2014-2017

NOTICE OF INTENT (NOI) and STORM WATER MANAGEMENT PLAN

4362 Peachtree Road, N.E.

Brookhaven, Georgia 30319

Prepared by: City of Brookhaven
Public Works Department
Storm Water Utility Division

Edition: April 1, 2014

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Brookhaven
GEORGIA

March 21, 2014

Mr. Glen R. Behrend, PE
Program Manager
Georgia Department of Natural Resources
Environmental Protection Division
Watershed Protection Branch-Nonpoint Source Program
2 MLK, Jr. Drive, S.W., Suite 1462
Atlanta, Georgia 30334

Re: City of Brookhaven
Phase II MS4-NPDES Permit: GAG610000
Storm Water Management Program

Mr. Behrend:

I, J Max Davis, Mayor of the City of Brookhaven hereby designate The City Manager as the City's authorized representative to sign the City of Brookhaven's Phase II MS4 Notice of Intent (NOI) and subsequent Annual Reports. At this time the City Manager is Marie L. Garrett.

Sincerely;

J Max Davis, Mayor
City of Brookhaven

STATE OF GEORGIA DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

GEORGIA NOTICE OF INTENT (GaNOI)

General NPDES Permit No. GAG610000 for
Small Municipal Separate Storm Sewer Systems (MS4)

1. General Information

A. Name of small MS4: City of Brookhaven, Georgia

B. Name of responsible official: Marie L. Garrett
Title: City Manager
Mailing Address: 4362 Peachtree Road
City: Brookhaven State: GA Zip Code: 30338
Telephone Number: (404)637-0500
Email Address: marie.garrett@brookhavenga.gov

C. Designated stormwater management program contact:
Name: L. Carl Carver, PE
Title: Stormwater Utility Manager
Mailing Address: 4362 Peachtree Road
City: Atlanta State: GA Zip Code: 30319
Telephone Number: (404) 637-0500
Email Address: carl.carver@brookhavenga.gov

2. Sharing Responsibility

A. Has another entity agreed to implement a control measure or BMP on your behalf? Yes_______ No X (If No, skip to Part 3)

Control Measure #1:

1. Name of entity N/A

2. Control measure or component of control measure to be implemented by entity on your behalf:

____
____
____

B. Attach an additional page if necessary to list additional shared responsibilities. **It is mandatory that you submit a copy of a written agreement between your MS4 and the other entity demonstrating written acceptance of responsibility.**

3. **Population**

Provide the population of your municipality based on the U.S. Census Bureau 2010 Census: ______________________________

4. **Certification Statement**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed Name: Marie L. Garrett Date: 3/24/14

Signature: ______________________ Title: City Manager

General NPDES
Stormwater Permit
No. GAG610000

STATE OF GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

STORM WATER DISCHARGES ASSOCIATED WITH SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS

In compliance with the provisions of the Georgia Water Quality Control Act (Georgia Laws 1964, p. 416, as amended), hereinafter called the "State Act," the Federal Clean Water Act, as amended (33 U.S.C. 1251 et seq.), hereinafter called the "Clean Water Act," and the Rules and Regulations promulgated pursuant to each of these Acts, all new and existing storm water point sources associated with small municipal separate storm sewer systems, upon submittal of a Georgia Notice of Intent, are authorized to discharge storm water to the waters of the State of Georgia in accordance with the limitations, monitoring requirements and other conditions set forth in Parts 1 through Appendix B hereof.

This permit shall become effective on December 6, 2012.

This permit and the authorization to discharge shall expire at midnight, December 5, 2017.

Signed this 6th day of December 2012.

Director,
Environmental Protection Division

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PART 1. COVERAGE UNDER THIS PERMIT

1.1 <u>Coverage</u>

1.1.1 This permit covers all new and existing point source discharges of storm water from a small municipal separate storm sewer system (MS4) as defined in Title 40 of the Code of Federal Regulations (CFR) Part 122.26 (b)(16) to the waters of the State of Georgia, except for those storm water discharges identified under Part 1.1.4.

1.1.2 The permittee is authorized to discharge stormwater under the terms and conditions of this general permit if it:

1.1.2.1 Owns or operates an MS4 within the permitted area; and

1.1.2.2 Is not a “large” or “medium” MS4 as defined in 40 CFR Part 122.26(b)(4) or (7); and

1.1.2.3 Submits a Georgia Notice of Intent (NOI) in accordance with Part 3 of this permit; and

1.1.2.4 Is fully or partially located within an urbanized area as determined by the latest Decennial Census by the Bureau of the Census; or

1.1.2.5 Is designated for permit coverage by the State of Georgia pursuant to 40 CFR Part 122.32.

1.1.3 The permittee is liable for permit compliance and the implementation of its Storm Water Management Program (SWMP) within the permitted area for all discharges from the MS4 for which it is owner and/or operator.

1.1.4 The following discharges are not regulated by this permit:

1.1.4.1 NPDES permitted storm water discharges associated with any of the ten categories of industries covered by General NPDES Permit No. GAR050000;

1.1.4.2 Conveyances that discharge storm water runoff combined with municipal sewage;

1.1.4.3 Discharges from a Publicly Owned Treatment Works (POTW);

1.1.4.4 Storm water discharges that enter the waters of the State other than from a point source;

1.1.4.5 Storm water discharges from construction sites which result in a land disturbance of less than one acre unless part of a larger common plan of development or sale; and

1.1.4.6 NPDES permitted non-storm water discharges, such as process and non-process wastewater.

1.2 Definitions - See Appendix A
All terms used in this permit shall be interpreted in accordance with the definitions as set forth in the Georgia Water Quality Control Act, as amended, and the Federal Clean Water Act, as amended, unless otherwise defined in Appendix A.

PART 2. CRITERIA FOR RECEIVING WATERS

The permittee shall implement controls to reduce pollutants to the maximum extent practicable (MEP) in discharges from the MS4 to the waters of the State, so as not to cause the following criteria to be exceeded in the receiving waters:

2.1 All waters shall be free from materials associated with municipal or domestic sewage, industrial waste or any other waste which will settle to form sludge deposits that become putrescent, unsightly, or otherwise objectionable;

2.2 All waters shall be free from oil, scum and floating debris associated with municipal or domestic sewage, industrial waste or other discharges in amount sufficient to be unsightly or to interfere with legitimate water uses;

2.3 All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor, or other objectionable conditions which interfere with legitimate water uses;

2.4 All waters shall be free from turbidity which results in a substantial visual contrast in a water body due to a man-made activity. The upstream appearance of a body of water shall be as observed at a point immediately upstream of a turbidity-causing man-made activity. That upstream appearance shall be compared to a point which is located sufficiently downstream from the activity so as to provide an appropriate mixing zone. For land disturbing activities, proper design, installation, and maintenance of best management practices and compliance with issued permits shall constitute compliance with this criteria; and

2.5 All waters shall be free from toxic, corrosive, acidic and caustic substances discharged from municipalities, industries, or other sources, such as nonpoint sources, in amounts, concentrations, or combinations which are harmful to humans, animals or aquatic life.

PART 3. NOTICE OF INTENT

3.1 Obtaining Coverage

3.1.1 To be authorized to discharge storm water from a small MS4, the permittee must submit an NOI. The NOI must be signed and dated in accordance with Part 6.10 of this permit.

3.1.2 Where the operator changes, or where a new operator is added after submittal of an NOI, a new NOI must be submitted.

3.1.3 The NOI form may be obtained by calling the NonPoint Source Program of the Environmental Protection Division's (EPD) Watershed Protection Branch at (404) 675-6240 or on EPD's website at www.gaepd.org.

3.1.4 The completed NOI and signed copies of all reports required herein shall be submitted to the following address:

Georgia Environmental Protection Division
Watershed Protection Branch
NonPoint Source Program, Storm Water Unit
4220 International Parkway, Suite 101
Atlanta, Georgia 30354

3.2 Submittal Deadline

3.2.1 If the permittee was covered under previous permit iterations due to meeting the criteria specified in 40 CFR Part 122.32(a)(1) or due to designation by EPD as specified in 40 CFR Part 122.32(a)(2), then they are required to submit a new NOI in accordance with Part 3.1 and Part 6.3 of the permit, and if notified by EPD, a new SWMP, within 180 days after the effective date of this permit.

3.2.2 If the permittee is newly designated by EPD under 40 CFR Part 122.32(a)(2) after the issuance date of this permit, then they are required to submit an NOI and SWMP within 180 days of written notification from EPD.

PART 4. STORM WATER MANAGEMENT PROGRAM

The permittee shall implement and enforce a SWMP designed to reduce the discharge of pollutants from the MS4 to the MEP, in order to protect water quality and to satisfy the appropriate water quality requirements of the State Act and Rules. The SWMP and its amendments, upon approval by EPD, shall become an enforceable part of this permit. The currently approved SWMP remains in effect and its requirements continue to be permit conditions until another SWMP is approved. The SWMP must include, at a minimum, the following information for each of the six minimum control measures (MCMs) described in 40 CFR Part 122.34(b):

4.1 Requirements

4.1.1 The best management practices (BMPs) that will be implemented for each of the six stormwater MCMs. The SWMP must include at least the BMPs listed in each MCM section below. For new permittees developing a SWMP, each MCM must contain at least two BMPs. Additional BMPs may be included in the SWMP by the permittee. At a minimum, each BMP must be implemented within the permitted area.

4.1.2 The measurable goals set for each of the BMPs.

4.1.3 The implementation schedule for each BMP, including, as appropriate, the date of implementation, the months and years in which each specific required action will be undertaken, any interim milestone dates and/or the frequency of the action(s).

4.1.4 The office or position(s) responsible for implementing or coordinating the BMPs in the SWMP.

4.2 Minimum Control Measures

4.2.1 Public Education and Outreach on Storm Water Impacts

The permittee must implement a Public Education Program to distribute educational materials to the community and/or conduct equivalent outreach activities about the impacts of storm water discharges on water bodies and the steps that the public can take to reduce pollutants in storm water runoff.

The permittee is encouraged to utilize USEPA's toolbox during development of a new or evaluation and modification of an existing public education program. The toolbox includes example public education BMPs and can be found at cfpub.epa.gov/npdes/stormwater/menuofbmps.

For existing permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.1(a) below:

Table 4.2.1(a) Public Education - Best Management Practices (Existing Permittees)

BMPs	Measurable Goals
1. Public Education Program	1.a. Evaluate your existing program to ensure that it meets the needs of your community. Continue to implement, and revise if necessary, the stormwater

	education program contained in the SWMP. 1.b. Comply with the measurable goal specified for each BMP contained in the SWMP. 1.c. Details on the implementation of each BMP, including documentation of activities, must be provided in each annual report.

For new permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.1(b) below:

Table 4.2.1(b) Public Education – Best Management Practices (New Permittees)

BMPs	**Measurable Goals**
1. Public Education Program	1.a. Develop a stormwater public education program as part of the SWMP and submit the program to EPD for review and approval, in accordance with Part 3.2.2 of this permit. 1.b. Implement the public education program in accordance with the implementation schedule specified for each BMP in the SWMP. 1.c. Details on the implementation of each BMP, including the status of implementation and documentation of any activities performed during the reporting period, must be provided in each annual report.

4.2.2 Public Involvement/Participation

The permittee must, at a minimum, comply with State and local public notice requirements when implementing a public involvement/participation program.

The permittee is encouraged to make the approved SWMP publicly accessible electronically or by other means.

For existing permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.2(a) below:

Table 4.2.2(a) Public Involvement/Participation - Best Management Practices (Existing Permittees)

BMPs	**Measurable Goals**
1. Public Involvement/Participation	1.a. Evaluate your existing program to ensure that it meets the needs of your community. Continue to

Program	implement, and revise if necessary, the public involvement/participation program contained in the SWMP. 1.b. Comply with the measurable goal specified for each BMP contained in the SWMP. 1.c. Details on the implementation of each BMP, including documentation of activities, must be provided in each annual report.

For new permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.2(b) below:

Table 4.2.2(b) Public Involvement/Participation - Best Management Practices (New Permittees)

BMPs	Measurable Goals
1. Public Involvement/Participation Program	1.a. Develop a public involvement/participation program as part of the SWMP and submit the program to EPD for review and approval in accordance with Part 3.2.2 of this permit. 1.b. Implement the public involvement/participation program in accordance with the implementation schedule specified for each BMP in the SWMP. 1.c. Details on the implementation of each BMP, including the status of implementation and documentation of any activities performed during the reporting period, must be provided in each annual report.

4.2.3 Illicit Discharge Detection and Elimination (IDDE)

The permittee must develop, implement and enforce a program to detect and eliminate illicit discharges (as defined in 40 CFR Part 122.26(b)(2)) into its MS4. The permittee must:

4.2.3.1 Develop, if not already completed, a storm sewer system map, showing the location of all outfalls and the names and location of all waters of the State that receive discharges from those outfalls;

4.2.3.2 Prohibit through ordinance, or other regulatory mechanisms, non-storm water discharges into the MS4 and implement appropriate enforcement procedures and actions;

4.2.3.3 Develop and implement a plan to detect and address non-storm water discharges including illegal dumping to the MS4;

4.2.3.4 Inform public employees, businesses, and the general public of the hazards associated with illegal discharges and improper disposal of wastes; and

4.2.3.5 Address the following categories of non-stormwater discharges or flows only if they are identified as significant contributors of pollutants to the MS4:

- water line flushing;
- landscape irrigation;
- diverted stream flows;
- rising ground waters;
- uncontaminated ground water infiltration (as defined in 40 CFR Part 35.2005(20));
- uncontaminated pumped ground water;
- discharges from potable water sources;
- foundation drains;
- air conditioning condensation;
- irrigation water;
- springs;
- water from crawl space pumps;
- footing drains;
- lawn watering;
- individual residential car washing;
- flows from riparian habitats and wetlands;
- swimming pool discharges;
- street wash water; and
- flows from fire fighting activities.

For existing permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.3(a) below:

Table 4.2.3(a) Illicit Discharge Detection and Elimination - Best Management Practices (Existing Permittees)

BMPs	Measurable Goals
1. Legal Authority	1.a. Evaluate, and if necessary, modify the existing ordinance. If the ordinance is revised during the reporting period, submit a copy of the adopted ordinance with the annual report.
2. Outfall Map and Inventory	2.a. Develop or update a map and an inventory showing the location of all outfalls from the MS4 and the names and locations of all waters of the State that receive

	discharges from those outfalls. The map and inventory must be submitted with the 2013 annual report, due February 15, 2014. 2.b. Provide an updated inventory and map showing any outfalls added during the reporting period and the total number of outfalls in subsequent annual reports.
3. IDDE Plan	3. Implement the IDDE Plan described in the SWMP to detect and address non-storm water discharges to the MS4. The components of the Plan are as follows: 3.a. Conduct dry weather screening (DWS) inspections on 100% of the total outfalls within the 5-year permit term in accordance with procedures contained in the SWMP. If the permittee conducts stream walks in conjunction with the DWS inspection, then 100% of the stream miles must be inspected within the 5-year permit term. Provide the number of outfall inspections conducted during the reporting period and documentation of the outfall inspections in each annual report. 3.b. Implement investigative procedures when the results of the DWS indicate a potential for an illicit discharge, including the sampling and/or inspection procedures described in the SWMP. Provide information on any illicit discharge detection activities performed during the reporting period in each annual report. 3.c. Ensure any identified illicit discharges are eliminated. If necessary, implement enforcement procedures described in the SWMP and in accordance with the Enforcement Response Plan (ERP) in Part 4.3 of this permit. Provide information on any eliminated discharges or on any enforcement actions taken to eliminate illicit discharges during the reporting period in each annual report.
4. Education	4.a. Continue to implement a program to educate the public, businesses, and government employees about the hazards of illicit discharges as described in the SWMP. Provide documentation of any activities conducted during the reporting period in each annual report.
5. Complaint Response	5.a. Develop procedures for receiving, investigating, and tracking the status of illicit discharge complaints and submit the procedures to EPD for review and approval with the 2013 annual report, due February 15, 2014.

	5.b. Implement the complaint response procedures upon approval by EPD. Provide a report on each illicit discharge related complaint received and investigated during the reporting period (e.g. complaint date, type of complaint, complaint status) in each annual report.

For new permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.3(b) below:

Table 4.2.3(b) Illicit Discharge Detection and Elimination - Best Management Practices (New Permittees)

BMPs	**Measurable Goals**
1. Legal Authority	1.a. Develop and adopt an IDDE ordinance that prohibits non-stormwater discharges to the MS4. Submit a copy of the adopted ordinance to EPD within one year of designation with that year's annual report.
2. Outfall Map and Inventory	2.a. Develop or update a map and an inventory showing the location of all outfalls from the MS4 and the names and locations of all waters of the State that receive discharges from those outfalls. The SWMP must include a schedule for completing the map, with a final completion date of no later than four years following the date of designation. The completed map and inventory must be submitted to EPD with the first annual report following completion of the map and inventory. 2.b. Provide a status of the mapping and the inventory of identified outfalls in each annual report. 2.c. After completion of the initial outfall map and inventory, provide an updated map and inventory showing any outfalls added during the reporting period and the total number of outfalls on the MS4 in subsequent annual reports.
3. IDDE Plan	3.a. Develop an IDDE Plan, including field screening procedures, source tracing procedures, and discharge elimination procedures. The program must include example forms, such as an inspection form, example enforcement letters, etc. Submit the IDDE Plan to EPD for review and approval within one year following the date of designation with that year's annual report. 3.b. Implement the IDDE Plan by conducting DWS inspections on outfalls as the mapping occurs in Item 2.a. above. Provide documentation of the outfall

	inspections conducted during the reporting period with each annual report. 3.c. Upon completion of the mapping, conduct DWS inspections on 100% of the outfalls within a 5-year period. If the permittee conducts stream walks in conjunction with the DWS inspections, then 100% of the stream miles must be inspected within the 5-year permit term. Provide the number of outfall inspections conducted during the reporting period and documentation of the outfall inspections in each annual report. 3.d. Implement investigative procedures when the results of the DWS indicate a potential for an illicit discharge, including the sampling and/or inspection procedures described in the IDDE Plan. Provide information on any investigative activities performed during the reporting period in each annual report. 3.e. Ensure any identified illicit discharges are eliminated. If necessary, implement enforcement procedures described in the SWMP and in accordance with the ERP in Part 4.3 of this permit. Provide information on any eliminated discharges or on any enforcement actions taken to eliminate illicit discharges during the reporting period in each annual report.
4. Education	4.a. Develop and implement a program to educate the public, businesses, and government employees about the hazards of illicit discharges. Submit the program to EPD for review and approval within one year of designation with that year's annual report. 4.b. Implement the education program upon approval by EPD. Provide documentation of any activities conducted during the reporting period in each annual report.
5. Complaint Response	5.a. Develop procedures for receiving, investigating, and tracking the status of illicit discharge complaints and submit the procedures to EPD for review and approval within one year of designation with that year's annual report. 5.b. Implement the complaint response procedures upon approval by EPD. Provide a report on each illicit discharge related complaint received and investigated during the reporting period (e.g. complaint date, type of complaint, complaint status) in each annual report.

4.2.3.6 The inventory and inspection of industrial and commercial facilities can help identify illicit discharges and the potential for pollution in storm water runoff from these facilities. EPD recommends that the permittee pursue a program addressing these types of facilities in the permitted area, including the development of an inventory, inspection of facilities, and possible enforcement. The permittee may establish its inventory of industrial facilities using EPD's Industrial General Permit (IGP) Notice of Intent and No Exposure Exclusion online listing. For commercial facilities, the permittee may use its business license list to identify facilities with the potential to have higher than normal levels of pollutants in storm water runoff. If the permittee chooses to implement a program to address industrial and/or commercial facilities, the details may or may not be defined in the SWMP. In accordance with Part 4 of the permit, all BMPs contained within the SWMP become part of the permit.

4.2.4 <u>Construction Site Storm Water Runoff Control</u>

The permittee must develop, implement and enforce a program to reduce pollutants in any storm water runoff to the MS4 from construction activities that result in a land disturbance of greater than or equal to one acre. Storm water discharges from construction activity disturbing less than one acre must be included in the permittee's program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more. The permittee must develop and implement a construction site storm water runoff control program that contains the following elements:

4.2.4.1 An ordinance or other regulatory mechanism to require erosion and sediment (E&S) controls, as well as sanctions to ensure compliance, to the extent allowable, under State or local law;

4.2.4.2 Requirements for construction site operators to implement E&S control best management practices;

4.2.4.3 Requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse water quality impacts;

4.2.4.4 Procedures for site plan review that incorporate consideration of potential water quality impacts;

4.2.4.5 Procedures for receipt and consideration of information submitted by the public; and

4.2.4.6 Procedures for site inspection and enforcement of control measures.

For existing permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.4(a) below:

Table 4.2.4(a) Construction Site Storm Water Runoff Control - Best Management Practices (Existing Permittees)

BMPs	**Measurable Goals**
1. Legal Authority	1.a. Evaluate, and if necessary, modify the existing E&S ordinance. Ensure either the E&S or litter ordinance requires construction site operators to control waste at the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste. If the ordinance is revised during the reporting period, submit a copy of the adopted ordinance with the annual report.
2. Site Plan Review Procedures	2.a. Implement the site plan review procedures described in the SWMP. 2.b. Provide a list of the site plans received and the number of site plans reviewed, approved, or denied during the reporting period in each annual report.
3. Inspection Program	3.a. Implement the construction site inspection procedures described in the SWMP. The purpose of the inspections is to ensure that structural and non-structural BMPs at construction sites are properly designed and maintained and that construction site waste is properly controlled. At a minimum, inspections must occur following installation of initial BMPs, during active construction, and after final site stabilization. 3.b. Provide a list of active construction sites and any inspections conducted during the reporting period in each annual report.
4. Enforcement Procedures	4.a. Implement enforcement procedures for E&S violations documented at construction sites during the reporting period as described in the SWMP and in accordance with the ERP required by Part 4.3 of this permit. Provide documentation of any enforcement actions taken during the reporting period in each annual report, including the number and type (e.g. Notice of Violation, Stop Work Order) and status (e.g. pending,

	resolved).
5. Complaint Response	5.a. Formalize E&S complaint receipt, investigation, response, and tracking procedures and submit the procedures to EPD for review and approval with the SWMP submittal, due 180 days after the effective date of the permit. 5.b. Implement E&S complaint response procedures upon approval by EPD. Provide information on complaints handled during the reporting period (e.g. complaint date, type of complaint, complaint status) in each annual report.
6. Certification	6.a. Ensure that any MS4 staff involved in construction activities subject to the Construction General Permits (CGPs) are trained and certified in accordance with the rules adopted by the Georgia Soil and Water Conservation Commission. 6.b. Provide the number and type of current certifications held by MS4 staff in each annual report.

For new permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.4(b) below:

Table 4.2.4(b) Construction Site Storm Water Runoff Control - Best Management Practices (New Permittees)

BMPs	Measurable Goals
1. Legal Authority	1.a. Develop an ordinance(s) that requires construction site operators to implement E&S controls and control waste at the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste. Submit the adopted ordinance(s) to EPD within one year of designation with that year's annual report.
2. Site Plan Review Procedures	2.a. Develop procedures for conducting site plan reviews. Submit the procedures to EPD for review and approval within one year of designation. 2.b. Implement the site plan review procedures upon approval by EPD. Submit a list of the site plans received and the number of site plans reviewed, approved, or denied during the reporting period in each annual report.
3. Inspection Program	3.a. Develop construction site inspection procedures. The purpose of the inspections is to ensure that structural and non-structural BMPs at construction sites are properly designed and maintained and that

	construction site waste is properly controlled. At a minimum, inspections must occur following the installation of initial BMPs, during active construction and after final site stabilization. Submit the procedures to EPD for review and approval within one year of designation with that year's annual report. 3.b. Implement the inspection procedures upon approval by EPD. Provide a list of active construction sites and any E&S inspections conducted during the reporting period in each annual report.
4. Enforcement Procedures	4.a. Upon approval of the ERP (required by Part 4.3 of this permit) by EPD, implement enforcement procedures for E&S violations documented at construction sites during the reporting period. Provide documentation of any enforcement actions taken during the reporting period in each annual report, including the number and type (e.g. Notice of Violation, Stop Work Order) and status (e.g. pending, resolved).
5. Complaint Response	5.a. Develop E&S complaint receipt, investigation, response, and tracking procedures. Submit the procedures to EPD for review and approval within one year of designation with that year's annual report. 5.b. Implement the E&S complaint response procedures upon approval by EPD. Provide information on complaints received and investigated during the reporting period (e.g. complaint date, type of complaint, complaint status) in each annual report.
6. Certification	6.a. Ensure that any MS4 staff involved in construction activities subject to the CGPs are trained and certified in accordance with the rules adopted by the Georgia Soil and Water Conservation Commission. 6.b. Provide the number and type of current certifications held by MS4 staff in each annual report.

4.2.5 <u>Post-Construction Storm Water Management in New Development and Redevelopment</u>

The permittee must develop, implement and enforce a program to address storm water runoff into the MS4 from new development and redevelopment projects, including projects less than one acre if they are part of a larger common plan of development or sale, as described in Parts 4.2.5.1 and 4.2.5.2. The program must ensure that controls are in place that will prevent or minimize water quality impacts. At a minimum, the Post-Construction Storm Water Management in New Development and Redevelopment Program must contain the following requirements:

- Develop and implement strategies which include a combination of structural and/or non-structural BMPs appropriate for your community;

- Use an ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under State and local law; and

- Ensure adequate long-term operation and maintenance of the BMPs.

4.2.5.1 Stormwater Design Manual

The permittee must implement either the latest Georgia Stormwater Management Manual (GSMM) or an equivalent local design manual. For those permittees located in the 11-county coastal management program service area (Bryan, Brantley, Camden, Charlton, Chatham, Effingham, Glynn, Liberty, Long, McIntosh, and Wayne), the adopted manual must include the applicable parts of the Coastal Stormwater Supplement (CSS) to the GSMM, specifically the performance standards.

For new permittees, the adoption of either the GSMM or a local design manual must be completed within one year of designation. Documentation of the design manual adoption must be provided to EPD with that year's annual report. Implementation must begin upon adoption.

At a minimum, the permittee shall apply the standards for new development and redevelopment to any site that meets one or more of the following criteria:

For those permittees located outside of the 11-county coastal management program service area and subject to the GSMM:

- New development that creates or adds 5,000 square feet or greater of new impervious surface area, or that involves land disturbing activity of 5,000 square feet or greater.

- Redevelopment that creates or adds 5,000 square feet or greater of new impervious surface area, or that involves land disturbing activity of 1 acre or more, including projects less that 1 acre if they are part of a larger common plan of development or sale.

For those permittees located outside of the 11-county coastal management program service area, subject to the GSMM and the Metropolitan North Georgia Water Planning District:

- New development that creates or adds 5,000 square feet or greater of new impervious surface area, or that involves land disturbing activity of 1 acre or greater.

- Redevelopment that creates or adds or replaces 5,000 square feet or greater of new impervious surface area, or that involves land disturbing activity of 1 acre or more.

For those permittees located within the 11-county coastal management program service area and also subject to the CSS:

- New development that creates or adds 5,000 square feet or greater of impervious surface area, or that involves land disturbing activity of 1 acre or greater.

- Redevelopment that creates or adds or replaces 5,000 square feet or greater of new impervious surface area, or that involves land disturbing activity of 1 acre or more, including projects less than 1 acre if they are part of a larger common plan of development or sale.

For sites meeting the above criteria, the permittee shall ensure that the following minimum standards are implemented where practicable during the site plan preparation process:

Stormwater Runoff Quality/Reduction:
All stormwater runoff shall be adequately treated prior to discharge. The stormwater management system shall be designed to remove 80% of the average annual post-development total suspended solids (TSS) load as defined in the GSMM or in the equivalent manual. Compliance with this performance standard is presumed to be met if the stormwater management system is sized to capture and treat the water quality treatment volume, which is defined as the runoff volume resulting from the first 1.2 inches of rainfall from a site.

Stream Channel/Aquatic Resource Protection:

Stream channel and/or aquatic resource protection shall be provided by using the following approaches: 1) 24-hour extended detention storage of the 1-year, 24-hour return frequency storm event; 2) erosion prevention measures such as energy dissipation and velocity control; and 3) preservation of the applicable stream buffer.

Overbank Flood Protection:
Downstream overbank flood protection shall be provided by controlling the post-development peak discharge rate to the predevelopment rate for the 25-year, 24-hour storm event.

Extreme Flood Protection:
Extreme flood protection shall be provided by controlling the 100-year, 24-hour storm event such that flooding is not exacerbated.

4.2.5.2 Green Infrastructure/Low Impact Development (GI/LID)

The requirements of Part 4.2.5.2 of this permit only apply to those permittees with a population exceeding 10,000 at the time of this permit issuance or at the time of designation. Permittees with a population less than 10,000 are exempt from this requirement at this time (See Appendix B).

EPD encourages the use of GI/LID practices and approaches on both new and redeveloped sites. The permittee shall review and revise, where necessary, building codes, ordinances, and other regulations to ensure they do not prohibit or impede the use of GI/LID practices, including infiltration, reuse, and evapotranspiration. At a minimum, the permittee shall assess those regulations governing road design and parking requirements. During the review, the permittee should consider the inclusion of incentives for use of GI/LID practices into the regulatory documents. For existing permittees, the evaluation must be completed within two years and a written report submitted to EPD with the 2014 annual report, due February 15, 2015. Any necessary revisions must be completed, and adopted ordinances submitted to EPD, within four years of the effective date of this Permit. For new permittees, the evaluation must be completed within two years of designation and a written report submitted to EPD with the subsequent annual report. Any necessary revisions must be completed, and adopted ordinances submitted to EPD within four years after designation.

Design information on GI/LID practices can be found on EPD's website (www.gaepd.org) for the GSMM and the CSS. Additional information on GI/LID and better site design can be found on numerous websites, including these suggested sites: USEPA (www.epa.gov), Center for Watershed Protection (www.cwp.org), Georgia Coastal Resource Division's "Georgia's Green Growth Guidelines" (crd.dnr.state.ga.us), and Green Infrastructure Center (www.gicinc.org). In addition, you may want to consult the following webpages on EPA's website: www.epa.gov/nps/lid and http://cfpub.epa.gov/npdes/home.cfm?program_id=298.

For existing permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.5(a) below:

Table 4.2.5(a) Post-Construction Storm Water Management - Best Management Practices (Existing Permittees)

BMPs	**Measurable Goals**
1. Legal Authority	1.a. Evaluate, and if necessary, modify the existing ordinance. If the ordinance is revised during the reporting period, submit a copy of the adopted ordinance with the annual report.
2. Inventory	2.a. Develop or update, as needed, an inventory of all publicly-owned post-construction storm water management structures (e.g. detention/retention ponds, water quality vaults, infiltration structures) and only those privately-owned structures designed after the December 9, 2008 deadline for adoption of the GSMM (i.e. new structures). The inventory shall include information on the number and type of structures, and ownership (i.e. publicly-owned, privately-owned). The permittee may choose to also include privately-owned structures designed prior to the December 9, 2008 deadline for adoption of the GSMM on the inventory. Provide the inventory with the first annual report after permit issuance. 2.b. Update the inventory as new structures are completed or existing structures are identified. Provide the updated inventory of post-construction storm water management structures, including those structures added during the reporting period in each annual report.
3. Inspection Program	3.a. Conduct inspections of all post-construction stormwater management structures included on the inventory required in BMP #2 above, so that 100% of

	the structures are inspected within the 5-year permit term. The inspections should be completed in accordance with the schedule contained in the SWMP. Provide documentation of the inspections conducted during the reporting period in each annual report.
4. Maintenance Program	4.a. Implement the long-term operation and maintenance program for post-construction storm water management structures described in the SWMP. At a minimum, the maintenance program must address all publicly-owned structures and those privately-owned structures with construction completed after the effective date of the permit. The permittee may choose to also address privately-owned structures constructed prior to the effective date of the permit. The maintenance may be performed by the permittee or by the owner/operator of the structure. Maintenance must be performed to the MEP. 4.b. For publicly-owned structures, provide a list of structures maintained and the type of maintenance performed, including documentation of maintenance activities performed during the reporting period with each annual report. 4.b.1. For privately-owned structures with construction completed after the effective date of the permit, the permittee must either conduct maintenance or require maintenance agreements. • If the permittee conducts the maintenance, provide a list of structures maintained and the type of maintenance performed, including documentation of maintenance activities performed during the reporting period in each annual report. • If maintenance is to be performed by an owner/operator in accordance with a maintenance agreement, the permittee must retain copies of maintenance agreements finalized after the submittal deadline date for the SWMP and submit a summary list of these agreements with the subsequent annual report. Any maintenance agreements executed during subsequent reporting periods should be included on the summary list submitted with each annual report. The total number of executed

	maintenance agreements should be provided in each annual report. 4.b.2. If the permittee addresses privately-owned structures constructed prior to the effective date of the permit in their program, then provide a list of structures maintained and the type of maintenance performed, including documentation of maintenance activities performed during the reporting period in each annual report.
5. GI/LID Structures	5.a. Develop an inventory of water quality-related GI/LID structures located within the permitted area and at a minimum, constructed after the effective date of the permit, including the total number of each type of structure (e.g. bioswales, pervious pavement, rain gardens, cisterns, and green roofs). Provide the inventory with the second annual report after permit issuance. 5.b. Track the addition of new water quality-related GI/LID structures through the plan review process and ensure the structures are added to the inventory. Provide an updated inventory, including those structures added during the reporting period, in each annual report.

For new permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.5(b) below:

Table 4.2.5(b) Post-Construction Storm Water Management - Best Management Practices (New Permittees)

BMPs	**Measurable Goals**
1. Legal Authority	1.a. Develop and adopt a post-construction ordinance that includes the adoption of the GSMM or a local design manual. Submit a copy of the adopted ordinance to EPD within one year of designation with that year's annual report.
2. Inventory	2.a. Develop an inventory of all publicly-owned post-construction storm water management structures (e.g. detention/retention ponds, water quality vaults, infiltration structures) and those privately-owned structures designed after the adoption of the GSMM. The inventory shall include information on the number and type of structures, and ownership (i.e. publicly-owned, privately-owned). The permittee may choose to also include other privately-owned structures on the

	inventory. The SWMP must include a schedule for completing the inventory with a final completion date of no later than 3 years following designation. The completed inventory must be submitted to EPD with the first annual report following completion. 2.b. Provide the status of the inventory development and/or update of the inventory in each annual report. 2.c. After completion of the initial inventory, update the inventory as new structures are completed or additional structures are identified. Provide an updated inventory of post-construction storm water management structures, including those structures added during the reporting period in each subsequent annual report.
3. Inspection Program	3.a. Develop an inspection program and provide details in the SWMP. The program must include a schedule for conducting inspections on all post-construction storm water management structures included on the inventory required in BMP #2 above, so that 100% of the structures are inspected within a 5-year period. Submit the program to EPD for review and approval no later than 3 years following designation with that year's annual report. 3.b. Conduct inspections in accordance with the approved program contained in the SWMP. Provide documentation of the inspections conducted during the reporting period in each annual report.
4. Maintenance Program	4.a. Develop a long-term operation and maintenance program for post-construction storm water management structures. At a minimum, the program must address all publicly-owned structures and those privately-owned structures with construction completed after the date of designation. The permittee may choose to also address privately-owned structures constructed prior to the date of designation. Submit the program to EPD for review and approval no later than 3 years following designation with that year's annual report. 4.b. Upon approval by EPD, implement the long-term operation and maintenance program for post-construction storm water management structures. The maintenance may be performed by the permittee or by the owner/operator of the structure. 4.b.1. For publicly-owned structures, provide a list of structures maintained and the type of maintenance

	performed, including documentation of maintenance activities performed during the reporting period with each annual report. 4.b.2. For privately-owned structures with construction completed after the date of designation, the permittee must either conduct maintenance or require maintenance agreements. • If the permittee conducts the maintenance, provide a list of structures maintained and the type of maintenance performed, including documentation of maintenance activities performed during the reporting period in each annual report. • If maintenance is to be performed by an owner/operator in accordance with a maintenance agreement, the permittee must submit a summary list of finalized maintenance agreements with the first annual report following program implementation. Any maintenance agreements executed during subsequent reporting periods should be added to the summary list and submitted with each annual report. The total number of executed maintenance agreements must be provided in each annual report. 4.b.3. If the permittee addresses privately-owned structures constructed prior to the date of designation in their program, then provide a list of structures maintained and the type of maintenance performed, including documentation of maintenance activities performed during the reporting period in each annual report.
5. GI/LID Structures	5.a. Develop an inventory of water quality-related GI/LID structures located within the permitted area and at a minimum, constructed after the date of designation, including the total number of each type of structure (e.g. bioswales, pervious pavement, rain gardens, cisterns, and green roofs). Provide the inventory within one year of designation with that year's annual report. 5.b. Track the addition of new water quality-related GI/LID structures through the plan review process and ensure the structures are added to the inventory. Provide an updated inventory, including those structures

	added during the reporting period, in subsequent annual reports.

4.2.6 Pollution Prevention/Good Housekeeping for Municipal Operations

The permittee must develop and implement an operation and maintenance program that includes a training component with the ultimate goal of preventing or reducing pollutant runoff from municipal operations. Using training materials available from the USEPA and other organizations as guidance, the permittee must, as a part of this program, include employee training to prevent and reduce storm water pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance. The program shall, at a minimum, contain all the following requirements:

For existing permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.6(a) below:

Table 4.2.6(a) Pollution Prevention/Good Housekeeping for Municipal Operations - Best Management Practices (Existing Permittees)

BMPs	Measurable Goals
1. MS4 Control Structure Inventory and Map	1.a. Develop or update an inventory and map of the MS4 control structures. At a minimum, the inventory and map must include catch basins, ditches (miles or linear feet), detention/retention ponds, and storm drain lines (miles or linear feet). The inventory and map must be submitted to EPD in accordance with a schedule established in the SWMP, but the completion date must not exceed February 15, 2015. 1.b. Update the inventory as necessary. Provide the number of structures added during the reporting period and the total number of structures in each annual report.
2. MS4 Inspection Program	2.a. Conduct inspections on the MS4 control structures so that 100% of the structures are inspected within a 5-year period. The MS4 inspections may be performed during mapping of the system or in accordance with a schedule contained in the SWMP. Provide the number and percentage of structures inspected during the reporting period in each annual report.
3. MS4 Maintenance Program	3.a. Conduct maintenance on the MS4 control structures as needed. Provide the number of each type of structure maintained during the reporting period in each annual report.
4. Street and Parking Lot Cleaning	4. Conduct street and parking lot cleaning using either of the following methods:

	4.a. Conduct street sweeping in accordance with the procedures established in the SWMP. Provide specifics on any street sweeping activities conducted during the reporting period in each annual report. 4.b. If the MS4 does not engage in street sweeping, then implement an alternate method of street cleaning, such as trash/litter removal, as described in the SWMP. Provide documentation of the litter removal activities conducted during the reporting period in each annual report.
5. Employee Training	5.a. Implement the employee training program specified in the SWMP. Provide documentation of the educational activities conducted during the reporting period in each annual report.
6. Waste Disposal	6.a. Implement procedures regarding the proper disposal of waste removed from the MS4 as specified in the SWMP. Provide documentation of activities performed during the reporting period in each annual report.
7. New Flood Management Projects	7.a. Ensure proposed flood management projects are assessed for water quality impacts during the design phase. Provide the number of plans reviewed where flood management projects were assessed for water quality impacts during the reporting period in each annual report.
8. Existing Flood Management Projects	8.a. Conduct an assessment of existing publicly-owned flood management projects for potential retrofitting to address water quality impacts in accordance with the procedures in the SWMP. Provide information on any assessment activities conducted during the reporting period in each annual report.
9. Municipal Facilities	9.a. Develop or update an inventory of municipal facilities with the potential to cause pollution. The inventory must be submitted to EPD with the 2013 annual report, due February 15, 2014. The inventory must be updated annually and submitted with each annual report. 9.b. Conduct inspections on 100% of the municipal facilities within the 5-year permit term in accordance with the procedures contained in the SWMP. Provide documentation of the inspections conducted during the reporting period in each annual report.

For new permittees, the program shall, at a minimum, contain the requirements shown in Table 4.2.6(b) below:

Table 4.2.6(b) Pollution Prevention/Good Housekeeping for Municipal Operations - Best Management Practices (New Permittees)

BMPs	Measurable Goals
1. MS4 Control Structure Inventory and Map	1.a. Develop an inventory and map of the MS4 control structures. At a minimum, the inventory and map must include catch basins, ditches (miles or linear feet), detention/retention ponds, and storm drain lines (miles or linear feet). The inventory and map must be submitted to EPD in accordance with a schedule established in the SWMP, but the completion date must not exceed 4 years from the date of designation. Submit the completed inventory and map with the annual report following inventory and map completion. 1.b. Upon completion of the inventory and map, update the inventory and map as necessary. Provide the number of structures added during the reporting period and the total number of structures in each annual report.
2. MS4 Inspection Program	2.a. Develop an inspection program and provide details in the SWMP. The program must include a schedule for conducting inspections of the MS4 control structures so that 100% of the structures are inspected within a 5-year period. Submit the program to EPD for review and approval with the SWMP. 2.b. Upon EPD approval, begin implementing the inspection program. The MS4 inspections may be performed during mapping of the system or in accordance with the schedule contained in the approved inspection program. Provide the number and percentage of structures inspected during the reporting period in each annual report.
3. MS4 Maintenance Program	3.a. Develop a storm sewer system maintenance program specifying such things as prioritization, factors determining the need for maintenance, etc. Submit the program to EPD for review and approval with the first annual report following designation. 3.b. Upon EPD approval, implement the maintenance program for the MS4 control structures. Provide the number of each type of structure maintained during the reporting period in each annual report.

4. Street and Parking Lot Cleaning	4.a. Develop street and parking lot cleaning procedures. The procedures may address the use of a street sweeper, trash/litter removal, or another method. Submit the procedures to EPD for review and approval with the first annual report following designation. 4.b. Upon EPD approval, implement the street and parking lot cleaning procedures. Provide documentation of the litter removal activities conducted during the reporting period in each annual report.
5. Employee Training	5.a. Develop an employee training program and submit the program to EPD for review and approval with the SWMP. 5.b. Upon EPD approval, implement the employee training program. Provide documentation of the educational activities conducted during the reporting period in each annual report.
6. Waste Disposal	6.a. Develop procedures for the proper disposal of waste removed from the MS4. Submit the procedures to EPD for review and approval with the SWMP. 6.b. Upon EPD approval, implement procedures regarding the proper disposal of waste removed from the MS4. Provide documentation of activities performed during the reporting period in each annual report.
7. New Flood Management Projects	7.a. Develop procedures for ensuring proposed flood management projects are assessed for water quality impacts during the design phase. Submit the procedures to EPD for review and approval with the SWMP. 7.b. Upon EPD approval, implement the procedures. Provide the number of plans reviewed where flood management projects were assessed for water quality impacts during the reporting period in each annual report.
8. Existing Flood Management Projects	8.a. Develop procedures for assessing existing flood management projects for potential retrofitting to address water quality impacts. Submit the procedures to EPD for review and approval with the first annual report following designation. 8.b. Upon EPD approval, implement the approved procedures. Provide information on any assessment activities conducted during the reporting period in each annual report.
9. Municipal Facilities	9.a. Develop an inventory of municipal facilities with the

	potential to cause pollution. The inventory must be submitted to EPD within one year of designation with that year's annual report. The inventory must be updated annually and submitted with each subsequent annual report. 9.b. Develop inspection procedures. Submit the procedures to EPD for review and approval within one year of designation with that year's annual report. 9.c. Upon EPD approval, implement the inspection procedures. Conduct inspections on 100% of the municipal facilities within the 5-year permit term in accordance with the approved procedures. Provide documentation of the inspections conducted during the reporting period in each annual report.

4.3 Enforcement Response Plan (ERP)

The permittee must develop and implement an ERP that describes the action to be taken for violations associated with this permit and the SWMP. The ERP will detail the permittee's responses to any noted storm water violations, including escalating enforcement responses to address repeat and continuing violations. The plan must detail:

- Names of ordinances providing the legal authority to undertake enforcement, including citation of specific ordinance sections;
- Types of enforcement mechanisms available. The ERP should list the enforcement actions the permittee has the authority to use, including such actions as:
  - verbal warnings;
  - written notice of violations;
  - citations (with fines);
  - stop work orders;
  - withholding plan approval or other authorizations; and
  - any other available enforcement mechanisms.
- Description of when each enforcement mechanism will be employed, including the path of escalation;
- Time frames for each step, including investigation of noncompliance, sequence and use of enforcement mechanisms, corrective action by responsible party, re-inspection of site, etc.
- Description of the methods to be used to track, either manually or electronically, instances of noncompliance, including such items as:
  - name of owner/operator of facility and/or the location or address;
  - type of site (e.g. IDDE, construction);
  - description of noncompliance;

- o description of enforcement action(s) used;
- o time frames for each step (e.g. investigation, corrective action, re-inspection);
- o documentation of inspection and enforcement actions taken;
- o documentation of referral to other departments or agencies; and
- o date of violation resolution.

