flathead Catfish, and Striped Bass	PCBs						1 meal/ month	1 meal/ month	1 meal/ month			
Number of Advisories		1	1	3	2	6	7	7	7	5	8	

Notes:

a - Phillipsburg, NJ to Delaware Water Gap

b - Delaware Water Gap to NJ northern border

c - New York did not issue advisories for any section of the mainstem Delaware River. The Table does list advisories for reservoirs that feed the mainstem.

Table 4-12 Fish Consumption Designated Use Assessment Results

AU	Fish Consumption Advisories	2010 Assessment	2008 Assessment
1A	-	NS	NS
1B	-	NS	NS
1C	-	NS	NS
1D	-	NS	NS
1E	-	NS	NS
2	-	NS	NS
3	-	NS	NS
4	-	NS	NS
5	-	NS	NS
6	-	NS	NS

+ (-): The parameter meets (does not meet) DRBC current water quality criteria.
 S: The assessment unit supports the designated use.
 NS: The assessment does not support the designated use.

4.3.5 Shellfish Consumption

Shellfish consumption, as a DRBC designated use, only applies to DRBC WQM zone 6. The state of Delaware classifies its designated shellfish waters within Delaware Bay as falling into the following two categories:

- Approved
- Prohibited

New Jersey classifies shellfish waters as falling into the following categories:

- Unrestricted
- Special Restricted
- Seasonal (Jan to Apr *or* Nov to Apr)
- Prohibited

Figure 4.1 indicates the current DE and NJ classifications for shellfish in zone 6. Table 4.13 lists the current DE and NJ classifications and the 2010 Assessment results, with the 2008 Assessment results given for comparison. In the 2010 Assessment, the “boat run” assessment units (e.g., 6brA) seen in previous assessment reports were collapsed back to the actual state assessment units for shellfish consumption (See Figure 4.1).

For the current 2010 assessment, approved harvesting areas were considered to be supporting (S) the use. Prohibited waters were considered to be not supporting (NS) the use. AUs classified as special restricted and seasonally restricted are considered to be supported, but with special conditions (SS). Note, however, that the states of DE and NJ do not list all prohibited or provisionally approved waters as impaired waters, as not all restrictions on shellfish harvesting are due to water quality issues (see the respective state

Integrated Assessment reports for further information). In total, 637 mi² are in full support (90% of zone 6), 33 mi² are supporting with special conditions (5%), and 40 mi² are not supporting the shellfish consumption use (5%).

Figure 4-1. Shellfish Consumption Classifications designated by New Jersey and Delaware for the Delaware Bay (DRBC WQM Zone 6)



Table 4-13. Shellfish Consumption Designated Use Assessment Results

State	Sub-Assessment Unit within Zone 6	Area (mi ²)	DE / NJ Shellfish Classification	2010 Assessment	2008 Assessment
Delaware	6de1	306	Approved	S	S
	6de2	6	Prohibited	NS	NS
	6de3	5	Prohibited	NS	ID
	6de4	5	Prohibited	NS	ID
	6de5	1	Prohibited	NS	ID
	6de6	4	Prohibited	NS	NS / ID
	6de7	17	Prohibited	NS	NS
New Jersey	6nj1	331	Approved	S	S
	6nj2	1	Prohibited	NS	NS
	6nj3	1	Prohibited	NS	NS
	6nj4	3	Seasonal (Nov-Apr)	SS	SS
	6nj5	4	Seasonal (Nov-Apr)	SS	SS
	6nj6	3	Special Restricted	SS	SS
	6nj7	1	Seasonal (Nov-Apr)	SS	SS
	6nj8	1	Seasonal (Nov-Apr)	SS	SS
	6nj9	1	Special Restricted	SS	SS
	6nj10	3	Seasonal (Nov-Apr)	SS	SS
	6nj11	0.2	Seasonal (Nov-Apr)	SS	S
	6nj12	2	Special Restricted	SS	SS
	6nj13	0.2	Seasonal (Nov-Apr)	SS	S
	6nj14	15	Special Restricted	SS	SS

S = "Supports": The assessment unit supports the designated use

SS = "Supports – Special": The assessment unit supports the designated use, but with special conditions

NS = "Not Supporting": The assessment unit does not support the designated use

ID = "Insufficient Data": Insufficient or unreliable data is present

4.4 Assessment Summary

The results of the 2010 assessment are described below:

- Fish consumption was not supported in all Zones, however, TMDLs have been completed in Zones 2 through 6, and numeric toxics criteria have not yet been adopted by the Commission in Zones 1A through 1E and in Zone 6;
- Drinking Water was supported in Zones 1A, 1B, 1D, 2, and 3. Data showed exceedances of EPA’s recommended criteria for arsenic in Zones 1C and 1E, however the arsenic criteria is under review;
- Recreation uses were supported in all Zones, with the exception of Insufficient Data in for Recreation in the lower portion of Zone 4;
- Although Aquatic Life was indicated as not supported in all Zones, there is uncertainty and ambiguity for most Zones, and a recognition that a TMDL would be an inappropriate remedy, as indicated below:
 - For violation of the toxics criteria, DRBC has yet to adopt numerical toxics criteria for Zone 1A through 1E, and had used EPA’s most recent National Recommended Water Quality Criteria to implement its narrative standards. Furthermore, only the recommended aluminum criteria was exceeded in Zones 1A through 1E. Previous work after the PPL fly ash

release showed high background (upstream) aluminum concentrations during high flow;

