4B Demonstration for Little Alamance Creek

Assessment Unit: 16-19-11

Alamance County, North Carolina

Cape Fear River Basin

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In Cooperation With:

North Carolina Division of Water Resources

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Overview:

Section 303(d) of the Clean Water Act and the Environmental Protection Agency's regulations in 40 CFR 130.7 require states to develop lists of waters impaired by a pollutant and needing a TMDL and to prepare a TMDL for each waterbody / pollutant combination. EPA regulations also recognize that alternative pollution control requirements that are stringent enough to implement applicable water quality standards within a reasonable period of time may obviate the need for a TMDL. The alternative referenced above is known as Category 4B.

According to EPA's Guidance for *2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* [2006 Integrated Reporting Guidance (IRG)] (EPA, 2005), Category 4 waters have available data and / or information indicating that at least one designated use is not being supported or is threatened, but a TMDL is not needed. Under subcategory 4B, a TMDL is not needed because other pollution control requirements are expected to result in attainment of the applicable water quality standard in a reasonable period of time. EPA evaluates on a case-by-case basis a state's decision to exclude certain segment / pollutant combinations from Category 5 (of the 303(d) list) based on the Category 4B alternative. Per the IRG, States should address the following six elements in their 4b demonstration:

1. Identification of segment and statement of problem causing the impairment;
2. Description of pollution controls and how they will achieve water quality standards;
3. An estimate or projection of the time when WQS will be met;
4. Schedule for implementing pollution controls;
5. Monitoring plan to track effectiveness of pollution controls; and
6. Commitment to revise pollution controls, as necessary.

This demonstration summarizes the documentation supporting the 4B classification of Little Alamance Creek, located in Alamance County, North Carolina. The project partners are the City of Burlington, City of Graham and North Carolina Department of Transportation in conjunction with the North Carolina Division of Water Resources. This demonstration is consistent with EPA's new Vision for 303(d) programs, which encourages "alternative approaches adaptively implemented to achieve water quality goals. The Cities of Burlington and Graham and NC DOT have provided a template for biologically impaired waters due to flow alterations that can guide other stakeholders in North Carolina as they address similar impairments within their jurisdictions. EPA is encouraging states and local communities to focus their pollution control efforts on protecting high quality waters and restoring priority waters. This collaborative effort by the Cities and DOT is a good example of how locals can effectively address priority waters and we support development of similar 4b demonstrations as alternatives to TMDLs in North Carolina.