For existing permittees, the ERP must be submitted to EPD for review with the second annual report following permit issuance. For permittees designated after the issuance date of the permit, the ERP must be submitted within one year, with that year's annual report. The ERP must be implemented within six (6) months of EPD approval. Once approved, the ERP will become an addendum to the permittee's SWMP.

4.4 Impaired Waters

4.4.1 The requirements of Part 4.4.1 of this permit apply to those permittees with a population less than 10,000 at the time of permit issuance (see Appendix B) or at the time of designation:

The permittee must identify any impaired waters located within its permitted area, using the latest approved 305(b)/303(d) List of Waters (http://www.gaepd.org/Documents/305b.html), which contain MS4 outfalls or are within one (1) linear mile downstream of MS4 outfalls. Also, the pollutant of concern (POC) must be identified. If a Total Maximum Daily Load (TMDL) containing a wasteload allocation specific to one or more of the permittee's outfalls is approved, then the wasteload allocation must be incorporated into the SWMP. All previous and newly approved TMDLs within the permitted areas must be included in either the proposed Impaired Waters Plan (Plan) or a revision to the existing Plan. The permittee must develop a Plan to reduce the POC, including:

- A list of the impaired waters and POC(s);
- A map showing the location of the impaired waters and all identified MS4 outfalls located on the impaired waters or occurring within one linear mile upstream of the waters;
- BMPs that will be implemented to address each POC; and
- A schedule for implementing the BMPs.

For existing permittees, the Plan must be submitted to EPD for review and approval by February 15, 2015. For permittees designated after the issuance date of the permit, the Plan must be submitted with the annual report due within 4 years of designation. Once approved, the Plan will become part of the SWMP.

Upon EPD approval of the Plan, the permittee must implement the chosen BMPs. After BMP implementation, each annual report must include an evaluation of the effectiveness of the chosen BMPs, and if necessary, revisions to existing BMPs or implementation of additional BMPs to reduce the POC.

Each year, the permittee must review the List of Waters to determine if additional impaired waters within the permitted area have been listed. If additional impaired waters are present, then the permittee must amend the Plan to include a map showing these impaired waters and the outfalls to these waters, identify BMPs to address the POC and a BMP implementation schedule. Each subsequent annual report must address Plan activities related to all of the impaired waters.

4.4.2 The requirements of Part 4.4.2 of this permit apply to those permittees with a population exceeding 10,000 at the time of permit issuance (see Appendix B) or at the time of designation:

The permittee must identify any impaired waters located within its permitted area, using the latest approved 305(b)/303(d) List of Waters (http://www.gaepd.org/Documents/305b.html), which contain MS4 outfalls or are within one (1) linear mile downstream of MS4 outfalls. Also, the POC must be identified. For those impaired waters with or without an approved TMDL, (http://www.gaepd.org/Documents/ TMDL_page.html), the permittee shall propose a Monitoring and Implementation Plan (Plan) addressing each POC. The permittee must annually check whether an impaired water within its permitted area has been added to the latest 305(b)/303(d) list. Newly listed waters must be addressed in the Plan and the SWMP must be revised accordingly. The permittee must report on all monitoring activities in subsequent annual reports. If a TMDL containing a wasteload allocation specific to one or more of the permittee's outfalls is approved, then the wasteload allocation must be incorporated into the SWMP. All previous and newly approved TMDLs within the permitted areas must be included in either the proposed Plan or a revision to the existing Plan.

The Plan shall include:

- Sample location, whether samples are collected instream (i.e. upstream and downstream), from outfalls during wet weather events, or a combination of both locations. If the permittee chooses to conduct outfall sampling and there are multiple outfalls located on an impaired stream, then the permittee may choose representative outfalls for sampling in place of sampling all outfalls;

- Sample type, frequency, and any seasonal considerations;
- Implementation schedule to start monitoring for each POC;
- Map showing the location of the impaired waters, the monitoring location, and all identified MS4 outfalls located on the impaired waters or occurring within one linear mile upstream of these waters, or a schedule for confirming the location of these outfalls; and
- Description of proposed BMPs to be used to control and reduce the POCs.

Each Annual Report will include an assessment of the data trends for each POC. The assessment shall initially include a characterization of baseline conditions to determine the effectiveness of the BMPs employed and what, if any, additional adaptive BMP measures may be necessary to return the waters to compliance with State water quality standards. Following review and comment on the Plan by EPD, the permittee will incorporate any necessary changes into the Plan. For those waters where the permittee is conducting monitoring, the data must be made available to other MS4 permittees upon request. In the event that monitoring is performed in accordance with an EPD-approved Sampling Quality and Assurance Plan, and a water is removed from the 303(d) list of impaired waters, then monitoring conducted under the Plan may cease. Monitoring for the purpose of de-listing an impaired water will benefit the permittee through reduced expenses associated with long-term testing.

For existing permittees, the Plan must be submitted to EPD for review and approval by February 15, 2015. For permittees designated after the issuance date of the permit, the Plan must be submitted with the annual report due within 4 years of designation. Once approved, the Plan will become part of the SWMP.

4.5 Sharing Responsibility

4.5.1 The permittee may share implementation of one or more of the SWMP minimum measures with another entity, or the entity may assume full responsibility for that measure. However, the permittee may rely on another entity only if:

4.5.1.1 The other entity is either implementing or will be implementing the control measure;

4.5.1.2 The particular control measure or component of that measure is at least as stringent as the corresponding permit requirement; and

4.5.1.3 The other entity agrees to implement the control measure on the permittee's behalf through a written agreement, memorandum of understanding, or other signed document that establishes the obligations of each party.

4.5.1.4 Written acceptance of this obligation is mandatory and must be maintained as a part of the SWMP. Conducting maintenance on a structure does not infer that the entity conducting the maintenance is the owner or operator of that structure. Even though the permittee may contract with another entity for control measure implementation, it is the permittee's responsibility to submit all NOIs, Annual Reports, Certification Statements, or any other information requested by EPD.

4.5.2 If the other entity fails to implement the control measure on the permittee's behalf, the permittee remains liable for any enforcement actions due to the failure to implement and/or report.

4.6 Storm Water Management Program Modifications

4.6.1 The SWMP may be modified by the permittee at any time. Written notification of any modifications must be submitted and EPD approval of the modification received prior to implementation of the SWMP modification.

4.6.2 EPD may require the permittee to modify the SWMP as needed to comply with the goals and requirements of the State Act, but specifically for any of the following reasons:

4.6.2.1 A change has occurred which will significantly impact the potential for the discharge of pollutants to the waters of the State of Georgia;

4.6.2.2 The permittee's program proves ineffective in controlling pollutants from the MS4 to the MEP;

4.6.2.3 An adverse impact to water quality has been documented as a result of discharges from the MS4; or

4.6.2.4 To include more stringent requirements necessary to comply with new State or Federal statutory or regulatory requirements.

The Director shall notify the permittee of the required modifications in writing and set forth a schedule for the permittee to develop and implement the modification(s). The permittee may propose alternative SWMP modifications to EPD.

PART 5. MONITORING, RECORDKEEPING AND REPORTING REQUIREMENTS

5.1 Annual Report

The permittee shall prepare and submit an annual report to EPD. The report shall cover the period from January 1 – December 31, shall be submitted by February 15th following the reporting period, and shall be in accordance with the SWMP in effect on January 1st of that reporting period. For new permittees designated after the issuance date of this permit, the first annual report is due upon notification by EPD and February 15th of each subsequent year. The report must include for each BMP, at a minimum, the following:

5.1.1 The activities conducted during the reporting period, progress towards achieving the measurable goal(s), and compliance with the implementation schedule;

5.1.2 Any information necessary to support documentation of the activities completed during the reporting period;

5.1.3 A summary of the storm water activities proposed for the next reporting period, including implementation schedules;

5.1.4 An evaluation of the effectiveness of the BMPs for each MCM. A summary of any proposed changes to a BMP, measurable goal, implementation schedule, or any other changes to any of the MCM; and

5.1.5 Notice if the permittee is relying on another entity to satisfy some portion of the permit obligations (as applicable).

5.2 Monitoring Requirements

Water quality monitoring, except for illicit discharge detection screening specified in Section 4.2.3 and monitoring of impaired waters specified in Section 4.4.2, is not required by this permit. If, however, the permittee conducts water quality monitoring at its MS4 as part of its SWMP, it is required to comply with the following:

5.2.1 Samples and measurements taken for the purpose of monitoring shall be representative. Monitoring must be conducted according to approved test procedures set forth in 40 CFR Part 136, unless other approved test procedures have been specified, excluding IDDE field screening procedures.

5.2.2 Parameters shall be analyzed to the detection limits specified by EPD. If a parameter is not detected at or above the detection limit, a value of “NOT DETECTED” will be reported for that sample and the detection limit will also be reported.

5.2.3 If the permittee monitors any parameter at the designated location(s) more frequently than required by this permit, the permittee shall analyze all samples using approved analytical methods specified in Part 5.2.1 of this permit. EPD may require more frequent monitoring or the monitoring of other parameters not specified in this permit or the SWMP by written notification to the permittee.

5.2.4 All monitoring data not prepared in situ shall be prepared by a laboratory accredited by the State of Georgia in accordance with EPD’s Rules for Commercial Environmental Laboratories 391-3-26, or, where the permittee does their own analysis with their own personnel, by a Laboratory Analyst certified in compliance with the Georgia State Board of Examiners for Certification of Water and Wastewater Treatment Plant Operators and Laboratory Analysts Act. In situ means that the sample is analyzed at the point of collection and has not been transported any distance.

5.3 <u>Retention of Records</u>

5.3.1 The permittee shall retain copies of all reports required by this permit, all monitoring information and records of all other data required by or used to demonstrate compliance with this permit, including any additional monitoring performed which is not required by this permit, for a period of at least three years. After EPD’s approval, the permittee will implement the latest version of the SWMP, while retaining on file the previous version of the program for a period of at least three years. These periods may be modified by the Director by written notification at any time.

5.3.2 Records of monitoring information shall include:

- The date, exact place, time of sampling or measurement;
- The individual(s) who performed the sampling or measurement;
- The date(s) analyses were performed;
- The individual(s) who performed the analyses;
- The analytical techniques or methods used; and
- The results of the analyses.

5.3.3 The permittee must submit its records to EPD upon written request. The permittee must make its records, including the NOI and SWMP, available to the public as required by open records requirements.

PART 6. STANDARD PERMIT CONDITIONS

6.1 Duty to Comply

6.1.1 The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and the State Act and is grounds for:

- Enforcement action;
- Permit termination, revocation and reissuance, or modification; or
- Denial of a permit renewal application.

6.1.2 The Clean Water Act and the State Act both provide that any person who falsifies or tampers with, or knowingly renders inaccurate any monitoring device or method required under this permit, or who makes any false statement, representation, or certification in any record submitted or required by this permit, including monitoring reports or reports of compliance or noncompliance, shall, if convicted, be punished by a fine or by imprisonment, or by both. Both Acts include procedures for imposing civil penalties for violations or for negligent or intentional failure or refusal to comply with any final or emergency order of the Director.

6.1.3 If, for any reason, the permittee does not comply with, or will be unable to comply with any condition specified in this permit, the permittee shall provide EPD with an oral report within 24 hours from the time the permittee becomes aware of the circumstances, followed by a written report within five (5) days. The written submission shall contain:

- Description of the noncompliance and its cause;
- Exact dates and times of noncompliance or, if not corrected, the anticipated time the noncompliance is expected to continue; and
- Steps being taken to reduce, eliminate and prevent recurrence of the noncompliance.

6.1.4 The permittee shall give written notice to EPD at least ten (10) days before any planned changes in the permitted activity, which may result in noncompliance with permit requirements.

6.2 Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

6.3 Duty to Reapply/Continuation of an Expired General Permit

6.3.1 If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit by submitting an NOI in accordance with the requirements of this permit, using an NOI form provided by EPD. The NOI must be submitted at least thirty (30) days prior to the expiration date of this permit to remain covered under the continued permit.

6.3.2 If this permit is not reissued or replaced prior to the expiration date, it may be administratively continued in accordance with the Administrative Procedures Act and remain in force and effect. Any permittee who was granted permit coverage prior to the expiration date will automatically remain covered by the continued permit until one of the following occurs:

- Reissuance or replacement of this permit, at which time the permittee must comply with the NOI conditions of the new permit to maintain authorization to discharge; or
- Issuance of an Individual permit for the permittee’s discharge; or
- A formal permit decision by the Director not to reissue this general permit. At that time, the permittee must seek coverage under an alternative permit or an individual permit.

6.4 Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

6.5 Proper Operation and Maintenance

The permittee shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), owned or operated by the permittee to achieve compliance with the terms and conditions of this permit and with the requirements of the SWMP. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of adequate backup or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

6.6 Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for permit modification, revocation reissuance, or termination, a notification of planned changes or anticipated noncompliance does not negate any permit condition.

6.7 Property Rights

The issuance of this permit does not convey any property rights of either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property, any invasion of personal rights, or any infringement of Federal, State, or local laws and regulations.

6.8 Duty to Provide Information

The permittee shall provide to EPD, within a reasonable time frame, any information which the Director may request to determine compliance with this permit. The permittee shall also provide EPD with any requested copies of records required by this permit.

6.9 Inspection and Entry

The permittee shall allow the Director, the Regional Administrator of USEPA, or their authorized representatives, agents, or employees, after presentation of credentials to:

- Enter the permittee’s premises where a regulated facility or activity is located or conducted, or where records are kept under the terms and conditions of this permit;
- Have access to and copy, at reasonable times, any records required under the terms and conditions of this permit;
- Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

6.10 Signatory Requirements

All information submitted to EPD, or that this permit requires the permittee to maintain, shall be signed by either a principal executive officer or ranking elected official, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

- The authorization is made in writing by the official person described above and submitted to EPD.
- The authorization specifies either an individual or a position having responsibility for the overall operation of the SWMP such as the position of manager, operator, superintendent, or position of equivalent responsibility.

- If an authorization is no longer accurate because of a different individual or position having been authorized, then a new authorization must be submitted to EPD prior to or together with any report, information, or application signed by the authorized representative.

- Any person signing documents under this section shall make the following certification:

  "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

6.11 Other Information
If the permittee becomes aware of a failure to submit any relevant facts or of submission of incorrect information in the NOI, Annual Report, or any report to EPD, the permittee shall promptly submit the relevant facts or information.

6.12 Availability of Reports
Except for data determined by EPD to be confidential under Section 16 of the State Act or by the Regional Administrator of the USEPA under 40 CFR Part 2, all reports prepared according to the terms of this permit shall be available for public inspection at an office of EPD under the Georgia Open Records Act. All monitoring data, permit applications, permittees' names and addresses, and permits shall not be considered confidential.

6.13 Severability
The provisions of this permit are severable. If any permit provision or the application of any permit provision to any circumstance is held invalid, the provision does not affect other circumstances or the remainder of this permit.

6.14 Contested Hearings
Any person who is aggrieved or adversely affected by any action of the Director shall petition the Director for a hearing within thirty (30) days of notice of this action.

6.15 Civil and Criminal Liability

The permittee is liable for civil and criminal penalties for noncompliance with this permit and must comply with applicable State and Federal laws. The permit cannot be interpreted to relieve the permittee of this liability even if it has not been modified to incorporate new requirements.

6.16 Transfer of Ownership

This permit is not transferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

6.17 Previous Permits

The previous iteration of NPDES Permit No. GAG610000 is hereby revoked by the issuance of this permit.

<u>Appendix A</u>

Definitions

Annual Report means the document submitted by the permittee on an annual basis summarizing the SWMP activities conducted during the previous reporting period.

Best Management Practice or **BMP** means both structural devices to store or treat storm water runoff and non-structural programs or practices which are designed to prevent or reduce the pollution of the waters of the State of Georgia.

Construction Activity means the disturbance of soils associated with clearing, grading, excavating, filling of land, or other similar activities which may result in soil erosion.

Construction General Permits or **CGPs** means the Georgia NPDES Permit for Stormwater Discharges Associated with Construction Activity Nos. GAR100001, GAR100002, and GAR100003, which identify the Manual for Erosion and Sediment Control in Georgia (Green Book) and stream buffer requirements.

Control Measure means any BMP or other method used to prevent or reduce the discharge of pollutants to the waters of the State of Georgia.

Clean Water Act or **CWA** means the Federal Clean Water Act (formerly known as the Federal Water Pollution Control Act or the Federal Water Pollution Control Act Amendments of 1972), as amended.

Director means the Director of the Environmental Protection Division of the Department of Natural Resources, State of Georgia.

Discharge means the discharge of a pollutant.

Discharge-related Activities includes activities which cause, contribute to, or result in storm water point source pollutant discharge; and measures to control storm water discharges, including the siting, construction and operation of BMPs to control, reduce or prevent storm water pollution.

EPA or **USEPA** means the United States Environmental Protection Agency.

EPD means the Environmental Protection Division of the Department of Natural Resources, State of Georgia.

Existing Permittee means a Phase II municipal separate storm sewer system designated by EPD for coverage under this permit prior to the issuance date of this permit.

Illicit Connection means any man-made conveyance connecting a non-stormwater discharge directly to a municipal separate storm sewer system.

Illicit Discharge means any discharge to a municipal separate storm sewer system that is not composed entirely of storm water except discharges pursuant to a NPDES permit and discharges resulting from fire fighting activities.

Maximum Extent Practicable or **MEP** means the technology-based discharge standards and controls necessary for the reduction of pollutants discharged from a municipal separate storm sewer system. These standards and controls may consist of a combination of BMPs, control techniques, system design and engineering methods, and such other provisions for the reduction of pollutants as described in the Storm Water Management Program.

Municipal Separate Storm Sewer System or **MS4** means a conveyance or system of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels or storm drains, owned or operated by a municipality or other public body, designed or used for collecting or conveying storm water runoff and is not a combined sewer or part of a Publicly Owned Treatment Works.

National Pollutant Discharge Elimination System or **NPDES** means the program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits and imposing and enforcing pretreatment requirements under Sections 307, 402, 318, and 405 of the Clean Water Act.

New Development means land disturbing activities, structural development (construction, installation or expansion of a building or other structure), and/or creation of impervious surfaces on a previously undeveloped site.

New Permittee means a Phase II MS4 designated by EPD for coverage under this permit based on the 2010 or subsequent decennial U.S. Census, or based on other State designation criteria.

Notice of Intent or **NOI** means the mechanism used to register for coverage under this general permit.

Outfall means the most downstream point (i.e. final discharge point) on an MS4 where it discharges to waters of the State.

Owner or **Operator** means the owner or operator of any MS4 or any activity subject to regulation under the NPDES program.

Permitted Area means the area of a City or County that is covered by this General NPDES Stormwater Permit. For a City, it refers to the entire City limits; for a County, it refers only to that part of the County contained within an "Urbanized Area" as defined by the latest Decennial Census by the Bureau of the Census.

Point Source means any discernible, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged into the waters of the State of Georgia. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal and agricultural waste discharged into water.

POTW means Publicly Owned Treatment Works.

Redevelopment means the structural development (construction, installation or expansion of a building or other structure), creation or addition of impervious surfaces, replacement of impervious surface not part of routine maintenance, and land disturbing activities associated with structural or impervious development. Redevelopment does not include such activities as exterior remodeling.

Small MS4 (defined in 40 CFR Part 122.26(b)(16)) means all separate storm sewers that are owned or operated by the United States, the State of Georgia, city, town, borough, county, parish, district, association, or other public body (either created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity or a designated and approved management agency under Section 208 of the CWA that discharges to the waters of the State of Georgia but is not defined as a "large" or "medium" MS4. This term includes systems similar to municipal MS4s, such as systems at military bases, large hospitals, universities, prison complexes, and highways and other thoroughfares. This definition does not include separate storm sewers in very discrete areas, such as individual buildings.

State Act means the Georgia Water Quality Control Act, as amended.

State Rules or **Rules** means the Georgia Rules and Regulations for Water Quality Control.

Storm Water means storm water runoff, snow melt runoff, and surface runoff and drainage.

SWMP or **Program** means the storm water management program required to be developed and implemented under the terms and conditions of this permit and refers to a comprehensive program to manage the quality of storm water discharged from a MS4.

Waters of the State means any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells, wetlands, and all other bodies of surface or subsurface water, natural or artificial, lying within or forming a part of the boundaries of the State which are not entirely confined and retained completely upon the property of a single individual, partnership, or corporation.

Appendix B

Phase II MS4s by Population

Phase II MS4s with a population greater than 10,000

Counties

Athens-Clarke
Barrow
Bartow
Catoosa
Cherokee
Columbia
Coweta
Dougherty
Douglas
Fayette
Floyd
Glynn
Hall
Henry
Houston
Jones
Lee
Liberty
Long
Lowndes
Newton
Oconee
Paulding
Peach
Rockdale
Spalding
Walker
Walton
Whitfield

Cities

Albany (Dougherty Co.)
Brunswick (Glynn Co.)
Canton (Cherokee Co.)
Conyers (Rockdale Co.)
Cordele (Crisp Co.)
Covington (Newton Co.)
Dallas (Paulding Co.)
Dalton (Whitfield Co.)
Douglasville (Douglas Co.)
Dunwoody (DeKalb Co.)
Fayetteville (Fayette Co.)
Gainesville (Hall Co.)
Griffin (Spalding Co.)
Grovetown (Columbia Co.)
Hinesville (Liberty Co.)
Johns Creek (Fulton Co.)
Loganville (Walton Co.)
McDonough (Henry Co.)
Milton (Fulton Co.)
Newnan (Coweta Co.)
Peachtree City (Fayette Co.)
Rome (Floyd Co.)
Sandy Springs (Fulton Co.)
Stockbridge (Henry Co.)
Valdosta (Lowndes Co.)
Warner Robins (Houston Co.)
Woodstock (Cherokee Co.)

Phase II MS4s with a population less than 10,000

Cities

Allenhurst (Liberty Co.)
Auburn (Barrow Co.)
Bogart (Oconee Co.)
Byron (Peach Co.)
Centerville (Houston Co.)
Chickamauga (Walker Co.)
Cumming (Forsyth Co.)
Emerson (Bartow Co.)
Flemington (Liberty Co.)
Flowery Branch (Hall Co.)
Fort Oglethorpe (Catoosa Co.)
Hampton (Henry Co.)
Hephzibah (Richmond Co.)
Hiram (Paulding Co.)
Holly Springs (Cherokee Co.)
Leesburg (Lee Co.)
Lookout Mountain (Walker Co.)
Mountain Park (Fulton Co.)
Oakwood (Hall Co.)
Oxford (Newton Co.)
Payne City (Bibb Co.)
Porterdale (Newton Co.)
Remerton (Lowndes Co.)
Ringgold (Catoosa Co.)
Rossville (Walker Co.)
Tunnel Hill (Whitfield Co.)
Tyrone (Fayette Co.)
Varnell (Whitfield Co.)
Walthourville (Liberty Co.)
Watkinsville (Oconee Co.)
Winterville (Clarke Co.)

STATE OF GEORGIA DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

Storm Water Management Program (SWMP)
General NPDES Permit No. GAG610000 for
Small Municipal Separate Storm Sewer Systems (MS4)

1. General Information

A. Name of small MS4: City of Brookhaven, Georgia

B. Name of responsible official: Mayor J Max Davis
Title: Mayor
Mailing Address: 4362 Peachtree Road
City: Atlanta State: GA Zip Code: 30319
Telephone Number: (404)637-0500

C. Designated stormwater management program contact:
Name: L. Carl Carver, PE
Title: Stormwater Utility Manager
Mailing Address: 4362 Peachtree Road
City: Atlanta State: GA Zip Code: 30319
Telephone Number: (404)637-0500
Email Address: carl.carver@brookhavenga.gov

2. Sharing Responsibility

A. Has another entity agreed to implement a control measure on your behalf?
Yes_______ No X (If no, skip to Part 3)

Control Measure or BMP:

1. Name of entity N/A

2. Control measure or component of control measure to be implemented by entity on your behalf:

B. Attach an additional page if necessary to list additional shared responsibilities. **It is mandatory that you submit a copy of a written agreement between your MS4 and the other entity demonstrating written acceptance of responsibility.**

3. **Minimum Control Measures and Appendices**

Appendix A. Public Education and Outreach*
Appendix B. Public Involvement/Participation*
Appendix C. Illicit Discharge Detection and Elimination
Appendix D. Construction Site Stormwater Runoff Control
Appendix E. Post-Construction Stormwater Management in New Development and Redevelopment
Appendix F. Pollution Prevention/Good Housekeeping
Appendix G. Section 10 – Enforcement Response Plan
Appendix H. Section 11 – Impaired Waters

* A minimum of two BMPs per minimum control measure is required.

4. **Certification Statement**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed Name: Marie L. Garrett Date: 3/24/14

Signature: [signature] Title: City Manager

Appendix A

Storm Water Management Program

Public Education and Outreach on Storm Water Impacts

40 CFR Part 122.34(b)(1) Requirement: The permittee must implement a public education program to distribute educational materials to the community and/or conduct equivalent outreach activities about the impacts of storm water discharges on water bodies and the steps that the public can take to reduce pollutants in storm water runoff.

See Table 4.2.1(b) of the Permit

A. Best Management Practice (BMP) A-1: Distribute Pamphlets

1. Target audience: __Citizens and General Public____________________

2. Description of BMP: _To inform individuals and households about ways to reduce stormwater pollution. Distribute pamphlets concerning stormwater pollution and prevention_______________________________________

3. Measurable goal(s): _250 Pamphlets per year______________________

4. Documentation to be submitted with each Annual Report: ____________
____

5. Schedule:
   a. Interim milestone dates (if applicable): Obtaining & Printing 2014

   b. Implementation date (if applicable): _2014___________

   c. Frequency of actions (if applicable): _Yearly___________

   d. Month/Year of each action (if applicable):_By December____

6. Person (position) responsible for overall management and implementation of the BMP: __Public Works, Community Development, Community Relations,____

7. Rationale for choosing BMP and setting measurable goal(s): _Educate the citizens about importance of stormwater pollution prevention and what they can do to help____

8. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: _The distribution of the pamphlets would reflect the increase in awareness of the community.____

B. BMP A-2: City StormWater Website

1. Target audience: _General citizens and employers within the City of Brookhaven

2. Description of BMP: __Use the media sources such as newspapers, website and brochures to inform citizens about stormwater po9llution and preventions and other issues concerning stormwater

3. Measurable goal(s): _Two articles per year

4. Documentation to be submitted with each Annual Report: Copies of Articles

5. Schedule:

   a. Interim milestone dates (if applicable): _Develop Progran 2014_

   b. Implementation date (if applicable): _Fall 2014

   c. Frequency of actions (if applicable): _Annually

   d. Month/Year of each action (if applicable):_By December

6. Person (position) responsible for overall management and implementation of the BMP: __Public Works,

7. Rationale for choosing BMP and setting measurable goal(s): _To inform the citizens and employers about stormwater runoff and pollution

8. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: _The involvement of the community in the stormwater program will reflect the effectiveness of the BMP

Note: At a minimum, the MS4 must include a BMP in the SWMP for each BMP listed in the NPDES Permit. For those minimum control measures (MCM) without specific BMPs listed in the Permit, the MS4 should implement at least 2 BMPs for each MCM. If additional BMPs are chosen, then you should attach an additional sheet for each BMP.

Public Works – Stormwater Division

The Brookhaven Stormwater Division is housed under the Public Works Department. This team is responsible for providing and maintaining a stormwater collection and disposal system for runoff precipitation. These structures are designed to carry runoff away from developed areas to prevent flooding. Please refer to the links below for additional information.

For questions related to stormwater drainage, please contact:

Gregory Anderson
Phone: 404-637-0528
Email: gregory.anderson@brookhavenga.gov

Ongoing Projects and Initiatives:

The Stormwater Division has several ongoing projects and initiatives:

- **Stormwater Infrastructure Inventory.** An inventory of the city's network of stormwater pipes is being collected along with information about their condition. This valuable information will assist the city in prioritizing pipeline rehabilitation and maintenance projects. This project supports compliance with the city's state and federal permits.

- **Nancy Creek Watershed Improvement Plan.** The city is completing a plan that identifies a list of 43 recommended projects to improve water quality in the Nancy Creek watershed. Approximately 60 percent of the city is located in the Nancy Creek watershed and the watershed includes city-owned Murphey Candler Park and Blackburn parks. The Draft Watershed Improvement Plan is available for review and download.

- **Osborne Road Flood Study.** The city has completed a study of the Osborne Road area that recommends projects to mitigate flooding in response to community concerns.

Stormwater Fees:

The stormwater utility fee is billed with the annual property tax bill to Brookhaven residents. DeKalb County collects and forwards the receipts (less an administration fee) in the last quarter of every year.

The fees were adopted by resolution, and the rates as adopted are $5 per month per equivalent residential unit (ERU) or $60 per year per ERU. A single family parcel is considered to be 1 ERU. For multi-family and condominium, each unit is considered to be 0.5 ERU. For non-residential, 3000 sf of impervious area is equal to 1 ERU.

Stormwater Links:

- Fats, Oils, and Grease program -http://dekalbwatershed.com/FOG.html
- Septic Tank Information – http://www.dekalbhealth.net/envhealth/septic-systems/
- Toilet Retrofit Rebate Program - http://dekalbwatershed.com/toilet_rebate.htm
- Brookhaven Stormwater Extent of Service Policy
- Brookhaven Stormwater Extent of Service Policy - One Pager

Other Links:

- Clean Water Campaign – http://www.cleanwatercampaign.com/
- Metropolitan North Georgia Water Planning District – www.northgeorgiawater.com
- Chattahoochee River Keeper – www.chattahoochee.org
- Georgia Stormwater Manual – www.georgiastormwater.com
- Conserve Water Georgia – www.conservewatergeorgia.net
- Georgia Environmental Protection Division – www.gaepd.org
- Georgia Department of Natural Resources – www.gadnr.org
- Rivers Alive – http://aesl.ces.uga.edu/aascd/riversalive/
- FEMA Floodplain Maps – https://msc.fema.gov/
- Georgia Water Wise Council – GA WaterWise Council (GWWC)
- DeKalb County Board of Health Mosquito Control - http://www.dekalbhealth.net/envhealth/west-nile-virus/

Appendix B

Public Involvement/Participation

40 CFR Part 122.34(b)(2) Requirement: The permittee must, at a minimum, comply with State and local public notice requirements when implementing a public involvement/ participation program.

See Table 4.2.2 (b) of the Permit

A. Best Management Practice (BMP) B-1: Storm Drain Marker Program

1. Target audience/stakeholder group: _General Public_________________

2. Description of BMP: __Install storm drain markers on existing structures within the City of Brookhaven_______________________________________

3. Measurable goal(s): __Install 100 markers per year___________________

4. Documentation to be submitted with each Annual Report:______________
____
____

5. Schedule:
   a. Interim milestone dates (if applicable): ______________________ _Purchase Markers 2014_

   b. Implementation date (if applicable): _2015_________________

   c. Frequency of actions (if applicable): _Annually_____________

   d. Month/Year of each action (if applicable):_By December_______

6. Person (position) responsible for overall management and implementation of the BMP: _Public Works, Community Development, Community Relations,____

7. Rationale for choosing BMP and setting measurable goal(s): To inform the citizens about the effects of dumping pollutants into storm drain structures

8. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: _The involvement of the Community in the stormwater program will reflect the effectiveness of the BMP____
____

City of Brookhaven, Georgia
BMP B-1
Storm-Drain Marker Program

1.0 Introduction

One of the primary sources of pollution in our streams is non-point pollution, which is the pollution coming from many undefined locations and often in small quantities. Most people do not realize that their daily activities, such as blowing leaves into the street, lead to the pollution of our streams. The public also may not know that when it rains, pollution spilled or placed on the ground is washed into the drains along our roads and in our parking lots, and these drains are directly connected to our streams by pipes. It is important to educate the public about how they can help prevent pollution and also to involve them in stormwater pollution education.

2.0 Program Description

The intent of the program is to involve residents in helping the City while also educating other residents and business owners about Stormwater pollution. Through a comprehensive communications campaign, we will be asking residents to contact the City to obtain markers that they attach to catch basins that say, "No dumping, Drains to stream." The volunteers will receive a map showing the location of catch basins in the area they wish to work in and pamphlets to distribute in the neighborhood/area.

3.0 Procedure

The City will purchase stormdrain markers that can be attached to catch basins. By contacting the City, residents will be able to receive the markers, instructions on how to attach the markers to catch basins and a map of showing the location of unmarked catch basins in the area in which they wish to work.

The volunteers will be asked to return unused markers and the map showing which catch basins they marked. The returned map will be used to update an overall map of the City showing which catch basins have been marked in the City.

A press release announcing the program will go out prior to the campaign. The program will be advertised on the City Web page and residents will be able to request participation in the program by e-mail, by phone and online. The updated map will also be posted to the City's Web site periodically.

The City will work with volunteer organizations such as the Boy Scouts, private schools, and Brookhaven Rivers Alive to solicit volunteers. These groups will be contacted by phone by the Public Works Department.

B. **BMP B-2: Streamside Clean-up Program**

1. Target audience/stakeholder group: __Citizens, Home Owner Associations and Employers

2. Description of BMP: _Use Volunteers to help cleanup identified streams__

3. Measurable goal(s): _One streamside clean-up event per year_________

4. Documentation to be submitted with each Annual Report: Approximate quantities and weights of debris

5. Schedule:

   a. Interim milestone dates (if applicable): ________________

   b. Implementation date (if applicable): _Fall 2015________

   c. Frequency of actions (if applicable): _Annually________

   d. Month/Year of each action (if applicable): By December ___

6. Person (position) responsible for overall management and implementation of the BMP: _Public Works, Communities Relations__________________

7. Rationale for choosing BMP and setting measurable goal(s): _To clean up the streams and educate the citizens on the importance and help them take ownership and be more responsible__

8. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: _The involvement of the community in the stormwater program will reflect the effectiveness of the BMP

Note: At a minimum, the MS4 must include a BMP in the SWMP for each BMP listed in the NPDES Permit. For those MCMs without specific BMPs listed in the Permit, the MS4 should implement at least 2 BMPs for each MCM. If additional BMPs are chosen, then you should attach an additional sheet for each BMP.

City of Brookhaven, Georgia
BMP B-2
Streamside Cleanup Program

1.0 Introduction

Urban streams are often unnoticed and unappreciated as a natural resource. The object of having a streamside cleanup program is to facilitate public participation in stormwater decisions and planning while making the public aware of this natural resource and improving the health of our streams. Once streams are more visible to the public, the condition of the streams will become important and people will begin to behave in a manner that will improve the health of our streams.

2.0 Program Description

The City will work with volunteer organizations such as the Boy Scouts, private schools, local churches, civic associations and home owner association to select and clean up a streamside segment every year.

3.0 Procedure

Local volunteer organizations will be contacted to determine who is interested in participating in a streamside cleanup. Once the organizations are determined, the group will select a date and a stream segment to be cleaned. A stream segment that has a safe entrance and exit with convenient parking at one end should be selected. Transportation will be arranged from the parking area to the other end.

Material removed from the streamside will be bagged. The material will be taken to a landfill and the gross weight of the material will be estimated.

The event should be publicized on the City web page and in the newspaper.

Appendix C

Illicit Discharge Detection and Elimination

40 CFR Part 122.34(b)(3) Requirement: The permittee must develop, implement and enforce a program to detect and eliminate illicit discharges into your small MS4. You must:

A) Develop, if not already completed, a storm sewer system map, showing the location of all outfalls and the names and location of all waters of the State that receive discharges from those outfalls;

B) Effectively prohibit, through ordinance, or other regulatory mechanism, non-storm water discharges into your storm sewer system and implement appropriate enforcement procedures and actions;

C) Develop and implement a plan to detect and address non-storm water discharges, including illegal dumping, to your system; and

D) Inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste.

See Table 4.2.3 (b) of the Permit

- Legal Authority
- Outfall Map and Inventory
- IDDE Plan
- Education
- Complaint Response

A. Best Management Practice (BMP) C-1: Legal Authority

1. Description of BMP: Legal Authority- Code of Ordinances Chapter 22.5, Article 1, 3, 8- ILLICIT DISCHARGE AND ILLEGAL CONNECTION.

2. Measurable goal(s): Review annually

3. Documentation to be submitted with each Annual Report: Updated ordinance as necessary

4. Schedule:

   a. Interim milestone dates (if applicable): Review 2014

   b. Implementation date (if applicable): Annually

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works – Stormwater Utility Manager

6. Rationale for choosing BMP and setting measurable goal(s): To identify illicit connections and discharges into the storm sewer system.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Effectiveness will be based on the City's ability to remove an illegal connection or illicit discharge from the MS4.

B. BMP C-2: Outfall Map and Inventory

1. Description of BMP: Develop a City of Brookhaven outfall Map and Inventory showing the location of all known outfalls and the names and locations of all Waters of the State

2. Measurable goal(s): Update map with new and inspected outfalls

3. Documentation to be submitted with each Annual Report: Update map

4. Schedule:

   a. Interim milestone dates (if applicable): Develop Map 2014

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Stormwater Utility Manager

6. Rationale for choosing BMP and setting measurable goal(s): The outfall Map and Inventory will allow the City to better determine potential pollution sources/areas. The number of added or removed outfalls will be reported annually along with the total.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Identification of a pollution source through use of the map and inventory will be a measure of the BMP's effectiveness. Absence of illegal connections or illicit discharges will also reflect overall effectiveness.

Assessment Area	Number of Outfalls	Acres
1	309	1,915
2	336	1,337
3	347	1,390
4	232	1,159
5	333	1,398

Brookhaven GEORGIA

Incorporated 17 December 2012

Stormwater System *Outfalls*

N W E S

Legend

- MARTA Station
- Expressway
- Major Road
- Rail
- PDK Airport
- Creek or Stream
- Lake or Pond
- Tax Parcel
- City Limits

Head Wall (Number of Structures)

- Public (976)
- Park (28)
- Private (443)
- State (14)
- Unknown (10)

Plain Pipe End

- Public (428)
- Park (9)
- Private (289)
- State (3)
- Unknown (5)

Flume

- Public (120)
- Private (238)
- State (1)
- Unknown (4)

Spillway

- Private (4)

Outfall Assessment Area

- Area 1 - 309 Outfalls - 1,915ac
- Area 2 - 336 Outfalls - 1,337ac
- Area 3 - 347 Outfalls - 1,390ac
- Area 4 - 232 Outfalls - 1,159ac
- Area 5 - 333 Outfalls - 1,398ac

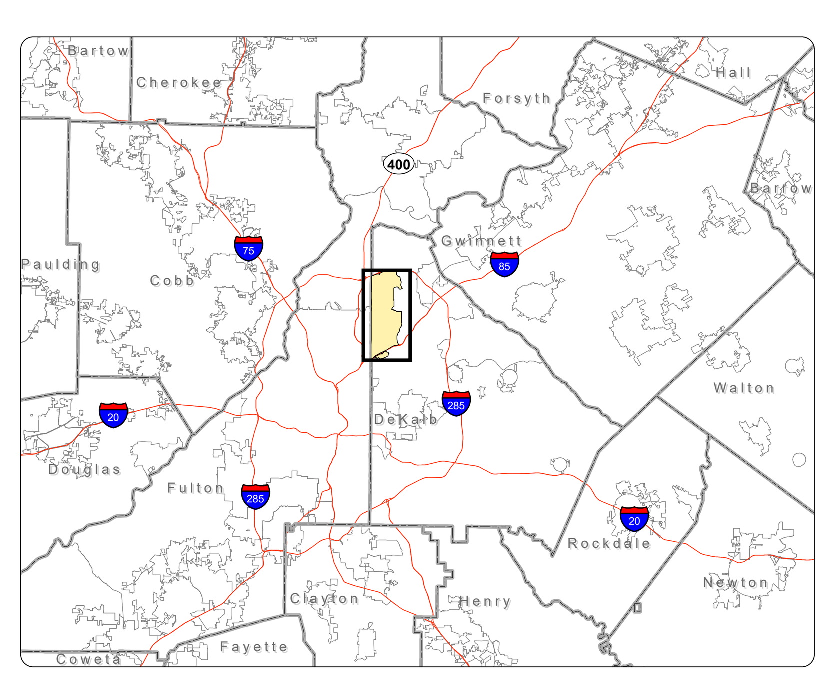
0 0.25 0.5 1
Miles

1 inch = 875 feet

Map Sheet size 30" x 42"

Prepared by the
City of Brookhaven IT/GIS Department
May 12, 2017

This map has been compiled from the most accurate source data from City of Brookhaven and/or other agencies. However, this map is for informational purposes only and is not to be interpreted as a legal document. The City assumes no legal responsibility for the information shown on this map. For inquiries please contact the City of Brookhaven.



H:\GIS\PublicWorks\Projects\2014\GregA_MS4_RFP

C. BMP C-3: IDDE Plan

1. Description of BMP: Develop City plan for dry weather screening of outfalls, investigation of suspected illicit discharges and elimination of identified illicit discharges.

2. Measurable goal(s): Perform dry weather screening of a minimum of 20% of the mapped outfall per year.

3. Documentation to be submitted with each Annual Report: List of inspected outfalls and updated map

4. Schedule:

   a. Interim milestone dates (if applicable): Develop 2014

   b. Implementation date (if applicable): Annually

   c. Frequency of actions (if applicable): By December

   d. Month/Year of each action (if applicable): Dec / yearly

5. Person (position) responsible for overall management and implementation of the BMP: Public works-Stormwater Manager

6. Rationale for choosing BMP and setting measurable goal(s): Dry weather screenings are useful in identifying illicity discharges.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Location and elimination of illegal connections will reflect effectiveness of BMP. Furthermore, documentation of systems with no illegal connections will also reflect effectiveness.

City of Brookhaven, Georgia

BMP C-3: IDDE Plans

Dry Weather Screening Procedure

1.0 Introduction

Illicit discharges are unpermitted non-stormwater flows to the stormwater drainage system that contain pollutants or pathogens. Illicit discharges can be direct discharges or dumping to the stormwater system, or can occur through upstream activities that eventually flow to storm drain or drainage channel. Illegal connections are physical connections such as pipes that allow illicit discharges to the stormwater system on an ongoing basis.

Screening of stormwater outfalls during dry weather is an important tool for investigating potential non-stormwater entries to the storm drainage system. Subsequent identification and elimination of illicit discharges and illegal connections can result in substantial improvements to local water quality.

2.0 Program Description

Dry weather screening is performed on prioritized stormwater outfalls which are selected based on the potential for illicit discharges. The City is committed to monitor 20% of the inventoried outfalls each year. The City will initially screen 20% outfalls in 2014, 20% outfalls in 2015, 20% outfalls in 2016, and 20 outfalls in 2017.
Screening of stormwater outfalls for illicit discharges is performed during periods of dry weather, which is defined as rainfall of less than 0.1 inch per day for at least 72 hours. This criterion avoids the screening of flows that may have resulted from wet weather (stormwater) events.

Each outfall is to be inspected for flow. When a dry weather flow is observed at an outfall, the following are to be performed on the flow:

1. **Field observations and measurements** – Site descriptions and qualitative observations of physical conditions of the outfall and flow, as well as measurement of several in-situ water quality parameters.
2. **Water Quality Sampling** – Collection of water quality samples for field analysis or laboratory analysis when indicated by the field observations and measurements.

In dry weather outfall screening, the field team is looking for indicators that point to or confirm an illicit discharge or illegal connection. Section 3.5 and 3.6 provide guidance on potential sources of pollution based upon the findings of the screening.

The discovery of an illicit discharge will warrant a more detailed pollutant source identification investigation.

An outfall is the point where a municipal separate storm sewer system discharges to waters of the State. The City will identify the outfall that is the lowest downstream point in a storm sewer system to monitor (the final outfall). The City may not maintain the storm sewer system continuously upstream from the point that is monitored, but the lowest point in the system is the best location to identify illicit connections and illegal discharges which is the objective of this procedure.

3.0 Procedure

3.1 Outfall Screening Locations

The City of Brookhaven is in the process of identifying outfalls. In the interim, the city will utilize information collected in the process of cleaning our system. We have currently identified 1,500 catch basins in the right of way and are in the process of cleaning these catch basins. Information on whether flow is found or if an illicit discharge is suspected will be used to prioritize outfall screening.

