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Appendix VIII

Draft April 2008 303(d) Listing Methodology for the Neuse River Basin

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Purpose

Section 303(d) of the federal Clean Water Act (CWA) which Congress enacted in 1972 requires States, Territories and authorized Tribes to identify and establish a priority ranking for waterbodies for which technology-based effluent limitations required by section 301 are not stringent enough to attain and maintain applicable water quality standards, establish total maximum daily loads (TMDLs) for the pollutants causing impairment in those waterbodies, and submit, from time to time, the list of impaired waterbodies and TMDLs to the U.S. Environmental Protection Agency (EPA). Current federal rules require states to submit 303(d) lists biennially, by April 1st of every even numbered year. EPA is required to approve or disapprove the state-developed §303(d) list within 30 days. For each water quality limited segment impaired by a pollutant and identified in the §303(d) list, a Total Maximum Daily Load (TMDL) must be developed.

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Assessment Units and Water Quality Classifications

Water quality assessments are based on water quality classifications as well as data availability. Water quality classifications are associated with a stream reach or area that is described in the schedule of classifications. Reaches vary in length or area and are sometimes split into smaller units to represent application of water quality data. Classifications are represented by a series of numbers called index numbers (27-33-43-(1) as an example). Water quality assessments are applied to assessment units or AUs. AUs are, for the most part, the same as index numbers. When an AU is subdivided because of data applicability a letter is added to indicate this smaller unit. If Index number 27-33-43-(1) (12 miles in length) is divided into three different segments because of three different available data types the new segments would be 27-33-43-(1)a, 27-33-43-(1)b and 27-33-43-(1)c. The combined mileage of the AUs would be 12 miles.

Decisions on the length or area to apply data to are based on the data type, waterbody characteristics, watershed information and landmarks on which to base descriptions. The segments where water quality concerns are found used as markers. Solutions to water quality concerns, including TMDLs, typically encompass entire watersheds.

Data Window

The data window for the 2008 Use Support Assessment (303d listings) includes data collected in calendar years 2002 through 2006. Some AUs may have biological data collected earlier for waters that have not been resampled during this data window or where the current impairment is based on that sample. The data collection year is noted for each AU.

Data Availability and Quality

Data are collected by various state and federal agencies. NC DWQ collects most of the data used for water quality assessments. There are significant data sets collected by NC DEH for use in coastal water quality assessment. Local governments and environmental groups as well as industry, municipal and university coalitions also provide data. Submitted data sets must include an approved QAPP to assure that the data were collected in a manner consistent with agency data. A standing solicitation for data is maintained on the NC DWQ website.

Use Support Categories and Water Quality Standards

There are numerical and narrative water quality standards that are in place to protect the various best uses of North Carolina waters. Best uses include aquatic life or biological integrity, recreation or swimming, fish consumption, shellfish harvesting and water supply. Water quality assessments are based on the

standards and data availability for the applicable use support category- aquatic life, recreation etc. Dissolved oxygen standards are used to assess aquatic life and pathogen indicators are used to assess recreation for example. Standards assessment criteria have been developed for each parameter assessed. The standards assessment criteria are used to make water quality assessments- not the standards themselves. While the standards assessment criteria are based on the standards they are different in that a frequency term is included. The details of how each standard is assessed are discussed in the following sections.

Aquatic Life Assessment Methodology

Dissolved Oxygen

Dissolved Oxygen (DO) Standards

Freshwater dissolved oxygen: not less than 6.0 mg/l for trout waters; for non-trout waters, not less than a daily average of 5.0 mg/l with a minimum instantaneous value of not less than 4.0 mg/l; swamp waters, lake coves or backwaters, and lake bottom waters may have lower values if caused by natural conditions.

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Salt water dissolved oxygen: not less than 5.0 mg/l, except that swamp waters, poorly flushed tidally influenced streams or embayments, or estuarine bottom waters may have lower values if caused by natural conditions.

Freshwater Dissolved Oxygen (DO) Assessment (Class C, B, WS)

A fresh non-swamp water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below 4 mg/l for instantaneous samples (monthly) or when greater than 10% of samples are below a daily average of 5mg/l. A minimum of 10 samples (or 10 daily averages) were needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Saltwater Dissolved Oxygen (DO) Assessment (Class SC, SB, SA)

A saline/estuarine non-swamp water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below 5 mg/l. A minimum of 10 samples was needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Trout Water Dissolved Oxygen (DO) Assessment (Secondary Class Tr)

A secondary classified Trout water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below 6 mg/l. A minimum of 10 samples was needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Swamp Water Dissolved Oxygen (DO) Assessment (Secondary Class Sw)

A classified swamp (Sw) AU was not rated for aquatic life when greater than 10% of samples were below 4 mg/l (5 for salt) for instantaneous samples (monthly) or when greater than 10% of samples were below a daily average of 5 mg/l (freshwater only). There is not a numerical standard for these water bodies and natural background conditions cannot be determined. This is a category 3a listing not requiring a TMDL.