1. Identification of segment and statement of problem causing the impairment.

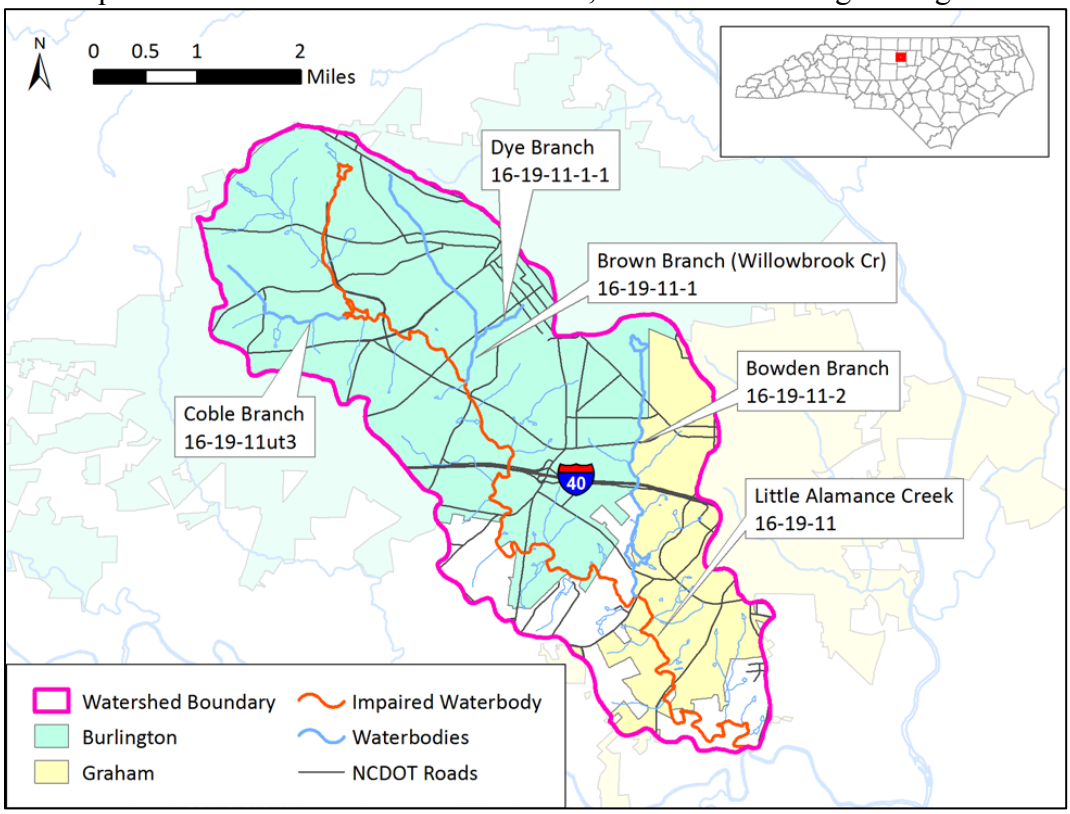
Segment Description

Based on sections 1, 2 and 3 of the Plan, the Little Alamance Creek (assessment unit 16-19-11) watershed is located in Alamance County, North Carolina, within the upper Cape Fear River Basin. The watershed includes portions of the cities of Burlington and Graham, is approximately 15.9 square miles in size and corresponds with the Unites States Geological Survey (USGS) 12 digit hydrologic unit code (HUC-12) 030300020309. In 2005, the Piedmont Triad Council of Governments (PTCOG) estimated a population amount of 29,512 from data utilized from its Regional Data Center. One major highway (I-85/I-40) transects the watershed. This watershed is mostly urbanized with 89.4% of the area developed. Industrial uses make up 12.4% of the area. Impervious surfaces (areas such as roof tops, roads and parking lots that prevent infiltration of precipitation into the soil) cover approximately 30% of this watershed.

Located in the Southern Outer Piedmont region, Little Alamance Creek watershed is drained by its tributaries: Cable Branch, Brown Branch (also referred to as Willowbrook Creek), Dye Branch and Bowden Branch (also known as Boyd Creek). The Creek flows southeast into Big Alamance Creek, three miles upstream of its confluence with the Haw River.

The surface water classifications for the Little Alamance Creek watershed include Classes C, Water Supply -V and Nutrient Sensitive Waters. All waters in North Carolina have the base classification of "C." Class C waters are protected for aquatic life propagation and biological integrity (including fishing and fish), wildlife, secondary recreation, agriculture and other uses suitable for Class C. The Little Alamance Creek watershed is located within the Jordan Reservoir watershed of the Cape Fear River Basin. Jordan Reservoir and all waters draining to it have been supplementally classified as Nutrient Sensitive Waters (NSW) pursuant to Rules 15A NCAC 2B .0101(e)(3) and 15A NCAC 2B .0223. Per the Jordan Water Supply Nutrient Strategy, waters not already designated as WS-II, WSIII, and WS-IV shall be classified WS-V (15A NCAC 02B.0262, 2008).

The map below shows Little Alamance Creek, tributaries and neighboring cities.



Impairment and pollutant causing impairment

In 2005, Little Alamance Creek was listed as impaired by DWR due to a "Poor" bioclassification rating of the benthic macroinvertebrate community. In 2013, Little Alamance Creek was assigned a "Good-Fair" bioclassification for fish, but remained in category 5 [303(d) list] due to a benthos bioclassification of "Poor". Coble Branch was listed as a category 3a due to inconclusive assessment results. Brown Branch, Dye Branch and Bowden Branch have not yet been assessed by DWR. Impaired, or Category 5, waters are those that do not meet defined water quality standards, i.e., are biologically or otherwise impaired and require a TMDL.

Little Alamance Creek is impaired for biological integrity which is based on a narrative standard that pertains to the aquatic life use designation. Biological integrity has been defined as "the ability of an aquatic ecosystem to support and maintain a balanced and indigenous community of organisms having species composition, diversity, population densities and functional organization similar to that of reference conditions" (15A NCAC 02B.0202). DWR's criterion for assessing aquatic life as impaired is a biological community at a benthic macroinvertebrate or fish sampling site with a bioclassification of Poor, Fair or Severe Stress. The criterion for assessing aquatic life as supporting is a bioclassification of Good-Fair, Good, Excellent, Not Impaired, Natural or Moderate Stress at a biological community sampling site.