The City of Brookhaven will select screening locations based on the potential for illicit discharges. The following guidelines are used to prioritize stormwater outfalls within a jurisdiction for dry weather screening of potential illicit connections:

- Utilize an up-to-date inventory of the city or county separate storm sewer system outfalls;
- Review records of previously screened outfalls to identify any subset of outfalls that have previously, and consistently, had illicit dry weather flows;
- Identify any new outfalls, or outfalls not previously screened, or outfalls identified by citizen complaints;
- Identify outfalls that drain into 303(d) listed waters, or have significant industrial land use, or discharge to streams with water quality concerns without obvious point sources;
- Rank previously screened outfalls by quarter since last screening; and
- Prioritize the set of outfalls for quarterly screening by adding the number of problem outfalls to the number of previously unscreened outfalls.

In order to provide a comprehensive screening of outfalls within the city, sites will be rotated on an annual basis.

3.2 Outfall Screening Preparation

3.2.1 Preliminary Mapping and Land Use Evaluation

To assist in outfall screening, preliminary mapping and land use evaluation will be completed following the prioritization and identification of target outfalls or drainage areas. Mapping information includes:

- Outfall locations;
- Outfall drainage areas;
- Commercial and industrial activities in each drainage area; and
- Locations of septic tanks in each drainage area.

Field maps are prepared to guide the screening team when appropriate. These maps, at a minimum, should have labeled streets and hydrologic features so field teams can orient themselves.

3.2.2 Field Sampling and Analysis Equipment

Table 1 lists the recommended equipment for dry weather outfall screening. Before undertaking field work, the field team should ensure that all of the necessary equipment is present and in order. Both the pH meter and the conductivity meter should be calibrated. In addition, field test kits should be inspected to ensure that they have sufficient reagents and test strips/discs.

TABLE 1

List of Equipment and Supplies for Dry Weather Outfall Screening

Field Equipment	Function
Field maps (with outfall locations, drainage areas, and street information)	Locating outfalls for screening
Field measurement equipment (temperature, pH, conductivity meters)	Measuring field temperature, pH and specific conductivity of dry weather flows
Field test kits	Measuring fluoride, surfactants and fecal coliform
Sample bottles with labels	For collection of grab samples
Sealed, sterile sample bottles with labels	For collection of bacteria grab samples
Grab water sampler (dipper on long pole)	For outfalls/flows that are difficult to reach
Waders and walking stick	For reaching outfalls near a stream or water body
Hand-operated vacuum pump sampler	For shallow dry weather flows
Clear tape and applicator	To apply over label
Coolers	For transport of grab samples
Ice / ice packs	To keep samples preserved after collection and during transport from the site
Clipboard or notebook with data collection forms and COC forms / Pens	To document field data and activities
List of outfalls, directions, protocols, and Health and Safety Plan	For reference in the field
Field logbook	To record notes
Permanent marker (extra fine)	Label sample bottles

Cell phone	Communication in the field
Handheld GPS receiver (if applicable)	Determining outfall locations
Digital camera	To document dry weather flow and/or conditions
Flashlight	Recording visual conditions
First Aid Kit	Health and Safety Plan
Disposable gloves, safety shoes, and safety glasses	Health and Safety Plan

3.2.3 Weather Considerations

Prior to any screening field work, check local rain gages to ensure that the conditions are appropriate for dry weather outfall screening. Dry weather is defined as rainfall of less than 0.1 inch per day for at least 72 hours.

3.3 Outfall Screening Procedures

Figure 1 is an example Dry Weather Outfall Screening Form which is used to record the observations and analytical results of the dry weather screening procedures. Figure 2 is an example Data Tracking Form to record Outfall Screenings.

3.3.1 Field Observations and Measurements

Outfall screening is initiated by driving or walking to the outfall location. When an outfall is reached, it should be physically marked or labeled, and the coordinates logged using the GPS receiver (if applicable).

Basic descriptive information is recorded at the top part of the Dry Weather Outfall Screening Form:

- Outfall location
- Outfall ID number
- Outfall type, material and size
- Receiving stream and/or watershed name
- Date and time of screening
- Weather observations
- Staff person(s) undertaking the screening

Digital photographs are taken of the outfall and photo numbers recorded on the screening form.

Physical observations of the site are recorded on the screening form under *Field Observations and Measurements*. If no flow is observed during the outfall screening, the "Flow from outfall?" field should be checked "No" and the screening is complete. This result will be counted towards the total number of outfalls screened.

If flow is observed, then "Yes" should be checked and the following physical indicators recorded. Each of these observations associated with flowing outfalls may predict the presence of an illicit discharge or illegal connection:

- **Odor** – Description of any odors that emanate from the outfall and an associated A severity score. Since noses have different sensitivities, the entire field team should reach consensus about whether an odor is present and how severe it is.

  A severity score of one means that it is faint or the team cannot agree on its presence or origin. A score of two indicates a moderate odor within the pipe.

  A score of three is assigned if the odor is so strong that the field team smells it a considerable distance away from the outfall.

- **Color** – The visual assessment of the discharge color. The intensity of color is ranked from one (slightly tinted) to three (clearly visible in the flow). The best way to measure color is to collect the discharge in a clear sample bottle and hold it up to the light. Field teams should also look for downstream plumes of color that appear to be associated with the outfall.

- **Turbidity** – The visual estimate of the turbidity of the discharge, which is a measure of the cloudiness or opaqueness of the water. Turbidity is ranked from one (slight cloudiness) to three (opaque). Like the color observation, turbidity is best observed using a clear sample bottle. The field team should also look for turbidity in the plunge pool below the outfall, and note any downstream turbidity plumes that appear to be associated with the outfall.

- **Floatables** – The presence of any floatable materials in the discharge or the plunge pool below. Sewage, oil sheen or film, and suds are all examples of floatable indicators. [Note that for dry weather screening, trash and debris are not considered indicators of an illicit discharge or illegal connection.]

Upon completing the physical observations, measure temperature, pH, and specific conductivity of the dry weather flow (either in-situ or using a sample bottle), and record the readings on the screening form.

3.3.2 Water Quality Sampling

Water quality sampling of a dry weather flow is performed to look for chemical indicators which may detect, characterize or confirm the presence of an illicit discharge or illegal connection. Water quality sampling is required for a dry weather flow that meets any of the following criteria:

- Visible sewage or sewage odor
- Physical indicator of potential illicit discharge (color, odor, turbidity or floatables)
- pH lower than 6.5 or higher than 7.5
- Specific conductivity greater than 300 μmho/cm

- Fluoride
- Surfactants (detergents)
- Fecal coliform – if conductivity reading is consistently greater than 300 µmho/cm, surfactants are present and a classic sewage order is present and detectable to the screener.

3.3.2.1 Field Sampling and Analysis

Field test kits with appropriate reagents, test strips/discs, and sampling equipment should be used. The test kits must have the ability to detect fluoride within the range 0 to 2.00 g/L and surfactants within the range 0 to 3.0 mg/L.

Follow the kit manufacturer's procedures for obtaining a test sample and completing the field analysis. Record the field analysis results on the screening form.

3.3.2.2 Grab Samples

Grab samples and subsequent laboratory analysis may be performed in lieu of field sampling for one or more of the water quality parameters. Grab samples should be analyzed using laboratory analysis methods according to Title 40 of the Code of Federal Regulations, Part 136 (40 CFR Part 136).

3.3.2.3 Grab Sample Collection

A manual grab sample for a dry weather flow is accomplished by inserting the sample container (either plastic or glass depending on the parameter) under or down current of a discharge with the container opening facing upstream. In many cases, the sample container itself can be used to collect the sample. Less accessible outfalls will require the use of poles and buckets to collect the grab sample. A pre-measured cut-off milk jug can be used to capture shallow flows from the outfall. To ensure that the manual grab samples are representative, the following procedures should be followed:

- Do not open sample bottle until sample is to be actually collected.
- Use gloves at all times when handling sampling bottles.
- Take the grab from the horizontal and vertical center of the outfall.
- Make sure not to disturb any sediments or benthic growth in the outfall.
- Transfer samples into proper container (e.g., from bucket to sample container). Fecal coliform grab samples must be collected directly into the sterile sample container.

All of the equipment and containers that come into contact with the sample should be cleaned in order to avoid contamination, and be non-reactive to prevent leaching of pollutants.

All of the equipment and containers that come into contact with the sample should be cleaned in order to avoid contamination, and be non-reactive to prevent leaching of pollutants.

3.3.2.4 Grab Sample Handling

The grab sample bottle type, preservation requirements, and holding time requirement for those parameters being tested are listed in Table 2. Proper preservation and maintenance of the holding times for each parameter is essential for the integrity of the sampling results. Note that fecal coliform samples have a **short holding time of six hours** and must be returned to the lab for analysis within this time or the results may be unrepresentative of the flow.

Modified Handling Requirements for Samples

Parameter	Container Type[1]	Sample Volume (g)	Sample Preservation	Maximum Holding Time
Fluoride	P,G	500ml	Cool, 4ºC	28 days
Surfactants (detergents)	P	500ml	Cool, 4ºC	48 hours
Fecal Coliform[2]	PP,G	100 ml	Cool, 4ºC	6 hours

[1] Polyethylene (P), Polypropylene (PP), Glass (G) – EPA-approved sample containers (40 CFR 136)
[2] In chlorinated waters, dechlorinate the sample with sodium thiosulfate by adding 1 ml of 10% $Na_2S_2O_3$ to the 100 ml sample

3.3.2.5 Grab Sample Identification and Labeling

A sample numbering system should be used to ensure that each sample is uniquely identified in the field and tracked on field data collection forms. The sample numbering should be as follows: ###-MMDDYY-HH:MM

Where:

- ### = A unique number for each sample location
- MMDDYY = Month, day, year
- HH:MM = Time in military units

All of the samples collected at the site should be placed in the appropriate sample containers for preservation and shipment to the designated laboratory. Each sample should be identified with a separate identification label. A waterproof, gummed label should be attached to each sampling container. Information to be recorded on the label should include:

- Site name;
- Sample number;
- Analysis to be performed;
- Date and time of collection;
- Preservation used and any other field preparation of the sample; and
- Initials of field crew collecting the sample.

3.3.2.6 Grab Sample Documentation

A chain-of-custody (COC) form should accompany all samples. See Figure 3 for a sample COC form. The COC form shall include all of the information provided on the sample label discussed in the preceding section.

The purpose of the COC form is to provide a mechanism for tracking each sample submitted for laboratory analysis. The information on the COC form must be identical to the information of the sample label. A COC form should be prepared by the sample collector for each set of samples submitted for laboratory analysis. The form should be placed in a re-sealable plastic bag (to keep the form dry) and sealed inside each sample cooler. When transferring possession of the samples, the individual relinquishing and receiving samples should sign, date, and note the time on the COC form. This record documents the transfer of custody from the sampler to another person, to/from a secure storage area, and to the laboratory. Copies of the COC forms should be kept for future reference.

3.3.2.7 Analytical Laboratory Coordination and Sample Delivery

The samples should be packed in coolers with ice (or ice packs) to ensure they maintain the required temperature of less than or equal to 4°C during transport to the designated laboratory. Contact the laboratory prior to sampling to assure that the samples will be analyzed within their holding time. Samples may be placed in individual one-gallon resealable bags as a precaution to avoid spilling the sample. All glass bottles should be individually bagged and bubble-wrapped to prevent breakage on the way to the lab. Samples may be placed in a large trash bag inside a cooler (to ensure against the sample leaking) with ice completely covering the samples.

3.4 Quality Assurance/Quality Control

This section describes the elements of the field quality assurance/quality control (QA/QC) program. The overall QA/QC objective for the monitoring program is to ensure that the data collected are of good quality.

3.4.1 Field QA/QC

Field quality control procedures include calibration procedures, field blanks and field duplicates. The field equipment should be calibrated appropriately prior to leaving for the sampling site to ensure proper performance of the equipment. This includes the pH meter, conductivity meter, and the thermometer. The pH meter should be calibrated using two buffers that bracket the expected pH range (typically 4 and 7). The conductivity meter is calibrated by rotating the probe below the surface in a standard Potassium Chloride solution in a circular motion. The readings must be within 10 percent to be acceptable. The thermometers used should be accurate to + 5°C.

Quality control blanks should be used in the field to determine potential sample contamination during sample collection, handling, shipment, storage, or laboratory handling and analysis. Reagent grade water should be used for the quality control blanks. A minimum of one field blank for surfactants (detergents) and fecal coliform is required each day with scheduled field screening. For fluoride, a field blank should be used with approximately 10 percent of samples (or as required by the lab).

Field duplicates should be collected on approximately 10 percent of the samples to assess the representativeness of sampling procedures in addition to the normal uncertainty associated with the analysis.

3.4.2 Laboratory QA/QC

The laboratories should follow Georgia EPD- approved methods and routinely perform quality control checks during laboratory analysis, including calibration standards, blanks, laboratory control samples, laboratory control duplicate samples, matrix spikes, and matrix spike duplicates. Spikes and duplicates should be performed on a minimum of 10 percent of the samples and should meet data quality objectives established by the client.

3.5 Evaluating Dry Weather Screening Results

3.5.1 Background

Dry weather screening of stormwater outfalls is an important tool used to evaluate non-stormwater flows in the storm drainage system. Effectively evaluating and interpreting dry weather screening results and data is the first step in identifying and tracing a potential illicit discharge or illegal connection.

3.5.2 Field Observations

Field observations of a dry weather flow include odor, color, turbidity and floatables. These parameters are qualitative indicators detected by visual inspection and smell, and require no measurement equipment. They are important in evaluating a dry weather flow for a potential illicit discharge, and may confirm the most severe or obvious discharges.

Table 3 lists the field observation parameters, along with potential sources for a number of observed conditions.

3.5.3 Field Measurements and Water Quality Sampling Results

Field measurements and water quality sampling provide additional information which may detect, characterize or confirm an illicit discharge or illegal connection. Temperature, pH and conductivity measurements are completed in-situ using probes or other equipment that is calibrated prior to field work. Water quality sampling for the presence of fluoride, surfactants and fecal coliform is performed either in-field using test kit equipment or by collecting grab samples for laboratory analysis.

Table 4 lists the various parameters included in the dry weather screening protocol along with benchmarks and guidance on evaluating results. *Figure 4* provides a flow chart which can be used to identify illicit discharges based upon findings.

3.5.4 Ranking the Potential for an Illicit Discharge

Based upon the screening results, all outfalls should be ranked for their potential for an illicit discharge:

- Those outfalls without flow or that appear to be from an uncontaminated source would be ranked "Unlikely or No Flow."
- Any flow that shows two or more suspect field observation or chemical indicator that falls outside of the range of normal stormwater or groundwater should be marked as "Possible" for an illicit discharge.
- The presence of one or more field observations with a rank of two or three, or chemical indicators far outside of the range of normal stormwater or groundwater should be ranked "Suspect."
- Any flow that is clearly an illicit discharge should be listing as "Obvious or Confirmed."

Physical Observations and Potential Sources

Parameter	Observations	Potential Source(s)
Odor	Sewage	Sanitary sewer; septic tank discharges
	Sulfur (rotten eggs)	Industrial discharge (sulfides and/or organics); sanitary sewer; septic tank discharges
	Oil / gasoline	Facilities associated with vehicle maintenance and operation; petroleum product manufacturing or storage; industrial discharge
	Rancid / sour	Food preparation facilities (restaurants, hotels, etc.)
Color	Orange / rust	Construction site or unstabilized soil (eroded soil and clay)
	White / milky	Sanitary sewer; septic tank discharges; residential or commercial washwater; concrete or stone operations; fertilizer
	Grey	Residential or commercial washwater; dairies
	Red	Meat packers
	Yellow	Industrial discharge
	Green	Industrial discharge; Facilities associated with vehicle maintenance and operation (antifreeze)
	Brown / black	Industrial discharge
Turbidity	Cloudy	Sanitary sewer; septic tank discharges; residential or commercial washwater; concrete or stone operations; fertilizer; industrial discharge
	Opaque	Food preparation facilities (restaurants, hotels, etc.); industrial discharge
	Silty / Muddy	Construction site or unstabilized soil (eroded soil and clay)
Floatables	Sewage	Sanitary sewer; septic tank discharges
	Petroleum (oil sheen)	Facilities associated with vehicle maintenance and operation; petroleum product manufacturing or storage; industrial discharge
	Suds	Sanitary sewer; septic tank discharges; residential or commercial

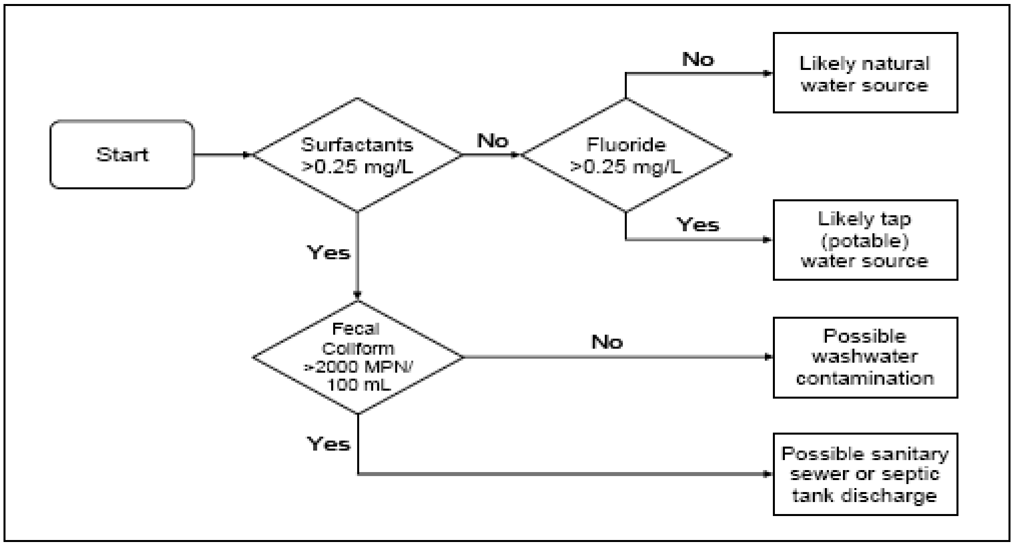
Table 4

Interpretation of Field Measurements and Water Quality Sampling Parameters

Parameter	Benchmarks	Evaluation
Temperature	Temperature should be near or below ambient conditions for groundwater or stormwater runoff.	Higher than ambient temperature may indicate stream condensate or industrial process water.
pH	The normal pH range for stormwater runoff is between 6 and 8, with 7 being neutral.	pH is a relatively good indicator of liquid wastes from industries, which can have very high or low pH values (ranging from 3 to 12). The pH of residential and commercial washwater tends to be in the range of 8 or 9.
Conductivity	Stormwater should have a low conductivity (under 300 µmho/cm).	Conductivity greater than 300 µmho/cm indicates a high dissolved solids content in the flow which may be from an illicit discharge or illegal connection
Fluoride	There should no traces of fluoride in the stormwater.	Presence of fluoride indicates the presence of potable (treated) water. Fluoride can often be used to separate treated potable water from untreated water sources, such as stormwater, groundwater or non-potable industrial waters.
Surfactants (detergents)	There should be no traces of surfactants (detergents) in the stormwater.	This parameter is associated with cleaning/washing operations and may indicate residential or commercial wastewater.
Fecal Coliform	Fecal coliform is an indicator of fecal bacteria from warm-blooded animals.	Its presence in high numbers often indicates contamination with sanitary waste, although high levels of pet waste may also produce similar results.

Figure 4

Flowchart to Identify Illicit Discharges using Outfall Screening Sampling Results



3.6 Following Up on Potential Illicit Discharges

All outfalls ranked as possible, suspect or obvious illicit discharges require follow-up actions and activities to determine the specific source(s) of contamination. There are a variety of methods for illicit discharge source identification, including:

- **Mapping Analysis** – Evaluation of the drainage area, land uses and properties above the outfall including the route of the storm drainage system and locations of storm drains. This enables local staff to predict the likely locations of illicit discharges and illegal connections. Geographic Information Systems (GIS) are a useful tool for identifying illicit discharges through mapping analysis.

- **Drainage Area Investigation –** A windshield survey or more detailed property inspections in the drainage area that has the illicit discharge. These inspections are often performed following a mapping analysis.

- **Piping Schematic Review** – Examination of building plans and plumbing details for potential sites where improper connections to the storm drainage system may have occurred.

- **Smoke Testing** – Testing of pipes to locate connections by injecting a non-toxic vapor (smoke) into the system and following its path of travel.

- **Dye Testing** – Addition of colored dye to the drain water in suspect piping and subsequent surveillance to determine if dyed water appears in the storm drain system, thus indicating an illegal connection.

• **Septic System Investigation –** Low density residential watersheds may require special investigation methods when failing septic systems are suspected. Homeowner surveys, surface investigations and infrared photography have all been used successfully to identify problem septic system facilities.

The appropriate method for any given outfall or area will be heavily dependent on the watershed and land use conditions, drainage system characteristics, available resources and the nature of the discharge and screening results.

4.0 References

"Illicit Discharge Detection and Elimination – A Guidance Manual for Program Development and Technical Assessments." Center for Watershed Protection. 2004.

"District-Wide Watershed Management Plan Standards and Methodologies for Surface Water Quality Monitoring." Metropolitan North Georgia Water Planning District, March 2007.

"Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems – A User's Guide. EPA/600/R-92/238," U.S. Environmental Protection Agency, January 1993.

"NPDES Stormwater Sampling Guidance Document. EPA-833-92-001,"
U.S. Environmental Protection Agency, July 1992.

Figure 1 – Dry Weather Outfall Screening Form

Dry Weather Outfall Screening Form	
Name of City or County:	Data Sheet Number:
Date of screening (MM/DD/YY):	Time of screening:
Weather conditions:	
Sampling performed by:	

Outfall Description	
Outfall Location:	Outfall I.D. Number:
Outfall Type/Material: ❒ Closed Pipe (circle): RCP CMP PVC HDPE Other: ______________ ❒ Open Channel (circle): Concrete Earthen Grassy Other: ______________	Outfall Diameter/Dimensions:
Receiving stream and watershed name:	
Land use/industries in drainage area:	
GPS Coordinates:	Photo numbers:

Field Observations and Measurements	
Flow from outfall? ❒ Yes ❒ No Flow Description: ❒ Trickle ❒ Moderate ❒ Substantial	
Odor: ❒ None ❒ Sewage ❒ Sulfide (rotten eggs) ❒ Petroleum/gas ❒ Rancid/sour ❒ Other ______________ Relative severity: ❒ 0-None ❒ 1-Faint ❒ 2-Easily Detected ❒ 3-Noticable from a distance	
Color: ❒ Clear ❒ White ❒ Gray ❒ Orange/Rust ❒ Red ❒ Yellow ❒ Green ❒ Brown/Black ❒ Other ______________ Relative severity: ❒ 0-None ❒ 1-Faint ❒ 2-Clearly visible in bottle ❒ 3-Clearly visible in flow	
Turbidity: ❒ None ❒ Cloudy ❒ Opaque ❒ Silty ❒ Muddy ❒ Other ______________ Relative severity: ❒ 0-None ❒ 1-Slight cloudiness ❒ 2-Cloudy ❒ 3-Opaque	
Floatables: ❒ None ❒ Sewage ❒ Petroleum (oil sheen) ❒ Suds ❒ Other ______________ Relative severity: ❒ 0-None ❒ 1-Few/slight ❒ 2-Some ❒ 3-Heavy	
Flow Temperature (ºC):	
Flow pH:	pH meter calibrated? ❒ Yes ❒ No
Flow Conductivity (µmho/cm):	Conductivity meter calibrated? ❒ Yes ❒ No

Water Quality Sampling			
Field Test Kit Manufacturer:		Model:	
Fluoride (mg/L):		Fecal Coliform (MPN/100ml):	
Surfactants (mg/L):		Analysis Comments:	
Grab sample for lab? (fluoride/surfactants) ❒ Yes ❒ No		Bacteria Grab sample for lab? (fecal coliform) ❒ Yes ❒ No	
Grab Sample ID:		Bacteria Grab Sample ID:	

Outfall Potential for Illicit Discharge:

❒ Unlikely - or- No Flow ❒ Possible (presence of two or more indicators)

❒ Suspect (one or more indicators with severity of 2 or 3) ❒ Obvious - or- Confirmed

Brookhaven
GEORGIA

Figure 2 - Dry Weather Outfall Screening – Data Tracking Form

Date	Outfall I.D. Number	Flow? (Y/N)	Odor (describe)	Color (describe)	Turbidity (describe)	Floatables (describe)	Temp (ºC)	pH	Conductivity (µmho/cm)	Fluoride (mg/L)	Surfactants (mg/L)	Fecal Coliform (MPN/100ml)	Follow-up Actions

Figure 3 – Sample Chain of Custody Form

REPORT TO:	CONTACT	PHONE NO.	SALESMAN
	PROJECT NAME	PROJECT NO.	P.O. NO.
	DATE SAMPLED	SAMPLER(S)	
BILL TO:			

ANALYSES TO BE PERFORMED

	SAMPLE DESCRIPTION/LOCATION	TIME OF SAMPLING	TOTAL NO. OF CONTAINERS														REMARKS
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

REMARKS:	SHIPPING CARRIER:
	SHIPPING TICKET NUMBER:
	CHAIN-OF-CUSTODY SEAL: INTACT BROKEN ABSENT

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
RELINQUISHED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME

©

D. BMP C-4: Education

1. Description of BMP: Education: Educational program for the general public, employees, contractors and developers about illicit discharge and pollution.

2. Measurable goal(s): Distribute 200 pamphlets, training classes and website per year

3. Documentation to be submitted with each Annual Report: 200 pamphlets per year and 1 training class

4. Schedule:

   a. Interim milestone dates (if applicable): Develop program 2014

   b. Implementation date (if applicable): 2015

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Community Development, Community Relations

6. Rationale for choosing BMP and setting measurable goal(s): Awareness of pollution into streams

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Attendance at training classes and compliant responses

E. BMP C-5: Complaint Response

1. Description of BMP: Develop program 2015

2. Measurable goal(s): Complete a Complaint Response Plan for EPD review and approval and the implement the plan and record the complaints received and investigated annually.

3. Documentation to be submitted with each Annual Report: List of complaints and responses

4. Schedule:

   a. Interim milestone dates (if applicable): Develop Program 2014

   b. Implementation date (if applicable): 2015

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Community Development

6. Rationale for choosing BMP and setting measurable goal(s): To address citizen concerns and eliminate pollution

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Number of complaints

Note: At a minimum, the MS4 must include a BMP in the SWMP for each BMP listed in the NPDES Permit. For those MCMs without specific BMPs listed in the Permit, the MS4 should implement at least 2 BMPs for each MCM. If additional BMPs are chosen, then you should attach an additional sheet for each BMP.

Appendix D

Construction Site Storm Water Runoff Control

40 CFR Part 122.34(b)(4) Requirement: The permittee must develop, implement, and enforce a program to reduce pollutants in any storm water runoff to the MS4 from construction activities that result in a land disturbance of greater than or equal to one acre. Storm water discharges from construction activity disturbing less than one acre must be included in the permittee's program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more. The program must include:

A) An ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance;

B) Requirements for construction site operators to implement appropriate erosion and sediment control best management practices;

C) Requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality;

D) Procedures for site plan review which incorporate consideration of potential water quality impacts;

E) Procedures for receipt and consideration of information submitted by the public; and

F) Procedures for site inspection and enforcement of control measures.

See Table 4.2.4 (b) of the Permit

- Legal Authority
- Site Plan Review Procedures
- Inspection Program
- Enforcement Procedures
- Complaint Response
- Certification

A. Best Management Practice (BMP) D-1: Legal Authority

1. Description of BMP: Ordinance- Currently City of Brookhaven adopted the DeKalb County Land Development Ordinance. City of Brookhaven will be adopting a revised ordinance 2014-2015.

2. Measurable goal(s): Review Ordinance Annually

3. Documentation to be submitted with each Annual Report: Revisions to Ordinance

4. Schedule:

   a. Interim milestone dates (if applicable): 2014-2015

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Community Development

6. Rationale for choosing BMP and setting measurable goal(s): To control stormwater runoff from new and redeveloped projects. Including water quality and channel protection.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Pollution will be reduced through enforcement of the ordinance.

B. BMP D-2: Site Plan Review Procedures

1. Description of BMP: Procedures and checklists for plan review and permitting of projects within Brookhaven.

2. Measurable goal(s): The City is in the process of revising the E&S Ordinance to comply with the current model ordinance.

3. Documentation to be submitted with each Annual Report: List of permitted projects with one (1) acre or more disturbed.

4. Schedule:

   a. Interim milestone dates (if applicable): 2014

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Community Development, Public Works

6. Rationale for choosing BMP and setting measurable goal(s): To develop consistence in the review and permitting with minimum standards.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: The quality of plans submitted for permitting.

C. BMP D-3: Inspection Program

1. Description of BMP: Inspection of all building and land disturbance.

2. Measurable goal(s): Maintain, list inspections and pre-construction meetings

3. Documentation to be submitted with each Annual Report: List of inspections

4. Schedule:

   a. Interim milestone dates (if applicable):

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Community Development, Public Works, Code Enforcement

6. Rationale for choosing BMP and setting measurable goal(s): Inspections establish accountability of the permit holder to meet the requirements of the permit and to limit pollutants from leaving the permit site to the M.E.P.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Inspections should limit the number of permit violations on construction sites.

Inspection Report

City of Brookhaven

Date

Kay Evanovich

Land development Inspector

Unit: Dodge 1500 Ram BZX2161

	Enforcement actions		Plan reviews
	CN		Tree permit
	Warnings		SFR
	SWO		LDA
	Summons		Park Tree issue
	Inspections		
	Finals		Pre-Cons

mileage start | end

ITEM	DESCRIPTION	INSPECTION ACTION			
		APPROVED	REJECTED	REASON	DISPOSITION
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

INSPECTED BY DATE

D. BMP D-4: Enforcement Procedures

1. Description of BMP: Develop a program to enforce erosion and sediment violations documented at construction sites.

2. Measurable goal(s): Tracking of action taken

3. Documentation to be submitted with each Annual Report: Provide documentation of any enforcement action taken.

4. Schedule:

   a. Interim milestone dates (if applicable): 2014- program

   b. Implementation date (if applicable): 2015

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public works, community development.

6. Rationale for choosing BMP and setting measurable goal(s): The number of violations will continue to decrease each year.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: We will monitor the reduction of the number of violations.

E. BMP D-5: Complaint Response

1. Description of BMP: Develop an erosion and sediment complaint receipt, investigation, response and tracking procedures.

2. Measurable goal(s):

3. Documentation to be submitted with each Annual Report: List of complaints with response and action taken.

4. Schedule:

   a. Interim milestone dates (if applicable):

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public works, community development

6. Rationale for choosing BMP and setting measurable goal(s): To respond to citizens and prevent pollution.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Reduction in complaints through education.

City of Brookhaven, Georgia
Construction Site Storm Water Runoff Control
BMP D-5
Complaint Response

1.0 Introduction

A major resource available to the City of Brookhaven in identifying and eliminating sources of pollution to our streams is citizen involvement. The ability to receive, log and follow up on complaints in a timely manner is important to the successful operation of the MS4.

2.0 Program Description

The City has a system in place to receive complaints from citizens. Complaints are made by calling City Hall at 404-637-0500; this contact information is available on the City's website at http://www.brookhavenga.gov. The complaints are recorded using a computerized reporting system and are routed to the appropriate department. Erosion and Sediment Control issues are directed to the Code Enforcement Personnel.

3.0 Procedure

Upon receipt of a complaint, Code Enforcement will:

- Maintain a log of the complaints received including date, type of complaint and status of the complaint
- Investigate the complaint
- Notify the owner or permit holder of necessary corrective actions if needed
- Follow the enforcement procedures if required
- Close the complaint when resolved or dismissed
- Provide an annual report of complaints and activities performed

4.0 Goal

The goal of the complaint response program is to help identify stormwater pollution problems or potential problems within the community and to correct or eliminate these in a timely manner.

A. BMP D-6: Certification

1. Description of BMP: Maintain a lot of certified employees.

2. Measurable goal(s): Increase/ maintain qualified and certified personnel.

3. Documentation to be submitted with each Annual Report: Provide a list of certified personnel.

4. Schedule:

   a. Interim milestone dates (if applicable):

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public works and Community development

6. Rationale for choosing BMP and setting measurable goal(s): To hire qualified personnel.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Increasing and maintaining qualified personnel.

Note: At a minimum, the MS4 must include a BMP in the SWMP for each BMP listed in the NPDES Permit. For those MCMs without specific BMPs listed in the Permit, the MS4 should implement at least 2 BMPs for each MCM. If additional BMPs are chosen, then you should attach an additional sheet for each BMP.

Appendix E

Post-Construction Storm Water Management in New Development and Redevelopment

40 CFR Part 122.34(b)(5) Requirement: The permittee must develop, implement, and enforce a program to address storm water runoff into the MS4 from new development and redevelopment projects, including projects less than one acre if they are part of a larger common plan of development or sale. You must:

A) Develop and implement strategies which include a combination of structural and/or non-structural BMPs appropriate for your community;

B) Use an ordinance or other regulatory mechanism to address post-construction runoff from new development or redevelopment projects; and

C) Ensure adequate long-term operation and maintenance of BMPs.

See Table 4.2.5 (b) of the Permit

- Legal Authority
- Inventory
- Inspection Program
- Maintenance Program
- GI/LID Structures

A. Best Management Practice (BMP) E-1: Legal Authority

1. Description of BMP: Ordinance

2. Measurable goal(s):

3. Documentation to be submitted with each Annual Report: Updates to Ordinance

4. Schedule:

   a. Interim milestone dates (if applicable): Update Ordinance 2015

   b. Implementation date (if applicable): N/A

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Community Development

6. Rationale for choosing BMP and setting measurable goal(s): The ordinance provides standards within the community to control the release of stormwater from construction sites.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Enforcement of the design standards will result in the implementation of pollution control devices with greater stormwater runoff control.

B. BMP E-2: Inventory

1. Description of BMP: Create a map of stormwater management facilities.

2. Measurable goal(s): Update inventory map

3. Documentation to be submitted with each Annual Report: Updated maps

4. Schedule:

   a. Interim milestone dates (if applicable): 2014

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Community Development, GIS

6. Rationale for choosing BMP and setting measurable goal(s): The inventory of existing and new structures in the community facilitates periodic inspection and maintenance for proper operation.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Maintaining an up to date inventory will help keep structures operating properly through scheduled inspection and maintenance, reducing peak runoff and erosion.

C. BMP E-3: Inspection Program

1. Description of BMP: Inspection of public and privately owned stormwater management facilities.

2. Measurable goal(s): Inspect 20% of stormwater management facilities annually.

3. Documentation to be submitted with each Annual Report: List of inspection and updated map.

4. Schedule:

   a. Interim milestone dates (if applicable): 2014

   b. Implementation date (if applicable):

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

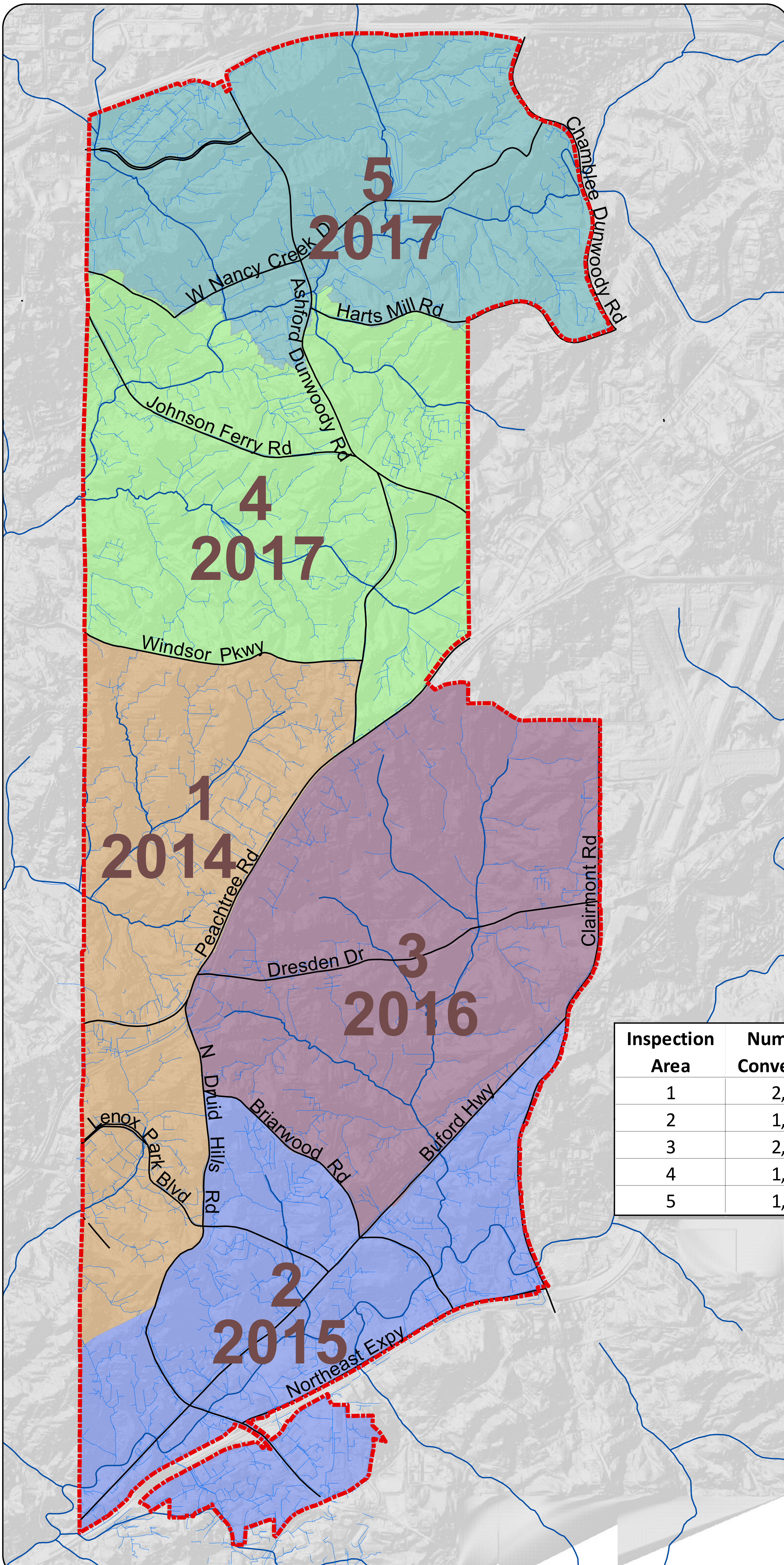
5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Community Development

6. Rationale for choosing BMP and setting measurable goal(s): Inspections will identify maintenance needs & will ensure proper operation of the structure. Performing a minimum of 20% per year will complete inspections for all structures during the 5 year permit period.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Inspections identifying and leading to maintenance will be reducing potential pollutant sources.

Brookhaven
GEORGIA

Proposed Stormwater System Inspection Areas



Legend

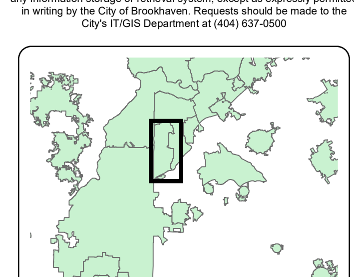
Inspection Areas

- 1
- 2
- 3
- 4
- 5
- Creek
- Storm Conveyance
- Major Road
- City Boundary

Inspection Area	Number of Conveyances	Number of Structures
1	2,102	2,139
2	1,909	1,843
3	2,312	2,240
4	1,844	1,795
5	1,825	1,715

0 0.25 0.5
Miles

Prepared by the
City of Brookhaven IT/GIS Department
May 12, 2017



H:\GIS\PublicWorks\Projects\2017\GregoryA_InspectionAreaUpdates

City of Brookhaven, Georgia

Post-Construction Storm Water Management in New Development and Redevelopment

BMP E-3

Inspection Program

(Applies to all Publicly-Owned and Privately-Owned Facilities)

1.0 Introduction

The control of stormwater runoff from publicly-owned and privately-owned property has been a requirement in DeKalb County and the City of Brookhaven for over 25 years. With the adoption of the *Georgia Stormwater Management Manual (GSMM*) by DeKalb County and later by Brookhaven (2009) stormwater management has placed a greater emphasis on the control of both the quality, as well as the quantity, of storm runoff.

The *Georgia Stormwater Management Manual (GSMM)* is an engineering design manual which advocates hydrologic procedures and methodology for the control of storm runoff quality and quantity. The manual offers design criteria for stormwater management that protects and preserves our natural water resources. Policy guidelines dictate that communities develop a program for better site development to include design and installation of water quality protection measures or Best Management Practices (BMPs) to protect Georgia's limited and valuable water supplies.

The City wants a program to provide regular inspections of publicly-owned and privately-owned facilities to assure that all stormwater systems receive periodic routine inspection and maintenance. This program will insure that these systems function as they were designed, to prevent flooding, erosion, and degradation of existing water resources. This procedure outlines the inspection process and organizes the administrative workload.

2.0 Program Description

The City currently owns and operates one stormwater management BMPs/detention facilities, located at one of the City owned parks. All other City-owned property was permitted at a time when no such requirements were in place.

An inventory of public and private ponds to be inspected has been developed within the City's GIS database inventory. The City of Brookhaven will inspect a minimum of 20% of the inventoried stormwater management facilities every year so that all inventoried ponds will be inspected during a five year permit term.

3.0 Procedure

The inventory of ponds to be inspected each year will be developed based on the City's GIS database inventory. The database will be updated each year as new ponds are added to the system.

An inspection checklist will be used and kept on file along with any photographs made of the structure or downstream channel and any documentation of corrective action for any problems noted during the inspection. After inspection, each job is placed into a project folder. The folder contains a copy of the final plat showing easements and boundaries and a written inspection report. A computer maintenance management system is planned to replace the paper files.

All inventoried stormwater management facilities will be inspected once every five years by the City of Brookhaven.

The inspection will include a thorough evaluation of the primary features of the BMPs. These inspections will focus on the condition of these features to insure proper operation. An operation and maintenance inspection report will be filled out to include all field notes. For inspections and maintenance, particular attention is given to the following areas:

A. Wet Detention Ponds

- Dam and Emergency Spillway
- Pond Inlet and Outlet
- Trash Racks
- Erosion
- Sediment Storage Capacity
- Water Quality
- Fences, Gates and Signs

B. Water Quality BMPs

- Riparian Buffers
- Vegetated Filter Strips and Level Spreaders
- Open Channel Practices
- Bio-retention Cells
- Constructed Wetlands

- Sand Filters
- Retention Ponds

The Format for the inspection report used by City is attached below.

Operational and Maintenance Inspection Report for Stormwater Management Ponds

(Adapted from Watershed Management Institute, Inc.)