A swamp like AU (not classified Sw) was not rated for aquatic life when greater than 10% of samples were below 4 mg/l (5 for salt) for instantaneous samples (monthly) or when greater than 10% of samples were

below a daily average of 5mg/l (freshwater only) and when greater than 10% of samples were below a pH of 6.0 (SU) for freshwater or 6.8 (SU) for saltwater. Geographic location, biological data, tributary classifications, discharges and land use were considered when making use support determinations on waters considered to be swamp like or receiving significant swamp water input.

pH

pH Standards

Freshwater pH: shall be normal for the waters in the area, which generally shall range between 6.0 and 9.0 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;

Saltwater pH: shall be normal for the waters in the area, which generally shall range between 6.8 and 8.5 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;

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Low pH Assessment (Class C, SC, B, SB, SA, WS)

A non-swamp water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below a pH of 6.0 (SU) for freshwater or 6.8 (SU) for saltwater. A minimum of 10 samples was needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

A swamp like AU (not classified Sw) was not rated for aquatic life when greater than 10% of samples were below a pH of 6.0 (SU) for freshwater or 6.8 (SU) for saltwater and when greater than 10% of samples were below a dissolved oxygen of 4 mg/l (5 for salt) for instantaneous samples (monthly) or when greater than 10% of samples were below a daily average of 5mg/l (freshwater only) Geographic location, biological data, tributary classifications, discharges and land use were considered when making use support determinations on waters considered to be swamp like or receiving significant swamp water input.

High pH Assessment (Class C, SC, B, SB, SA, WS)

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than a pH of 9 (SU) for freshwater or 8.5 (SU) for saltwater. A minimum of 10 samples was needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Swamp Water Low pH Assessment (Secondary Class Sw)

A classified swamp (Sw) AU was assessed as Impaired when greater than 10% of samples were below 4.3 (SU). A minimum of 10 samples was needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Temperature Use Assessment

Temperature Standards

For freshwaters- Temperature: not to exceed 2.8 degrees C (5.04 degrees F) above the natural water temperature, and in no case to exceed 29 degrees C (84.2 degrees F) for mountain and upper piedmont waters and 32 degrees C (89.6 degrees F) for lower piedmont and coastal plain waters. The temperature for trout waters shall not be increased by more than 0.5 degrees C (0.9 degrees F) due to the discharge of heated liquids, but in no case to exceed 20 degrees C (68 degrees F).

Lower piedmont and coastal plain waters mean those waters of the Catawba River Basin below Lookout Shoals Dam; the Yadkin River Basin below the junction of the Forsyth, Yadkin, and Davie County lines; and all of the waters of Cape Fear, Lumber, Roanoke, Neuse, Tar-Pamlico, Chowan, Pasquotank, and White Oak River Basins; except tidal salt waters which are assigned S classifications.

Mountain and upper piedmont waters mean all of the waters of the Hiwassee; Little Tennessee, including the Savannah River drainage area; French Broad; Broad; New; and Watauga River Basins; and those portions of the Catawba River Basin above Lookout Shoals Dam and the Yadkin River Basin above the junction of the Forsyth, Yadkin, and Davie County lines.

For saltwaters- Temperature: shall not be increased above the natural water temperature by more than 0.8 degrees C (1.44 degrees F) during the months of June, July, and August nor more than 2.2 degrees C (3.96 degrees F) during other months and in no cases to exceed 32 degrees C (89.6 degrees F) due to the discharge of heated liquids.

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Temperature Assessment

A mountain or upper piedmont water AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 29°C. A minimum of 10 samples was needed to rate the water as Impaired.

A lower piedmont or coastal plain stream AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 32°C. A minimum of 10 samples was needed to rate the water as Impaired.

If the 10% criterion was exceeded and fewer than 10 samples were collected the water was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Temperature Screening Criteria for Tr Classified Waters

A trout water AU was not rated for aquatic life when greater than 10% of samples were greater than 20°C for classified trout waters (Tr). The presence of heated discharges was not determined. This is a category 3a listing not requiring a TMDL.