There is no single pollutant responsible for the biological integrity impairment of Little Alamance Creek, rather a suite of factors. This is a predominantly urban watershed with a considerable percentage of impervious surfaces (roughly 30%). Stormwater runoff and pollutants present in stormwater, hydrologic changes and habitat degradation are some of the factors responsible for impairment. Additional factors are explained more in depth in the next section. (Section 1 of the Plan, Page 3)

Sources of pollutant causing impairment

Potential stressors in the Little Alamance watershed were evaluated and identified by reviewing water quality data, benthic data, habitat, riparian conditions, and channel and stream geomorphology. Causes of impairment were characterized using a "strength of evidence" approach which analyzed whether candidate stressors were primary causes of impairment, secondary causes of impairment, part of the cumulative cause of impairment, a contributing stressor, a potential cause or contributor or an unlikely cause or contributor.

Water quality data was collected during December 2006 – August 2007 from seven sites. The analysis included physicochemical parameters, nutrients, metals, and bacteria as well as benthic community samples and habitat assessments. Samples were taken approximately monthly during baseflow and on three occasions during stormflow.

In 2003 DWR (then DWQ) conducted a stressor study in the Little Alamance Creek watershed. This effort assessed benthic macroinvertebrates, habitat characteristics, and chemical and physical data to analyze specific stressors to the aquatic community. Based on this effort, the following were determined to be significant causes of impairment:

- Stormwater runoff due to high levels of impervious surfaces and lack of stormwater control. High conductivity measurements across the watershed are indicative of a mixture of pollutants from urban runoff. The benthic macroinvertebrate data lacked specific indicator taxa but rather exhibited highly pollution tolerant benthic communities, suggesting considerable impacts from urban/suburban pressures. The stream bank erosion and sedimentation associated with these events contribute to habitat degradation associated with biological impairment. The lack of stormwater treatment and control was found to be the most pervasive stressor in the watershed.
- Hydromodification (resulting from riparian vegetation removal). Many of the benthic community sites noted significant lack of riparian vegetation areas. Hydrologic changes, due to channelization and large amounts of impervious surface, have degraded instream habitat. This was identified as a secondary stressor.
- Hydromodification (resulting from channelization). Many of the benthic community sites evidenced previous or historical channelization of the stream. Hydrologic changes, due to channelization and large amounts of impervious surface, degrade instream habitat. This was also identified as a secondary stressor.

There are three MS4 operators in the Little Alamance watershed. The City of Burlington and the City of Graham are both NPDES stormwater Phase II permit holders (NCS000428 and NCS000408, respectively) and NCDOT is a NPDES stormwater Phase I permit holder (NCS000250). A review of the NCDENR's Stormwater Permitting Program list indicates that there are 14 active general NPDES stormwater permittees in or close to the Little Alamance Creek watershed, three individual NPDES stormwater permittees (listed above), and two facilities with No Exposure certifications within the watershed (Section 4 and Appendix C of the Plan).

2. Description of pollution controls and how they will achieve water quality standards

Water quality target

Little Alamance Creek is impaired for biological integrity. Impairment for biological integrity pertains to the aquatic life use designation. Biological integrity means "the ability of an aquatic ecosystem to support and maintain a balanced and indigenous community of organisms having species composition, diversity, population densities and functional organization similar to that of reference conditions" (15A NCAC 02B.0202, 2007).

Based on the Plan (Section 7, page 58), the overall goal of this Category 4b Demonstration Plan is to achieve a benthic macroinvertebrate community bioclassification of "Not Impaired", "Good-Fair", or better for Little Alamance Creek. Numeric values associated with a bioclassification of Good-Fair or better are determined by DWR, and listed in the current *Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates*. For example, a bioclassification of Good-Fair is based on the average of the biotic index and EPT scores = 3 (DWR, 2013). Actual numeric values depend upon stream size, flow regime, season of collection, and collection method. Numeric target levels used to evaluate attainment will be consistent with the SOP in effect at the time of evaluation.