Inspector Name: ______________________________ Project Location: ______________________________

Inspection Date: ______________________________ ______________________________

Stormwater Pond ______________________________

Normal Pool ___

Normally Dry ___ Watershed: __________

Inspection Items	Checked Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
Pond Components				
1. Embankment & Emergency Spillway				
a. Adequate vegetation & ground cover			A	
b. Embankment erosion			A	
c. Animal burrows			A	
d. Unauthorized plantings			A	
e. Cracking, bulging, or sliding of dam			A	
i. Upstream Face			A	
ii. Downstream Face			A	
iii. At or beyond toe upstream			A	
At or beyond toe downstream			A	
iv. Emergency Spillway			A	
f. Pond, Toe, & Chimney drains clear & functioning			A	
g. Leaks on downstream face			A	
h. Abutment protection or rip-rap failures			A	
i. Visual settlement or horizontal misalignment of top of dam			A	
j. Emergency spillway clear of debris			A	
k. Other (Specify)			A	
Riser and principal spillway				
Type: Reinforced Concrete _______			A	
Corrugated pipe _______			A	
Masonry _______			A	

a. Low flow orifice obstructed			A	
b. Low flow trash rack			A	
i. Debris removal necessary			A	
ii. Corrosion control			A	
c. Weir trash rack			A	
i. Debris removal necessary			A	
ii. Corrosion control			A	
d. Excessive sediment accumulation inside riser			A	
e. Concrete/masonry condition Riser & Barrels			A	
i. Cracks or displacement			A	
ii. Minor spalling (<1")			A	
iii. Major spalling (rebars exposed)			A	
iv. Joint failures			A	
v. Water tightness			A	
f. Metal pipe condition			A	
g. Control valve			A	
i. Operational/exercised			A	
ii. Chained & locked			A	
h. Pond drain valve			A	
i. Operational/exercised			A	
ii. Chained & locked			A	
i. Outfall channels flowing			A	
j. Other (Specify)			A	
Permanent pool (wet pond)				
a. Undesirable vegetation growth			M	
b. Floating or floatable debris removal required			M	
c. Visible pollution			M	
d. High water marks			M	
e. Shoreline problems			M	
f. Other (Specify)			M	
Sediment forebays				
a. Sedimentation noted			M	
b. Sediment removal when depth < 50% design depth			M	
Dry Pond areas				

a.	Vegetation adequate			M	
b.	Undesirable vegetative growth			M	
c.	Undesirable woody vegetation			M	
d.	Low flow channels clear of obstructions			M	
e.	Standing water or wet spots			M	
f.	Sediment and/or trash accumulation			M	
g.	Other (Specify)			M	
Condition of outfalls into pond					
a.	Rip-rap failures			A,S	
b.	Slope erosion			A,S	
c.	Storm drain pipes			A,S	
d.	Endwalls/headwalls			A,S	
e.	Other (Specify)			A,S	
Other					
a.	Enhancement on ponds or easement area			M	
b.	Complaints from residents (describe on back)			M	
c.	Aesthetics			M	
	i. Grass height			M	
	ii. Graffiti removal necessary			M	
	iii. Other (Specify)			M	
d.	Any public hazards (specify)			M	
e.	Maintenance access			M	
Constructed wetland areas					
a.	Vegetation healthy and growing			A	
b.	Evidence of invasive species			A	
c.	Excessive sedimentation in wetland area			A	

[‘Inspection Frequency Key A=Annual, M=Monthly, S=After major storm

Summary

1. Inspectors Remarks ____
____
____
____
____
____
____

2. Overall Condition of Facility (Check one)

__________ Acceptable

__________ Unacceptable

3. Dates any maintenance must be completed by:

____
____
____

____
Inspectors
Signature

D. BMP E-4: Maintenance Program

1. Description of BMP: Provide for proper maintenance of public and private stormwater management structures as outlined in the city's maintenance procedures.

2. Measurable goal(s): Implement the maintenance program and record maintenance with each annual report.

3. Documentation to be submitted with each Annual Report: ______________

4. Schedule:

   a. Interim milestone dates (if applicable): 2014

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works

6. Rationale for choosing BMP and setting measurable goal(s): Maintenance is a vital part in the long term proper operation of stormwater operation of stormwater structures and tracking maintenance activities helps in planning and preparing for future needs.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Maintenance activities will potentially eliminate a pollution source and will facilitate proper function of the stormwater structures.

City of Brookhaven, Georgia

Post-Construction Storm Water Management in New Development and Redevelopment

BMP E-4

Maintenance Program

(Applies to all Publicly-Owned and Privately-Owned Facilities)

1.0 Introduction

The control of stormwater runoff from publicly-owned and privately-owned property has been a requirement in DeKalb County and the City of Brookhaven for over 25 years.
The *Georgia Stormwater Management Manual (GSMM)* is an engineering design manual which advocates hydrologic procedures and methodology for the control of storm runoff quality and quantity. The manual offers design criteria for stormwater management that protects and preserves our natural water resources. Policy guidelines dictate that communities develop a program for better site development to include design and installation of water quality protection measures or Best Management Practices (BMPs) to protect Georgia's limited and valuable water supplies.

The City has a program to provide regular inspections of publicly-owned and privately-owned facilities to assure that all stormwater systems receive periodic routine inspection and maintenance. These programs will insure that the systems function as they were designed, to prevent flooding, erosion, and degradation of existing water resources. This procedure outlines the maintenance process.

2.0 Program Description

An inventory of public and private ponds has been developed based on the City's GIS database inventory. The database will be used to schedule inspections of a minimum of 20% of the inventoried existing stormwater management facilities every year. The inventory process will identify special maintenance needs in addition to routine maintenance required of the structures.

3.0 Procedure

The City currently owns and operates one stormwater management BMP/detention facility, located at one of the City owned parks. This facility will be maintained by City staff. The City is also responsible for the maintenance of inventoried privately owned facilities as accepted through plat or other legal means. These structures will also be maintained by City Staff.

Privately owned and maintained structures designed and built after December 9, 2008 will have a maintenance agreement kept on file with the City. After an inspection, a letter will be sent to the affected property owners notifying them of our findings with a time frame for completion of any noted repairs or maintenance deficiencies. If repairs are not properly completed within the specified time frame, the City may make the necessary repairs at the owner's expense.

Example letter to notify homeowners of maintenance required on their Property:

Date

Name
Address of owner

RE: Inspection of Detention Facility

Dear Name:

This letter is to notify you of an inspection on DATE of the detention pond located at:

Address of property with detention pond

On that date the deficiencies identified on the following page were found. In accordance with the City of Brookhaven Regulations, it is your responsibility to repair these items and notify us when they are corrected.

It is the city's desire to work with you to resolve this matter. Should you have any questions regarding this letter, or should you require any further information or

advice regarding compliance with the directions contained within this letter, please contact me at 404-637-0524.

Respectfully,

Name
Title

E. **BMP E-5: GI/LID Structure Inventory**

1. Description of BMP: Develop and maintain an inventory of water quality related GI/LID structures located within the community.

2. Measurable goal(s): Develop an inventory of GI/LID structures by 02/15/2015 and then maintain the inventory annually as new structures are installed.

3. Documentation to be submitted with each Annual Report: Updated map and list.

4. Schedule:
   a. Interim milestone dates (if applicable): ______
   b. Implementation date (if applicable): 2015
   c. Frequency of actions (if applicable): Annually
   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Community Development, GIS

6. Rationale for choosing BMP and setting measurable goal(s): Identifying and inventorying GI/LID structures will help the community track pollution/ stormwater reducing structures within the basins.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Tracking GI/LID structures will assist in evaluating the impact of these structures on water quality in each basin.

Note 1: For those permittees with a population exceeding 10,000 at the time of designation, Part 4.2.5.2 of the Permit requires an evaluation of the MS4's building codes, ordinances, and other regulations to ensure they do not prohibit or impede the use of Green Infrastructure/Low Impact Development (GI/LID). Include a BMP at the end of the Post-Construction minimum control measure to address this requirement.

Note 2: At a minimum, the MS4 must include a BMP in the SWMP for each BMP listed in the NPDES Permit. For those MCMs without specific BMPs listed in the Permit, the MS4 should implement at least 2 BMPs for each MCM. If additional BMPs are chosen, then you should attach an additional sheet for each BMP.

City of Brookhaven, Georgia

Post-Construction Storm Water Management in New Development and Redevelopment

BMP E-5

GI/LID Structures Inventory

(Applies to all Publicly-Owned and Privately-Owned Structures)

1.0 Introduction

Green Infrastructure (GI) and Low Impact Development (LID) can assist communities in lowering the amount and rate of runoff and pollutants from development sites through infiltration, reuse and evapotranspiration. To maintain a record of these devises within the community, the City will develop a process to inventory GI and LID structures.

2.0 Program Description

GI and LID structures installed after December 6, 2012 will be inventoried and added to the City's GIS database. Devices permitted on site plans in the future will be added to the inventory annually as they are constructed.

3.0 Procedure

GI and LID structures installed in the City since December 6, 2012 will be identified from construction permits and located in the GIS data base from as-built information or from field surveys. GI or LID structures will be noted during plan review on new plan submittals and will be added to the inventory when installation is verified through the inspection process.

Appendix F

Pollution Prevention/Good Housekeeping for Municipal Operations

40 CFR Part 122.34(b)(6) Requirement: The permittee must develop and implement an operation and maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations. Using training materials available from the USEPA and other organizations as guidance, the permittee must, as a part of this program, include employee training to prevent and reduce storm water pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance.

See Table 4.2.6 (b) of the Permit

- MS4 Control Structure Inventory and Map
- MS4 Inspection Program
- MS4 Maintenance Program
- Street and Parking Lot Cleaning
- Employee Training
- Waste Disposal
- New Flood Management Projects
- Existing Flood Management Projects
- Municipal Facilities

A. Best Management Practice F-1: MS4 Control Structure Inventory & Map

1. Description of BMP: The inventory includes catch basins, roadside ditches, detention/ retention ponds, and storm drain lines.______________

   ____

2. Measurable goal(s): Update the existing inventory and map of structures to include the minimum list of required structures by Dec. 31, 2014. Update the inventory and map annually to include any changes to the length or number of structures.____________________________________

3. Documentation to be submitted with each Annual Report: ____________

   ____

   ____

4. Schedule:

   a. Interim milestone dates (if applicable): _2014____________

      ____

      ____

   b. Implementation date (if applicable): _2014____________

   c. Frequency of actions (if applicable): _Annually_________

   d. Month/Year of each action (if applicable):_ By December____

      ____

      ____

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, GIS____________________________________

6. Rationale for choosing BMP and setting measurable goal(s): Identifies and locates all MS4 control structures within the community that will require inspection and possible maintenance.________________________________

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: The inventory will assist in identifying maintenance needs that would improve function and reduce erosion or pollutants.________________________________

Assessment Area	Number of Ponds	Acres
1	152	2,430
2	32	466
3	26	710
4	90	2,131
5	45	1,496

H:\GIS\PublicWorks\Projects\2014\GregA_MS4_RFP

Brookhaven GEORGIA

Incorporated 17 December 2012

Stormwater System
Detention Ponds

N W E S

Legend

- MARTA Station
- Expressway
- Major Road
- Rail
- PDK Airport
- Creek or Stream
- Lake or Pond
- Tax Parcel
- City Limits

Detention Pond (Number of Ponds)

- Public (85)
- Park (4)
- Private (159)

Retention Pond

- Public (10)
- Private (12)

Underground Pond

- Public (16)
- Private (54)

Lake

- Public (6)
- Private (2)

Detention Pond Assessment

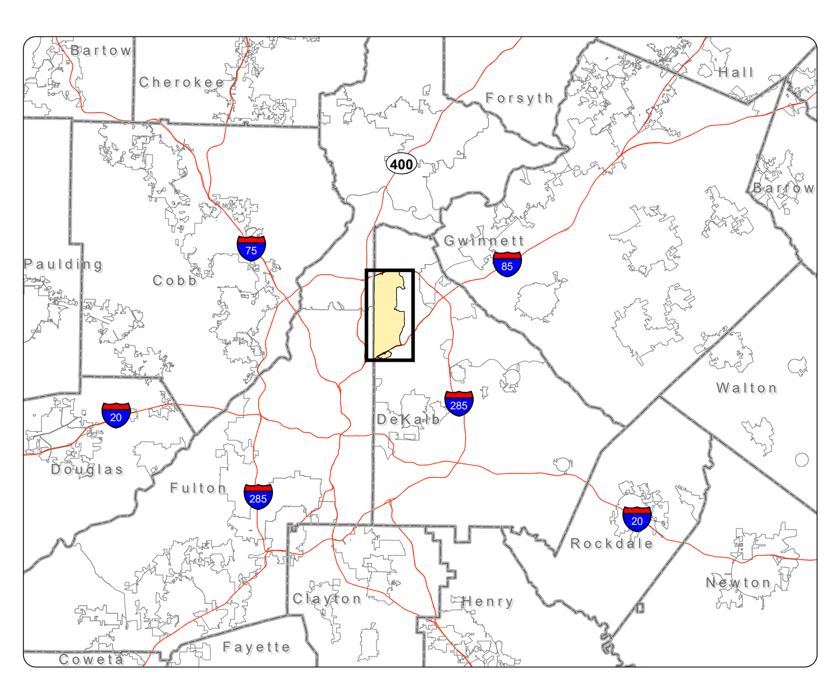
- Area 1 - 152 Ponds - 2,430ac
- Area 2 - 32 Ponds - 466ac
- Area 3 - 26 Ponds - 710ac
- Area 4 - 90 Ponds - 2,131ac
- Area 5 - 45 Ponds - 1,496ac

0 0.25 0.5 1
Miles

1 inch = 875 feet

Map Sheet size 30" x 42"

Prepared by the
City of Brookhaven IT/GIS Department
March 3, 2017



B. BMP F-2: MS4 Inspection Program

1. Description of BMP: Conduct annual inspections of the minimum required MS4 control structures listed in BMP #1 so that 100% of the inventoried structures are inspected during the 5 year permit term.

2. Measurable goal(s): Inspect 20% of the inventoried structures each year with any additional number required to complete all inspections to the MS4 at the end of the 5 year cycle.

3. Documentation to be submitted with each Annual Report: ____________

4. Schedule:

   a. Interim milestone dates (if applicable): N/A

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works

6. Rationale for choosing BMP and setting measurable goal(s): Providing inspections of all structures helps identify maintenance needs for the proper operation of the MS4 system.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Proper operation of the system will reduce erosion and pollution of stormwater.

City of Brookhaven, Georgia
Pollution Prevention/Good Housekeeping for Municipal Operations
BMP F-2
MS4 Operation and Maintenance Program
(Applies to Publicly-Owned and Privately-Owned Facilities)

1.0 Introduction

The City's Municipal Separate Storm Sewer System (MS4) is made up of structures, facilities and natural drainage-ways used for collecting, conveying, storing and/or treating stormwater. In order to ensure that the stormwater system continues to operate as designed to safely convey stormwater volume, velocity, and quality, it is the City's responsibility to maintain the MS4. An adequate Operation and Maintenance (O&M) program is essential to maintain the functionality of the system and should be a high priority for the City's comprehensive Stormwater Management Plan. In addition, it is a requirement of the City's Phase II NPDES Stormwater Permit that the City proactively maintain the MS4 in accordance with the procedures set forth in the accepted Notice of Intent (NOI). This document outlines the City's procedures for system inspection, maintenance, and documentation, and will become part of the City's NOI upon acceptance by EPD.

The City must develop and implement a drainage system O&M program that is customized to the policies, priorities, and issues that are predominant in the City. Failure to perform effective O&M activities can potentially reduce both the conveyance capacity and pollutant removal efficiency of stormwater drainage system infrastructure. Ideally, the O&M program should address maintenance issues proactively instead of addressing issues (i.e. flooding, infrastructure failure, etc.) on a reactive basis. One of the purposes of formalizing the City's O&M plan is to outline how City staff will transition from an existing reactive O&M program to a proactive O&M program which incorporates schedules/planned activities and tasks into its day to day efforts.

The City is currently developing a program to provide regular inspections of publicly-owned and privately-owned facilities to assure that all stormwater systems receive periodic routine inspection and maintenance. This program is being developed to insure that these systems function as they were designed, to prevent flooding, erosion, and degradation of existing water resources. This program was created to outline the inspection process, organize the administrative workload and develop a systematic method for maintenance and repair functions.

2.0 Program Description

The existing publicly-owned Municipal Separate Storm Sewer System (MS4) components will be inspected by the City of Brookhaven. The City maintains the stormwater system within the right-of-way and stormwater components and controls on property owned by the City or within an easement with an express acceptance by the City. It is estimated that the City has 7,500 structures and 180 miles of pipe in our system. It is the City's intention to inspect each of these components at least once every five years.

Within the right-of-way and for publicly owned stormwater components, the City will inspect and provide periodic, remedial and condition driven inspections and maintenance. However, for privately-owned stormwater components other than BMP facilities, the city will only inspect the condition and provide information/ recommendations on proper maintenance to the private owners on a remedial basis.

3.0 Procedure

It is essential to establish an Extent of Service (EOS) and Level of Service (LOS) for the various components of the MS4 and to develop a proactive plan for O&M of the system. The extent of service policy basically spells out the "responsibility status" of the various drainage infrastructure components based upon system component location and ownership factors. The City maintains the stormwater system within the right-of-way and stormwater components and controls on property owned by the City or within an easement with an express acceptance by the City.

The LOS for each major component of the system must be defined. The LOS is defined as the types and frequencies of O&M activities that a community will provide to different components of the MS4. Within the right-of-way and for publicly owned stormwater components, the City will inspect and provide periodic, remedial and condition driven inspections and maintenance, unless service is provided by a private third party. However, for privately-owned stormwater components other than BMP facilities, the city will only inspect the condition and provide information/recommendations on proper maintenance to the private owners on a remedial basis.

A comprehensive O&M program will incorporate three types of maintenance and inspection:

1. Remedial inspections and maintenance
2. Periodic inspections
3. Condition driven maintenance

Remedial inspection and maintenance is performed on an as-needed basis established on evidence of system failure during regular inspections or citizen complaints.
Periodic inspection involves performing inspection on a routine or set schedule.
Condition driven maintenance involves performing maintenance activities when certain criteria are met.

In order for the City to implement a proactive O&M program with limited resources, it is recommended and necessary for the City to prioritize areas and system components within the MS4 to inspect. By identifying and prioritizing inspections based on a history of flooding, the City's responsibilities, and the systems condition, the City can cost effectively focus its resources on those systems with priority needs.

Priority drainage systems can be identified as those structures where significant harm or damage could occur if the system were to fail. The highest priority would be assigned to those systems that cannot be allowed to fail due to the potential for serious threat of citizen safety, significant damage to habitable structures, or damage to public infrastructure. This priority could also be assigned to systems where the loss of other public infrastructure (i.e. roads, culverts, etc.) would result in a public safety issue or major inconvenience to citizens or business owners. Loss of access to a residential structure or business cans severely limit access of emergency services such as fire and medical vehicles in these cases. Other high priority drainage systems would include systems that cause flooding of livable structures but do not cause damage to the livable spaces. For example, flooding would include unfinished basements, crawl spaces, debris against the structure and damage to mechanical systems (air conditioning units, furnaces, etc.).

Secondary drainage systems could include all other drainage systems not classified as a primary system within the City's EOS. A high priority secondary system would include systems that could cause road closures but not necessarily result in loss of access to an area. Other secondary systems should include those that result in flooding of non-livable structures (i.e. sheds, storage buildings, etc.) and those that cause nuisance flooding. These criteria could be tied into the city's performance LOS criteria as it relates to flooding. After the initial inspections begin, the City will have a better concept of where the priority areas are in the City.

For private systems, an inspection will be conducted and kept on file along with documentation of corrective action for any problems noted during the inspection. After inspection, each job is placed into a project folder. The folder contains a copy of the final plat showing easements and boundaries and a written inspection report. The City is planning to develop a computer maintenance management system (CMMS) that will replace paper files. Once the inspection of a private system is complete and a report has been finalized, a letter is sent to the affected property owners notifying them of our findings with a time frame for completion of repairs if necessary. If repairs are not properly completed within the specified time frame, the City may make the necessary repairs at the owner's expense.

3.1 Inventory

The current inventory of MS4 components is based on the City's GIS database and field survey completed in 2011. The database will be updated as part of the new permit to include the structural elements listed in the required minimum list of structures and will be updated annually in the future as new information is obtained or as structures are installed or deleted from the MS4. The MS4 components includes such features as inlets, catch basins, storm sewers, culverts, ditches, and structural stormwater control facilities. The components may be located on publicly-owned property or on privately-owned property within an easement expressly accepted by the City for maintenance.

The breakdown of the structures is:

Catch Basin	2317
Flume	363
Headwall	1471
Inlet	2245
Manhole	777
Detention/Retention	248
Ditches	No/Miles
Pipes/Culverts	No/Miles
Total	To Be Determined

3.2 Remedial Inspection and Maintenance Procedures

Remedial maintenance is performed based on evidence of system impairment or failure identified through citizen complaints or City staff inspection. Inspection and maintenance is performed on an as needed basis and is logged in as work performed through a work order system. This type of maintenance can include sediment/litter removal, vegetation clearing, channel stabilization, and outlet structure repairs.

Upon receipt of a complaint, the City staff will generate a work order for the individual project. A City staff member will perform an inspection of that complaint within five (5) business days. The City staff person will assess the system for condition, material, water quality issues, structural issues, etc. Maintenance will be recommended and performed based on the condition driven maintenance standards established below. If recommended remedial maintenance calls for more specialized expertise and equipment then the work order may be transferred to another department or an outside entity specializing in that activity.

3.3 Periodic Inspections

Periodic inspection is performed on a scheduled basis (i.e. a work order is not necessary). The City will perform periodic inspections on our MS4 system once every five years with the goal to inspect a minimum of 20% of the system each year of the permit term. The number of structure inspections made each year will be adjusted to include new structures being added to the inventory.

3.4 Condition Driven Maintenance

Condition driven maintenance is performed based on the results of City staff inspections conducted as part of a periodic or remedial inspection program. If certain standards are not met during inspection, City staff will perform applicable maintenance procedures including removal of litter, debris, or sediment; re-grading; minor repair; replacement; etc.

Standards for System Components:

- Catch Basins: Catch basins with sumps should be cleaned if accumulated sediment, debris or other deposits are equal to or greater than one-third the depth from the invert of the basin sump to the invert of the lowest pipe into or out of the basin. If catch basins are found to significantly exceed this standard, they should be inspected and cleaned more often. If deposits of concern are rarely found during regular inspections, inspection may be moved to a more infrequent schedule.

- Storm Drain Lines: Storm sewers should be inspected as the catch basins are inspected. Storm pipes shall be cleaned if accumulated sediment, debris or other deposits are blocking more than 35% of the pipe diameter.

- Culverts: Woody debris and other blockages should be immediately removed from culverts and other critical conveyance components.

- Open Drainage: Open drainage refers to ditches, canals, swales, etc. Drainage ditches should be inspected and cleaned if accumulated sediment, debris or other deposits exceed 35% of the functional depth. Excess vegetation shall be removed manually if it is restricting flow.

- Municipally-Owned Detention Ponds and other Regional Controls: Inspections of inflow and outflow structures are required. Sediment should be removed before 50% of the capacity has been lost (typically every 10 to 20 years). Stormwater structural control facilities shall be maintained according to criteria or procedures present in Volume 2 of the *Georgia Stormwater Management Manual*. Maintenance requirements are detailed at the end of each structural control design criteria section.

- Outfalls: Dry weather flows in the stormwater system observed during inspection and that indicate a potential pollution problem should be investigated for potential illegal dumping and /or illicit connections. If flow of water from outfall is causing erosion, energy dissipaters should be installed as part of a programmed system improvement plan.

3.5 Emergency Maintenance

The City may conduct emergency maintenance operations within drainage easements in order to protect the common good. Emergency maintenance includes maintenance necessary to remedy a condition which is potentially damaging to life, property, or public roads. Such emergency maintenance, conducted for the common good, shall not be construed as constituting accepting a continuing maintenance obligation by the City, nor prevent the City from seeking reimbursement for expenses from the property owner(s) of the land that generated the condition.

3.6 Categorizing Project Requests

There are currently more projects than the City can address at one time. The order of response to these projects will be determined by the category of the request. Requests for projects will be categorized as:

Category I: Posing an immediate danger or threat to public safety,

Category II: Rapidly degrading to a dangerous condition, or

Category III: Maintenance or cosmetic repair.

Projects in Category I will receive priority.

City Public Works staff will review project requests and will perform the initial project categorization. Public Works staff will periodically monitor the conditions at the project location, prior to repair/maintenance, and will modify the categorization when needed.

3.7 Funding Issues (Set Funding Allocated in Budget)

The Mayor and City Council may allocate funding for stormwater projects during each budget cycle. Projects will be recommended for implementation based on the determination of City responsibility, by Category, and by approved funding level.

3.8 Record Keeping

The City staff will keep records of all inspection and maintenance activities performed as part of the MS4 inspection program. Service Requests will be generated based on citizen complaints or other unforeseen maintenance activities not usually performed as part of scheduled maintenance. Service Requests will detail the source of the complaint, nature of the stormwater issues, inspection results, and all maintenance and/or enforcement activities. The service request will detail the project from start to finish including dates, activities and staff. City Crews will also keep daily activity logs detailing all of their inspection and maintenance activities as they relate to system inspection and maintenance. These logs will include structures inspected, activities performed, dates, etc.

C. BMP F-3: Maintenance Program

1. Description of BMP: Provide maintenance to the MS4 control structures as needed as determined by the results of the inspections program.

2. Measurable goal(s): Provide the number of each type of structure maintained annually.

3. Documentation to be submitted with each Annual Report:______________
____
____

4. Schedule:

   a. Interim milestone dates (if applicable): _2014____________
   ____
   ____

   b. Implementation date (if applicable): _2014____________

   c. Frequency of actions (if applicable): _Annually_________

   d. Month/Year of each action (if applicable):_ By December_____
   ____
   ____

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Parks

6. Rationale for choosing BMP and setting measurable goal(s): Maintenance is required for long term proper operation of MS4 structures.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Maintenance will improve operation of the MS4 structures and should reduce erosion and pollution loads in stormwater.

D. BMP F-4: Street and Parking Lot Cleaning

1. Description of BMP: Street cleaning will be performed by city staff and volunteers as described in the volunteers as described in the street cleaning procedure.

2. Measurable goal(s): The litter removal activities will be documented annually with the number of miles cleaned.

3. Documentation to be submitted with each Annual Report:

4. Schedule:

   a. Interim milestone dates (if applicable): N/A

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): N/A

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, GIS, Parks

6. Rationale for choosing BMP and setting measurable goal(s): Reduce the amount of solid waste and pollutants in stormwater runoff from streets.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: The waste collected will reduce pollutants to stormwater.

City of Brookhaven, Georgia

Pollution Prevention/Good Housekeeping for Municipal Operations
BMP F-4
Street Cleaning Procedure

1.0 Introduction

Road surfaces collect pollution that comes from vehicles and from deposition from the air. When it rains, this pollution is washed into our streams. Vehicles deposit many forms of pollutions on the road surface such as oil, grease and particles from tires and brakes as they are used and worn. Air pollution comes from soil that is blown into the air and from factories. To minimize pollution reaching the stream, streets can be cleaned to pick up this pollution before it is washed into the streams by rain water runoff.

2.0 Program Description

The City of Brookhaven has in excess of 150 miles of roads. The City encourages the collection of debris and liter from right-of-ways through its Adopt-A-Spot program. The program is administered by the City's Public Works Department.

In addition, prior to mowing, trash and debris is collected in within the right-of-way (ROW) limit that is not currently being maintained by adjacent land owners at least twice a year. Litter pick-up crews are deployed to collect and dispose of the bagged liter and debris.

3.0 Procedure

3.1 Trash and Debris Removal

Prior to mowing, trash and debris will be cleaned from the area between the curb and the right of way limit that is not currently being maintained by adjacent land owners. All debris, trash and litter associated with grass cutting and ROW maintenance activities, including grass clippings will be cleaned up for proper disposal in a landfill.

A reasonable effort will be made to police and remove cigarette butts and trash at intersections.

3.2 Litter Pick Up

Included in right-of-way maintenance is litter pick up. A maintenance crew will be deployed with a primary focus along the main arterial roadways. This crew will have pickup-type trucks capable of carrying and securing hand tools such as shovels, rakes, trash bags, etc. and personnel and safety equipment as required by the *Manual of Uniform Traffic Control Devices (MUTCD*) for work zone traffic control as needed to safely work in the ROW areas in the City of Brookhaven.

E. **BMP F-5: Employee Training**

1. Description of BMP: Conduct one training session per year for applicable employee to address pollution prevention for municipal activities.________

2. Measurable goal(s): Conduct a training session annually and provide documentation of the educational activity.

3. Documentation to be submitted with each Annual Report: ____________

4. Schedule:

   a. Interim milestone dates (if applicable): _N/A_____________

   b. Implementation date (if applicable): _2014_

   c. Frequency of actions (if applicable): _Annually_________

   d. Month/Year of each action (if applicable): _By December____

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Community Development, Community Relations, Web, Park, GIS, Volunteer

6. Rationale for choosing BMP and setting measurable goal(s): Training helps employees be aware of the potential water quality impacts their job actions may cause, so that they can take steps to prevent them.________

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Directing to stormwater at job activities and pollution concerns should help reduce pollutant impacts.

City of Brookhaven, Georgia

Pollution Prevention/Good Housekeeping for Municipal Operations

BMP F-5

Pollution Prevention Employee Training Program

1.0 Introduction

One of the primary sources of pollution in our streams is non-point source pollution which is the pollution coming from many undefined locations and often in small quantities. Most people do not realize that their daily activities lead to the pollution of our streams. The public often does not know that when it rains, pollution spilled or placed on the ground is washed into the drains along our roads and in our parking lots and these drains are directly connected to our streams by pipes. One activity that has a large potential of being a source of non-point source pollution is ground maintenance since it often involves the application of herbicides, pesticides and fertilizers. Educating the public about non-point source pollution and what they can do to prevent is an important best management practice.

2.0 Program Description

Once a year the City will prepare information regarding the City's Storm Water Management Program and the proper handling and use of herbicides, pesticides, and fertilizers. This material will be presented to City staff and any contractors employed by the City to maintain the landscape on City facilities.

3.0 Procedure

Once a year the City will prepare information regarding the City's Storm Water Management Program and the proper handling and use of following:

- Herbicides
- Pesticides
- Fertilizers
- Fuels
- Oils
- Garage maintenance fluids
- Paints
- Cleaners
- Other possible pollutants

Materials are readily available on the subject such as Gwinnett County's video titled, "Protecting our Waterways, Herbicide Use." Information is also available from the Clean Water Campaign supported by the Metropolitan North Georgia Water Planning District and managed by the Atlanta Regional Commission. Another source is the Center for Watershed Protection.

This material will be presented in a training section conducted by a representative from the Public Works Department. Representatives from all divisions within the Public Works Department and Community Development Department are required to attend. Attendance at the presentations will be documented using a sign in sheet.

F. BMP F-6: Waste Disposal

1. Description of BMP: All waste and debris removed from the MS4 will be disposed of properly into an active land fill.

2. Measurable goal(s): The estimated volume of debris removed from the system will be recorded and included in the annual report.

3. Documentation to be submitted with each Annual Report:

4. Schedule:

   a. Interim milestone dates (if applicable): N/A

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Ongoing

   d. Month/Year of each action (if applicable): N/A

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, Community Development

6. Rationale for choosing BMP and setting measurable goal(s): To ensure wastes resulting from stormwater management activities are disposed of appropriately and prevented from re-entering the MS4.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: The volume of debris removed from the system will reduce pollution.

City of Brookhaven, Georgia
Pollution Prevention/Good Housekeeping for Municipal Operations
BMP F-6
Waste Disposal Procedure

1.0 Introduction

In the process of cleaning the municipal separate storm sewer system, dirt and debris will be removed from the system. Since the municipal stormwater system drains to streams, the material removed from the system must be disposed of properly to effectively eliminate the material as a source of pollution for our streams. As a result, the City will dispose of the material in an active land fill.

2.0 Program Description

The City requires that material removed from the municipal storm system be taken to an active landfill for proper disposal.

3.0 Procedure

The City has two primary methods of cleaning the municipal system which generate waste material that needs to be properly disposed:

- The first method is catch basin cleaning and the second is system maintenance when the system is repaired or replaced. For catch basin cleaning, hand tools and vacuum trucks are used. Material removed with hand tools will be places on a truck. Waste material will be taken to the landfill for proper disposal.

- For the system repair and replacement, the waste material is placed in trucks. This material will also be taken to a landfill for proper disposal.

In order to document the benefit to the system. Weight tickets will be collected from the landfill and recorded in a spreadsheet that will be submitted as a part of the City of Brookhaven's annual report.

G. BMP F-7: New Flood Management Projects

1. Description of BMP: Assess proposed flood management projects for water quality impacts during the design phase as required by the Stormwater Management Ordinance.

2. Measurable goal(s): Report the number of plans reviewed annually where water quality impacts have been assessed.

3. Documentation to be submitted with each Annual Report: ____________

4. Schedule:

   a. Interim milestone dates (if applicable): No

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Ongoing

   d. Month/Year of each action (if applicable): N/A

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, GIS

6. Rationale for choosing BMP and setting measurable goal(s): Improve water quality of stormwater runoff form new development or redevelopment sites.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: The installation of water quality measures will have a reduction in TSS per the design standards.

H. BMP F-8: Existing Flood Management Projects

1. Description of BMP: Assess existing publicly-owned flood management projects for potential retrofitting to address water quality impacts.

2. Measurable goal(s): Perform assessment of all existing publicly-owned flood management projects during the 5 year term of the permit and report annually on assessment activities.

3. Documentation to be submitted with each Annual Report: ____________

4. Schedule:

   a. Interim milestone dates (if applicable): N/A

   b. Implementation date (if applicable): 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): N/A

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, GIS

6. Rationale for choosing BMP and setting measurable goal(s): Improve the water quality of stormwater runoff.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Any retrofit installed would be designed to improve water quality and reduce pollution.

City of Brookhaven, Georgia
Pollution Prevention/Good Housekeeping Program for Municipal Operations
BMP F-8
Existing Flood Management Projects

1.0 Introduction

Projects that control flooding present a good opportunity to also address water quality of our streams. This procedure puts a method in place to ensure that controls to improve water quality will be considered as a part of any flood control project. It is appropriate to assess these structures for water quality benefits at the design stage and any retrofit stage.

2.0 Program Description

Flood management projects generally fall into one of two structural categories, flood control dams or detention/retention basins.

During the design or retrofit of these structural flood control projects, post-construction structural best management practices, as described in the *Georgia Stormwater Management Manual*, will be evaluated to determine if they can be added to the project to improve water quality.

3.0 Procedure

3.1 Flood Control Dams

The City of Brookhaven has no responsibility for the maintenance of any Natural Resource Conservation Service (NRCS) Watershed Dams.

3.2 Detention/ Retention Basins

3.2.1 New Detention/Retention Basins

Since 2009, the City required that storm water management structures/facilities planned as a part of new development or redevelopment be designed to include water quality benefits. These changes were incorporated into the City's Development Regulations, which require that an engineer assess the post construction site conditions, and incorporate BMPs that include water quality benefits into the design plans.

A list of these BMPs is included within the *Georgia Stormwater Management Manual*. The regulations require that BMPs be used to reduce post construction total suspended solids (TSS) loadings by 80% as measured on an annual average basis. The manual has assigned removal efficiencies to each of the BMPs provided in the manual and has designed a spreadsheet model that allows developers to assess which BMPs may be used to achieve the goal.

The Community Development Division reviews all submitted development plans to determine compliance with the water quality requirements of the Development Regulations.

In summary, all new development in Brookhaven is required to incorporate water quality BMPs into that development so as to improve the quality of post construction runoff from that development.

3.2.2 Existing Detention/Retention Basins Retrofits

The City will have two opportunities to assess existing detention/ retention basins to retrofit. The first opportunity will be during complaint investigations and the second will be during BMP inspections outlined in Post Construction Storm Water Management in New Development and Redevelopment (BMP #3 – Inspection Program) and Pollution Prevention/Good Housekeeping for Municipal Operations (BMP #2 – Inspection Program). The criteria that will be used to select basins to retrofit will be:

1) Type of problem to be solved
2) Ability of a retrofit to resolve an existing problem
3) Ownership of the BMP
4) Constructability
5) Accessibility
6) Benefit verses cost
7) Funding available

The types of existing problems that will be considered will be ranked (Highest to lowest) based on:

5 - Impact to life or safety
4 - Impact to property
3 - Impact on water quality/ biota for pollutant of concern for a water which has a Total Maximum Daily Load (TMDL) implementation plan.
2 - Impact on water quality/ biota

For ownership, facilities owned outright by the City will receive a rank of 5, private BMPs with maintenance responsibility belonging to the City and having all easements provided by the owner will receive a rank of 1.

The Form on the last page will be used to score the retrofits. This score will be used to determine a cost / benefit ratio to help select the best project for the least cost.

Based on funding available, the best projects will be placed on the Capital Improvement Projects list for the City to perform. These retrofit projects will be ranked with other Operation and Maintenance projects as outlined in BMP #3 (Pollution Prevention/Good Housekeeping for Municipal Operations). Private property owners will be encouraged to construct projects identified on private property.

The existing detention/ retention ponds inspected as part of the Inspection Program BMP's that require maintenance will be evaluated using this procedure.

When the City retrofits an existing facility, the design criteria and methodologies in the *Georgia Stormwater Management Manual* will be used to first address the existing problem and second to maximize the reduction in post construction TSS.

Detention/ Retention Pond Retrofit Evaluation Form

Tracking Number: ___________________________

Date: _____________________________________

Location: __________________________________

Criteria	Score (5 best to 1 least)
Type of Problem	
Ability to solve problem	
Ownership of BMP	
Constructability	
Accessibility	
Total (Score of 25 possible)	

Cost: ___________________________

Cost/ Benefit: ____________________

I. BMP F-9: Municipal Facilities

1. Description of BMP: Develop an inventory of facilities with the potential to cause pollution to the MS4 and inspect all inventoried facilities during the 5 year permit term.

2. Measurable goal(s): Develop an inventory of the Municipal Facilities with the potential to cause pollution to the MS4 by Dec. 31, 2013 and inspect all facilities by the end of the 5 year permit.

3. Documentation to be submitted with each Annual Report: ______________

4. Schedule:

   a. Interim milestone dates (if applicable): Dec. 31, 2014

   b. Implementation date (if applicable): Jan. 2014

   c. Frequency of actions (if applicable): Annually

   d. Month/Year of each action (if applicable): By December

5. Person (position) responsible for overall management and implementation of the BMP: Public Works, GIS, Parks

6. Rationale for choosing BMP and setting measurable goal(s): Identifying facilities and practices aimed at reducing or eliminating the pollutant.

7. How you will determine whether this BMP is effective in reducing pollution to stormwater in accordance with Part 5.1.4 of the Permit: Pollution will be reduced if pollutant sources or practices are found and are corrected.

Note: At a minimum, the MS4 must include a BMP in the SWMP for each BMP listed in the NPDES Permit. For those MCMs without specific BMPs listed in the Permit, the MS4 should implement at least 2 BMPs for each MCM. If additional BMPs are chosen, then you should attach an additional sheet for each BMP.

City of Brookhaven, Georgia
Pollution Prevention/Good Housekeeping for Municipal Operations
BMP F-9
Municipal Facilities Inventory

1.0 Introduction

Municipal Operations can be a source of stormwater pollution within a community. The facilities and activities performed there need to be considered to determine any impacts that they may have on water quality. Some of the facilities to be considered include:

- Fleet or maintenance shops
- Maintenance and storage yards
- Wastewater treatment facilities
- Drinking water treatment facilities
- Vehicle washing or fueling
- Waste transfer stations
- Parks and public areas

2.0 Program Description

For Municipal facilities, the City will evaluate all operations that occur at that location and determine if a risk of stormwater pollution exists. Facilities that are determined to have a risk will be included in the GIS Inventory. The operation and maintenance practices will be reviewed and inspections will be performed for each of the facilities to determine if procedures need to be developed or revised to improve pollution prevention.

3.0 Procedure

Municipal Facilities will be identified through the GIS database and the operation and maintenance activities will be reviewed to determine possible stormwater pollution impacts. Facilities determined to have no impact will be removed from the list. Facilities found to have a potential impact will be included in the City's "Municipal Facilities Inventory" to be completed by December 31, 2013.

All inventoried facilities will be inspected prior to the end of the permit term. A minimum of 25% of the facilities will be inspected each year beginning in 2014. A review of the practices and procedures found at the facility may lead to additional policies or employee training on the use of herbicides, pesticides and fertilizers, washing of vehicles, storage of chemicals or supplies, spill prevention and response.

Appendix G

Enforcement Response Plan

1. The MS4 must develop and implement an Enforcement Response Plan (ERP) that describes the action to be taken for violations of the Storm Water Management Program. The ERP must be completed and submitted within one year of designation, with that year's annual report.

   Final completion date: December 2015______
   Date of submittal to EPD: 12/31/2015_______

2. In accordance with Part 4.3 of the NPDES Permit, the ERP must include escalating enforcement responses for repeat and continuing violations. At a minimum, the ERP must address the following categories (refer to Part 4.3 of the NPDES Permit for more detail):
   - Names of ordinances and citations;
   - Types of enforcement mechanisms;
   - Description of the use of these enforcement mechanisms;
   - Time frames; and
   - Description of the tracking and reporting mechanism.

NOTE: Upon completion, the ERP will be included as Section 10 of the SWMP.

ENFORCEMENT RESPONSE PLAN

DEPARTMENT OF PUBLIC WORKS
STORMWATER DIVISION

Referred as APPENDIX G (BMP G) of the City of Brookhaven Stormwater Management Plan (SWMP)

General NPDES Permit No. GAG610000

Small Municipal Separate Storm Sewer Systems (MS4)

Submitted February 15, 2016

City of Brookhaven
4362 Peachtree Road, Brookhaven, GA 30319
Phone: 404-637-0500 • Fax: 404-637-0501
www.brookhavenga.gov

TABLE OF CONTENTS

Quick Glance

For a quick reference and examples please refer to the following tables:

Table A: E&S Page 9

Table B: IDDE Page 18

Table C: Post Development Page 25

Table D: Floodplain Page 30

INTRODUCTION AND GOAL

The Enforcement Response Plan outlines ordinance enforcement responsibilities, methods and procedures that ultimately protect public and environmental health, safety and welfare as well as improves water quality, preserves and enhances valuable natural resources.

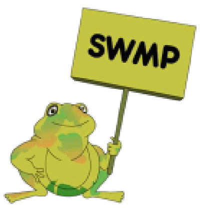
Our goal is to provide a guide that will clearly and directly identify the proper procedures when conducting enforcement actions encountered by all compliance personnel. The plan will allow personnel to act in unison when addressing typical or usual enforcement requirements. However, these procedures and processes can be modified in the event a severe condition is encountered that may pose a serious threat to public and environmental health and safety if not expeditiously addressed.

AUTHORITY AND DESCRIPTION

Authority is given by General NPDES Permit No. GAG610000 for Small Municipal Separate Storm Sewer Systems (MS4), reissued December 6, 2012. The City must comply with all permit requirements. With this purpose, the City of Brookhaven implemented local ordinances that protect public and environmental health, safety and general welfare. Local ordinances are enforced in compliance with General NPDES Permit No. GAG610000. The City of Brookhaven Code of Ordinances can be found at http://www.brookhavenga.gov/city-government/code-of-ordinances.

The following ordinances also provide enforcement authority:

- Environmental Control Ordinance (Chapter 14: Article II – Section 14-27 through 14-38)
- Stream Buffer Ordinance (Chapter 14: Article II)
- Floodplain Management Ordinance (Chapter 14: Article IV)
- Illicit Discharge and Illegal Connection Ordinance (Chapter 25: Article VI)
- Post Development Ordinance (Chapter 14: Article II)



In addition, the City of Brookhaven Stormwater Management Program, as approved by the Georgia Department of Natural Resources, Environmental Protection Division, sets enforcement requirements the City must comply with.

Enforcement Actions

Erosion, Sedimentation, and Pollution Control and Stream Buffer Ordinance.

1) Goal

To ensure E&S plan compliance during our plan review process. To monitor proper installation and maintenance of permanent and temporary structures and to ensure full compliance with all local applicable ordinances. To provide enforcement of codes that will improve water quality, preserves and enhances valuable natural resources. To minimize public and private losses due to erosion, siltation and water pollution.

2) Authority

a) City of Brookhaven Ordinance Chapter 14, Article II, Sec. 14-31 provides authority to implement Environmental Control enforcement measures.

b) City of Brookhaven Ordinance Chapter 14, Article II, Sec. 14-44.2 provides authority to implement Stream Buffer enforcement measures.

c) The City has entered into a Memorandum of Agreement with the Dekalb County Soil and Water Conservation District and the Georgia Soil and Water Conservation Commission. The Memorandum of Agreement authorizes the City of Brookhaven as a Local Issuing Authority. As a Local Issuing Authority, the Memorandum of Agreement authorizes Brookhaven to:

- Review Erosion, Sedimentation and Pollution Control Plans
- Conduct erosion control enforcement; and
- Implement a tracking program of land disturbance activities

3) Responsibility for Enforcement

The City of Brookhaven Department of Community Development ensures compliance with Brookhaven's environmental regulations and construction requirements pertaining to E&S control, stream buffers and floodplain management. When a citation is necessary, the Department of Community Development will issue such citation.

4) Responsibilities

- Plan review and approval.
- Permit approval or denial
- Inspections of land disturbing activities
- Enforcement of proper installation and maintenance of approved BMPs
- Enforcement of Stream Buffer setbacks
- Wetland Protection

5) Potential Violations: Instances of Non-Compliance (See TABLE A)

1) Examples of instances of non-compliance include, but are not limited to:

- Acting outside the E & S approved plan and/ or permit.
- Inadequate E & S BMP control measures.
- Failure to obtain permits for land disturbance activities.

- Disturbing stream buffer zones.