- Zone 1A was also indicated as not supporting aquatic life due to pH violations. However, DRBC is in the process of revising its pH criteria to allow for variation due to natural conditions. In Zone 1A, pH fluctuations are likely to be naturally occurring as evidenced by low nutrient concentrations.
- Zone 1B was also indicated as not supporting aquatic life due to pH violations. However, pH violations were below the historical 10% threshold and DRBC is in the process of revising its pH criteria.
- Zone 1E was also indicated as not supporting aquatic life due to violations of pH, alkalinity, and biological assessment criteria. DRBC is in the process of revising its pH criteria. Alkalinity violations were below the historical 10% threshold and low alkalinity is not amenable to correction through a TMDL. Due to the developing nature of the biological assessment program, the Methodology indicated that Zones apparently not supporting aquatic life uses based on biological assessment should be identified and investigated further, but should not yet be subjected to a TMDL;
- Zone 2 is indicated as not supporting aquatic life due to DO, turbidity, temperature, and alkalinity violations. However, DO, turbidity, and alkalinity were all below the historical 10% threshold. Low alkalinity is not amenable to correction through a TMDL. In addition, temperature is strongly driven by meteorologic forcing, and the relative contribution of controllable thermal loads remains unclear;
- Zone 3 is indicated as not supporting aquatic life due to DO, pH, temperature, and alkalinity violations. All were below the historical 10% threshold. Low alkalinity is not amenable to correction through a TMDL. Temperature is strongly driven by meteorologic forcing, and the relative contribution of controllable thermal loads remains unclear;
- Zone 4 is indicated as not supporting aquatic life due to temperature and alkalinity violations. Both were below the historical 10% threshold. Low alkalinity is not amenable to correction through a TMDL. Temperature is strongly driven by meteorologic forcing, and the relative contribution of controllable thermal loads remains unclear;
- Zone 5 was indicated as not supporting aquatic life due to DO and temperature violations. DO and temperature were below the historical 10% threshold, and temperature is strongly driven by meteorologic forcing. In addition, assessment against copper criteria was inconclusive as described in Section 4.3.1.6.
- Zone 6 was indicated as not supporting aquatic life due to DO, pH, temperature, and toxics violations. DO, pH, and temperature were all below the historical 10% threshold. Temperature is strongly driven by meteorologic forcing, and the relative contribution of controllable thermal loads remains unclear. DRBC has yet to adopt numerical toxics criteria

for Zone 6, and had used EPA’s most recent National Recommended Water Quality Criteria to implement its narrative standards;

Table 4-14. 2010 Assessment Summary for DRBC WQM Zones

AU	<u>Aquatic Life</u>		<u>Drinking Water</u>		<u>Recreation</u>		<u>Fish Consumption</u>		<u>Shellfishing</u>	
	2010	2008	2010	2008	2010	2008	2010	2008	2010	2008
1A	NS	NS	S	S	S	S	NS	NS	NA	NA
1B	NS^A	ID	S	S	S	S	NS	NS	NA	NA
1C	NS^A	ID	NS^A	S	S	S	NS	NS	NA	NA
1D	NS^A	ID	S	S	S	S	NS	NS	NA	NA
1E	NS	NS	NS^A	S	S	S	NS	NS	NA	NA
2	NS	NS	S	S	S	S	NS	NS	NA	NA
3	NS^A	S	S	S	S	S	NS	NS	NA	NA
4	NS^A	NS	NA	NA	ID/S	ID/S	NS	NS	NA	NA
5	NS^{A,B}	NS	NA	NA	S	S	NS	NS	NA	NA
6	NS^A	S	NA	NA	S	S	NS	NS	See Table 4-13	

S: The assessment unit supports the designated use.

SS: The assessment unit supports the designated use, but with special conditions.

NS: The assessment does not support the designated use.

NA: DRBC WQR does not contain applicable criteria for a parameter in the AU.

ID: Insufficient or unreliable data is present.

^A NS for this Zone is considered tentative due to uncertainties associated with comparison to EPA recommended toxics criteria in the absence of DRBC numerical criteria and/or observations that exceeded EPA’s currently required threshold of 1 violation and 1 confirmation, but not the previously utilized threshold of 10%.

^B Assessment against copper criteria in Zone 5 was inconclusive. See description in Section 4.3.1.6.

5 Ground Water Monitoring and Assessment

The water quality of ground water for its applicable uses is not assessed in the 2010 Assessment. However, it is the general policy of DRBC that all ground water of the Basin should not exceed MCLs listed in the National Primary Drinking Water Standards. Since this report focuses on the main stem of the Delaware River, the reader is directed to the 2010 water quality assessment reports of each of the Basin States for the status of ground water in that state.

6 Public Participation

DRBC provided many opportunities for the public, stakeholders, and interested parties to participate in the Integrated Assessment process:

- On March 25, 2009, DRBC published a Request for Water Quality Data in the Federal Register.

- On June 24, 2009, DRBC published notice of its proposed Assessment Methodology in Federal Register.
- On August 6, 2010, DRBC convened a special joint meeting of its Toxics Advisory Committee (TAC), Water Quality Advisory Committee (WQAC), and Monitoring Advisory Committee (MAC) to review the proposed Assessment Methodology.
- In addition, the proposed Assessment Methodology was posted on DRBC's web site beginning in June 2009.

DRBC received comments on the proposed Assessment Methodology, and developed a Response to Comments document on November 19, 2009. The Response to Comments document was sent electronically to all who had submitted comments and was posted on the DRBC web site. The Assessment Methodology was revised to incorporate changes resulting from the submitted comments, and the revised Assessment Methodology was posted on DRBC's web site.

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