Point and nonpoint source loadings that when implemented will achieve WQS

As previously stated, it is likely that the biological impairment is due to a combination of many complex factors. The existing reports have attributed the impairment to the general conditions typical of an urban watershed, including: hydro-modification, insufficient riparian buffer, streambank erosion, pollutants in stormwater runoff and degradation of instream habitat. There is no single pollutant or single source that is responsible for the biological impairment in this watershed. For these reasons, pollutant loads were not allocated; rather, a suite of BMPs will be implemented that will provide control of discharges that that could alter natural hydrology, reduce stormwater pollutants and mitigate other stressors that contribute to the impairment.

Controls that will achieve WQS

Based on the data and study results, DWR made several recommendations for the watershed: (1) Little Alamance Creek, particularly its tributary Willowbrook Creek, would likely benefit from stormwater controls to help moderate the "flashy" hydrology and to reduce sediment and

chemical pollutant inputs. (2) Restoration is recommended in the Willowbrook Creek subwatershed to improve conditions and to reduce downstream impacts on Little Alamance Creek. (3) Particular attention needs to be directed to detecting and correcting the sources of elevated nutrients, heavy metals, and other pollutants in Willowbrook Creek and just downstream of its confluence with Little Alamance Creek.

Sections 5 and 6 of the Plan describe the pollution controls, in detail, that will be implemented and those already in place by the City of Burlington, City of Graham and NCDOT. The project partners all share responsibility in implementing their individual pollution controls within the boundaries of their MS4s as well as at owned and operated facilities. Tables within Sections 5 and 6 outline pollution controls by the type of control and the partner (MS4) responsible for implementation. The controls selected are expected to mitigate urban stormwater runoff and hydrologic changes resulting from channelization and riparian vegetation removal. The end result will be attainment of water quality standards; which in this case, is a benthic macroinvertebrate community bioclassification of Good-Fair or better throughout the Little Alamance Creek watershed.

Description of requirements under which pollution controls will be implemented

The City of Burlington, City of Graham and NCDOT have each submitted letters of commitment to the development of the 4b plan for Little Alamance Creek watershed and the implementation of pollution control measures outlined in the document. The letters of commitment can be found in Appendix A of the Plan.

The Little Alamance Creek watershed is located within the Jordan Reservoir watershed; therefore, the waterbody is subject to the rules in the Jordan water supply nutrient strategy. NC Session Law 2005-190 directed the Environmental Management Commission to adopt permanent rules to establish and implement nutrient management strategies to protect drinking water supply reservoirs. In 2009, permanent rules for the Jordan Water Supply Nutrient Strategy were adopted by the General Assembly. The strategy contains a total of thirteen separate enforceable rules. Several rules require stormwater controls to reduce nutrient loads delivered from new and existing development as wells as protection of existing buffers (15A NCAC 02B .0265-.0267).

As previously mentioned, waterbodies in the Little Alamance Creek watershed are classified as WS-V. Pursuant to G.S. 143-214.5(b), the entire Jordan watershed shall be designated a critical water supply watershed and through the Jordan Water Supply Nutrient Strategy given additional, more stringent requirements than the state minimum water supply watershed management requirements. The best usage of WS-V waters are protected as water supplies which are generally upstream and draining to Class WS-IV waters (15A NCAC 02B.0218, 2007). All of these administrative codes apply in Little Alamance Creek watershed and for the jurisdictions of Burlington, Graham and NCDOT are subject to the Jordan Water Supply Nutrient Strategy (15A NCAC 02B.0262).

3. Estimate or projection of time when WQS will be met

It is understood that improvement of the benthic macroinvertebrate community will take time to achieve a "Not Impaired", "Good-Fair", or better bioclassification. Section 8 of the Plan, page 61 states that water quality standards are projected to be achieved by 2030.

4. Schedule for implementing pollution controls

The schedule for implementation can be found in Section 6 of the Plan, Tables 6.1 – 6.10. The project partners all share responsibility in implementing their individual pollution controls within the boundaries of their MS4s as well as at owned and operated facilities.