2) City of Brookhaven Ordinances state violations that merit enforcement actions:

City of Brookhaven Ordinance Chapter 14, Article II, Sec. 14-38 (b) (4) General Provisions

a. *General provisions.* Excessive soil erosion and resulting sedimentation can take place during land-disturbing activities. Therefore, plans for those land-disturbing activities that are not exempted by this chapter shall contain provisions for application of soil erosion and sedimentation control measures and practices. The provisions shall be incorporated into the erosions and sedimentation control plans.
Soil erosion and sedimentation control measures and practices shall conform to the minimum requirements of subsections (b)(4)b. and c. of this section and any other applicable provision of this section. The application of measures and practices shall apply to all features of the site, including street and utility installations, stormwater management facilities, drainage facilities and other temporary and permanent improvements. Measures shall be installed to prevent or control erosion and sedimentation pollution during all stages of any land-disturbing activity in accordance with the requirements of this ordinance and the NPDES general permit. The Community Development Director may require that land disturbance activity be phased. Soil erosion and sedimentation control plans shall address appropriate measures to effectively control soil erosion during successive phases of construction.

6) Enforcement Mechanisms

The inspector must identify appropriate enforcement responses for each violation. Brookhaven inspectors will determine the appropriate response for each violation, in accordance with the City of Brookhaven Ordinance Chapter 14, Article II, Sec. 14-38. There are several types of enforcement actions:

- Verbal Warnings – these can consist of phone calls or face-to-face discussions. The inspector should specify the nature of the violation and the required corrective action during the conversation.

- Notice of Violation (NOV) – A NOV could be issued by an inspector. It will consist of a form or a letter that has been hand-delivered or sent certified mail. Copies of the NOV will be retained by the Brookhaven inspector for potential escalating enforcement.

- Citations–the citation will specify the ordinance section violated. A fine of up to $1000 per violation may be imposed or 6 months imprisonment.

- Stop work order. The City of Brookhaven may issue a stop work order which shall be served on the applicant or other responsible person. The stop work order shall remain in effect until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violation or violations described therein, provided the stop work order may be withdrawn or modified to enable the applicant or other responsible person to take the necessary remedial measures to cure such violation or violations.

- Withhold Certificate of Occupancy. The City of Brookhaven may refuse to issue a Certificate of Occupancy for the building or other improvements constructed or being constructed on the site until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein.

- Suspension, revocation or modification of permit. The City of Brookhaven may suspend, revoke or modify the permit authorizing the development project. A suspended, revoked or modified permit may be reinstated after the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein, provided such permit may be reinstated (upon such conditions as Brookhaven may deem necessary) to enable the applicant or other responsible person to take the necessary remedial measures to cure such violations.

The inspector must ensure each enforcement action is documented. Documentation is necessary in the event of escalation of enforcement to a judicial level.

7) Appropriate Responses (See TABLE A)

The inspector will consider the enforcement response. When making this determination, the inspector should consider the following:

- Magnitude of the problem.
- Duration of the problem.
- Effects on State Waters
- Effect on the MS4
- Compliance history
- Good faith

City of Brookhaven Ordinance Chapter 14, Article II, Sec. 14-38 (b) (7) (b) Penalties and incentives:

a. *Stop work orders*. Upon notice from the Community Development Department or other city authorized representative, work on any project that is being done contrary to the provisions of this chapter or in a dangerous or unsafe manner, shall be immediately stopped. Such notice shall be in writing and shall be given to the owner of the property, his/her authorized agent or the person or persons in charge of the activity on the property, and shall state the conditions under which work may be resumed. Where an emergency exists, no written notice shall be required.

1. For the first and second violations of the provisions of this section on a site, the Community Development Department shall issue a written notice of violation. The violator shall have five (5) days to correct the violation. If the violation is not corrected within five (5) days, the Community Development Department shall issue a stop work order requiring that land-disturbing activities be stopped until necessary corrective action or mitigation has occurred; provided that if the violation presents an imminent threat to public health or waters of the state, the Community Development Department shall issue an immediate stop work order in lieu of a warning.

2. For a third and each subsequent violation on a site, the Community Development Department shall issue an immediate stop work order, and;

3. All stop work orders shall be effective immediately upon issuance and shall be in effect until the necessary corrective action or mitigation has occurred.

4. When a violation in the form of land disturbance without a permit, failure to maintain a stream buffer, or significant amounts of sediment, as determined by the Community Development Department, have been or are being discharged into state waters and where best management practices have not been properly designed, installed, m1d maintained, a stop work order shall be issued by the Community Development Department. All such stop work orders shall be effective immediately upon issuance and shall be in effect until the necessary corrective action or mitigation has occurred. Such stop work orders shall apply to all land-disturbing activity on the site with the exception of the installation and maintenance of temporary or permanent erosion and sediment controls.

8) Time Frames (See TABLE A)

1) Enforcement must be timely to be effective. In the event a violation constitutes an immediate danger to public health or public safety, the City of Brookhaven will act immediately. City of Brookhaven Ordinance Chapter 14, Article II, Sec. 14-38 (b) (7) (b) states:

> (b) Upon notice from the Community Development Department or other city authorized representative, work on any project that is being done contrary to the provisions of this chapter or in a dangerous or unsafe manner, shall be immediately stopped. Such notice shall be in writing and shall be given to the owner of the property, his/her authorized agent or the person or persons in charge of the activity on the prope1iy, and shall state the conditions under which work may be resumed. Where an emergency exists, no written notice shall be required.

2) In any other case Section 12-6-2 (b) (6) applies. A violator may appeal a NOV within 30 days of the issued NOV. If no appeal is received, it is expected for the violator to comply with the date set forth in the NOV or the violation must have been corrected by the end of the 30 days:

> (6)A statement that the determination of violation may be appealed to the City Manager or his or her designee by filing a written notice of appeal within 30 days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, corrective action shall be taken to comply with Subsection (c) of this section. Said appeal shall be filed as set forth in Section 12-6-5.

9) Tracking Mechanism

1) It is vital that each violation is tracked and documented appropriately. The inspector shall track the following:

- Name of owner/operator of the facility and/or location and address
- Type of site (e.g. Construction)
- Description of noncompliance
- A description of the remedial measures necessary to bring the action or inaction into compliance
- Description of enforcement mechanism/actions used
- Time frame given to owner for corrections, repairs or cleanup
- A statement of the penalty or penalties
- Time frame for other enforcement actions (e.g. before citation is issued)
- A statement that the determination of violation may be appealed
- Date of violation resolution

2) Refer to Section 12-6-2 (b) The notice of violation shall contain:

> (1)The name and address of the owner or the applicant or the responsible person or alleged violator;
> (2)The address when available or a description of the building, structure or land upon which the violation is occurring;
> (3)A statement specifying the nature of the violation;
> (4)A description of the remedial measures necessary to bring the action or inaction into compliance with the permit, the stormwater management plan or an approved erosion, sedimentation and pollution control plan, an approved State General Permit for construction activity, an approved site plan or the provisions of this chapter and a time schedule for the completion of such remedial action;

(5)A statement of the penalty or penalties that may be assessed against the person to whom the notice of violation is directed; and

(6)A statement that the determination of violation may be appealed to the City Manager or his or her designee by filing a written notice of appeal within 30 days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, corrective action shall be taken to comply with Subsection (c) of this section. Said appeal shall be filed as set forth in Section 12-6-5.

3) The Code Enforcement software or the Helpdesk Software are the best electronic methods of tracking information and notes: The Inspector will open a helps desk ticket or file and will, as needed, document and make notes of new developments. The system will automatically track dates and keep records of such information. A hardcopy file is recommended in addition to electronic tracking system. The hardcopy file will remain with the inspector until case is resolved, it will then be filed but made available at all times.

10) Title 12 of the City of Brookhaven Code of Ordinances

Enforcement Actions are based on our Code of Ordinances, Title 12; Water Quality, Chapter 6, "Violations, Penalties and Appeals". This Section covers all enforcement actions available. **SEE APPENDIX A**

TABLE A

This table was created for the purpose of providing examples of probable instances of non-compliance/violations, appropriate response for such violation and appropriate response time frames for various circumstances an inspector might encountered. Violations, actions, responses that might occur are not limited to the listed items.

Instances of non-compliance/violations	Response	Time Frame Provided for Corrections	Possible Additional Steps to be taken.
Use of BMP not approved on the E&S Plan: e.g. wrong sediment barrier	Verbal Warning: install appropriate BMP.	30 Days	If no action, issue NOV and STOP WORK order. Issue Citation.
Disturbing land without a permit or a stream buffer.	NOV and STOP WORK order.	24 hrs Violator to take remedial actions to protect disturbed area and file for permits.	A Citation to be issued if no action is taken.
Required number of BMPs not installed	STOP WORK order and Verbal Warning to install additional BMPs.	24 hrs	If no action, issue NOV. Issue Citation.
Silt fence no longer functional: broken or sediment filled	STOP WORK order and Verbal Warning to correct violation	24 hrs	If no action, issue NOV. Issue Citation.
Sediment on the road.	STOP WORK order and Verbal Warning to correct violation	24 hrs	If no action, issue NOV. Issue Citation.
Sediment on a waterway.	NOV and STOP WORK order.	24 hrs Violator to take remedial actions to stop source and start clean up.	Citation to be issued if no action is taken.
Debris filled site/ Overflowing waste containers.	Verbal Warning to cleanup site and add, if necessary, additional dumpster.	30 Days	If no action, issue NOV and STOP WORK order. Consider possible Citation.
Concrete Pit: Inappropriate location/unprotected.	Verbal Warning to protect pit and if necessary move to new location.	30 Days	If no action, provide NOV and STOP WORK order. Consider possible Citation.
Site lacking stabilization	NOV and STOP WORK	24 hrs	Issue a citation.

Enforcement Actions

Illicit Discharge and Illegal Connection Ordinance

1) Goal

To protect the public health, safety, environment and general welfare through the regulation of non-stormwater discharges to the City of Brookhaven separate storm sewer system (MS4) to the maximum extent practicable as required by Federal law. This chapter establishes methods for controlling the introduction of pollutants into the Brookhaven separate storm sewer system in order to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process. The objectives of this chapter are to:

(1)Regulate the contribution of pollutants to the Brookhaven separate storm sewer system by any person;
(2)Prohibit illicit discharges and illegal connections to the Brookhaven separate storm sewer system;
(3)Prevent non-stormwater discharges, generated as a result of spills, inappropriate dumping or disposal, to the Brookhaven separate storm sewer system; and
(4)Establish the legal authority to carry out all inspection, surveillance, monitoring and enforcement procedures necessary to ensure compliance with this chapter.

2) Authority

City of Brookhaven Ordinance Chapter 25: Article VI provides authority to implement illicit discharge and illegal connection enforcement measures. It provides the authority to implement an inspection, investigation and enforcement mechanism to prevent any type of illicit discharge or illegal connection into our MS4 system.

3) Enforcement Responsibility

The City of Brookhaven Department of Stormwater Services ensures compliance with the City's environmental regulations when controlling and eliminating non stormwater discharges into the MS4 system. When a citation is necessary, the Brookhaven Department of Community Development will issue such citation.

4) Responsibilities

- Respond to reports of any type of illicit discharge or illegal connection
- Inspect Municipal, Industrial Facilities operating under specific SIC Codes
- Inspect Visible Pollutant Sources(e.g. automotive related business)
- Perform dry-weather screenings of our MS4 system

5) Potential Violations: Instances of Non-Compliance (See Table B)

1) Examples of instances of non-compliance include, but are not limited to:

- Non-stormwater discharges to the MS4 system (e.g. chemicals, paint, automotive oil)
- Industrial discharges (e.g. industry practice of washing floors and hosing pollutants to or close to MS4 structure, a leaking dumpster)
- A HVPS discharge (e.g. mechanic shop with exposed, non-contained, leaking containers)
- A residential pipe connection to the MS4 system (e.g. washing machine drain connection)

2) City of Brookhaven Ordinance state violations that merit enforcement actions:

- Sec. 25-523. - Prohibited and illicit discharges.

  It is unlawful for any person to discharge or to cause, permit, or suffer to be discharged any pollutants or any water or stormwater containing any pollutants to any component of the City of Brookhaven MS4. Such discharge shall be deemed an illicit discharge and constitutes a violation of the provisions of this chapter.

- Sec. 25-524. - Prohibited and illegal connections.

  (a) It is unlawful for any person to collect a stormwater conveyance of any type that discharges any matter of any nature that is not composed entirely of stormwater or such unpolluted water as exempted in accordance with the provisions of section 25-525 of this chapter. Such connection shall be deemed an illegal connection and constitute a violation of the provisions of this chapter.

  (b) Illegal connections must be disconnected and redirected immediately, as necessary and appropriate, to the sanitary sewer system upon approval of the authority having jurisdiction to provide sanitary sewer service within the city. Any such redirection to the sanitary sewer system must be in compliance with the applicable provisions of the Code, state and federal law and regulations.

  (c) The prohibition against illegal connections expressly includes, without limitation, illegal connections made in the past, regardless of whether the connection was permissible w1der law or practices applicable or prevailing at the time of connection.

  (d) Any drain or conveyance that has not been documented in the City's plans or maps, and which is illegally connected to the City of Brookhaven MS4, shall be relocated immediately by the owner or occupant of that property upon receipt of written notice of violation from the director requiring that such relocation be completed.

- Sec. 25-525. - Exemptions from prohibition on illicit discharges and illegal connections.

(a) The following categories of discharges and connections are exempt from the prohibitions set forth in sections 25-523 and 25-524 unless the director determines that the following discharge or connection is a significant source of pollution:

(1) Water line flushing performed or approved by the director and other unpolluted discharges from potable water sources;

(2) Landscape irrigation and lawn watering;

(3) Uncontaminated pumped groundwater;

(4) Diverted stream flows;

(5) Rising groundwater;

(6) Groundwater infiltration to the City of Brookhaven MS4;

(7) Water from foundation and footing drains (not including active groundwater dewatering systems) crawl space pumps, and air conditioning condensation;

(8) Springs;

(9) Individual residential car washing where biodegradable soap is used;

(10) Natural flows from riparian habitats and wetlands;

(11) Unpolluted dechlorinated swimming pool discharges;

(12) Flows from firefighting; or

(13) Other water not containing pollutants.

(b) In the event that the director determines a discharge or connection to constitute a significant source of pollution, then the director shall notify the discharger that the discharge or connection is prohibited by the terms of this chapter, and the discharger shall be required to immediately cease the illicit discharge or disconnect the illegal connection.

(c) The discharger, after notice, shall immediately cease the illicit discharge or disconnect the illegal connection and bring any discharge or connection to the City of Brookhaven MS4 into compliance with the applicable provisions of this chapter.

(d) This section shall not apply to any non-stormwater discharge permitted under an NPDES permit or order issued to the discharger and administered under the authority of the State and the EPA, provided that the discharger is in full compliance with all the requirements of the permit, waiver, or order and other applicable laws and regulations. The discharger must supply the director with a copy of the NPDES permit or order.

Sec. 25-526. - Stormwater discharges associated with industrial or construction activity.

(a) Discharges of stormwater associated with industrial activities or construction activities must comply with the permit requirements of the NPDES program for stormwater discharges and the regulations in Chapter 14 of the City of Brookhaven Code of Ordinances. Specific dischargers of stormwater associated with industrial or construction activity are responsible for submitting a permit application to the Georgia EPD.

(b) A copy of the permit application shall be submitted to the director.

(c) Discharges of stormwater associated with industrial or construction activity must comply with all provisions of this chapter for any discharges which are made to the City of Brookhaven MS4.

6) Enforcement Mechanisms

Sec. 25-551. - Investigation.

The department shall have authority to investigate any apparent violation of any provision of this chapter and to take any action authorized by this chapter which it deems necessary to enforce the provisions of this chapter.

Sec. 25-552. - Inspection and right of entry.

(a) The department may inspect any stormwater conveyance within or outside of an existing drainage easement.

(b) The department, bearing proper credentials and identification, and in accordance with state and federal law, shall be permitted to enter private or public property at reasonable times to inspect or investigate conditions relating to the enforcement of this chapter, the investigation of any apparent violation of any provision of this chapter, compliance with the terms of the permit, observation, measurement, sampling or testing with respect to the City of Brookhaven Stormwater Management Program or compliance with the permit, and periodic investigations in accordance with provisions of this chapter. The department shall notify the owner of said property or the representative onsite, except in the case of an emergency.

(c) The department, bearing proper credentials and identification, and in accordance with state and federal law, shall be permitted to enter private or public property at reasonable times for repairs, maintenm1ce and other similar purposes related to any portion of the City of Brookhaven MS4. The department shall notify the owner of said property or the representative onsite, except in the case of an emergency.

(d) The department, in addition to other procedures provided, may obtain an inspection warrant for the purpose of inspection or investigation of conditions relating to the enforcement of this chapter, compliance with the terms of the permit, or observation, measurement, sampling or testing with respect to the City of Brookhaven Stormwater Management Program or the permit, and periodic investigations in accordance with the provisions of this chapter.

(1) Inspection warrants may be issued by the municipal court when the issuing judge is satisfied that the department has established by oath or affirmation that the property to be inspected is to be inspected as a part of a legally authorized program of inspection that includes the property or that there is probable cause for believing that there is a condition, object, activity, or circumstance which legally justifies such an inspection of the property.

(2) An inspection warrant will be validly issued only if it meets the following requirements:

a. The warrant is attached to the affidavit required to be made in order to obtain the warrant.

b. The warrant describes, either directly or by reference to the affidavit, the property upon which the inspection is to occur and is sufficiently accurate that the executor of the warrant and the owner or occupant of the property or discharger can reasonably determine from it the property for which the warrant authorizes an inspection.

c. The warrant indicates the conditions, objects, activities or circumstances which the inspection is intended to check or reveal.

d. The warrant refers, in general terms, to the code provisions sought to be enforced.

e. Measurements, samples, tests and analyses performed by City of Brookhaven or required of any discharger to the City of Brookhaven MS4 shall be in accordance with 40 Code of Federal Regulations Part 136, unless another method is approved by the director.

Sec. 25-553. - Emergency powers.

(a) If, after inspection, the condition of a stormwater conveyance presents an immediate danger to the public health, safety or general welfare because of unsafe conditions or improper maintenance, the City of Brookhaven shall have the right to take action as may be necessary to protect the public health, safety and general welfare and make the stormwater conveyance safe.

(b) The department may conduct emergency maintenance or remediation operations on private property and on private stormwater conveyances. Emergency maintenance or remediation operations shall constitute actions to remedy conditions that in the opinion of the director create a condition potentially injurious to life, property or the City of Brookhaven MS4.

(c) Emergency maintenance conducted on any stormwater conveym1ce shall not be construed as constituting a continuing maintenance obligation on the part of the City of Brookhaven.

Sec. 25-554. - Authority to require person to cooperate with department.

Whenever required to carry out the objectives of this chapter, including but not limited to obtaining information regarding permit compliance, implementing the City of Brookhaven Stormwater Management Program, or determining whether any person is in violation of any provision of this chapter, the director may in writing require a discharger to the City of Brookhaven MS4to:

(1) Establish and maintain records;

(2) Make reports;

(3) Install, use, and maintain monitoring equipment or methods, including where appropriate, biological monitoring methods;

(4) Sample such discharges, in accordance with such methods, at such locations, at such intervals, and in such manner as the director shall prescribe; and

(5) Provide such other information as he or she may reasonably require.

Sec. 25-561. - Notice of violation and summons.

(a) Whenever the department determines that a violation of this chapter or regulations and procedures adopted thereto has occurred, the department shall serve upon the discharger a notice of violation. The notice of violation shall be in writing, include a description of the property sufficient for identification of where the violation has occurred, list the provisions of this chapter which have been violated, and state that, if the violation is not remedied within a specified reasonable time to be determined by the department, a summons shall be issued for the discharger to appear in municipal court. The notice of violation shall set forth the potential penalty involved and the fact that each day the violation continues shall constitute a new and separate violation.

(b) Notwithstanding the foregoing, the department may issue a summons to appear in municipal court without first issuing a notice of violation if, in the judgment of the director, the illicit discharge or illicit connection was not an accidental discharge or if the violation constitutes a threat to the public health, safety, general welfare, or the City of Brookhaven MS4.

(c) If the violation has not been remedied within the time specified in the notice of violation, the department shall issue a summons' to the discharger to appear in municipal court. The summons shall be in writing, include a description of the property sufficient for identification of where the violation has occurred, list the provisions of this chapter which have been violated, set forth the penalty if the discharger is convicted of the violation, and state that each day the violation continues shall constitute a new and separate violation.

(d) Nothing in this Code section shall limit the authority of the department to take any action, including emergency actions or any other enforcement action, without first issuing a notice of violation.

7) Appropriate Responses (See Table B)

The inspector will consider the enforcement response. When making this determination, the inspector should consider the following:

- Magnitude of the problem.
- Duration of the problem.
- Effects on State waters
- Effect on the MS4
- Compliance history
- Good faith
- Code of Ordinance Sec. 25-561. – Notice of Violation and Summons.

Sec. 25-561. - Notice of violation and summons.

(a) Whenever the department determines that a violation of this chapter or regulations and procedures adopted thereto has occurred, the department shall serve upon the discharger a notice of violation. The notice of violation shall be in writing, include a description of the property sufficient for identification of where the violation has occurred, list the provisions of this chapter which have been violated, and state that, if the violation is not remedied within a specified reasonable time to be determined by the department, a summons shall be issued for the discharger to appear in municipal court. The notice of violation shall set forth the potential penalty involved and the fact that each day the violation continues shall constitute a new and separate violation.

(b) Notwithstanding the foregoing, the department may issue a summons to appear in municipal court without first issuing a notice of violation if, in the judgment of the director, the illicit discharge or illicit connection was not an accidental discharge or if the violation constitutes a threat to the public health, safety, general welfare, or the City of Brookhaven MS4.

(c) If the violation has not been remedied within the time specified in the notice of violation, the department shall issue a summons' to the discharger to appear in municipal court. The summons shall be in writing, include a description of the property sufficient for identification of where the violation has occurred, list the provisions of this chapter which have been violated, set forth the penalty if the discharger is convicted of the violation, and state that each day the violation continues shall constitute a new and separate violation.

(d) Nothing in this Code section shall limit the authority of the department to take any action, including emergency actions or any other enforcement action, without first issuing a notice of violation.

8) Time Frames (See Table B)

An illicit discharge or illegal connection needs to be addressed immediately. In the event a violation constitutes an immediate danger to public health or public safety, the City of Brookhaven will act immediately.

Sec. 25-553. - Emergency powers.

(a) If, after inspection, the condition of a stormwater conveyance presents an immediate danger to the public health, safety or general welfare because of unsafe conditions or improper maintenance, City of Brookhaven shall have the right to take action as may be necessary to protect the public health, safety and general welfare and make the stormwater conveyance safe.

(b) The department may conduct emergency maintenance or remediation operations on private property and on private stormwater conveyances. Emergency maintenance or remediation operations shall constitute actions to remedy conditions that in the opinion of the director create a condition potentially injurious to life, property or the City of Brookhaven MS4.

(c) Emergency maintenance conducted on any stormwater conveym1ce shall not be construed as constituting a continuing maintenance obligation on the part of the City of Brookhaven.

Sec. 25-562. - Submission of a corrective plan.

(a) Within ten (10) business days of conviction by municipal court or resolution of any appeal, the discharger shall submit to the director a plan for the satisfactory correction of the violation, including corrective and preventive procedures, and implementation of best management practices, where necessary to prevent recurrence.

(b) Submission of this plan in no way relieves the discharger of liability for any violations occurring after conviction of the violation. The failure to submit this plan as required by this Code section shall constitute a separate violation of this chapter.

9) Tracking Mechanism

1) It is vital that each violation is tracked and documented appropriately. The inspector shall track the following:

- Name of owner/operator of the facility and/or location and address
- Type of site
- Description of noncompliance, discharge type, amount
- A description of the remedial measures necessary to bring the action or inaction into compliance
- Description of enforcement mechanism/actions used
- Time frame given to owner for corrections and cleanup
- A statement of the penalty or penalties
- Time frame for other enforcement actions (e.g. disconnection or before citation is issued)
- A statement that the determination of violation may be appealed
- Date of violation resolution

Refer to Sec. 14-44.12 Violations, Enforcement and Penalties

Any action or inaction which violates the provisions of this ordinance or the requirements of an approved site plan or permit may be subject to the enforcement actions outlined in this Section. Any such action or inaction which is continuous with respect to time is deemed to be a public nuisance and may be abated by injunctive or other equitable relief. The imposition of any of the penalties described below shall not prevent such equitable relief.

a) Notice of Violation

If the city determines that an applicant or other responsible person has failed to comply with the terms and conditions of a permit, an approved site plan or the provisions of this ordinance, it shall issue a written notice of violation to such applicant or other responsible person. Where a person is engaged in activity covered by this ordinance without having first secured the appropriate permit therefor, the notice of violation shall be served on the owner or the responsible person in charge of the activity being conducted on the parcel.

The notice of violation shall contain:

1) The name and address of the owner or the applicant or the responsible person;
2) The address or other description of the parcel upon which the violation is occurring;
3) A statement specifying the nature of the violation;

4) A description of the remedial measures necessary to bring the action or inaction into compliance with the permit, the approved site plan or this ordinance and the date for the completion of such remedial action;
5) A statement of the penalty or penalties that may be assessed against the person to whom the notice of violation is directed; and,
6) A statement that the determination of violation may be appealed to the Zoning Board of Appeals by filing a written notice of appeal within fifteen (15) days after the notice of violation (except that in the event the violation constitutes an immediate danger to public health or public safety, 24-hour notice shall be sufficient).

b) Enforcement

In the event the remedial measures described in the notice of violation have not been completed by the date set forth for such completion in the notice of violation, any one or more of the following actions or penalties may be taken or assessed against the person to whom the notice of violation was directed. Before taking any of the following actions or imposing any of the following penalties, the city shall first notify the applicant or other responsible person in writing of its intended action, and shall provide a reasonable opportunity, of not less than ten days (except that in the event the violation constitutes an immediate danger to public health or public safety, 24 hour notice shall be sufficient) to cure such violation. In the event the applicant or other responsible person fails to cure such violation after such notice and cure period, the city may take any one or more of the following actions or impose any one or more of the following penalties.

1) Stop Work Order - The city may issue a stop work order which shall be served on the applicant or other responsible person. The stop work order shall remain in effect until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violation or violations described therein, provided the stop work order may be withdrawn or modified to enable the applicant or other responsible person to take necessary remedial measures to cure such violation or violations.
2) Withhold Certificate of Occupancy - The city may refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the parcel until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein.
3) Suspension, Revocation or Modification of Permit - The city may suspend, revoke or modify the permit authorizing the land development project. A suspended, revoked or modified permit may be reinstated after the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein, provided such permit may be reinstated (upon such conditions as the city may deem necessary) to enable the applicant or other responsible person to take the necessary remedial measures to cure such violations.
4) Penalties - In the event the applicant or other responsible person fails to take the remedial measures set forth in the notice of violation or otherwise fails to cure the violations described therein within ten days (or such greater period as the city shall deem appropriate) (except that in the event the violation constitutes an immediate danger to public health or public safety, 24 hour notice shall be sufficient) after the city has taken one or more of the actions described above, the city may issue a citation to the applicant or other responsible party required such party to appear in municipal

court to answer charges for such violation. Any violation of this ordinance is punishable upon conviction according to the provision of Sec. 1-10 of the code. Each day any violation of this ordinance shall continue shall constitute a separate offense.

10) Other Utilities and Jurisdictions

- In the event a **damaged sewer system** is located by the City of Brookhaven compliance inspectors, a call for repairs will be made to: Dekalb Watershed – 770-270-6243
- In the event an **illicit discharge** or **illegal connection** is located and confirm as a discharge to the City of Brookhaven jurisdiction, a call for action will be made to:

  Brookhaven Stormwater Department – 404-637-0540 or email stormwater@brookhavenga.gov.

- In the event of a **discharge or connection** that are **outside of City or County** legal enforcement authority is encountered, the information will be provided to:

  Georgia EPD Spill Response Hotline - 404-565-4863 or 1-800-241-4113

TABLE B

This table was created for the purpose of providing examples of probable instances of non-compliance/violations, appropriate response for such violation and appropriate response time frames for various circumstances an inspector might encountered. Violations, actions, responses that might occur are not limited to the listed items.

Instances of non-compliance/violations	Response	Time Frame Provided for Corrections	Possible Additional Steps to be taken.
Drain line discharge: e.g. washing machine	Educate and give NOV to stop practice and remove line.	Practice to stop immediately. 24 hrs to remove or cap line.	Follow up. If no actions issue Citation.
Discharging/dumping pollutants to the MS4: e.g. Paint, F.O.G, motor oil	Educate and give NOV to stop practice.	Practice to stop immediately. 24 hrs to remove pollutants from MS4 and cleanup.	Follow up. If no actions issue Citation.
Discharging/dumping pollutants to the MS4: e.g. grass clippings	Educate and give NOV to stop practice.	Practice to stop immediately. 24 hrs to remove pollutants from MS4 and cleanup.	Follow up. If no actions issue Citation.
Leaking Dumpster	Educate and give NOV	24 hrs stop using dumpster and request to have dumpster removed and replaced.	Consider time for replacement of dumpster. Suggested 5 business days. Follow up. If no actions issue Citation.
Exposed, leaking containers	Educate and give NOV- protect/ cover exposed containers and move with secondary containment.	Practice to stop immediately. 24 hrs to move to covered protected secondary container and remove/ replace leaking containers	Follow up. Suggested 5 business days. If no actions issue Citation.
Dry weather outfall discharge	Investigate source and discharge. If needed, grab sample for testing. Educate and give NOV to stop practice.	Practice to stop immediately. 24 hrs to remove pollutants from MS4 and cleanup.	Follow up. If no actions issue Citation.
Business or Industry practice of hosing floors, surrounding to MS4 system.	Educate and give NOV to stop practice.	Practice to stop immediately. 24 hrs to remove, if any, pollutants from MS4 and cleanup.	Follow up. If no actions issue Citation.

Enforcement Actions

Post Development Ordinance

1) Goal

As stated in Section 12-4-1. General provisions:

To protect, maintain and enhance the public health, safety, environment and general welfare by establishing minimum requirements and procedures to control the adverse effects of increased post-development stormwater runoff and nonpoint source pollution associated with new development and redevelopment. It has been determined that proper management of post-development stormwater runoff will minimize damage to public and private property and infrastructure, safeguard the public health, safety, environment and general welfare of the public, and protect water and aquatic resources.

2) Authority

Local Ordinance 698, Title 8, Chapter 11, "Stormwater", Title 12, Chapter 4, "Post Development Stormwater Management for New Development and Redevelopment", and Title 12, Chapter 6, "Violations, Penalties and Appeals", of our Code of Ordinances provide the authority to implement enforcement actions to insure proper MS4 system development, maintenance and operation.

3) Enforcement Responsibility

The City of Brookhaven Department of Community Development ensures compliance with the City's environmental regulations and construction requirements associated with new development and redevelopment. The City of Brookhaven Stormwater Department ensures compliance with the City's environmental regulations by inspecting the MS4 system and confirming proper use and maintenance of such system. When a citation is necessary, the Brookhaven Department of Community Development will issue such citation.

4) Responsibilities

As stated by Sec. 12-4-1. General provisions:

(1)Establish decision-making processes surrounding land development activities that protect the integrity of the watershed and preserve the health of water resources;
(2)Require that new development and redevelopment maintain the pre-development hydrologic response in their post-development state as nearly as practicable in order to reduce flooding, streambank erosion, nonpoint source pollution and increases in stream temperature, and maintain the integrity of stream channels and aquatic habitats;
(3)Establish minimum post-development stormwater management standards and design criteria for the regulation and control of stormwater runoff quantity and quality;
(4)Establish design and application criteria for the construction and use of structural stormwater control facilities that can be used to meet the minimum post-development stormwater management standards;
(5)Encourage the use of nonstructural stormwater management and stormwater better site design practices, such as the preservation of greenspace and other conservation areas, to the maximum extent practicable. Coordinate site design plans, which include greenspace, with the City's greenspace program;
(6)Establish provisions for the long-term responsibility for and maintenance of structural stormwater control facilities and nonstructural stormwater management practices to ensure that they continue to function as designed, are maintained, and pose no threat to public safety; and

(7)Establish administrative procedures for the submission, review, approval and disapproval of stormwater management plans, and for the inspection of approved active projects, and long-term follow up.

5) Potential Violations: Instances of Non-Compliance (See Table C)

1) Examples of instances of non-compliance include, but not limited to:

- Stormwater structures not built to design specifications
- Construction of structures outside of the approved stormwater management plan
- Failure to submit either actual "as-built" plans or actual subdivision final plats for any stormwater management facilities or practices after final construction is completed.
- Violate maintenance agreement specifications
- Lack of maintenance of a post-development structure

2) Local Ordinance state violations that merit enforcement actions:

- As stated by Sec. 12-6-1. Violations

  (a)Any action or inaction which violates the provisions of this title or the requirements of an approved stormwater management plan or an approved erosion, sedimentation and pollution control plan, an approved State General Permit for construction activity, an approved site plan, or permit, shall be subject to the enforcement actions outlined in this section. Any such action or inaction that is continuous with respect to time is deemed to be a public nuisance and may be abated by preliminary or permanent injunctive or other equitable relief. The imposition of any of the penalties described below shall not prevent such equitable relief.

- (b) Failure to obtain a permit for land disturbing activity. If any person commences any land disturbing activity requiring a land disturbing permit as prescribed in this chapter without first obtaining said permit, the person shall be subject to revocation of his occupation tax registration, work permit or other authorization for the conduct of business and associated work activities within the jurisdictional boundaries of the City. (Ord. No. 799, § 1(12-6-1), 6-2-2010)
- Sec. 12-4-18. Final inspection and as-built plans

  Upon completion of a project, and before a certificate of occupancy shall be granted, the applicant is responsible for certifying that the completed project is in accordance with the approved stormwater management plan. All applicants are required to submit either actual "as-built" plans or actual subdivision final plats (required by Section 8-6-54 for any stormwater management facilities or practices after final construction is completed. The plan must show the final design specifications for all stormwater management facilities and practices and must be certified by a professional engineer licensed in the State. A final inspection by the City Manager or his or her designee is required before the release of any performance securities can occur. (Code 1990, § 12-4-18; Ord. No. 698, 10-20-2004)

- Sec. 12-4-19. Longterm maintenance inspection of stormwater facilities and practices

  (f)Failure to maintain. If a responsible person fails or refuses to meet the requirements of the inspection and maintenance agreement, the City Manager or his or her designee, after 30 days written notice (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24-hours notice shall be sufficient), may correct a violation of the design standards or maintenance requirements by performing the necessary work to place the facility or practice in proper working condition. The City Manager or his or her designee may assess the owner(s) of the facility for the cost of repair work that shall be a lien on the property, and upon recordation as required by O.C.G.A. § 9-12-86, shall constitute a lien on the property for the amount of the assessment. (Code 1990, § 12-4-19; Ord. No. 698, 10-20-2004)

6) Enforcement Mechanisms

The inspector must identify appropriate enforcement responses for each violation. The City inspector will determine the appropriate applicable response for each violation, in accordance with local ordinance Sec. 12-6-2. There are several types of enforcement actions:

- Verbal Warnings – these can consist of phone calls or face-to-face discussions. The inspector should specify the nature of the violation and the required corrective action during the conversation.

- Notice of Violation (NOV) – A NOV could be issued by an inspector. It will consist of a form or a letter that has been hand-delivered or sent certified mail. Copies of the NOV will be retained by the City inspector for potential escalating enforcement.

- Citations–the citation will specify the ordinance section violated. A fine of up to $1000 per violation may be imposed or 6 months imprisonment.

- Stop work order. The City of Brookhaven may issue a stop work order which shall be served on the applicant or other responsible person. The stop work order shall remain in effect until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violation or violations described therein, provided the stop work order may be withdrawn or modified to enable the applicant or other responsible person to take the necessary remedial measures to cure such violation or violations.

- Withhold certificate of occupancy. The City of Brookhaven may refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the site until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein.

- Suspension, revocation or modification of permit. Brookhaven may suspend, revoke or modify the permit authorizing the development project. A suspended, revoked or modified permit may be reinstated after the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein, provided such permit may be reinstated (upon such conditions as the City may deem necessary) to enable the applicant or other responsible person to take the necessary remedial measures to cure such violations.

The inspector must ensure each enforcement action is documented. Documentation is necessary in the event of escalation of enforcement to a judicial level.

7) Appropriate Responses (See Table C)

The inspector will consider the enforcement response. When making this determination, the inspector should consider the following:

- Magnitude of the problem.
- Duration of the problem.
- Effects on State waters
- Effect on the MS4
- Compliance history
- Good faith
- Ordinance Sec. 12-6-3, (a)Actions

  "In the event the remedial measures described in the notice of violation have not been completed by the date set forth for such completion in the notice of violation, or the time for filing an appeal has expired, any one or more of the following actions or penalties may be taken or assessed against the person to whom the notice of violation was directed. Before taking any of the following actions or imposing any of the following penalties, the City Manager or his or her designee shall first notify the applicant or other responsible person in writing of its intended action, and shall provide a reasonable opportunity to cure such violation."

8) Time Frames (See Table C)

1) Enforcement must be timely to be effective. In the event a violation constitutes an immediate danger to public health or public safety, the City of Brookhaven will act immediately. Ordinance section 12-6-2 (c) states:

> (c) In the event the violation constitutes an immediate danger to public health or public safety, the City Manager or his or her designee is authorized to enter upon the subject private property, without giving prior notice, to take any and all measures necessary to abate the violation and/or restore the property. The City Manager or his or her designee is authorized to seek costs of the abatement as outlined in Section 12-6-4 (Ord. No. 799, § 1(12-6-2), 6-2-2010)

2) In any other case Section 12-6-2 (b) (6) applies. A violator may appeal a NOV within 30 days of the issued NOV. If no appeal is received, it is expected for the violator to comply with the date set forth in the NOV or the violation must have been corrected by the end of the 30 days:

> (6)A statement that the determination of violation may be appealed to the City Manager or his or her designee by filing a written notice of appeal within 30 days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, corrective action shall be taken to comply with Subsection (c) of this section. Said appeal shall be filed as set forth in Section 12-6-5.

9) Tracking Mechanism

1) It is vital that each violation is tracked and documented appropriately. The inspector shall track the following:

- Name of owner/operator of the facility and/or location and address
- Type of site
- Description of noncompliance
- A description of the remedial measures necessary to bring the action or inaction into compliance
- Description of enforcement mechanism/actions used
- Time frame given to owner for corrections, maintenance or cleanup
- A statement of the penalty or penalties

- Time frame for other enforcement actions (e.g. before citation is issued)
- A statement that the determination of violation may be appealed
- Date of violation resolution

2) Refer to Section 12-6-2 (b) The notice of violation shall contain:

(1)The name and address of the owner or the applicant or the responsible person or alleged violator;
(2)The address when available or a description of the building, structure or land upon which the violation is occurring;
(3)A statement specifying the nature of the violation;
(4)A description of the remedial measures necessary to bring the action or inaction into compliance with the permit, the stormwater management plan or an approved erosion, sedimentation and pollution control plan, an approved State General Permit for construction activity, an approved site plan or the provisions of this chapter and a time schedule for the completion of such remedial action;
(5)A statement of the penalty or penalties that may be assessed against the person to whom the notice of violation is directed; and
(6)A statement that the determination of violation may be appealed to the City Manager or his or her designee by filing a written notice of appeal within 30 days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, corrective action shall be taken to comply with Subsection (c) of this section. Said appeal shall be filed as set forth in Section 12-6-5.

3) The Code Enforcement software or the Helpdesk Software are the best electronic methods of tracking information and notes: The Inspector will open a helps desk ticket or file and will, as needed, document and make notes of new developments. The system will automatically track dates and keep records of such information. A hardcopy file is recommended in addition to electronic tracking system. The hardcopy file will remain with the inspector until case is resolved, it will then be filed but made available at all times.

4) In addition refer to Sec. 12-4-17, Inspections to ensure plan compliance during construction:

(b)All inspections shall be documented with written reports that contain the following information:
(1)The date and location of the inspection;
(2)Whether construction is in compliance with the approved stormwater management plan;
(3)Variations from the approved construction specifications; and
(4)Any other variations or violations of the conditions of the approved stormwater management plan.

10) Title 12 of the City of Brookhaven Code of Ordinances

Enforcement Actions are based on our Code of Ordinances, Title 12; Water Quality, Chapter 6, "Violations, Penalties and Appeals". **SEE APPENDIX A**

Table C

This table was created for the purpose of providing examples of probable instances of non-compliance/violations, appropriate response for such violation and appropriate response time frames for various circumstances an inspector might encountered. Violations, actions, responses that might occur are not limited to the listed items.

Instances of non-compliance/violations	Response	Time Frame Provided for Corrections	Possible Additional Steps to be taken.
Storm Drain box not built to specification	Verbal Warning to correct BMP to Specifications.	30 Days	If no action, issue NOV and STOP WORK order.
Wrong type of drainage materials outside the approved plans	Verbal Warning to provide materials specified in approved plans.	30 Days	If no action, issue NOV and STOP WORK order.
Straying from E&S Approved Plans	Verbal Warning to change, replace non- permitted BMPS	24 hrs to start corrections	If no action, issue NOV and STOP WORK order and possible suspension, revocation or modification of permit.
Development outside the area specified in the approved plans.	NOV and Stop Work order requiring corrections	24 hrs to start corrections/ stabilization of non-permitted area disturbed	Follow up. If no actions issue Citation and possible Suspension, revocation or modification of permit.
Failure to submit as- built plans or final plats	Verbal Warning to submit plans or plats	30 Days	If no action, withhold certificate of occupancy.
Lack of Maintenance/Violation of Maintenance Agreement: e.g. Overgrown Landscape.	Send NOV to owner	30 Days to start corrections or reach us with correction plan and schedule.	If no action, issue citation.

Enforcement Actions

Floodplain Management

1) Goal

To protect, maintain and enhance the public health, safety, environment and general welfare and to minimize public and private losses due to flood conditions in flood hazard areas, as well as to protect the beneficial uses of floodplain areas for water quality protection, streambank and stream corridor protection, wetlands preservation and ecological and environmental protection

2) Authority

a) Local Ordinance 741, 8-4, provides authority to implement floodplain management enforcement measures.

b) Brookhaven has entered into a Memorandum of Agreement with the Dekalb County Soil and Water Conservation District and the Georgia Soil and Water Conservation Commission. The Memorandum of Agreement authorizes the City as a Local Issuing Authority.

3) Responsibility for Enforcement

The City of Brookhaven Department of Community Development ensures compliance with the City's environmental regulations and construction requirements pertaining to floodplain management. When a citation is necessary, the Brookhaven Department of Community Development will issue such citation.

4) Responsibilities

- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Restrict or prohibit uses which are dangerous to health, safety and property due to flooding or erosion hazards, or which increase flood heights, velocities, or erosion;
- Control filling, grading, dredging and other development which may increase flood damage or erosion;
- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands;
- Limit the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in the accommodation of floodwaters; and
- Protect the stormwater management, water quality, streambank protection, stream corridor protection, wetland preservation and ecological functions of natural floodplain areas.

5) Potential Violations: Instances of Non-Compliance (See Table D)

1) Examples of instances of non-compliance include, but are not limited to:

- Performing any development activities on a site where an area of special flood hazard is located without first meeting the ordinance requirements
- Unauthorized filling, grading, dredging
- Illegal alteration of natural floodplains, stream channels, and natural protective barriers

- Disturbance of a wetland

2) Local Ordinances state violations that merit enforcement actions:

- Sec. 8-4-26. Generally:

  Any action or inaction which violates the provisions of this chapter or the requirements of an approved stormwater management plan or permit, may be subject to the enforcement actions outlined in this section. Any such action or inaction which is continuous with respect to time is deemed to be a public nuisance and may be abated by injunctive or other equitable relief. The imposition of any of the penalties described below shall not prevent such equitable relief.

6) Enforcement Mechanisms

The inspector must identify appropriate enforcement responses for each violation. The Brookhaven inspector will determine the appropriate response for each violation, in accordance with local ordinance Sec. 8-4. There are several types of enforcement actions:

- Verbal Warnings – these can consist of phone calls or face-to-face discussions. The inspector should specify the nature of the violation and the required corrective action during the conversation.

- Notice of Violation (NOV) – A NOV could be issued by an inspector. It will consist of a form or a letter that has been hand-delivered or sent certified mail. Copies of the NOV will be retained by the Brookhaven inspector for potential escalating enforcement.

- Citations–the citation will specify the ordinance section violated. A fine of up to $1000 per violation may be imposed or 6 months imprisonment.