Assessment of Extreme Temperature Conditions

A waterbody that exceeds the above criteria may be not rated for aquatic life because of meteorological conditions that occur on a regular basis. These conditions must be documented and reassessment will occur after more normal conditions return. This is a category 3a listing not requiring a TMDL. Examples of extreme conditions may include extreme drought, reservoir drawdown, hurricane impacts and flooding, dam failure, and saltwater encroachment. Other extreme conditions may be documented as needed for future assessments

Chlorophyll *a*

Chlorophyll *a* Standard

Chlorophyll *a* (corrected): not greater than 40 µg/l in sounds, estuaries, and other waters subject to growths of macroscopic or microscopic vegetation.

Other waters subject to growths are interpreted by NC DWQ to include dam backwaters, lakes and reservoirs.

Chlorophyll *a* Standards Assessment

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 40 µg/l. A minimum of 10 samples was needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Toxic Substances

Toxic Substances Numerical Standards

Refer to Water Quality "Redbook" for complete text of standards
Arsenic: 50 ug/l
Beryllium: 6.5 ug/l;
Cadmium: 0.4 ug/l for trout waters and 2.0 ug/l for non-trout waters;
Chlorine, total residual: 17 ug/l;
Chromium, total recoverable: 50 ug/l;
Cyanide: 5.0 ug/l
Fluorides: 1.8 mg/l;
Lead, total recoverable: 25 ug/l;
Mercury (assessed in fish consumption category)
Nickel: 88 ug/l; 8.3 ug/l
Chlorides: 230mg/l; (note this is an action level standard)

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Toxic Substances Assessment

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than the above standards. A minimum of 10 samples was needed to rate the water as Impaired. These are category 5 listings requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Toxic Substances Action Level Standards

Refer to Water Quality "Redbook" for complete text of standards
Copper: 7 ug/l
Iron: 1.0 mg/l;
Silver: 0.06 ug/l;
Zinc: 50 ug/l;
Chlorides were assessed with other toxic substances when data were available

Toxic Substances Action Level Assessment

Copper, Iron, Silver, and Zinc exceedances of the 10% criterion were not adequate indicators of impacts to ecological/biological integrity in North Carolina waters due to high naturally occurring levels and were not used to assess waters as Impaired.

Turbidity

Turbidity Standards

Turbidity: the turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level cannot be increased.

Turbidity Assessment

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 50 NTU or 10 NTU for Tr waters or 25 NTU lakes, reservoirs and estuarine waters. A minimum of 10 samples was needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Ecological/Biological Integrity

Aquatic Life Standards

Waters shall be suitable for aquatic life propagation and maintenance of biological integrity, wildlife, secondary recreation, and agriculture. Sources of water pollution which preclude any of these uses on either a short-term or long-term basis shall be considered to be violating a water quality standard;

Aquatic Life Assessment

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An AU was assessed as Impaired for aquatic life when a fish community or benthos sample received a bioclassification of Severe, Poor or Fair and there were no other Aquatic Life standards violations. This is a category 5 listing requiring a TMDL.

An AU was assessed as Impaired for aquatic life when a fish community or benthos sample received a bioclassification of Severe, Poor or Fair and there were other Aquatic Life standards violations. This is a category 4s listing requiring a TMDL for the identified aquatic life numerical standards violation (category 5 or 4a listing) impairing the ecological/biological integrity of the waterbody.

An AU was assessed as Impaired for aquatic life when a fish community or benthos sample received a bioclassification of Severe, Poor or Fair and an approved TMDL for an aquatic life numerical water quality standard has been completely implemented. This is a category 5s listing requiring a TMDL.

Recreation Assessment Methodology

Recreation standards were assessed using fecal coliform bacteria data collected at DWQ ambient stations and special study sites and enterrococci data collected at DEH RECMON beach monitoring sites in coastal waters. Screening criteria were used to assess areas for potential standards violations. DEH advisory postings were also used for recreation assessments as well. The following criteria were used to assess waters for recreation.

Pathogen Indicator Standards

Organisms of coliform group: fecal coliforms not to exceed geometric mean of 200/100 ml (MF count) based on at least five consecutive samples examined during any 30-day period and not to exceed 400/100 ml in more than 20 percent of the samples examined during such period.