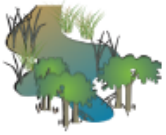
5. Monitoring plan to track effectiveness

The monitoring plan can be found in Section 7 of the Plan. Since the biological impairment is due to a combination of factors (stressors), a dashboard approach will be used to monitor effectiveness. The dashboard will allow tracking of toolbox item implementation, which correlates progress with available data, and communicates efforts to the public. The toolbox items comprise the various pollution controls that are to be implemented or are already in place. The dashboard approach allows the project partners to maintain a long-term focus on addressing the various stressors, even as refined effectiveness data on toolbox items becomes available and as project partner's ability to implement or organizational responsibilities evolve. Additionally, the dashboard approach facilitates the communication of technical water quality information to a more public-friendly format in order to communicate progress and encourage public participation in watershed restoration. The organization of the dashboard also provides direct linkages from dashboard group to the toolbox items to the metrics. Metric tracking provides common ground for the project partners to work separately but collectively to a consistent goal. The cumulative tracking of these metrics will be used to reinforce the implementation progress being made with respect to analytical monitoring results.

The "Stream Health" dashboard group will be compiled from water quality monitoring sources within and near the watershed. These sources of water quality monitoring principally include NCDENR ambient monitoring programs, municipal ambient monitoring programs for illicit discharge detection and elimination, and special studies being performed by others in the watershed. NCDENR's ambient monitoring program includes, but is not limited to, temperature, specific conductance, turbidity, total suspended solids, dissolved oxygen, pH, fecal coliform, nutrients, total hardness, chloride, fluoride, sulfate, oil and grease and dissolved metals. The fish community and benthic macroinvertebrate community will also be monitored. Assessment results will be posted to a website that will be regularly updated by the project partners and NCDENR.

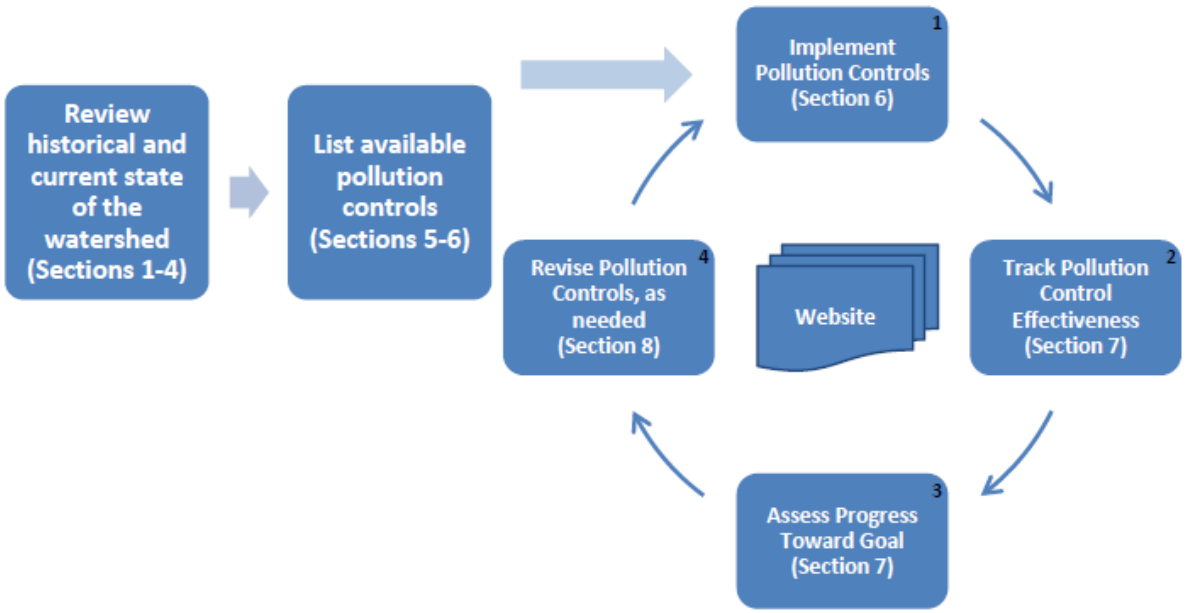
In the table below, is the dashboard created by the project partners to track effectiveness of pollution controls in Little Alamance Creek watershed. Section 8 of the Plan, page 62.