- Stop work order. Brookhaven may issue a stop work order which shall be served on the applicant or other responsible person. The stop work order shall remain in effect until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violation or violations described therein, provided the stop work order may be withdrawn or modified to enable the applicant or other responsible person to take the necessary remedial measures to cure such violation or violations.

- Withhold certificate of occupancy. Brookhaven may refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the site until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein.

- Suspension, revocation or modification of permit. Brookhaven may suspend, revoke or modify the permit authorizing the development project. A suspended, revoked or modified permit may be reinstated after the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein, provided such permit may be reinstated (upon such conditions as Brookhaven may deem necessary) to enable the applicant or other responsible person to take the necessary remedial measures to cure such violations.

The inspector must ensure each enforcement action is documented. Documentation is necessary in the event of escalation of enforcement to a judicial level.

7) Appropriate Responses (See Table D)

The inspector will consider the enforcement response. When making this determination, the inspector should consider the following:

- Magnitude of the problem.
- Duration of the problem.
- Effects on State waters
- Effect on the MS4
- Compliance history
- Good faith
- Ordinance Sec. 8-4-27. Notice of violation (a)

  "If the City determines that an applicant or other responsible person has failed to comply with the terms and conditions of a permit, an approved stormwater management plan or the provisions of this chapter, it shall issue a written notice of violation to such applicant or other responsible person. Where a person is engaged in activity covered by this chapter without having first secured a permit therefor, the notice of violation shall be served on the owner or the responsible person in charge of the activity being conducted on the site."

8) Time Frames (See Table D)

- In the event the violation constitutes an immediate danger to public health or public safety, the violator has 24 hours to correct or appeal. If no appeal is receive, Brookhaven will act immediately to correct the violation.

- In any other case, the violator may appeal a NOV within 30 days of the issued NOV. If no appeal is received, it is expected for the violator to comply with the date set forth in the NOV or the violation must have been corrected by the end of the 30 days:
- Sec. 8-4-27(a) states:

  (6) A statement that the determination of violation may be appealed to the City by filing a written notice of appeal within 30 days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours' notice shall be sufficient).

9) Tracking Mechanism

1) It is vital that each violation is tracked and documented appropriately. The inspector shall track the following:

- Name of owner/operator of the facility and/or location and address
- Type of site
- Description of noncompliance
- A description of the remedial measures necessary to bring the action or inaction into compliance
- Description of enforcement mechanism/actions used
- Time frame given to owner for corrections, repairs or cleanup
- A statement of the penalty or penalties

- Time frame for other enforcement actions (e.g. before citation is issued)
- A statement that the determination of violation may be appealed
- Date of violation resolution

2) Refer to Sec. 8-4-27. Notice of violation.

(b)The notice of violation shall contain:

(1)The name and address of the owner or the applicant or the responsible person;
(2)The address or other description of the site upon which the violation is occurring;
(3)A statement specifying the nature of the violation;
(4)A description of the remedial measures necessary to bring the action or inaction into compliance with the permit, the stormwater management plan or this chapter and the date for the completion of such remedial action;
(5)A statement of the penalty or penalties that may be assessed against the person to whom the notice of violation is directed; and
(6)A statement that the determination of violation may be appealed to the City by filing a written notice of appeal within 30 days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours' notice shall be sufficient).

3) The Code Enforcement software or the Helpdesk Software are the best electronic methods of tracking information and notes: The Inspector will open a helps desk ticket or file and will, as needed, document and make notes of new developments. The system will automatically track dates and keep records of such information. A hardcopy file is recommended in addition to electronic tracking system. The hardcopy file will remain with the inspector until case is resolved, it will then be filed but made available at all times.

10)Title 8, Chapter 4, Article F of the City of Brookhaven Code of Ordinances

Enforcement Actions are based on our Code of Ordinances, Title 8, Chapter 4, Article F "Violations, Enforcement and Penalties". This Section covers all enforcement actions available. **SEE APPENDIX B**

Table D

This table was created for the purpose of providing examples of probable instances of non-compliance/violations, appropriate response for such violation and appropriate response time frames for various circumstances an inspector might encountered. Violations, actions, responses that might occur are not limited to the listed items.

Instances of non-compliance/violations	Response	Time Frame Provided for Corrections	Possible Additional Steps to be taken.
Performing development activities in future-conditions floodplain area or areas of special flood hazards without a permit.	NOV and STOP WORK order	24 hrs to start corrections/ stabilization of non-permitted areas disturbed	If no action, issue citation.
Failure to submit a floodplain management and flood damage prevention plans as required.	Verbal Warning: Provide documentation needed.	30 Days	Suspension, revocation or modification of permit.
Failure to submit required	Verbal Warning: Provide	30 Days	Suspension, revocation or

engineering flood management studies.	documentation needed.		modification of permit.
Failure to performed required maintenance that would insure flood-carrying or flood storage capacity is not diminished	NOV	30 Days to perform maintenance or to provide City with maintenance schedule.	If no action, issue citation.
Failure to follow approved building standards for structures located within future-condition floodplain.	Verbal Warning to make corrections per approved standards.	30 Days	Issue NOV and Stop Work order.
If a variance is granted, failure to adhere to variance specifications.	Verbal Warning to adhere to variance	30 Days	NOV, STOP WORK order and possible Suspension, revocation or modification of variance.

APPENDIX A
Title 12 of the City of Brookhaven Code of Ordinances

Sec. 12-6-1. Violations.

(a)

Any action or inaction which violates the provisions of this title or the requirements of an approved stormwater management plan or an approved erosion, sedimentation and pollution control plan, an approved State General Permit for construction activity, an approved site plan, or permit, shall be subject to the enforcement actions outlined in this section. Any such action or inaction that is continuous with respect to time is deemed to be a public nuisance and may be abated by preliminary or permanent injunctive or other equitable relief. The imposition of any of the penalties described below shall not prevent such equitable relief.

(b)

Failure to obtain a permit for land disturbing activity. If any person commences any land disturbing activity requiring a land disturbing permit as prescribed in this chapter without first obtaining said permit, the person shall be subject to revocation of his occupation tax registration, work permit or other authorization for the conduct of business and associated work activities within the jurisdictional boundaries of the City of Brookhaven.

(Ord. No. 799, § 1(12-6-1), 6-2-2010)

Sec. 12-6-2. Notice of violation.

(a)

If the City Manager or his or her designee determines that an applicant or other responsible person has failed to comply with the terms and conditions of a permit, an approved stormwater management plan or an approved erosion, sedimentation and pollution control plan, an approved State General Permit for construction activity, an approved site plan, or the provisions of this chapter, the City Manager or his or her designee shall issue a written notice of violation to such applicant or the property owner delivered personally or by registered or certified mail, sent to the billing address for property tax purposes of the property owner or to the address given on the application. Where a person is engaged in activity covered by this chapter without having first secured a permit therefor, the notice of violation shall be served on the owner or the responsible person in charge of the activity being conducted on the site.

(b)

The notice of violation shall contain:

(1)

The name and address of the owner or the applicant or the responsible person or alleged violator;

(2)

The address when available or a description of the building, structure or land upon which the violation is occurring;

(3)

A statement specifying the nature of the violation;

(4)

A description of the remedial measures necessary to bring the action or inaction into compliance with the permit, the stormwater management plan or an approved erosion, sedimentation and pollution control plan, an approved State General Permit for construction activity, an approved site plan or the provisions of this chapter and a time schedule for the completion of such remedial action;

(5) A statement of the penalty or penalties that may be assessed against the person to whom the notice of violation is directed; and

(6)

A statement that the determination of violation may be appealed to the City Manager or his or her designee by filing a written notice of appeal within 30 days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, corrective action shall be taken to comply with Subsection (c) of this section.

Said appeal shall be filed as set forth in Section 12-6-5.

(c)

In the event the violation constitutes an immediate danger to public health or public safety, the City Manager or his or her designee is authorized to enter upon the subject private property, without giving prior notice, to take any and all measures necessary to abate the violation and/or restore the property. The City Manager or his or her designee is authorized to seek costs of the abatement as outlined in Section 12-6-4

(Ord. No. 799, § 1(12-6-2), 6-2-2010)

Sec. 12-6-3. Penalties.

(a)

Actions. In the event the remedial measures described in the notice of violation have not been completed by the date set forth for such completion in the notice of violation, or the time for filing an appeal has expired, any one or more of the following actions or penalties may be taken or assessed against the person to whom the notice of violation was directed. Before taking any of the following actions or imposing any of the following penalties, the City Manager or his or her designee shall first notify the applicant or other responsible person in writing of its intended action, and shall provide a reasonable opportunity to cure such violation. In the event the applicant or other responsible person fails to cure such violation after such notice and cure period, the City Manager or his or her designee may take any one or more of the following actions or impose any one or more of the following penalties:

(b)

Stop work orders.

(1)

For the first and second violations of the provisions of this chapter, the Director or the City Manager or his or her designee shall issue a written warning to the violator. The violator shall have five days to correct the violation. If the violation is not corrected within five days, the Director or the City Manager or his or her designee shall issue a stop work order requiring that land disturbing activities be stopped until necessary corrective action or mitigation has occurred; provided, however, that, if the violation presents an imminent threat to public health or waters of the state or if the land disturbing activities are conducted without obtaining the necessary permit, the Director or the City Manager or his or her designee shall issue an immediate stop work order in lieu of a warning;

(2)

For a third and each subsequent violation, the Director or the City Manager or his or her designee shall issue an immediate stop work order; and

(3)

All stop-work orders shall be effective immediately upon issuance and shall be in effect until the necessary corrective action or mitigation has occurred;

(4) When a violation in the form of taking action without a permit, failure to maintain a stream buffer, or significant amounts of sediment, as determined by the City Manager or his or her designee or by the Director or his or her designee, have been or are being discharged into State waters and where best management practices have not been properly designed, installed, and maintained, a stop work order shall be issued by the City Manager or his or her designee or by the Director or his or her designee. All such stop work orders shall be effective immediately upon issuance and shall be in effect until the necessary corrective action or mitigation has occurred. Such stop work orders shall apply to all land disturbing activity on the site with the exception of the installation and maintenance of temporary or permanent erosion and sediment controls.

(c)

Withhold certificate of occupancy. The City Manager or his or her designee may refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the site until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein.

(d)

Suspension, revocation or modification of permit. The City Manager or his or her designee may suspend, revoke or modify the permit authorizing the land development project. A suspended, revoked or modified permit may be reinstated after the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein, provided such permit may be reinstated (upon such conditions as the City Manager or his or her designee may deem necessary) to enable the applicant or other responsible person to take the necessary remedial measures to cure such violations.

(e)

Violations deemed a public nuisance. Any condition caused or permitted to exist in violation of any of the provisions of this chapter that is a threat to public health, safety, welfare and environment shall be deemed a public nuisance, and may be summarily abated by injunctive or restored at the alleged violator's expense, and/or a civil action to abate, enjoin or otherwise compel the cessation of such nuisance may be taken.

(f)

Citation. Any person who violates any provisions of this chapter, or any permit condition or limitation established pursuant to this chapter, or who negligently intentionally fails or refuses to comply with any final or emergency order of City, the City Manager or his or her designee may issue a citation requiring such person to appear in the Municipal Court of the City to answer charges for such violation. Upon conviction, such person shall be punished by a fine not to exceed $1,000.00 or imprisonment for a period of not more than six months, or both. Each act or violation and each day upon which any violation shall occur shall constitute a separate offense.

(g)

Remedies not exclusive.

a.

The remedies listed in this chapter are not exclusive of any other remedies available under any applicable Federal, State or local law and the City Manager or his or her designee may seek cumulative remedies.

b.

The City Manager or his or her designee may recover attorney's fees, court costs, and other expenses associated with enforcement of this chapter, including sampling and monitoring expenses.

(h) *Compliance disclaimer*. Full compliance by any person or entity with the provisions of this chapter shall not preclude the need to comply with other local, State or Federal statutory or regulatory requirements, which may be required for the control of discharge of pollutants into stormwater and/or the protection of stormwater quality.

(Ord. No. 799, § 1(12-6-3), 6-2-2010)

Sec. 12-6-4. Abatement of violation.

(a)

If the violation has not been corrected pursuant to the requirements set forth in the notice of violation, and the time to appeal has expired, or, in the event of an appeal, the terms of the decision of the appellate body have not been complied with, then the City Manager or his or her designee may enter upon the subject private property and are authorized to take any and all measures necessary to abate the violation and/or restore the property.

(b)

It shall be unlawful for any person, owner, agent or person in possession of any premises to refuse to allow Brookhaven or its designated contractor to enter upon the premises for the purposes set forth above. If permission to enter the premises for the purposes set forth above is denied, the City Manager or his or her designee may seek issuance of a search warrant from any court of competent jurisdiction.

(c)

Costs of abatement of the violation.

(1)

Within 15 days after abatement of the violation, the owner of the property will be notified of the cost of abatement, including administrative costs. The costs of abatement will be issued in writing and shall be served on the property owner personally or by registered or certified mail sent to the billing address for property tax purposes of the property owner or to the person and address specified in the application. The property owner may file a written appeal objecting to the assessment or to the amount of the assessment within 30 days of such notice. An appeal shall comply with the provisions of Section 12-6-5

(2)

If the amount due is not paid within a timely manner as determined by the final decision of the City of Brookhaven, or by the expiration of the time in which to file an appeal, the charges shall become a special assessment against the property and upon recordation as required by O.C.G.A. § 9-12-86 shall constitute a lien on the property for the amount of the assessment.

(Ord. No. 799, § 1(12-6-4), 6-2-2010)

Sec. 12-6-5. Appeal.

(a) An appeal for an alleged violation of the provisions of this chapter or for the alleged violation of the requirements of an approved stormwater management plan, an approved erosion, sedimentation and pollution control plan, an approved State General Permit for construction activity, or an approved site plan or permit, or for an alleged violation of any of the provisions of this chapter, or for failing to meet any of the terms and conditions of the requirements for any of the above-noted plans and/or permits may be appealed to the City Manager or his or her designee by filing a written notice of appeal within 30 days after receipt of the notice of violation.

(b) An appeal of the suspension, revocation, modification or grant with conditions of a permit or stormwater management plan, erosion and sediment control plan or State General Permit for construction activity may be appealed in writing within ten days after receipt of such action to the City Manager or his or her designee.

(c) The appeal shall include a written statement setting forth the factual basis for the appeal. Notice of the appeal shall be delivered in writing to the City Manager or his or her designee by the appellant. The City Manager or his or her designee may require the submission of additional written evidence and/or hold a hearing on the matter. The City Manager or his or her designee shall use the terms, conditions and criteria included in each chapter in this title in reaching its decision. The City Manager or his or her designee shall issue a written decision on the appeal within 30 business days of the date of delivery to him or her of the notice of appeal. All decisions by the City Manager or his or her designee shall be in writing and shall be served on the property owner personally or by registered or certified mail, sent to the billing address for property tax purposes of the property owner or to the person and address specified in the application for the applicable permit or plan.

(d) A decision of the City Manager or his or her designee that is adverse to an appellant may be further appealed to the City Council within 30 days of the date that the adverse decision is issued by the City Manager of his or her designee. Notice of the appeal shall be delivered in writing to the City Clerk of Brookhaven. The City Council may require the submission of additional written evidence and/or hold a hearing on the matter. The City Council shall use the terms, conditions and criteria included in each chapter in this title in reaching its decision. Public notice of said public hearing shall be given in a newspaper of general circulation within the City. The City Council shall issue a written decision on the appeal within 30 business days of the date of delivery of the notice of appeal. All decisions by the City Council shall be in writing and shall be served on the property owner personally or by registered or certified mail, sent to the billing address for property tax purposes of the property owner or to the person and address specified in the application for the applicable permit or plan. All decisions of the City Council shall be final.

(e) The appeal process contained in this section shall be a condition precedent to an aggrieved property owner seeking judicial relief. Any person, aggrieved by a decision or order of the City of Brookhaven, after exhausting administrative remedies, shall have the right to appeal within 30 days of the date of the service of the decision of the City Council to the Superior Court of the County via writ of certiorari, in accordance with the provisions set forth in O.C.G.A. § 5-4-1 et seq.

(Ord. No. 799, § 1(12-6-5), 6-2-2010)

Sec. 12-6-6. Liability.

(a) Neither the approval of a plan under the provisions of these ordinances, nor the compliance with provisions of this chapter shall relieve any person from responsibility for damage to any person or property otherwise imposed by law nor impose any liability upon the City for damage to any person or property.

(b) The fact that land disturbing activity for which a permit has been issued results in injury to the property of another shall neither constitute proof of nor create a presumption of a violation of the standards provided for in this chapter or terms of permit.

(c) No provision of this chapter shall permit any persons to violate the Georgia Erosion and Sedimentation Act of 1975, the Georgia Water Quality Control Act, or the rules and regulations promulgated and approved hereunder or pollute any waters of the State as defined thereby.

(Ord. No. 799, § 1(12-6-6), 6-2-2010)

APPENDIX B
Title 8, Chapter 4, Article F of the City of Brookhaven Code of Ordinances

Sec. 8-4-26. Generally.

Any action or inaction which violates the provisions of this chapter or the requirements of an approved stormwater management plan or permit, may be subject to the enforcement actions outlined in this section. Any such action or inaction which is continuous with respect to time is deemed to be a public nuisance and may be abated by injunctive or other equitable relief. The imposition of any of the penalties described below shall not prevent such equitable relief.

(Code 1990, § 8-4-26; Ord. No. 741, 12-6-2006)

Sec. 8-4-27. Notice of violation.

(a) If the City determines that an applicant or other responsible person has failed to comply with the terms and conditions of a permit, an approved stormwater management plan or the provisions of this chapter, it shall issue a written notice of violation to such applicant or other responsible person. Where a person is engaged in activity covered by this chapter without having first secured a permit therefor, the notice of violation shall be served on the owner or the responsible person in charge of the activity being conducted on the site.

(b) The notice of violation shall contain:

(1) The name and address of the owner or the applicant or the responsible person;
(2) The address or other description of the site upon which the violation is occurring;
(3) A statement specifying the nature of the violation;
(4) A description of the remedial measures necessary to bring the action or inaction into compliance with the permit, the stormwater management plan or this chapter and the date for the completion of such remedial action;
(5) A statement of the penalty or penalties that may be assessed against the person to whom the notice of violation is directed; and
(6) A statement that the determination of violation may be appealed to the City by filing a written notice of appeal within 30 days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours' notice shall be sufficient).

(Code 1990, § 8-4-27; Ord. No. 741, 12-6-2006)

Sec. 8-4-28. Penalties.

In the event the remedial measures described in the notice of violation have not been completed by the date set forth for such completion in the notice of violation, any one or more of the following actions or penalties may be taken or assessed against the person to whom the notice of violation was directed. Before taking any of the following actions or imposing any of the following penalties, the City shall first notify the applicant or other responsible person in writing of its intended action, and shall provide a reasonable opportunity, of not less than ten days (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours' notice shall be sufficient) to cure such violation. In the event the applicant or other responsible person fails to cure such violation after such notice and cure period, the City may take any one or more of the following actions or impose any one or more of the following penalties:

(1) *Stop work order.* The City may issue a stop work order which shall be served on the applicant or other responsible person. The stop work order shall remain in effect until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violation or violations described therein, provided the stop work order may be withdrawn or modified to enable the applicant or other responsible person to take the necessary remedial measures to cure such violation or violations.

(2) *Withhold certificate of occupancy.* The City may refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the site until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein.

(3) *Suspension, revocation or modification of permit.* The City may suspend, revoke or modify the permit authorizing the development project. A suspended, revoked or modified permit may be reinstated after the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein, provided such permit may be reinstated (upon such conditions as the City may deem necessary) to enable the applicant or other responsible person to take the necessary remedial measures to cure such violations.

(4) *Civil penalties.* In the event the applicant or other responsible person fails to take the remedial measures set forth in the notice of violation or otherwise fails to cure the violations described therein within ten days, or such greater period as the City shall deem appropriate (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24-hour's notice shall be sufficient). After the City has taken one or more of the actions described herein, the City may impose a penalty not to exceed $1,000.00 (depending on the severity of the violation) for each day the violation remains unremedied after receipt of the notice of violation.

(5) *Criminal penalties.* For intentional and flagrant violations of this chapter, the City may issue a citation to the applicant or other responsible person, requiring such person to appear in Municipal Court to answer charges for such violation. Upon conviction, such person shall be punished by a fine not to exceed $1,000.00 or imprisonment for 60 days, or both. Each act of violation and each day upon which any violation shall occur shall constitute a separate offense.

END OF ENFORCEMENT RESPONSE PLAN

Appendix H

Impaired Waters

1. Population at the time of designation: 49,000-50,000___

   If the population is less than 10,000, then see items #2 and #3 below.

   If the population exceeds 10,000, then see items #4 and #5 below.

2. If the population is less than 10,000, then the MS4 must develop an Impaired Waters Plan (see Part 4.4.1 of the NPDES Permit) including:
   - A list of impaired waters and the pollutant(s) of concern;
   - A map showing the location of the impaired waters and all identified MS4 outfalls located on the impaired waters or occurring within one linear mile upstream of the waters;
   - BMPs that will be implemented to address each pollutant of concern; and
   - A schedule for implementing the BMPs.

3. The Impaired Waters Plan must be submitted with the annual report due within 4 years of designation.

   Final completion date/date of submittal to EPD:_12/31/2015_____

4. If the population exceeds 10,000, then the MS4 must develop an Impaired Waters Plan/Monitoring and Implementation Plan (see Part 4.4.2 of the NPDES Permit) including:
   - A list of impaired waters and the pollutant(s) of concern.
   - A Monitoring and Implementation Plan, that includes:
     a. Sample location;
     b. Sample type, frequency, and seasonal considerations;
     c. Monitoring implementation schedule;
     d. A map showing the location of the impaired waters and all identified MS4 outfalls located on the impaired waters or occurring within one linear mile upstream of the waters or a schedule for confirming those outfalls; and
     e. Description of proposed BMPs.
   - Description of the method used to annually assess data trends for each pollutant of concern.

5. The Impaired Waters Plan/Monitoring and Implementation Plan must be submitted with the annual report due 4 years of designation.

   Final completion date/date of submittal to EPD: _12/31/2015______

NOTE: Upon completion, the Impaired Waters Plan will be included as Section 11 of the SWMP.

City of Brookhaven
Impaired Waters Plan

December 2015

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Appendix B: Revised Total Maximum Daily Load Evaluation for Seventy-Nine Stream Segments in the Chattahoochee River Basin for Fecal Coliform, November 2008

Appendix C: DeKalb County Watershed Sampling Data

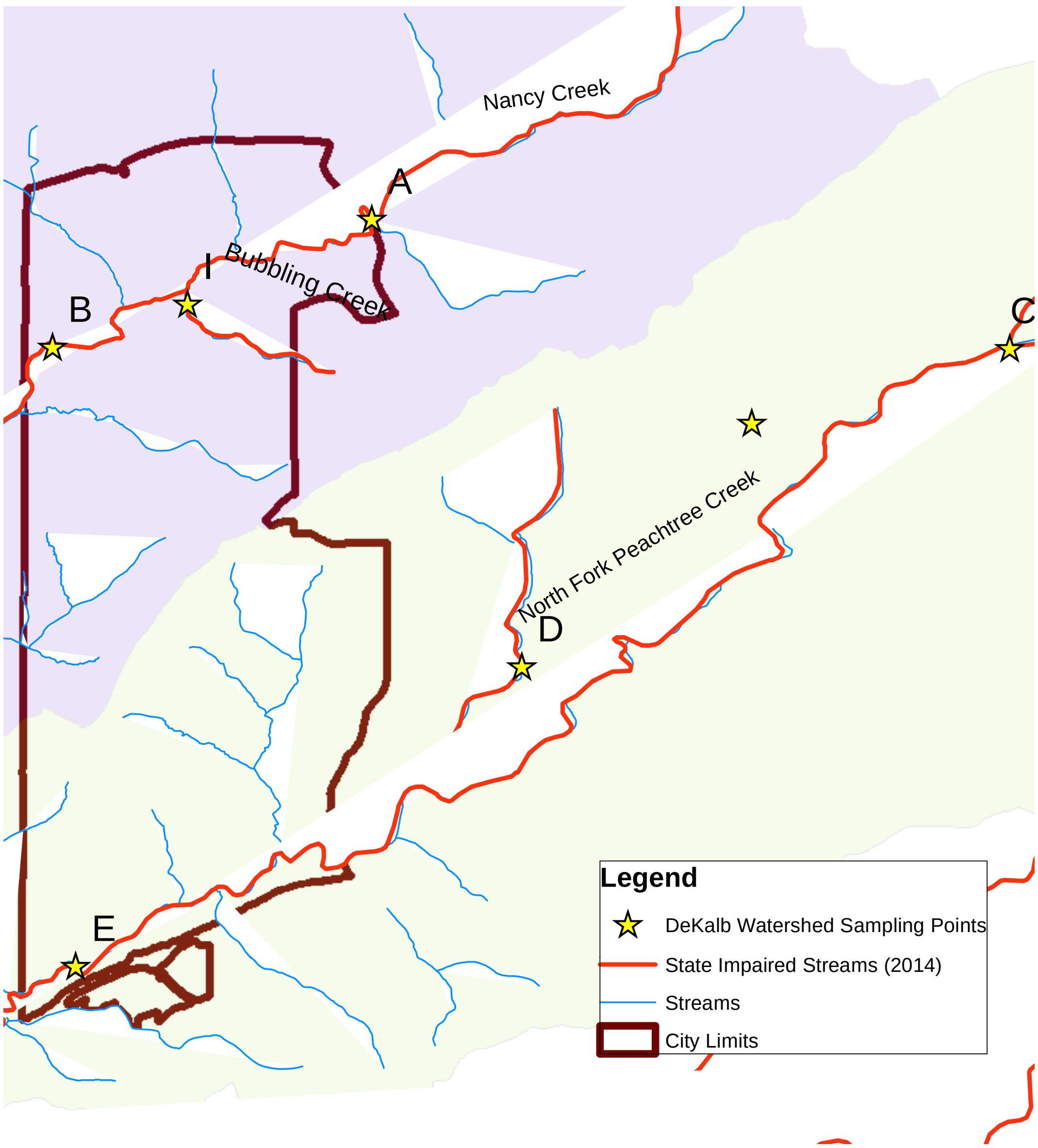
Appendix D: DeKalb County Press Release: DeKalb County Reaches Agreement with EPA, EPD. December 13, 2010.

Appendix E: Total Maximum Daily Load Evaluation for Twenty-Five Stream Segments in the Chattahoochee River Basin for Sediment (Biota Impacted)

Executive Summary

The City of Brookhaven has a National Pollutant Discharge Elimination System (NPDES) Phase II permit. One of the requirements under this permit is the development of this Impaired Waters Plan. This Plan was developed consistent with the permit guidance provided by the Georgia Environmental Protection Division (EPD). Although this document was developed to comply with state requirements, the City of Brookhaven has a strong commitment to protecting and improving water quality as evidenced by the ongoing development of a Watershed Improvement Plan for the Nancy Creek watershed.

Figure E-1. City of Brookhaven's Impaired Waters



The City of Brookhaven has three streams that have been classified by the state as impaired; Bubbling Creek, Nancy Creek, and North Fork Peachtree Creek as shown in Figure E-1. Bubbling Creek, a tributary to Nancy Creek, is considered impaired for fecal coliform bacteria. Nancy Creek is considered impaired for fecal coliform bacteria and fish biota. North Fork Peachtree Creek is considered impaired for fecal coliform bacteria, fish biota, and macroinvertebrate biota. The most likely sources of fecal coliform bacteria in the watershed include sanitary sewer overflows, domestic animals, and wildlife. The most likely sources of the fish and macroinvertebrate biota impairment are sediments from historic agricultural lands or from stream bank erosion.

DeKalb County watershed currently performs routine water quality sampling at four stations within the city limits that cover all three impaired waters. DeKalb County also performs biota monitoring on the downstream Nancy Creek sampling location and the North Fork Peachtree Creek sampling stations within the City limits. This Impaired Waters Plan recommends leveraging the existing monitoring data to better understand the challenges within these three streams.

As the City analyzes the data to characterize watershed conditions, they will continue to implement actions to protect water quality consistent with their approved Stormwater Management Plan as part of their Municipal Separate Storm Sewer System (MS4) permit. These activities among others include implementation of the illicit discharge detection and elimination program, erosion and sedimentation control program, and post-development stormwater management requirements. Following an adaptive management model, the City will continue to learn, assess, and adapt programs to protect stream health and improve aquatic health within Brookhaven.

1.0 Background

The purpose of this Impaired Waters Plan is to identify the waters within the City of Brookhaven that are classified by the state as impaired and present a plan of actions to improve watershed conditions. This plan is a required element under the City's National Pollutant Discharge Elimination System (NPDES) permit.

There are currently three stream segments that are classified as impaired according to the state's 303(d) list of impaired waters. These stream segments include Bubbling Creek, Nancy Creek, and North Fork Peachtree Creek. These stream segments are shown in Figure 1-1 and listed in Table 1-1.

Figure 1-1. Streams Listed as Impaired within the City of Brookhaven

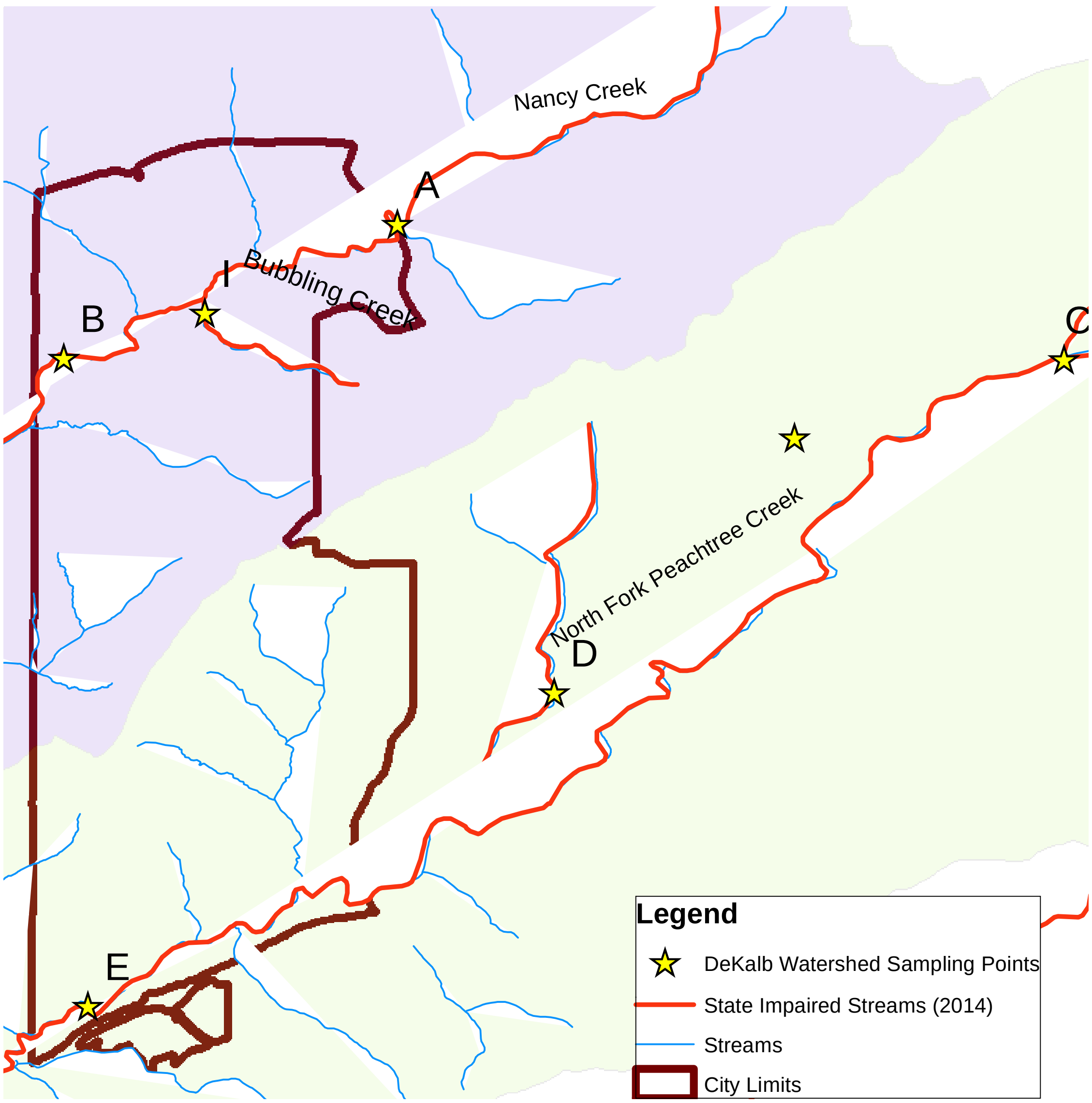


Table 1-1. Streams Listed as Impaired within the City of Brookhaven

Impaired Stream Segment	Parameters
Bubbling Creek (headwaters to Nancy Creek)	Fecal Coliform
Nancy Creek (headwaters to Peachtree Creek)	Fecal Coliform, Fish Biota
North Fork Peachtree Creek (headwaters to Peachtree Creek)	Fecal Coliform, Fish Biota, Macroinvertebrate Biota

This section presents background information intended to provide context for the remainder of the Impaired Waters Plan. There is an overview of applicable regulations as well as of the parameters of concern for the three listed streams.

1.1 Regulatory Overview

The Georgia Environmental Protection Division (EPD) is responsible for establishing water quality standards for waterbodies in the state. Consistent with the U.S. Clean Water Act, the state collects water quality sampling data and identifies streams that do not meet these water quality standards. The list, published bi-annually, of waters that do not meet state standards is referred to as the 303(d) list of impaired waters (after the section in the Clean Water Act where the state requirement is identified). As noted before, three streams within Brookhaven were classified as impaired on the 2014 list because they do not meet state water quality standards.

Some important considerations regarding the 303(d) list of impaired waters:

- The list is generated by EPD based on the best available sampling data that is collected by a state agency or a local jurisdiction with an adopted Sampling Quality Assurance Plan (SQAP).
- Brookhaven has the option to develop a SQAP and, once approved by the state, submit water quality data to support removing a stream segment from the list of impaired waters.
- Jurisdictions were not required to have a SQAP prior to 2005 in order to have data used for listing and TMDL purposes. Much of the data used for listing purposes prior to 2000 was sampling data collected following a sanitary sewer overflow. As the state was building its water quality database, this was the only data available for use.
- Impaired streams remain on the list until sufficient data is collected to show that the impairment no longer exists. Therefore, conditions may have changed but monitoring has been insufficient to remove a stream from the list.
- Typically, the entire headwaters of a stream will be considered impaired if a downstream sample exceeds the standard. Meaning a sample downstream of Brookhaven may have shown impairment that classifies the upstream area as impaired; however the stream may meet state standards within the City limits.

The sampling data needed to remove a stream from the impaired waters list is summarized by parameter in Section 1.2.

<u>Total Maximum Daily Loads</u>: The state must further evaluate impaired streams and develop a Total Maximum Daily Load (TMDL), which accounts for the likely sources of pollution as well as activities in the watershed to reduce pollution loads. The TMDL presents a percent reduction in the pollutant load that would be needed in order for that waterbody to meet state standards. These reductions are shown in Table 1-2 for each of the listed streams by parameter. TMDL implementation plans often summarize likely sources of pollution as well as planned activities to address potential pollution sources.

Table 1-2. Percent Reduction Needed in Pollutant Loads as Outlined in the TMDL

Impaired Stream Segment	Parameters	Reduction Needed
Bubbling Creek (headwaters to Nancy Creek)	Fecal Coliform	93%
Nancy Creek (headwaters to Peachtree Creek)	Fecal Coliform	84%
	Fish Biota	35%
North Fork Peachtree Creek (headwaters to Peachtree Creek)	Fecal Coliform	91%
	Fish Biota	26%
	Macroinvertebrate Biota	NA

*Note that the TMDL for macroinvertebrate biota on North Fork Peachtree Creek has not been published.

Stormwater Program – The City of Brookhaven is responsible for a National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Phase II permit. The permit includes six minimum control measures and requires that the City establish and then meet measurable goals for each of these six measures. The six minimum measures under the MS4 permit include public education, public involvement, illicit discharge detection and elimination, construction site runoff management, post-development stormwater management requirements, and implementation of pollution prevention/good housekeeping practices for municipal activities. This Impaired Waters Plan is one facet of compliance with this permit. The City has adopted ordinances and developed programs in order to comply with these requirements. These ongoing efforts are all related to protecting water quality and reducing stream impairment.

Watershed Assessment and Protection Plan - The DeKalb County Watershed Department, as part of its NPDES wastewater discharge permit, must implement a watershed assessment and protection plan. Among other elements, this plan includes water quality monitoring. This program is unique to Georgia and is based on the concept that when the state approves additional wasteload allocations for additional wastewater treatment capacity; this act permits additional development that could negatively impact water quality. As part of this program, DeKalb County monitors watershed conditions and has adopted ordinances similar to the ones adopted by the City of Brookhaven as part of the MS4 permit program.

DeKalb County Consent Order – DeKalb County has entered into an agreement with EPA and EPD in order to reduce the occurrences of sanitary sewer overflows within the county service area as well as decrease the time to respond to these occurrences. The consent order agreement establishes a schedule for completing specific actions to reduce the number of overflows with emphasis on certain priority areas. This program is relevant to this Impaired Waters Plan, as all three streams are impaired for fecal coliform bacteria. Planned rehabilitation of the collection system may reduce the fecal coliform bacteria loading to these waterbodies such that no additional actions are required. There are a number of different documents related to the Consent Order. The most relevant of these documents is the DeKalb County Priority Sewer Repair Areas report, which is included in Appendix A.

1.2 Parameters of Concern

There are two different parameters of concern for the City of Brookhaven which are described in greater detail below: fecal coliform bacteria and biota (fish and macroinvertebrates).

Fecal Coliform Bacteria

Fecal coliform bacteria are found in the digestive tract of all warm blooded mammals (humans, dogs, cats, deer, etc.). Although most of these bacteria are not harmful, their presence is used as an indicator that there is potential for health impacts. In suburban areas, like Brookhaven, sources of fecal coliform bacteria may include pet waste runoff, native animals such as deer and raccoon, overflows from the sanitary sewer system, leaking septic tanks, or improperly connected wastewater plumbing. Fecal coliform is the most common impairment seen in Georgia waterbodies.

The state's fecal coliform standard varies based on the time of year. The "winter" standard from November to March is 1,000 counts/100mL and the "summer" standard from April to October is 200 counts/100mL. The summer standard is lower to reflect the higher probability that people will be recreating in the state's waterways thus increasing the chance for possible health impacts.

Fecal coliform is typically reported in terms of a geometric mean, or 4 samples taken within a 30 day period. The geometric mean provides some flexibility for natural variability in levels. For example, if one out of the four samples exceeds the water quality standard, it is possible that the geometric mean will meet state standards. In order to remove a stream from the 303(d) list for fecal coliform bacteria, 4 geometric means collected over 4 calendar quarters (or 16 total samples) are needed in accordance with an approved SQAP. The timing of the samples must ensure that the geometric means do not overlap from April to May or from October to November, as the standards are seasonal.

Biota (Fish and Macroinvertebrates)

The state periodically performs assessments to look at the quantity and health of fish and macroinvertebrates in streams around the state. The state's fish bioassessments were based on Fish Index of Biotic Integrity (IBI) protocols. Streams that ranked "poor" or "very poor" on the IBI index are classified as impaired for fish biota. Often the fish impairment is due to high sediment loads that impact the fish spawning habitats and also generally impact their well-being. Macroinvertebrate bioassessments were based on the "Macroinvertebrate Biological Assessment of Wadeable Streams in Georgia". There is a standardized numerical scoring system for macroinvertebrates that translates into a 5-level classification system of Very Good, Good, Fair, Poor or Very Poor. Streams that ranked "poor" or "very poor" on this index are classified as impaired for macroinvertebrate biota.

Sediment loads in suburban areas like Brookhaven include migration of historic sediment in streams from former agricultural practices in the area and instream bank erosion aggravated by suburban runoff. Erosion from new development projects is also a source of sediment in some communities; but is likely not a major contributor in Brookhaven because of the City's erosion and sedimentation control program. Impairment for habitat, such as fish biota, is relatively common in the urbanized areas around metropolitan Atlanta.

Due to the complexity of fish and macroinvertebrate sampling protocols, the state does not currently accept locally collected biota data to support removing streams from the 303(d) list. The only entity who can affect the impairment classification is the state's Wildlife Resources Division. A community may request that sampling be performed on a stream listed as impaired, but typically the state requires compelling evidence such as the completion of a water quality improvement project in order to justify additional sampling.

Sediment is often used as a surrogate parameter for biota in TMDL modeling; therefore, total suspended solids (TSS) sampling is recommended as part of this plan to determine whether conditions in Brookhaven's impaired streams are improving. The sediment data may also be used as a justification to request the state to collect fish samples at the City of Brookhaven limits.

2.0 Bubbling Creek Watershed

Bubbling Creek is a tributary to Nancy Creek. It originates in Chamblee near the Chamblee MARTA station and flows northwesterly into Brookhaven and then to the confluence with Nancy Creek near Murphey Candler Park, as shown in Figure 2-1. The watershed is bounded by Harts Mill Road to the north and Ashford-Dunwoody Road to the south.

2.1 Land Use

The watershed within the City limits is primarily single-family residential (60%) with residential land use comprising 96.6% of the watershed, as shown in Table 2-1. The multi-family and commercial land uses are primarily located along Ashford-Dunwoody Road as shown in Figure 2-1.