Enterococcus, including *Enterococcus faecalis, Enterococcus faecium, Enterococcus avium* and *Enterococcus gallinarium*: not to exceed a geometric mean of 35 enterococci per 100 ml based upon a minimum of five samples within any consecutive 30 days.

Fecal Coliform Bacteria Assessment Criteria

An AU was assessed as Impaired when the geometric mean was greater than 200 colonies/100ml or greater than 20% of the samples were higher than 400 colonies/100ml. At least 5 samples must have been collected within the same 30-day period. This is a category 5 listing requiring a TMDL.

Fecal Coliform Bacteria Screening Assessment

An AU was Not Rated when the geometric mean was greater than 200 colonies/100ml or greater than 20% of the samples were higher than 400 colonies/100ml. Samples were not collected in the same 30 day period. This is a category 3a listing not requiring a TMDL. These AUs are prioritized for resampling 5 times in 30 days based on classification and available resources. Data are reviewed yearly for prioritization.

Enterrococci Assessment Criteria

An AU was assessed as Impaired when the geometric mean was greater than 35 colonies/100ml. At least 5 samples must have been collected within the same 30-day period. This is a category 5 listing requiring a TMDL.

Enterrococcus Screening Assessment

An AU was Not Rated when the geometric mean was greater than 35 colonies/100ml. Samples were not collected in the same 30 day period. This is a category 3a listing not requiring a TMDL.

Advisory Posting Assessment

An AU was assessed as Impaired when a swimming advisory was posted greater than 61 days in any 5 year period (includes permanent postings). This is a category 4cr listing not requiring a TMDL.

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Shellfish Harvesting Assessment Methodology

Shellfish Harvesting standards were assessed using fecal coliform bacteria data collected at DEH monitoring stations in Class SA waters. DEH growing area classifications were also used for use assessments. The following criteria were used to assess waters for shellfish harvesting.

Shellfish Harvesting Standards

Organisms of coliform group: fecal coliform group not to exceed a median MF of 14/100 ml and not more than 10 percent of the samples shall exceed an MF count of 43/100 ml in those areas most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions.

Fecal Coliform Bacteria Assessment Criteria

An AU was assessed as Impaired when the geometric mean was greater than 14 colonies/100ml or greater than 10% of the samples were higher than 43 colonies/100ml. This is a category 5 listing requiring a TMDL.

DEH Shellfish Sanitation Growing Area Classification Assessment

An AU was assessed as Impaired when the DEH growing area classification was Prohibited or Conditionally approved. This is a category 4cs listing not requiring a TMDL.

Water Supply Assessment Methodology

Water Supply standards were assessed using data collected at DWQ ambient stations located in Class WSI-WSV waters. The following criteria were used to Impair waters for water supply. Category 5 listings were only made when Standards Assessment Criteria (SAC) were exceeded.

Water Supply Standards

Refer to Water Quality "Redbook" for complete text of standards
Barium: 1.0 mg/l;
Chloride: 250 mg/l;
Manganese: 200 ug/l; (not human health or aquatic life- not assessed)
Nickel: 25 ug/l;
Nitrate nitrogen: 10.0 mg/l;
2,4-D: 100 ug/l;
2,4,5-TP (Silvex): 10 ug/l;
Sulfates: 250 mg/l;

Water Supply Assessment

An AU was assessed as Impaired for water supply when greater than 10% of samples were greater than the above standards except for manganese. A minimum of 10 samples was needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Fish Consumption Assessment Methodology

Fish Consumption was assessed based on site-specific fish consumption advisories. The advisories were based on DHHS consumption advisories developed using fish tissue data that exceed standards. The following criteria were used to Impair waters for fish consumption. Because of the statewide Mercury advice there were no use cases for Supporting fish consumption and therefore no overall Category 1 waters.

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PCBs Assessment Criteria

An AU was assessed as Impaired when a site-specific advisory was posted for PCBs. This is a category 5 listing requiring a TMDL.

Dioxin Assessment Criteria

An AU was assessed as Impaired when a site-specific advisory was posted for dioxins. This is a category 5 listing requiring a TMDL.

Mercury Assessment Criteria

An AU was assessed as Impaired for fish consumption when greater than 10% of samples were greater than 0.012 μg/l. A minimum of 10 samples was needed to rate the water as Impaired. This is a category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was not rated and targeted for further sampling. This is a category 3a listing not requiring a TMDL.

Statewide advice for Mercury in fish tissue was not assessed because it was not associated with a specific AU but was applied to all waters of the state. Previous Category 5 listings for Mercury based on site specific advisories will remain.