Table 7.1 Dashboard groups, toolbox items and examples of associated tracking and metrics

Dashboard Groups	Toolbox Items (see section 6)	Example Metrics for Tracking Effectiveness
Streamside Enhancement 	Stream Buffers	Linear feet/sq feet protected; # of potential sites assessed/identified
	Stream Restoration	Linear feet of enhancement or restoration; # of potential sites assessed/identified; instream habitat index results; streambank stability index results
Public Involvement and Outreach 	Public Education and Outreach and Public Involvement Programs	# of stream clean-up events; # of volunteers; feet of streams cleaned up; # of bags of trash collected; # of events where information was distributed; individual narratives highlighting specific public initiatives
	Research	Individual narratives on current collaboration efforts
Pollution Prevention & Reduction 	Illicit Discharge Detection and Elimination	# of outfalls screened; # of illicit discharges detected; # of internal training events/participants, related to the IDDE program
	Erosion and Sediment Control Program	# of sites inspected; # of internal training events/participants, related to the Erosion and Sediment Control program
	Post-Construction Runoff Program	# of sites inspected; # of training events/participants, related to the Post-Construction Runoff Program
	Pollution Prevention and Good Housekeeping	# of training events/participants, related to the PPGH program; individual narratives illustrating an improvement or concerted effort in water quality protocols at a municipal maintenance facility
	Collection System Improvements	Feet of lines assessed; # of manholes assessed; feet of lines slip-lined/replaced; # of manholes repaired
	Retrofits	# of potential sites assessed/identified; # of existing sites; total drainage area of all completed BMPs; nitrogen and phosphorus reduction estimates from implemented BMPs; inspection & maintenance results
Stream Health 	Ambient Water Chemistry*	Narrative discussion of physicochemical water quality results
	Fish Community*	North Carolina Index of Biotic Integrity (NCIBI) score and rating results†
	Benthos*	Bioclassification results†
	All monitoring*	Summary of monitoring activities performed

6. Commitment to revise pollution controls, as necessary

Per Section 8.1 of the Plan, an adaptive management process will be used to revise pollution controls within the watershed if progress toward meeting water quality standards is not being shown. Based on Table 8-1 (shown below), the adaptive management process is built upon the overview of the historical and current state of the watershed (Sections 1–4) and the assessment of appropriate pollution controls (section 5–6). The adaptive management process begins with the **implementation** of the toolbox items (Figure 8-1, box 1). Pollution controls and monitoring activities performed by the project partners across the Little Alamance Creek watershed will be **tracked** (box 2). Efforts by the project partners will be **assessed** against available water quality data collected by NCDENR and the project partners (box 3). Results of this analysis will be used to **adjust** future actions performed by the project partners (box 4). A summary of the information gathered during the adaptive management process will be presented in a website that will be updated on a regular basis.



References:

City of Burlington, City of Graham and North Carolina Department of Transportation. 2014. Category 4b Demonstration Plan to Address Biological Impairment In Little Alamance Creek, NC. December 2014.

Monschein, E. and L. Mann. 2007. Category 4b – A Regulatory Alternative to TMDLs. Proceedings: Water Environment Federation TMDL 2007 Conference, Bellevue, Washington, pp. 454-463.
URL: http://www.epa.gov/owow/tmdl/results/pdf/36monschein_wef07_paper7.pdf

NCDENR DWR. Jordan Lake Rules Homapage.
URL: http://portal.ncdenr.org/web/jordanlake/home

NCDENR DWQ. 2010. Total Maximum Daily Load to Address Impaired Biological Integrity in the Little Alamance Creek Watershed, Alamance County, Cape Fear River Basin, Draft, December 2010.
URL: http://portal.ncdenr.org/c/document_library/get_file?uuid=f8291bf6-b8c1-476a-a8ef-c90adf0146d8&groupId=38364

NCDENR DWQ. 2003. TMDL stressor study of Little Alamance Creek, Alamance County, Cape Fear subbasin, June 2003.
URL: http://portal.ncdenr.org/c/document_library/get_file?uuid=270b8f1b-0feb-47ef-91f8-d8b7dfa0b4be&groupId=38364

USEPA. 2005. Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act. USEPA Office of Water, Office of Wetlands, Oceans and Watersheds, Assessment and Watershed Protection Division, Watershed Branch, July 29, 2005, 89pp.
URL: http://www.epa.gov/owow/tmdl.