Figure 2-1. Bubbling Creek Watershed

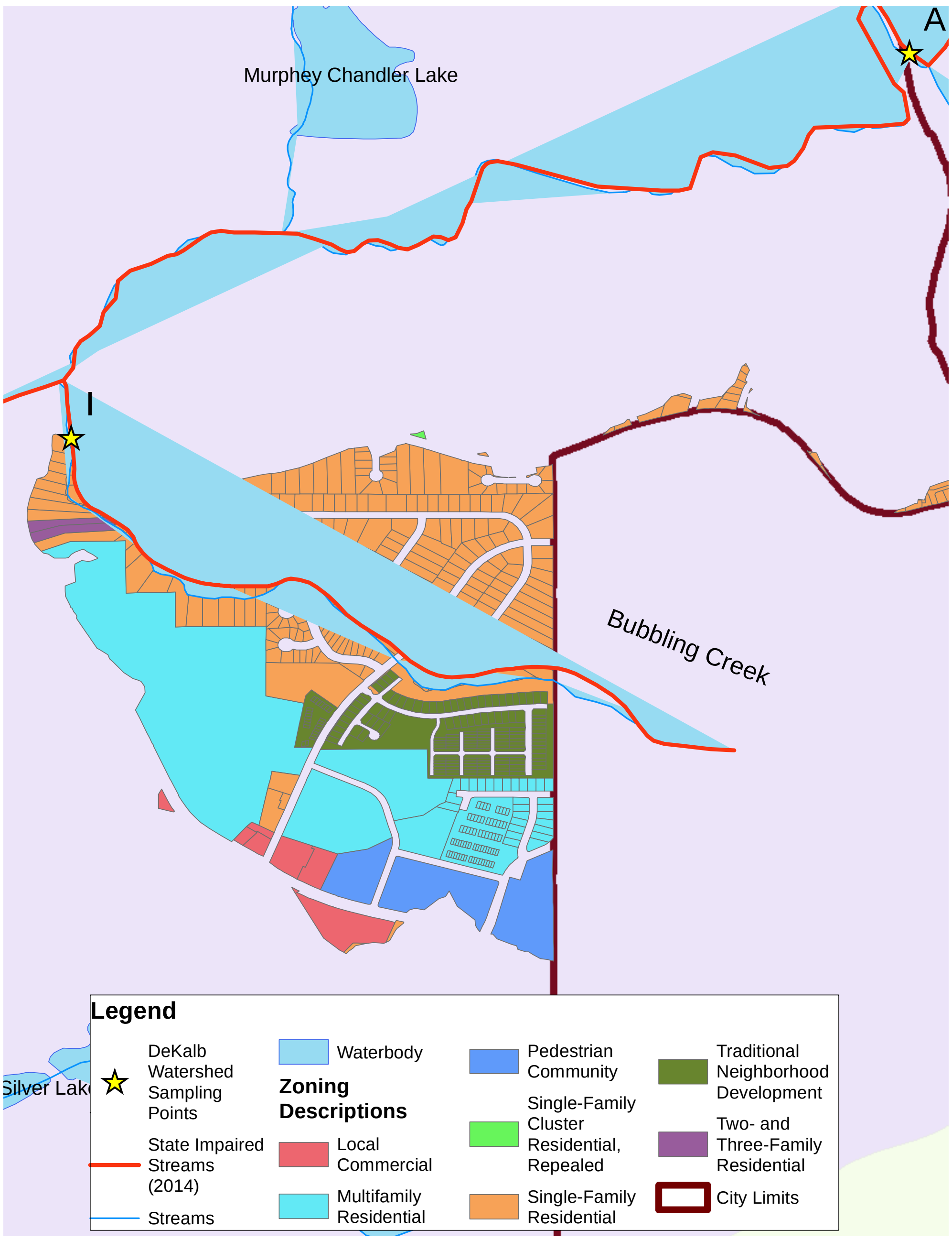


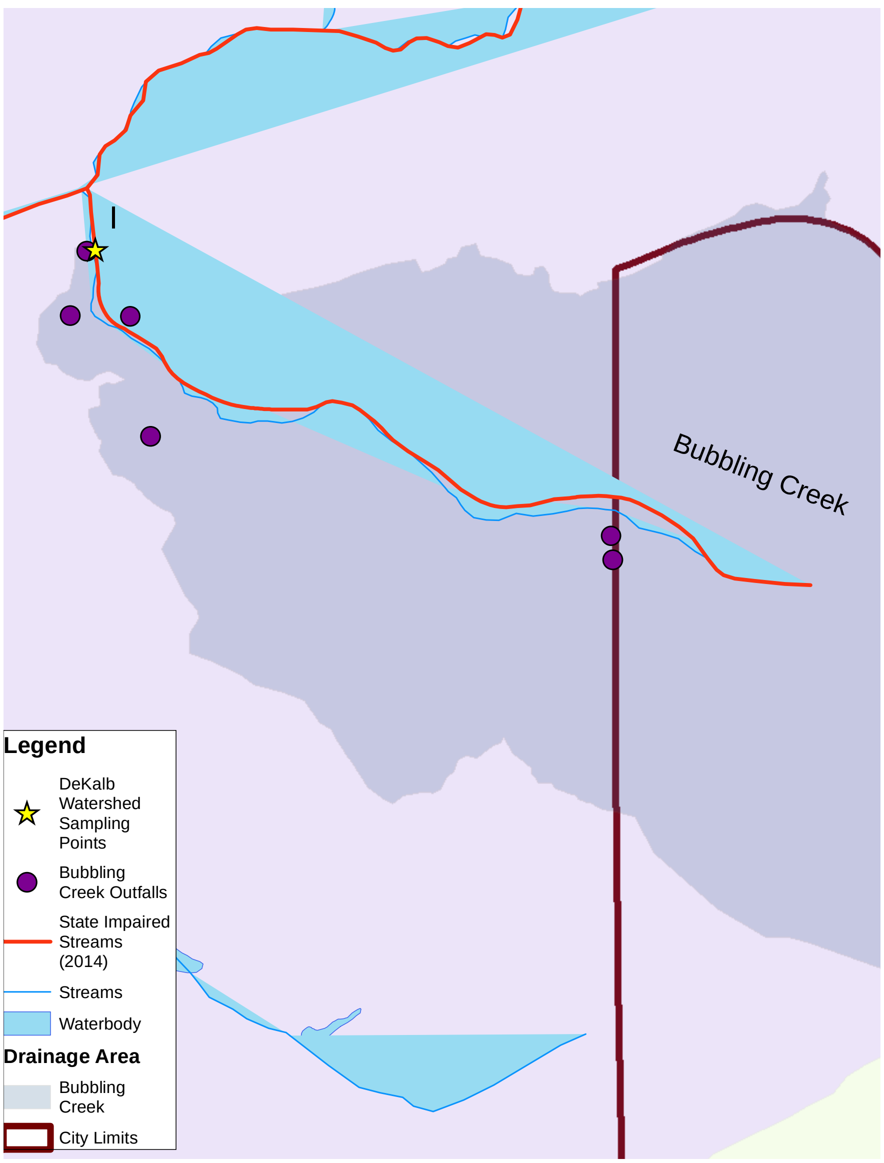
Table 2-1. Estimated Percentage of Land Use by Zoning Category in the Bubbling Creek Watershed

Land Use (based on Zoning Category)	Acres	% of Watershed
Single-Family Residential	197.8	60.3%
Pedestrian Community	18.5	5.6%
Commercial	11.0	3.4%
Multi-Family Residential	81.3	24.7%
Traditional Neighborhood Development	19.8	6.0%
TOTAL	328.4	100.0%

2.2 MS4 System Outfalls

Figure 2-2 shows the outfalls within the Bubbling Creek Watershed according to the City's stormwater infrastructure inventory.

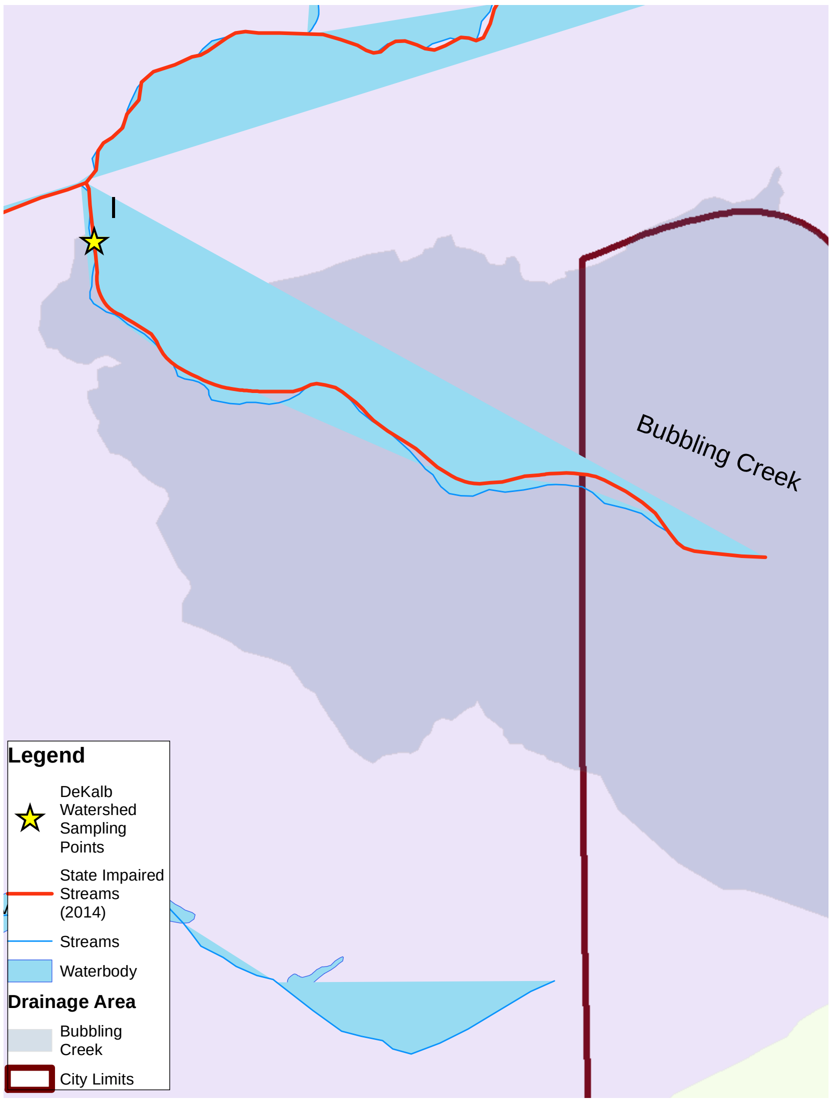
Figure 2-2. Bubbling Creek Outfalls



2.3. Summary of Available Water Quality Data

Bubbling Creek is considered impaired for fecal coliform bacteria. The 303(d) list indicates that EPD data was used as the basis for the impaired determination on Bubbling Creek. Additionally, DeKalb County Watershed performs routine monitoring of Bubbling Creek just upstream of Nancy Creek to comply with their wastewater permits.

Figure 2-3. Bubbling Creek 303(d) List Sampling Stations



The most recent TMDL for Bubbling Creek (Appendix B) indicates that a 93% reduction in fecal coliform bacteria is needed to meet water quality standards. The data used to develop the TMDL was considered “limited” and included 24 samples collected by DeKalb County from 1994-1995. The overall geometric mean for the sampling data was 707.8 counts/100 mL, which exceeds the summer standard of 200 counts/100mL but is lower than the winter standard of 1,000 counts/100mL.In order to meet the summer standard, a 93% reduction is needed in overall loads.

Although the data was not used in the 2014 state’s 303(d) listing evaluation, DeKalb County currently collects water quality data on Bubbling Creek within the City limits at the same station shown in Figure 2-3. This data is collected for the county’s ongoing Bacteria and Water Quality Sampling program and part of the ongoing Watershed Management

Plan activities required as part of the County's wastewater treatment program. The County collects geometric means (i.e., four samples within a 30 day period) every quarter or 16 samples per year. Data from 2003 through 2014 was secured from DeKalb County and ranged from 20 colonies/100mL to 300,000 colonies/100mL. Out of 127 samples, 33 samples exceeded the summer water standard and 44 exceeded the winter and summer standards, while 50 samples met the state standard. The average fecal coliform bacteria was 5,679 colonies/100mL and the median value was 465 colonies/100 mL.

2.4. Possible Sources of Pollutants of Concern

The most recent TMDL (Appendix B) calculated that a 93% reduction in fecal coliform is needed in order for Ball Mill Creek to meet state standards. The source of fecal coliform bacteria identified within the TMDL is stormwater runoff which includes sources such as; sanitary sewer sources, septic systems, domestic animals (dogs, cats, etc.), wildlife (deer, raccoons, etc.), and illegal stormwater connections. A listing of the most likely of these sources is presented below; however this information is only based on available evidence.

As part of DeKalb County's ongoing sewer maintenance program, the Nancy Creek watershed sewer infrastructure is a priority for rehabilitation, which includes the Bubbling Creek watershed (Appendix A). Any issues associated with the sanitary sewer system will be identified and prioritized across the county service area. Based on the periodic high spikes in fecal coliform bacteria, it is likely that there are older sections of sanitary sewer within the Bubbling Creek watershed that leak or overflow into the creek. Like most communities, DeKalb County is working to address the impact of their aging infrastructure on a prioritized basis with available funding.

Another source of fecal coliform that may be present in the watershed is from domestic animals and wildlife. The area is highly developed with residential properties and domestic animals are popular.

Illegal stormwater connections are a possible source although the contribution from these sources is likely small. It is possible that illegal sanitary sewer lines associated with basement remodels and/or illegal construction practices have been connected to the storm drain system instead of the sanitary sewer system. The City's stormwater infrastructure inventory and ongoing asset management program will continue to look for these rare occurrences.

2.5. Existing Watershed Activities

The City of Brookhaven implements the MS4 stormwater program that is outlined in Section 1.1. This program includes activities designed to monitor and reduce potential pollution in the city. The specific activities are outlined within the City's Stormwater Management Plan and not duplicated in this Impaired Waters Plan.

DeKalb County Watershed Management is responsible for the maintenance of the sanitary sewer collection system. As mentioned previously, DeKalb County is currently identifying, designing, and implementing improvements within the Nancy Creek watershed that includes Bubbling Creek. Based on the inventory and condition assessment, DeKalb County will prioritize and complete any needed rehabilitation projects. DeKalb County has a consent order with EPD and EPA that outlines a schedule for assessing and rehabilitating the system in order to reduce sanitary sewer overflows (http://www.dekalbwatershed.com/ConsentDecree.html and Appendix D).

2.6 Recommendations for the Watershed

DeKalb County Watershed Management currently monitors fecal coliform levels in Bubbling Creek upstream of the confluence with Nancy Creek. This is an excellent monitoring location and is located within the city limits. As data is currently being collected, this Impaired Waters Plan does not recommend additional sampling of Bubbling Creek but rather additional analysis of the data collected by DeKalb County. Section 5 of this Impaired Waters Plan outlines the details of the recommended monitoring program.

Continued implementation of the MS4 program activities by the City of Brookhaven will help collect additional information to inform future actions. The completion of the sanitary sewer evaluation in the Bubbling Creek watershed may assist with narrowing the list of possible sources within the watershed. Brookhaven should request the results of the ongoing sampling data on at least an annual basis in order to work with DeKalb County on identifying and reducing the impact of fecal coliform sources in the watershed.

3.0 Nancy Creek Watershed

Nancy Creek begins in Dunwoody near DeKalb County Water Treatment Plant. It flows through portions of Dunwoody, Doraville, Chamblee, Brookhaven, Sandy Springs, and Atlanta prior to flowing into the Chattahoochee River. The Nancy Creek watershed is unusual because it flows from Dunwoody, into Chamblee, back into Dunwoody, and then flows downstream.

3.1 Land Use

The watershed is primarily single family residential (79.1%) within Brookhaven with office – institution, multi-family residential, and several forms of commercial property located along major roadways. The land use data for the watershed based on Brookhaven's zoning is summarized in Table 3-1.

Figure 3-1. Nancy Creek Watershed

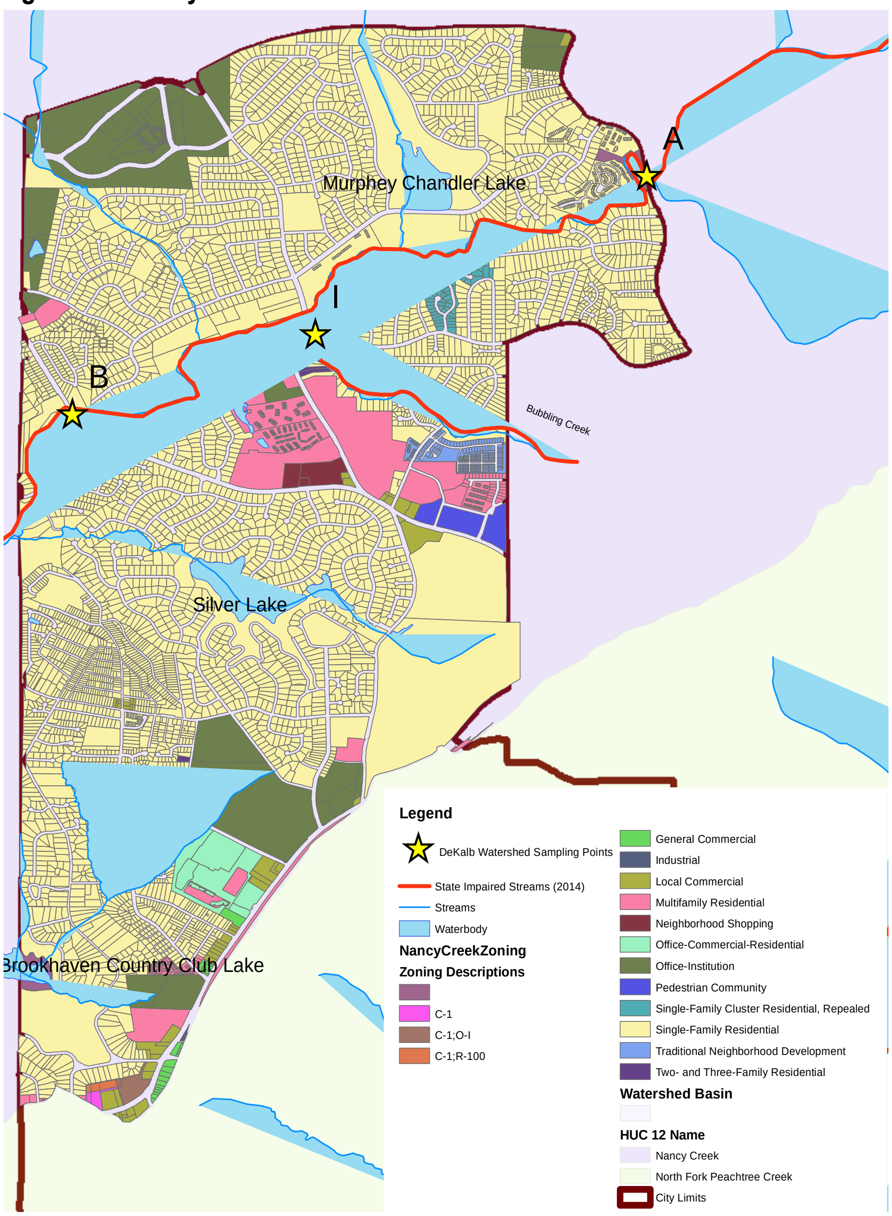


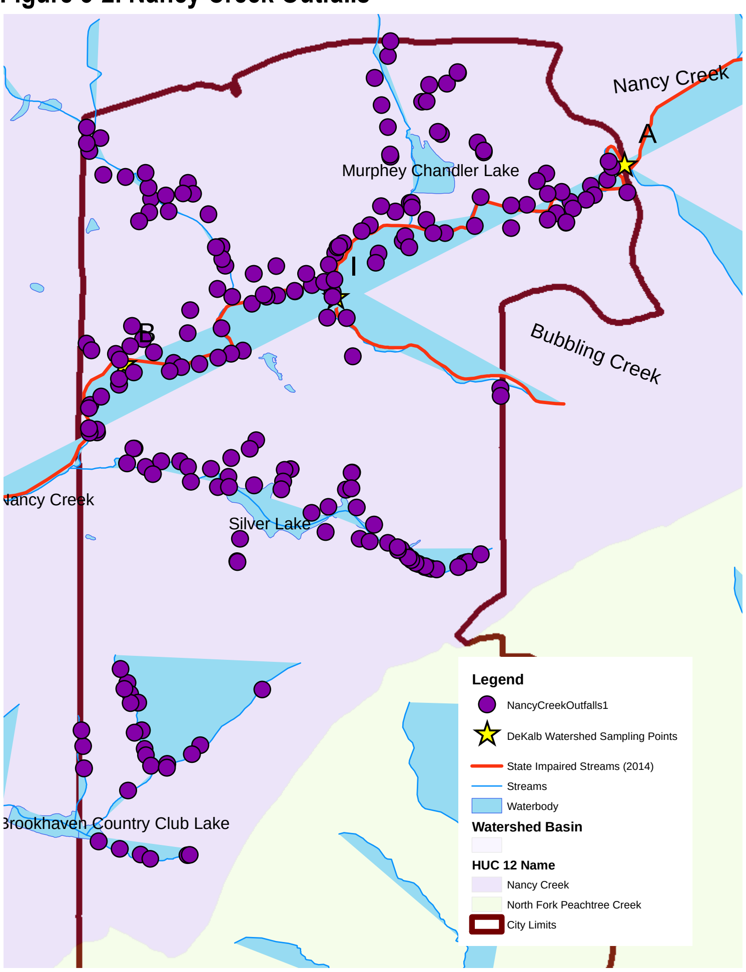
Table 3-1. Estimated Percentage of Land Use by Zoning Category in the Nancy Creek Watershed

Land Use (based on Zoning Category)	Acres	% of Watershed
Single-Family Residential	2,757.9	79.1%
Single-Family Cluster or Similar Residential	55.8	1.6%
Multi-family Residential	210.5	6.0%
General Commercial	8.3	0.2%
Local Commercial	38.9	1.1%
Neighborhood Shopping	12.4	0.4%
Mixed Use	46.3	1.3%
Office – Institution	313.9	9.0%
Other Commercial	10.7	0.3%
Industrial	0.40	0.0%
Other	35.6	1.0%
TOTAL	3,490.7	100.0%

3.2 MS4 System Outfalls

Figure 3-2 shows the outfalls within the Nancy Creek Watershed according to the City's stormwater infrastructure inventory.

Figure 3-2. Nancy Creek Outfalls

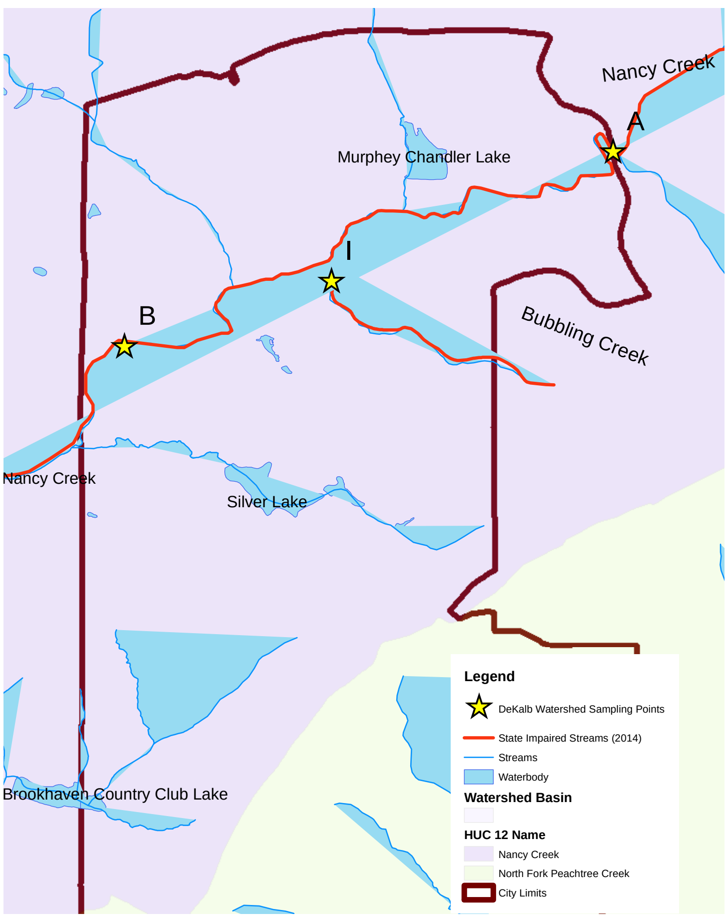


3.3. Summary of Available Water Quality Data

Nancy Creek is considered impaired for fecal coliform bacteria and fish biota. The 303(d) list indicates that there are three sources of data that were used as the basis for the impaired determination on Nancy Creek; EPD Watershed Planning Unit, DNR Wildlife Resources, USGS. However, from discussions with EPD, the listing for fecal coliform was based on data collected by the City of Atlanta on Nancy Creek at West Wesley and the fish biota data was collected by the state Wildlife Resources Division at Johnson Ferry Road, Northside Drive, and West Wesley. As shown in Figure 3-3, the Johnson Ferry Road site is the downstream point in the City limits but West Wesley is several miles downstream.

DeKalb County water quality data from 2005 to 2014 was also available, although was not used for listing decisions. There are two DeKalb County sampling stations within the Nancy Creek watershed.

Figure 3-3. Nancy Creek 303(d) List Sampling Stations



3.3.1 Fecal Coliform Bacteria

The most recent TMDL for Nancy Creek (Appendix B) indicates that an 84% reduction in fecal coliform bacteria is needed to meet water quality standards. The TMDL includes 16 miles of Nancy Creek from the headwaters in Dunwoody to the confluence with Peachtree Creek in the City of Atlanta.

The data used to develop the TMDL was collected in 2000 by the City of Atlanta on Nancy Creek at West Wesley, just upstream of the confluence with Peachtree Creek. The geometric means range from 170 counts/100mL to 1,363 counts/100mL. Three of the geometric means were collected under the summer standard with one mean meeting the standard and two exceeding the standard. The one sample collected under the winter standard exceeded the winter standard (Appendix B).

Although the data was not used in the state's 303(d) listing evaluation, DeKalb County collects water quality data on Nancy Creek for the locations shown in Figure 3-3.

The fecal coliform bacteria at the upstream station (Chamblee-Dunwoody Road) ranged from 60 colonies/ 100mL to 400,000 colonies/ 100mL with the average of 13,079.2 colonies/ 100mL and the median value of 1,700 colonies/ 100 mL. The median value exceeds both the summer and winter fecal coliform bacteria standards. There were 130 samples taken at this station during this time period and of those 25 samples (19%) met their water quality standard. Of those not meeting the standard, 35 samples (27%) exceeded the summer standard but would have met the winter standard and 70 samples (54%) did not meet either the summer or the winter standard. The fecal coliform numbers are very high and indicative of issues common to older sanitary sewer systems.

The fecal coliform bacteria at the downstream station (Johnson Ferry Road) were similar and ranged from 30 colonies/ 100mL to 600,000+ colonies/ 100mL with an average of 5,964 colonies/ 100mL and a median of 600 colonies/ 100mL. The average exceeded the state standards but the median value would meet the winter standard. There were 131 samples taken at this station and of those 17 met the state standards (13%), 45 samples exceeded the summer standard but would have met the winter standard (34%), and 54 samples exceeded both standards (41%). These results are similar to the upstream station and appear to be associated primarily with sanitary sewer issues.

3.3.2 Fish Biota/ Sediment

The monitoring data for the biota impairment were collected between 1998 and 2003 and include locations that are classified as upstream, midstream, and downstream in the TMDL (Appendix E). The upstream location is located in DeKalb County and has a habitat score of good to poor, depending on the indices as shown in Table 3-2. The midstream location, however, has an IBI score of very poor for both indices.

Table 3-2. Nancy Creek TMDL Biota Sampling Data

Stream Name	Area upstream Drainage (sq. mi.)	Date	IBI Score	IBI Category	IWB Score	IWB Category	Habitat Total
Nancy Creek u/s (Johnson Ferry)	12.6	7/31/03	28	Poor	7.7	Good	85.7
Nancy Creek mid (Northside Drive)	30.9	10/07/03	18	Very Poor	5.4	Very Poor	57.1
Nancy Creek d/s (W Wesley)	37.2	10/07/03	24	Very Poor	6.8	Fair	87.4
IBI = Index Biotic Integrity IWB = Index of Well-Being							

3.4. Possible Sources of Pollutants of Concern

The possible sources of fecal coliform bacteria and fish biota impacts are presented in the following two sections.

3.4.1 Possible Sources of Fecal Coliform Bacteria

The TMDL indicates that an 84% reduction in fecal coliform bacteria is needed. Sources mentioned in the TMDL include sanitary sewer sources, septic systems, domestic animals (dogs, cats, etc.), wildlife (deer, raccoons, etc.), and illegal stormwater connections. A listing of the most likely of these sources is presented below; however this information is only based on available evidence.

As part of the DeKalb County consent order agreement with EPD and EPA, they have identified a number of locations in their sewer service area that are priorities for improvement projects. Some of the highest priority projects are located within the Nancy Creek watershed. Hopefully, as the capital improvement projects are completed within the Nancy Creek watershed, the fecal coliform bacteria spikes will reduce to meeting state standards.

The City of Atlanta has also had challenges with sanitary sewer overflows on Nancy Creek that are evident in the data used to develop the TMDL. The City of Atlanta has been working to address their aging sanitary sewer infrastructure to reduce contributions of fecal coliform bacteria to local waterways as well.

In addition to sanitary sewer sources, domestic pets and wildlife are also potential sources as are failing septic systems or improper connections of domestic sewage to the storm sewer system. These sources are considered secondary to the sanitary sewer sources however as part of the City's MS4 program implementation, the City staff will continue to look for issues and address them when identified.

3.4.2 Possible Sources of Sediment

The most recent Biota TMDL for Nancy Creek (Chattahoochee River Basin Biota Impacted – January 2008) indicates that a 35% reduction in sediment load is needed. The majority of the sediment load in the TMDL for Nancy Creek is classified as "stormwater" and associated with runoff from high and medium density residential land uses within the watershed.

The Nancy Creek watershed relatively urbanized watershed and includes I-285 and most of the development was completed prior to modern day post-development stormwater requirements. The increased urban runoff from a major interstate system that has not been historically retained or treated could result in an increase in instream sediment loads that would impact fish habitat conditions. The City will continue to be diligent with the erosion and sediment control program and continue to look for other potential sources of sediment loads.

3.5. Existing Watershed Activities

The City of Brookhaven implements the MS4 stormwater program that is outlined in Section 1.1. This program includes activities designed to monitor and reduce potential pollution in the city. The specific activities are outlined within the City's Stormwater Management Plan and not duplicated in this Impaired Waters Plan.

Additionally, the City is completing a Watershed Improvement Plan for the Nancy Creek watershed. Based on watershed conditions, the WIP will list projects to be implemented long-term to improve watershed health.

DeKalb County Watershed Management is responsible for the maintenance of the sanitary sewer collection system. As mentioned previously, DeKalb County is currently inventorying the collection system within the Marsh Creek watershed. Based on the inventory and condition assessment, DeKalb County will prioritize and complete any needed rehabilitation projects. DeKalb County has a consent order with EPD and EPA that outlines a schedule for assessing and rehabilitating the system in order to reduce sanitary sewer overflows (Appendix A and D).

3.6 Recommendations for the Watershed

There are currently two Nancy Creek sampling stations monitored by DeKalb County in Brookhaven. One location is near the upstream city limits and the other is near the downstream city limits, allowing Brookhaven to understand the city's contributions on the system. No new sampling stations are included in the recommended monitoring plan, outlined in Section 5 of this Impaired Waters Plan.

4.0 North Fork Peachtree Creek Watershed

North Fork Peachtree Creek begins at the edge of Gwinnett County and flows southwest, parallel to I-85, until it's confluences with South Fork Peachtree Creek near GA400. The North Fork Peachtree Creek watershed encompasses most of the southern portion of the City of Brookhaven, as shown in Figure 4-1.

4.1 Land Use

The land cover in this watershed is more intense than the other two impaired watersheds but more than half of the area is single-family residential (57.4%). There is a higher percentage of multi-family residential (18.9%), industrial (9.1%), office-institutional (5.9%), and local commercial development (5%). The higher intensity land uses are generally adjacent to I-85 and Buford Highway, which parallel the North Fork Peachtree Creek. The land use data for the watershed based on Brookhaven's zoning is summarized in Table 4-1.

Figure 4-1. North Fork Peachtree Creek Watershed

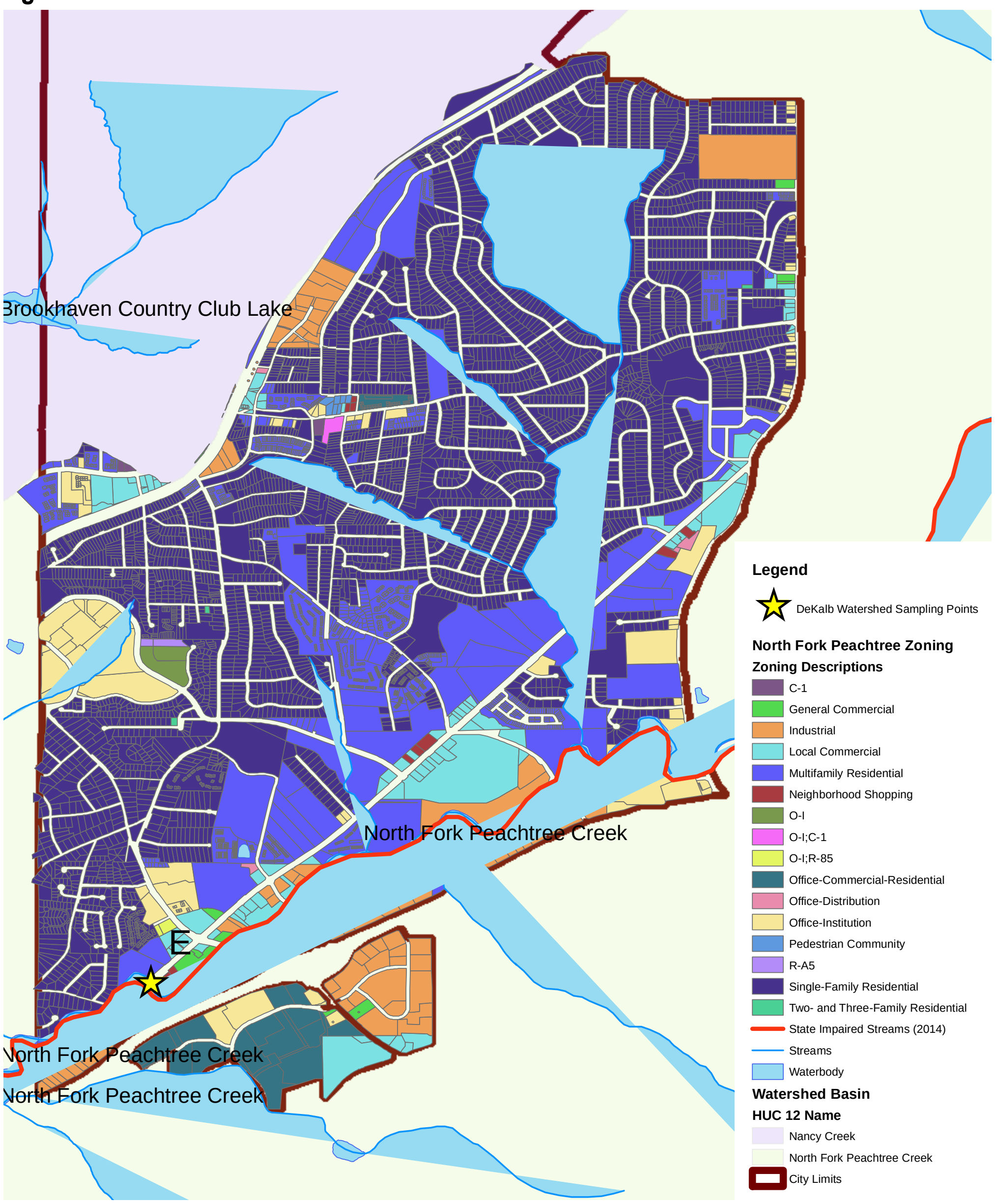


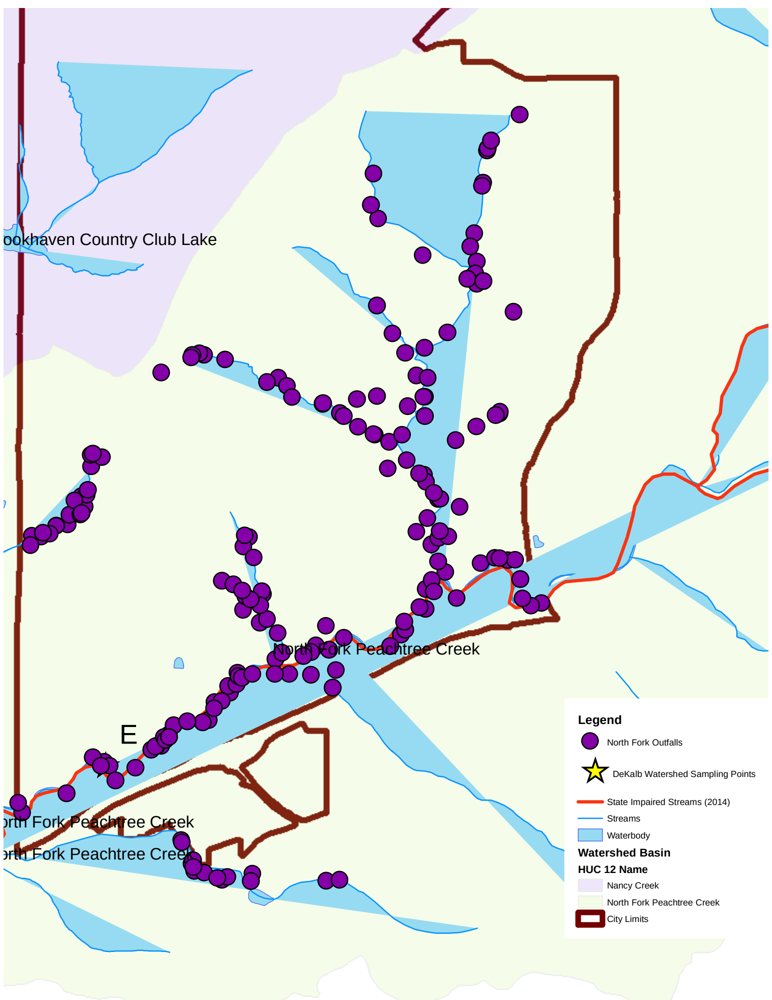
Table 4-1. Estimated Percentage of Land Use by Zoning Category in the North Fork Peachtree Creek Watershed

Land Use (based on Zoning Category)	Acres	% of Watershed
Single-Family Residential	1,791.4	57.4%
Single-Family Cluster Residential	5.6	0.2%
General Commercial	17.9	0.6%
Local Commercial	157.0	5.0%
Industrial	283.3	9.1%
Multi-Family Residential	588.4	18.9%
Mixed Use	75.6	2.4%
Office Miscellaneous	15.4	0.5%
Office-Institution	184.3	5.9%
TOTAL	3118.9	100.00%

4.2 MS4 System Outfalls

Figure 4-2 shows the outfalls within the North Fork Peachtree Creek Watershed according to the City's stormwater infrastructure inventory.

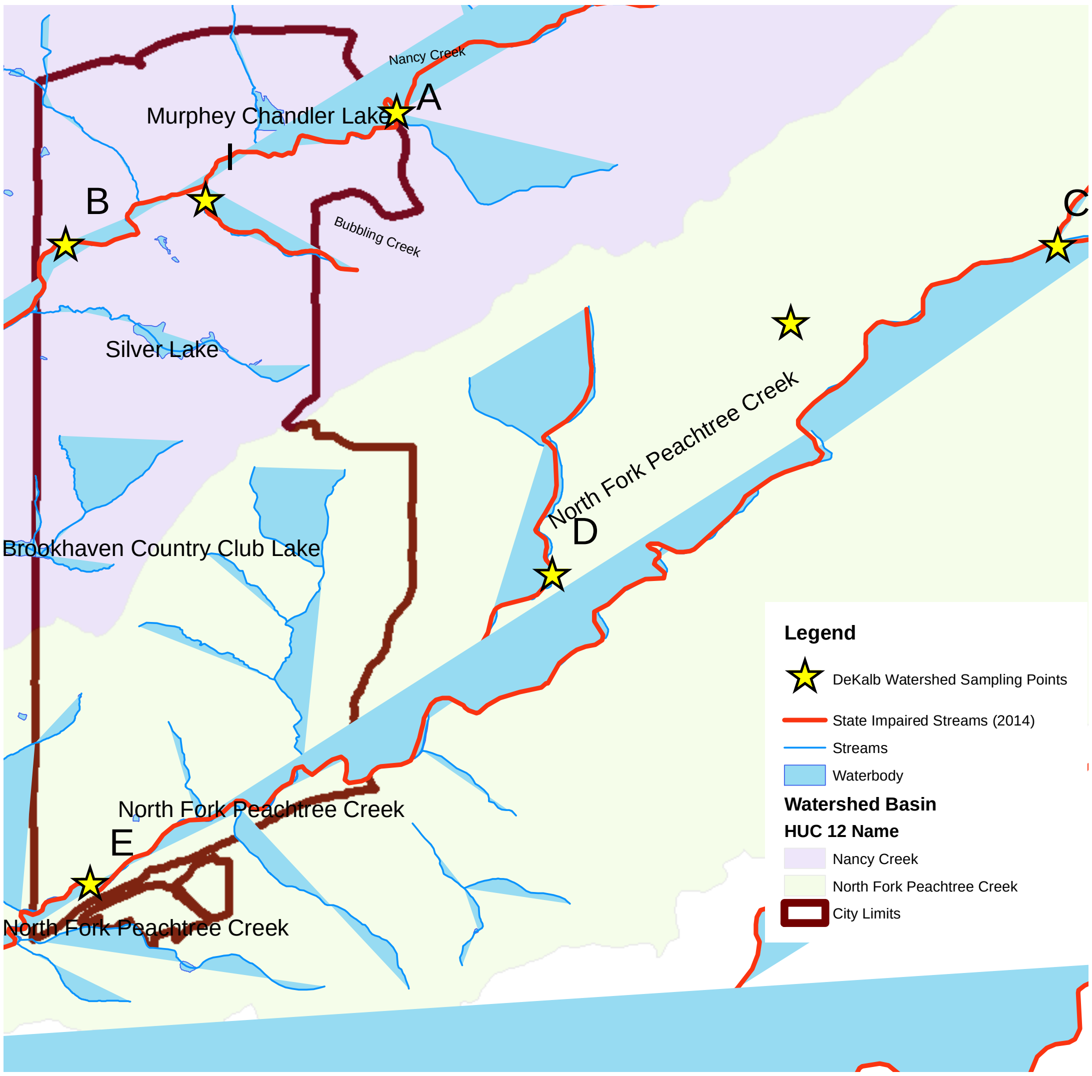
Figure 4-2. North Fork Peachtree Creek Outfalls



4.3. Summary of Available Water Quality Data

North Fork Peachtree Creek is considered impaired for fecal coliform bacteria, macroinvertebrate biota, and fish biota. The 303(d) list indicates that there are four sources of data that were used as the basis for the impaired determination on North Fork Peachtree Creek; DNR Wildlife Resources, DeKalb County, Gwinnett County, and DNR-EPD Ambient Monitoring Unit Macroinvertebrate Team.

Figure 4-3. North Fork Peachtree Creek 303(d) List Sampling Stations



4.3.1 Fecal Coliform Bacteria

The most recent TMDL for North Fork Peachtree Creek (Appendix B) indicates that a 91% reduction in fecal coliform bacteria is needed to meet water quality standards. The TMDL includes 14 miles of North Fork Peachtree Creek from the headwaters in Gwinnett County to the confluence with South Fork Peachtree Creek in the City of Atlanta near GA400 and I-85.

The data used to develop the TMDL was collected in 2001 on North Fork Peachtree Creek at Graves Road, which is in the upper reaches of the watershed in Gwinnett County. The geometric means range from 205 counts/100mL to

2,187 counts/100mL. The two summer geometric means exceeded the summer fecal coliform standard and the two winter geometric means were well below the winter standard. The highest geometric mean included one very high sample value of 46,000 on July 26, 2001; which was likely the result of a sanitary sewer overflow (Appendix B).

Although the data was not used in the state's 303(d) listing evaluation, DeKalb County actively collects water quality data at two stations on North Fork Peachtree Creek (Pleasantdale Road and Buford Highway) and one on a tributary to North Fork Peachtree Creek (Arrow Creek) upstream of the city limits. The county's watershed sampling map shows an additional station on a tributary upstream of Brookhaven but no data was available for that sampling station. These sampling stations are part of the County's Bacteria and Water Quality sampling associated with their wastewater collection and treatment operations. The sampling locations are shown in Figure 4-4 and described below. The results from these three sampling stations exceeded the state standard approximately 80% of the time with the highest values indicative of a sanitary sewer issue.

The data from the downstream station, North Fork Peachtree Creek at Buford Highway (Station E), shows that the fecal coliform bacteria ranged from 150 colonies/ 100mL to 620,000 colonies/ 100mL with an average 10 times the winter standard at 10,705 colonies/ 100mL and a median value of 1,800 colonies/ 100mL. Of the 181 samples taken, only 26 samples (14%) met the state standards, 46 samples (25%) exceeded the summer standard but would have met the winter standard, and 109 samples (60%) exceeded the winter standard and summer standard.

The fecal coliform data from the upstream sampling station, North Fork Peachtree Creek at Pleasantdale Road (Station C), ranged from 60 colonies/ 100mL to 600,000 colonies/ 100mL with an average of 10,702 colonies/ 100mL and a median of 1,800 colonies/ 100mL. Of the 131 sampling events, the samples met the fecal coliform standard 32 times (24%), exceeded the summer standard but would have met the winter standard 26 times (20%), and exceeded the winter standard 73 times (56%).

The samples from Arrow Creek, a tributary to North Fork Peachtree Creek upstream of the City limits) had fecal coliform values ranging from 40 colonies/ 100mL to 400,000 colonies/ 100mL with an average of 9,317 colonies/ 100mL and a median value of 750 colonies/ 100mL. There were 180 samples on the tributary and of these 40 samples met the standard (22%), 48 samples (27%) exceeded the summer standard but would have met the winter standard, and 92 samples (51%) exceeded the winter standard.

4.3.2 Biota/ Sediment

The monitoring data for the biota impairment were collected in 2003 on North Fork Peachtree Creek according to the TMDL (Appendix E). The index of biotic integrity (IBI) measures the health of aquatic communities based on the functional and compositional attributes of the fish population. The index of well-being (IWB) measures the health of aquatic communities based on the structural attributes of the fish population. Together, these two indices give a good summary of the overall fish population. The IBI score was very poor and the IWB category was fair but the overall ranking looking at both the IBI and the IWB was considered poor to very poor, and thus this segment was classified as impaired. The rapid habitat assessment protocol was also performed and the overall ranking was 68.7 out of 200. The macroinvertebrate TMDL is not completed and the sampling data was not available.

Table 4-2. North Fork Peachtree Creek TMDL Fish Biota Sampling Data

Stream Name	Area upstream Drainage (sq. mi.)	Date	IBI Score	IBI Category	IWB Score	IWB Category	Habitat Total
North Fork Peachtree Creek	10.9	7/31/03	20	Very Poor	6.10	Fair	68.7
IBI = Index Biotic Integrity IWB = Index of Well-Being							

4.4. Possible Sources of Pollutants of Concern

The possible sources of fecal coliform bacteria and biota impacts are presented in the following two sections.

4.4.1 Possible Sources of Fecal Coliform Bacteria

The TMDL indicates that an 84% reduction in fecal coliform bacteria is needed. Sources mentioned in the TMDL include sanitary sewer sources, septic systems, domestic animals (dogs, cats, etc.), wildlife (deer, raccoons, etc.), and illegal stormwater connections. A listing of the most likely of these sources is presented below; however this information is only based on available evidence.

As part of the DeKalb County consent order agreement with EPD and EPA, they have identified a number of locations in their sewer service area that are priorities for improvement projects. Some of the highest priority projects are located within the North Fork Peachtree Creek watershed as well is in the list of additional priorities. Hopefully, as the capital improvement projects are completed within the North Fork Peachtree Creek watershed, the fecal coliform bacteria spikes will reduce to meeting state standards.

Gwinnett County has also had challenges with sanitary sewer overflows on North Fork Peachtree Creek that are evident in the data used to develop the TMDL. Gwinnett County has been working to address their aging sanitary sewer infrastructure to reduce contributions of fecal coliform bacteria to local waterways as well.

In addition to sanitary sewer sources, domestic pets and wildlife are also potential sources as are failing septic systems or improper connections of domestic sewage to the storm sewer system. These sources are considered secondary to the sanitary sewer sources however as part of the City's MS4 program implementation, the City staff will continue to look for issues and address them when identified.

4.4.2 Possible Sources of Sediment

The most recent Biota TMDL for North Fork Peachtree Creek (Chattahoochee River Basin Biota Impacted – January 2008) indicates that a 26% reduction in sediment load is needed. The majority of the sediment load in the TMDL for North Fork Peachtree Creek is classified as "stormwater" and associated with runoff from higher intensity land uses within the watershed.

This watershed includes I-85 and the adjacent commercial and high intensity land uses. The increased urban runoff from a major interstate system that has not been historically retained or treated could result in an increase in instream sediment loads that would impact fish habitat conditions. The City will continue to be diligent with the erosion and sediment control program and continue to look for other potential sources of sediment loads.

4.5. Existing Watershed Activities

The City of Brookhaven implements the MS4 stormwater program that is outlined in Section 1.1. This program includes activities designed to monitor and reduce potential pollution in the city. The specific activities are outlined within the City's Stormwater Management Plan and not duplicated in this Impaired Waters Plan.

DeKalb County Watershed Management is responsible for the maintenance of the sanitary sewer collection system. As mentioned previously, North Fork Peachtree Creek is considered a priority watershed for rehabilitation of the aging sanitary sewer system in order to reduce overflows. DeKalb County has a consent order with EPD and EPA that outlines a schedule for assessing and rehabilitating the system in order to reduce sanitary sewer overflows.

4.6 Recommendations for the Watershed

Although the data used to develop the TMDL reflects conditions upstream of Brookhaven, the DeKalb County watershed monitoring results indicate that North Fork Peachtree Creek at the City limits does not typically meet water quality standards. The North Fork Peachtree Creek watershed is a priority for sanitary sewer rehabilitation projects that will hopefully reduce the fecal coliform bacteria loading. While DeKalb County monitors a number of stations within the North Fork Peachtree Creek watershed, this Plan recommends the City collecting quarterly geometric means at one new station to measure the fecal coliform and sediment entering the city limits. The recommended monitoring plan is outlined in Section 5 of this Impaired Waters Plan.

5.0 Monitoring and Implementation Plan

This section outlines the proposed monitoring locations, monitoring details, and proposed monitoring schedule. This monitoring plan leverages the data that is currently being collected by DeKalb County watershed management within the City limits. The data evaluation will establish the City's future actions as outlined in Section 6.0.

5.1 Sample Location

The City of Brookhaven has identified four monitoring stations with the following goals in mind:

- Monitor as close to the City boundary as possible in order to reflect conditions within Brookhaven
- Sampling location with safe access
- Sites that would be conducive to habitat assessments or biota assessments in the future
- Avoidance of duplicate monitoring sites to provide for additional data collection
- Sites that would represent the watershed conditions

The proposed sampling locations are shown in Figure 5.1. Figures 5-2 through 5-5 show pictures of the four sampling locations.

Figure 5-1. Recommended Water Quality Monitoring Locations

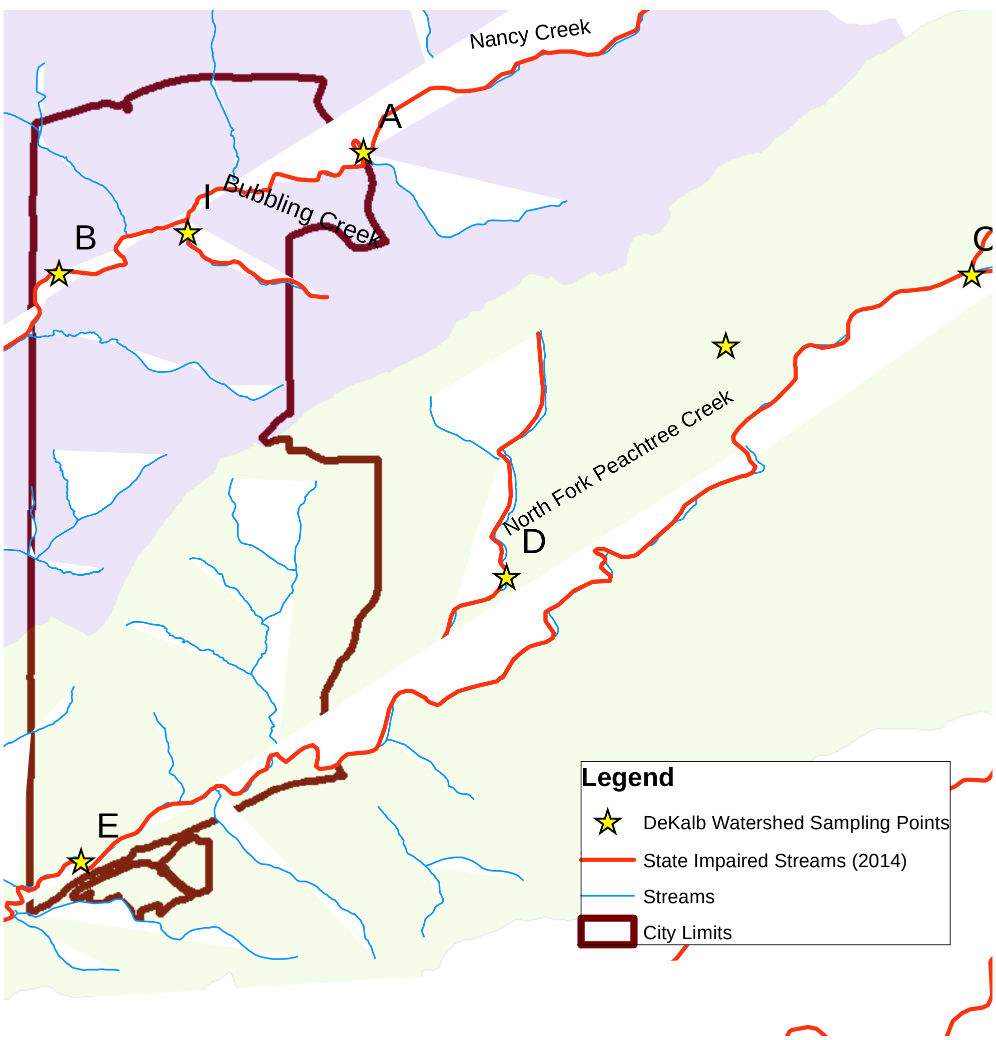


Table 5-1. Recommended Water Quality Monitoring Locations

Sampling Station Location	Status	Sampling Location Details	Recommended Frequency
1. Bubbling Creek at Harts Mill Road (I)	Existing DeKalb County site	Near confluence with Nancy Creek	Request data annually
2. Nancy Creek at Chamblee-Dunwoody Road (A)	Existing DeKalb County site	Upstream city limits adjacent D'Youville subdivision	Request data annually
3. Nancy Creek at Johnson Ferry Road (B)	Existing DeKalb County site	Downstream city limits	Request data annually
4. North Fork Peachtree Creek at Buford Highway (E)	Existing DeKalb County site	Near the downstream city limits	Request data annually

Figure 5-2. Bubbling Creek at Harts Mill Road Monitoring Location

Figure 5-3. Nancy Creek at Chamblee-Dunwoody Road

Figure 5-4. Nancy Creek at Johnson Ferry Road

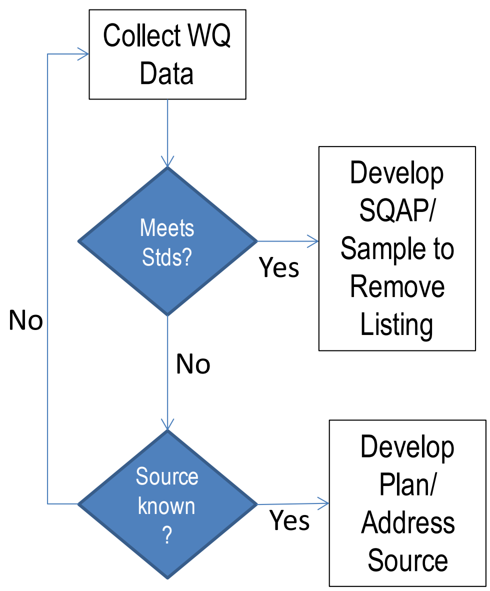
Figure 5-5. North Fork Peachtree Creek at Buford Highway

5.2. Sample Characteristics

Fecal coliform bacteria and TSS monitoring will help Brookhaven better understand progress towards meeting state standards in the three impaired stream segments. DeKalb County Watershed Management is currently sampling these three streams at locations that benefit the City's understanding of water quality issues. This plan recommends that Brookhaven collect the results of the DeKalb County sampling on an annual basis. The data should be compiled in the existing spreadsheet to further track trends and changes overtime.

If the fecal coliform numbers reduce to a level that would meet state standards, the city could consider developing a Sampling Quality Assurance Plan (SQAP) and submitting data to remove the stream segments from the 303(d) list; however the data does not currently support this effort. This adaptive management approach is shown in Figure 5-6.

Figure 5-6. Adaptive Management Approach



5.3 Monitoring Implementation Schedule

The City will request the DeKalb County sampling data starting in 2016 for the previous 12 month tirmeframe. The City will add this data to the spreadsheet developed as part of this impaired waters plan and review the data for notable trends. The City will continue this on an annual schedule.

6.0 Proposed Best Management Practices (BMPs)

Both fecal coliform bacteria and sediment are tough parameters to address. The City's phased approach reflects the complexity and dynamics associated with both of these parameters. For example, studies have shown that no single BMP type is able to consistently reduce bacteria to levels below summer standards and in some instances structure BMPs can even increase the levels of fecal coliform bacteria because they provide habitat for wildlife. Gwinnett County has been studying sediment loads in their county and found that most of the sediment is either legacy or instream and the ability to distinguish between the two loads is difficult. The phased and adaptive approach suggested in this Impaired Waters Plan will allow Brookhaven to advance their approach based on data. A few specific BMPs are recommended:

1. **Continued coordination with DeKalb County Watershed Management Department.** As noted in this Impaired Waters Plan, DeKalb County is evaluating the sanitary sewer system in both the Nancy Creek and North Fork Peachtree Creek watersheds. Parts of both watersheds have already been classified as a priority areas for rehabilitation. It is likely that the fecal coliform levels in these watersheds will reduce as DeKalb County continues to rehabilitate their system.

2. **Continued Public Education and Outreach.** One source of fecal coliform bacteria in suburban areas, similar to the three impacted watersheds, is domestic animal waste. There are a number of campaigns including the Clean Water Campaign's "Here's the Scoop" brochure (shown on the right). Distributing these in partnership with local domestic animal providers (veterinary clinics, pet food stores, groomers, and trainers) could help distribute the information in a targeted fashion. These brochures are available either for free or for a reduced cost from the Metropolitan North Georgia Water Planning District. Many communities in the region have also elected to install pet waste stations in public parks and require pet waste stations in multi-family developments. Some communities have partnered with single-family neighborhoods to install these in appropriate areas. Even if domestic animals are not the source of the fecal coliform bacteria, educating pet owners on their responsibilities to protect the community may be an important message.
3. **Continued Illicit Discharge Detection and Elimination.** As part of Brookhaven's MS4 permit, the city performs inspections of industrial and commercial facilities on a rotating basis. Confirmation that facilities that cater to domestic animals are following best practices is one aspect of these inspections. Similarly, the City through the ongoing asset management program and MS4 outfall inspection program are looking for areas where illicit discharges may be occurring to the stormwater system. These will be addressed as found by the City during these routine inspections.
4. **Continued Implementation of Ordinances for new developments and redevelopments.** While it is difficult to control the migration of historic sediment through a watershed, it is relatively easy to control the new contribution of sediment into waterbodies. The City has an active Erosion and Sediment Control program that includes plan review and inspections throughout construction. Working closely with the development community to limit the sediment that enters local waterbodies helps limit the sediment impact to fish habitat. Instream sediment loads from bank erosion is drawing greater attention in metropolitan Atlanta and several communities are performing bank studies to better estimate the contribution. Ensuring new developments have the proper post-development stormwater controls that mitigate peak flows will reduce the bank erosion that is common in more urban stream systems.

5. Watershed Improvement Planning. The City of Brookhaven is developing a Watershed Improvement Plan (WIP) for the Nancy Creek watershed, which also includes Bubbling Creek. One of the goals within the WIP is to implement projects that address water quality impairment in the watershed over time. The City is committed to better understanding water quality challenges and implementing projects and programs, over time, to address impacts from within the city.

With the data available and the ongoing work by DeKalb County's Watershed Management Department, these ongoing BMPs are seen as the best strategies for protecting water quality in Brookhaven. As additional monitoring is performed, additional BMPs or other Watershed Improvement Projects may be added based on the result of that data.

APPENDIX A: DEKALB COUNTY PRIORITY SEWER REPAIR AREAS

Priority Areas Sewer Assessment and Rehabilitation Program

DeKalb County Department of Watershed Management (DWM)

December 20, 2012

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ACRONYMS

ASCE	American Society of Civil Engineers
AWTF	Advanced Wastewater Treatment Facility
CCTV	Closed Circuit Television
CERP	Contingency and Emergency Response Plan
CIPP	Cured in Place Pipe Lining
C&M	DeKalb County Department of Watershed Management Construction and Maintenance Division
CMMS	Computerized Maintenance Management System
CMOM	Capacity, Management, Operations, and Maintenance
DWM	DeKalb County Department of Watershed Management
FOG	Fats, Oil, and Grease
EPA	U.S. Environmental Protection Agency
EPD	Georgia Environmental Protection Division
GAWP	Georgia Association of Water Professionals
GIS	Geographical Information System
GWEF	Georgia Water Environment Federation
I/I	Infiltration/Inflow
KPI	Key Performance Indicators
MACP	Manhole Assessment and Certification Program
NPDES	National Pollutant Discharge Elimination System
NACWA	National Association of Clean Water Agencies
NASSCO	National Association of Sewer Service Companies
O&M	Operation and Maintenance
OSARP	Ongoing Sewer Assessment and Rehabilitation Program
PACP	Pipeline Assessment and Certification Program
PASARP	Priority Areas Sewer Assessment and Rehabilitation Program
RDI/I	Rainfall Dependent Infiltration/Inflow
ROW	Rights-of Way

SSES	Sewer System Evaluation Survey
SOP	Standard Operating Procedures
SSOS	Sanitary Sewer Overflows
WCTS	Wastewater Collection and Transmission System

1 INTRODUCTION

1.1 Overview

This Priority Areas Sewer Assessment and Rehabilitation Program (PASARP) has been prepared in accordance with the requirements of Section VI.B(x).35 of the Consent Decree - DeKalb County, Civil Action File No. 1:10-CV-4039-WSD. Section VI.B(x).35 of the Consent Decree requires the County to submit the PASARP to the U.S. Environmental Protection Agency (EPA) and the Georgia Environmental Protection Division (EPD), for review and comment, within one (1) year of the Date of Entry of the Consent Decree. The Consent Decree was entered on December 20, 2011.

The main purpose of the PASARP is to provide for the identification, delineation, assessment, prioritization, and rehabilitation of Priority Areas (both Initial Priority Areas and Additional Priority Areas as explained in the Consent Decree) within the DeKalb County Wastewater Collection and Transmission System (WCTS). The Initial and Additional Priority Areas total approximately 776 miles of sewers (approximately 29.5 % of the WCTS). In implementing the PASARP, the County will undertake certain condition, structural, and hydraulic assessments within the Priority Areas, and identify, prioritize, and complete appropriate rehabilitation measures within those areas. As part of the implementation process, the County will track and inventory rehabilitation measures completed within the Priority Areas and determine the effectiveness of those measures, using selected key performance indicators (KPIs). The County will complete implementation of the PASARP within eight and one-half (8½) years from the Date of Entry of the Consent Decree. The County is in the process of hiring an outside contractor experienced in managing the implementation of Consent Decree sewer system improvement programs to assist it in the implementation of the PASARP in the capacity of a Program Manager.

This document contains the following key elements in compliance with the requirements of Section VI.B(x).35 of the Consent Decree:

- List and map of the Initial Priority Areas identified in the Consent Decree.
- Schedule for completing sewer assessment and for identifying, prioritizing, and completing rehabilitation projects within the Initial Priority Areas.
- List and map of Additional Priority Areas identified after the Date of Entry of the Consent Decree, including an explanation of how the County identified, delineated, and prioritized the Additional Priority Areas.
- Specifications, guidelines, and procedures, as appropriate, for the following evaluative tools and programs that will be used during the assessment of the Initial and Additional Priority Areas:
    - Private Lateral Investigations.

- Dyed Water Flooding.
- Corrosion Defect Identifications.
- Manhole Condition Assessment.
- Flow Monitoring.
- Closed Circuit Television ("CCTV") Inspection.
- Gravity Sewer Line and Force Main Defect Analysis.
- Smoke Testing.

- Criteria for identifying and prioritizing rehabilitation measures to be implemented within the Priority Areas.
- Procedures for tracking and inventorying completed rehabilitation measures completed within the Priority Areas, including key performance indicators (KPIs).
- List of currently scheduled rehabilitation measures within the Priority Areas.

1.2 Description of the DeKalb County WCTS

The DeKalb County WCTS (defined to include all pipes, lift stations, force mains, gravity sewer lines, manholes and other appurtenances) consists of an estimated 2,600 miles of sewers, 66 lift stations, and an estimated 61,500 manholes. The County is divided into three (3) sewer basins (Intergovernmental, Snapfinger, and Pole Bridge) containing a total of thirty-five (35) sewersheds, two (2) of which do not currently contain any sewers. The following are summary descriptions of the three (3) sewer basins:

- *Inter-Governmental Basin*: The Intergovernmental Basin is divided into the following nine (9) sewersheds: Ball Mill Creek, Camp Creek, Lucky Shoals Creek, Marsh Creek, Northeast Creek, Nancy Creek, North Fork Creek, South Fork Creek, and Peavine Creek. This basin contains an estimated 1,136 miles of sanitary sewers and an estimated 25,800 manholes.

  The approximately thirty-six (36) million gallons per day (MGD) of wastewater generated within the Intergovernmental Basin is collected, transmitted, and treated at the City of Atlanta R. M. Clayton Water Reclamation Facility under an intergovernmental agreement with the City of Atlanta. Sewers located within the City of Atlanta, through which wastewater from the Intergovernmental Basin flows, are owned and maintained by the City of Atlanta under the above-mentioned intergovernmental agreement with the City of Atlanta.

- *Snapfinger Basin*: This basin is divided into the following fifteen (15) sewersheds: Barbashela Creek, Blue Creek, Cobb Fowler Creek, Conley Creek, Constitution Area, Corn Creek, Doolittle Creek, Indian Creek, Intrenchment Creek, Lower Snapfinger Creek, Shoal Creek, South River, Sugar Creek, Upper Snapfinger Creek, and Upper Stone Mountain. This basin contains an estimated 1,098 miles of sanitary sewers and an estimated 25,100 manholes.

There are two (2) areas served by septic tanks only in the Snapfinger Basin. These areas include approximately one-third (⅓) of the Cobb Fowler Creek sewershed and the entire Upper Stone Mountain sewershed.

- *Pole Bridge Basin*: The Pole Bridge Basin is divided into the following eleven (11) sewersheds: Crooked Creek, Honey Creek, Johnson Creek, Lower Crooked Creek, Lower Stone Mountain, Pine Mountain Creek, Plunket Creek, Polebridge Creek, Swift Creek, Upper Crooked Creek, and Yellow River. This basin includes an estimated 398 miles of sanitary sewer and an estimated 10,600 manholes.

1.3 WCTS Condition and Context of the PASARP

In order to promote effective operation and longevity of its WCTS, the County maintains an assortment of equipment and a diverse group of personnel to perform both proactive and reactive maintenance work twenty-four (24) hours per day. In addition to its inventory of equipment and personnel resources, the County has developed and continues to improve and implement Capacity, Management, Operations, and Maintenance (CMOM) programs countywide. Specifically, and as a part of its Consent Decree obligations, the County is implementing the following CMOM programs:

- Contingency and Emergency Response Plan.
- Fats, Oils, and Grease Management Program.
- Sewer Mapping Program.
- Maintenance Management Systems Program.
- Collection and Transmission System Training Program.
- System-Wide Flow and Rainfall Monitoring Program.
- System-Wide Hydraulic Model.
- Financial Analysis Program.
- Infrastructure Acquisitions Program.

In addition to the above programs, and also separate from the PASARP, the County is required to implement an Ongoing Sewer Assessment and Rehabilitation Program ("OSARP") that will ensure continuous assessment and rehabilitation of the County's WCTS. The OSARP will begin its focus on areas outside the Initial and Additional Priority Areas. However, this program is intended to be maintained on a permanent basis by the County. In effect, the entire WCTS will be continuously assessed and rehabilitated.

The PASARP focuses on a subset of the WTCS, the areas potentially needing more urgent attention, hence the term Priority Areas. As noted, these Priority Areas are estimated to be about 29.5% of the WCTS. Because of the relatively young age of the County's WCTS (84% of the WCTS is less than 50 years old), the extent of the County's ongoing proactive and reactive maintenance program, and the CMOM Programs, the County's WCTS is in relatively good condition. For instance, for the last several years, the County has been assessing the condition of its manholes (Manhole Condition Assessment) and ranking observed manhole structural defects based on the Manhole Assessment and Certification Program (MACP) developed by the National Association of Sewer Companies (NASCO). Based on the results of the Manhole Condition Assessment performed to date, more than ninety percent (90%) had no structural defects. Similarly, in 2010, the County evaluated a representative portion of its WCTS for Excessive infiltration and inflow (I/I) and found that the average "R-Value" for all the meters analyzed was approximately 1.7%; indicating that the County's WCTS experiences a relatively insignificant amount of I/I during periods of wet weather. Nonetheless, the CMOM Programs, the PASARP, and the OSARP, while individually addressing different aspects of the WCTS, will together ensure the long-term viability of the WCTS and eliminate SSOs.

2 PRIORITY AREAS IDENTIFICATION, DELINEATION, AND PRIORITIZATION

2.1 Initial Priority Areas Identification

As part of the Consent Decree, the County identified twenty-three (23) Initial Priority Areas within its WCTS for further assessment and rehabilitation. The Initial Priority Areas consists of areas determined by the County as having sewers that are estimated to be older than fifty (50) years; areas with calculated "R-Values" greater than three (3) percent; and areas determined by the County, through its ongoing sewer system maintenance program, as needing additional assessment and/or prioritized rehabilitation. The Initial Priority Areas constitute approximately 463 miles of sewers, which is approximately eighteen percent (18%) of the County's WCTS. Table 2-1 presents a list of the Initial Priority Areas including summary descriptions of each numbered Initial Priority Area, estimated length of each Initial Priority Area, and the name of the basin where each Initial Priority Area is located. Appendix A presents a map showing the locations of each numbered Initial Priority Area. It should be noted that a new numbering system for the Priority Areas has been adopted by the County. The first letter in the Priority Areas numbers identifies whether the Priority Area is an Initial Priority Area (I) or an Additional Priority Area (A). The second two letters identifies the sewer basin where the Priority Area is located (IG for the Intergovernmental Basin, SF for the Snapfinger Basin, and PB for the Pole Bridge)

Table 2-1
List of Initial Priority Areas

Consent Decree Number	New Priority Area Number	Area Description	Length of Sewers (LF)
		INTER-GOVERNMENTAL BASIN	
2	I-IG1	Winters Chapel Rd at Homeland Drive	7,387
3	I-IG2	Carver Circle	12,401
1	I-IG3	Ashford Dunwoody-Nancy Creek	16,399
4	I-IG4	North Peachtree-North Shallowford	20,104
5	I-IG5	Oakcliff Road	23,232
6	I-IG6	City of Chamblee	144,915
16	I-IG7	Embry Circle Pipe Bursting	6,713
17	I-IG8	Embry Circle Relining	15,916
7	I-IG9	Windsor Parkway	22,557
9	I-IG10	Drew Valley Road subdivisions	52,231
8	I-IG11	Skyland Road	3,712
18	I-IG12	Henderson Mill Rd	83,783
23	I-IG13	Area contributing to TSFORK 5 monitor	188,775
19	I-IG14	Briarcliff Rd	90,215
11	I-IG15	Lavista - Oak Grove area	39,197
10	I-IG16	Lavista Rd-Clairmont Rd-Houston Mill Rd	176,260
12	I-IG17	North DeKalb Mall area	57,669
13	I-IG18	Scott Blvd-Clairmont Rd	37,969
14	I-IG19	Old Rockbridge Rd-Avondale (partial)	19,698
		SUBTOTAL:	*1,019,133*
		SNAPFINGER BASIN	
	I-SF1	Old Rockbridge Rd-Avondale (partial)	46,897
15	I-SF2	Cobb Fowler Basin	733,145
20	I-SF3	Shoal Creek Basin	608,920
22	I-SF4	Covington Hwy at Kensington Rd	12,203
		SUBTOTAL:	*1,401,165*
		POLE BRIDGE BASIN	
21	I-PB1	Lithonia Industrial Pkwy	22,773
		SUBTOTAL:	22,773

2.2 Additional Priority Areas Identification, Delineation, and Prioritization

Subparagraphs 35(b) and 35(c) of Section VI.B(x) of the Consent Decree requires the County to identify Additional Priority Areas within the County's WCTS for further assessment and rehabilitation and to provide an explanation of how the Additional Priority Areas were identified, delineated, and prioritized. Subparagraph 35(d) of Section VI.B.(x) of the Consent Decree lists the criteria for identifying, delineating, and prioritizing the Additional Priority Areas. Section 2.2.1 of this document provides summary descriptions of the criteria used to identify, delineate, and prioritize Additional Priority Areas. Section 2.2.2 provides a summary of the process followed during the identification, delineation, and prioritization of the Additional Priority Areas. The details regarding the Additional Priority Areas identification, delineation, and prioritization process, including how the criteria were applied, are included in a report titled "DeKalb County Department of Watershed Management Wastewater Collection and Transmission System (WCTS) Additional Priority Areas Identification, Delineation, and Prioritization Process", which is included in Appendix B of this document. The Additional Priority Areas constitute approximately 313 miles of sewers, which is approximately 12% of the County's WCTS.

2.2.1 Description of the Criteria Used to Identify, Delineate, and Prioritize Additional Priority Areas

The following are summary descriptions of the criteria used to identify, delineate, and prioritize Additional Priority Areas:

- *Relative Age of the WCTS Infrastructure*: Three (3) age categories were identified and delineated in the County's GIS: (1) sewers installed prior to and including the year 1960, sewers installed between the time period of 1961 through 1984, and sewers installed after 1984.

  Generally, the condition of sewers deteriorates with time. The rate and extent of sewer degradation is dependent upon several factors including age, pipe material, soundness of original construction, concentration of wastewater constituents, type and duration of external loading, and types of surrounding soils. During the identification, delineation, and prioritization of Additional Priority Areas, the County made the reasonable assumption that sewers constructed before 1960 have passed half their usable life and are probably in need of inspection to determine if they are in need of rehabilitation; sewers constructed during the time period of 1961 through 1984 would not be expected to have undergone significant deterioration and, for the most part, may not need any rehabilitation but may need assessment to determine their condition; and sewers constructed after 1984 are structurally sound and should not need any rehabilitation based on age alone.

- *Estimated Rainfall Dependent Infiltration/Inflow ("RDI/I") Into the System*: RDI/I is defined as the portion of I/I that is directly influenced by the intensity and duration of a storm event. Two indicators of RDI/I include the peaking factor and the "R-Value". The peaking factor is the ratio of the maximum flow to the average flow for a selected period of time (hour or day). The “R-Value” is defined as the fraction (generally expressed as a percentage) of rainfall entering a sewer system as RDI/I. Extraneous water enters the sewer system in direct response to rainfall through storm drains and other sources such as defective manhole and sewers.

Both the peaking factors and R-Values are important in evaluating the quantity and type of RDI/I. For example, whereas relatively high peaking factors and “R-Values” may indicate a significant inflow problem, relatively low peaking factors and high “R-Values” may suggest a significant infiltration problem.

- *Proactive and Reactive Maintenance Records, Including Results from Lift Station Inspections:* The County regularly performs both proactive and reactive maintenance throughout its WCTS. Records of proactive and reactive maintenance are maintained in the County’s work order system. Sanitary sewer service calls are tracked and recorded by the date, time, address, cause, and action taken for each incident within the WCTS. The most common sanitary sewer complaint codes logged by the County's Construction and Maintenance Division (C&M) are recorded in the following categories: manhole/pipe clean or inspect, vacuum, root cut, and SSOs. The frequency and type of maintenance activity performed on a sewer, or a sewer appurtenance is a good indicator of the overall condition of a sewer.

- *SSO Records*: The County tracks and monitors all reported spills that occur within the County's WCTS. Each spill is classified as either a structural-related defect spill or a service-related spill. Structural-related defect spills include cracked and broken sewers, offset joints, and root intrusion. Service-related spills primarily occur because of solidified fats, oils, and grease (FOG) or debris blockages. Less common service-related spills occur when equipment fails or the sanitary sewer system is vandalized. Structural-related defect spills provide a good indication of the overall condition of a sewer.

- *Known Structural Defects Including Known Manholes Defects*: Over the last several years, the County has been performing Manhole Condition Assessment to identify the types and locations of manhole defects. The County has also been performing targeted sewer line condition assessment, either proactively or reactively, using various sewer system assessment tools including smoke testing and CCTV. In addition, the County performs routine lift stations inspections as part of its lift stations proactive maintenance program. As part of these programs, the County maintains an inventory of the types and locations of known manhole and pipe defects and utilizes this information to schedule and to implement manhole and pipe rehabilitation work either internally or through annual contracts. Known sewer system structural defects provide the most accurate information on the condition of a sewer system.

- *Relative Risk that SSOs are Likely to Reach Surface Waters*: Discharges of untreated wastewater into surface waters pose a risk to human health and the environment. Wastewater can either enter surface waters directly from overflowing manholes and/or defective sewers, and/or through stormwater outfalls when overflowing manholes and/or defective sewers discharge into a storm drainage structure that conveys the wastewater into the receiving stream. The closer a sanitary sewer is to a surface water body (e.g. interceptor sewers and sewer stream crossings), the greater the relative potential for wastewater overflows to enter the water body that is in close proximity to the sanitary sewer. The County maintains GIS shapefiles of its WCTS and shapefiles of water bodies within the County. In evaluating this criterion, the County made the reasonable assumption that there exists a direct correlation between the sum of the length of streams and the perimeters of water bodies within a Ranking Area and the potential risk associated with spills in that Ranking Area.

- *Relative Risk that SSOs are Likely to Present Public Health and Welfare Concerns Based on Proximity and Access to Population Centers and Water Bodies*: SSOs can occur in close proximity to public places such as streams, parks, schools, and buildings. The County maintains shapefiles of its WCTS as well as shapefiles of public places. In evaluating this criterion, the County made the reasonable assumption that the greater the density of public places, the greater the potential for SSOs to present public health and welfare concerns.

- *Information Obtained from Maintenance Personnel Knowledgeable of the Conditions of the WCTS Based on Actual Experience and Historic Investigations*: The County's computerized maintenance management system (CMMS) is used to track customer/public complaints, to create work orders, and to track corrective actions associated with sewer problems. In addition to the computerized records, the County's personnel have first-hand individual and collective knowledge of the condition of the WCTS. This first-hand knowledge provides a good indication of the condition of various segments of the WCTS.

- *Standard Industry Practices as Documented in Industry Manuals, Engineering Textbooks, EPA Publications, and Lessons Learned*: The sewer system assessment and rehabilitation processes have advanced tremendously over the last twenty (20) years. Numerous sewer assessment and rehabilitation programs have been implemented throughout the world with various degrees of success. In addition to the readily available information regarding sewer systems assessment and rehabilitation programs, various entities, including the EPA, have published several documents regarding effective sewer system assessment and rehabilitation techniques. This information provided the County with a wealth of knowledge regarding how to identify, delineate, and prioritize the Additional Priority Areas including how to assign weights and scores to various criteria.

- *Professional Judgment*: Professional judgment can be defined as: The process of forming an opinion by discerning and comparing various alternatives. Sound professional judgment is characterized by, and conforms to, established technical, industry, and ethical standards and requires specialized knowledge and experience in the relevant professional field. The science of applying technical criteria, especially in determining the relative weights and relative scores to assign to various criteria and criteria categories (respectively) requires the superior ability to recognize the relative potential for various criteria to advance the goals and objectives of a sewer system assessment and rehabilitation program. During the identification, delineation, and prioritization of Additional Priority Areas, the

County thoughtfully and realistically applied individual and collective professional judgment. Although professional judgment is sometimes difficult to quantify or explain, the professional industry has realized that, in the majority of cases, the results of professional judgment, when applied correctly supersedes those obtained through the application of technical facts and technology alone. This is indeed the case in the field of sewer system assessment and rehabilitation.

2.2.2 Additional Priority Areas Identification, Delineation, and Prioritization Process

As indicated previously in this document, the details regarding the Additional Priority Areas identification, delineation, and prioritization process are included in a report titled "DeKalb County Department of Watershed Management Wastewater Collection and Transmission System (WCTS) Additional Priority Areas Identification, Delineation, and Prioritization Process", which is included in Appendix B of this document.

During the early stages of the Additional Priority Areas identification, delineation, and prioritization process, the County determined that it would be prudent to rank and to prioritize the Additional Priority Areas on a sewer basin by sewer basin basis, whereby each of the County's three (3) sewer basins would be treated as a separate sewer system. This approach allowed the leveraging of each basin's unique characteristics, took into account the data that was available for each of the sewer basins, advanced the potential to protect impaired [303(d)] streams throughout the County, and ensured the advancement environmental justice concerns within the County. The differentiating characteristics for each basin include the following:

- The three basins are hydraulically independent of each other and discharge to different wastewater treatment plants.

- Manhole condition assessment data was not available for the Inter-Governmental Basin, but was available for most of the manholes within the Snapfinger and the Pole Bridge basins.

- The Snapfinger Basin has some of the oldest pipes in the system. Root intrusion issues are more prevalent as a result of the presence of mature trees. Moreover, development within this basin has been individually planned and implemented over a period of time, rather than being developed using a master plan. As a result, some of the sewers within this basin do not flow as smoothly as sewer systems that follow a master plan.

The following is a summary of the Additional Priority Areas identification, delineation, and prioritization process:

- *Data Gathering:* The initial phase of this process involved gathering available relevant data that support the criteria used to identify, delineate, and prioritize the Additional Priority Areas. Whenever possible, data were gathered in electronic format but when electronic data were not available, hard copy data were gathered.

Gathered data were cataloged and archived in formats deemed most efficient for evaluation and analysis.

- *Delineation of Ranking Areas:* Following data gathering, the County divided its entire WCTS into 171 areas for evaluation, ranking, and prioritization. These areas were designated as "Ranking Areas" for purposes of this project. The areas were delineated based on the sewer pipe networks flowing to the corresponding downstream flow meters. The 171 Ranking Areas were selected because they were deemed to be of appropriate size; have readily identifiable boundaries; and data are available to support the application of the technical criteria selected for identifying, delineating, and prioritizing Additional Priority Areas.

- *Identification of Criteria Data Categories*: During the review and analysis of available data, it was determined that some of the technical criteria were supported by two (2) types of data categories and that the application of criteria having two (2) available data categories required consideration of the two (2) available data categories supporting such criteria. The criteria having two (2) types of supporting data categories included (1) Estimated Rainfall Dependent Infiltration/Inflow (RDI/I) into the System, where both the Peaking Factors and the "R-Values" are available; (2) Proactive and Reactive Maintenance Records, including results from lift station inspections, where both proactive and reactive maintenance data are available; (3) SSO Records, where both structural-related defect spills and service–related spills are available; and (4) Known Structural Defects Including Known Manholes Defects, where both manhole structural-related defects and manhole service-related defects are available.

- *Assigned Weights to Various Criteria*: In order to facilitate the application of the technical criteria to the Ranking Areas, weights were assigned to the various technical criteria based on their professionally perceived potential to advance the objectives of the Consent Decree. In assigning weights to various technical criteria, the County made the reasonable assumption that the available data supporting the universal set of the technical criteria, included in the Consent Decree and summarized above; coupled with professional judgment, are sufficient to predict the need and indeed the priority of the rehabilitation of various Ranking Areas within each sewer basin. Therefore, the total of all the weights assigned to the technical criteria was made to equal 100%. The spread among the weights assigned to various technical criteria was made sufficiently large to enable the mathematical discrimination between possible outcomes. A three-tier approach was used to divide the criteria into low, medium, and high, with weights of 5%, 10%, and 15%, respectively. The weights assigned to various criteria are shown in Table 2-2 below.

Table 2-2: Weights Assigned to Various Criteria

Criteria	Percentage Weight
Relative Age of WCTS	15%
Estimated RDI/I into System: Peaking Factor	5%
Estimated RDI/I into System: R-Value	5%
Proactive Maintenance	10%
Reactive Maintenance	15%
Structural-Related Defect Spills	15%
Service-Related Defect Spills	5%
Known Structural Defects: Manhole Structural-Related Defects	15%
Known Structural Defects: Manhole Service-Related Defects	5%
Relative Risk that SSOs Reach Surface Waters	5%
Relative Risk that SSOs Present Public Health and Welfare Concerns	5%

- *Developed Three (3) Raw Data Spreadsheets, One for Each of the Three (3) Sewer Basins, Showing the Available Raw Data for Each Ranking Area:* To facilitate the ranking process, three (3) Excel raw data spreadsheets were developed (one for each sewer basin). Each of the three (3) spreadsheets included the names of the sewersheds within the basin, the Ranking Areas within the basin, the ranking criteria, and the available data for each Ranking Area. To ensure that data was independent of the length of sewers in the Ranking Areas, some of the raw data were divided by the lengths of sewers within the associated Ranking Area, as appropriate. Following the data entry, three (3) data scoring spreadsheets were developed, one for each sewer basin. The data scoring spreadsheets were developed by assigning scores to each data item in the raw data spreadsheets. In order to compare data equally across various criteria, scores assigned to various data items were normalized on a scale of 1 to 10 with the highest score in each column receiving a score of 10. All other scores were adjusted linearly on a scale of 1 to 10. For example, if the largest value was 30, it was assigned a score of 10; a value of 15 in the same category was assigned a score of 5.

- *Developed Ranking Areas Prioritization Matrices:* Following the development of the raw data spreadsheets and the normalization of data within each criteria data categories, three Ranking Areas Prioritization Matrices were developed (one for each sewer basin in the County's WCTS). The Ranking Areas Prioritization Matrices were developed by multiplying the scores in each criterion category by the weight assigned to the corresponding criterion to obtain the Weighted Scores. In cases where categories of data were missing within a basin, (for example, manhole condition assessment data was not available for the Intergovernmental Basin), the weight associated with that criterion was redistributed to the other criteria. The Weighted Scores for each Ranking Area were then summed up to obtain the Total Weighted Score. The Ranking Areas within each sewer basin were then ranked in order of priority based on the Total Weighted Scores, with the Ranking Area having the highest Total Weighted Score obtaining a rank of 1.

- *Performed a "Knee of the Curve" Analysis on Prioritization Results*: Following the ranking of the Ranking Areas within each sewer basin, as explained above, a "Knee of the Curve" analysis was performed. The "Knee of the Curve" analysis is a mathematical tool that is used in several applications to determine the point at which performance improvements start to level off as a function of one or more tunable parameters. The "Knee of a Curve" is mathematically the point on a curve with maximum curvature. In cost benefit analysis, the "Knee of the Curve" is the point on the curve beyond which the relative effort to increase some tunable parameter is not cost effective.

  The "Knee of the Curve" was performed to aid the County in determining the number of Ranking Areas, and hence the length and percentage of sewers within each sewer basin, where additional assessment and/or the implementation of rehabilitation measures would realize the optimum benefits cost effectively. In deciding to use the "Knee of the Curve" analysis, the County made the reasonable assumption that the assessment and/or the implementation of rehabilitation measures will be directed towards the elimination of Non-FOG Spills and that there exists a correlation between Non-FOG Spills and the length of sewers in each Ranking Area.

- *Identified Additional Ranking Areas for Further Assessment and Rehabilitation*: Following the "Knee of the Curve" analysis, the Ranking Areas below the point of greatest curvature (Knee of the Curve) were selected for further assessment and/or prioritized rehabilitation. Some overlap was found to exist between the areas selected through the "Knee of the Curve" analysis and the Initial Priority Areas. The areas outside the Initial Priority Areas but within the areas selected for further assessment and/or rehabilitation, through the "Knee of the Curve" analysis, were identified as the Additional Priority Areas. Table 2–3 Presents a list of the Additional Priority Areas selected for further assessment and/or prioritized rehabilitation. Appendix C presents two maps. The first one shows the locations of the Additional Priority Areas. The second shows the combined Initial Priority Areas and the Additional Priority Areas.

TABLE 2-3
List of Additional Priority Areas

Priority Area Number	Area Description	Length of Sewers (LF)
	INTER-GOVERNMENTAL BASIN	
A-IG1	Ranking Area MARSH-FUL (Marsh Creek)	56,651
A-IG2	Ranking Area TAZTEC5 (Aztec)	41,324
A-IG3	Ranking Area TNANCY2 (Nancy Creek)	50,937
A-IG4	Ranking Area TNANCY5 (Nancy Creek)	57,976
A-IG5	Ranking Area TNFORK1 (North Fork Peachtree Creek)	527,354
A-IG6	Ranking Area TSFORK4 (South Fork Peachtree Creek)	46,778
A-IG7	Ranking Area TSFORK3 (South Fork Peachtree Creek)	31,582
	SUBTOTAL:	*812,602*
	SNAPFINGER BASIN	
A-SF1	Ranking Area TUSF14 (Upper Snapfinger Creek)	58,415
A-SF2	Ranking Area BAR5 (Barbashela Creek)	60,730
A-SF3	Ranking Area IND1 (Indian Creek)	46,221
A-SF4	Ranking Area USF4 (Upper Snapfinger Creek)	11,531
A-SF5	Ranking Area USF2 (Upper Snapfinger Creek)	75,491
A-SF6	Ranking Area ITMC-ATL (Intrenchment Creek)	41,344
A-SF7	Ranking Area TDOL5 (Doolittle Creek)	28,390
A-SF8	Ranking Area TDOL6 (Doolittle Creek)	46,241
A-SF9	Ranking Area SUG5 (Sugar Creek)	22,461
A-SF10	Ranking Area CON-CLAY (Conley Creek)	17,005
	SUBTOTAL:	*407,829*
	POLE BRIDGE BASIN	
A-PB1	Ranking Area UCKC2 (Upper Crooked Creek)	146,424
A-PB2	Ranking Area LCKC1 (Lower Crooked Creek)	59,278
A-PB3	Ranking Area TJSC1 (Johnson Creek)	41,156
A-PB4	Ranking Area THON4 (Honey Creek)	37,563
A-PB5	Ranking Area PINEM2 (Pine Mountain)	46,939
A-PB6	Ranking Area PB1 (Pole Bridge Creek)	90,167
A-PB7	Ranking Area PBPLNT1 (Pole Bridge Wastewater Treatment Plant)	11,450
	SUBTOTAL:	*432,977*

3 SPECIFICATIONS, GUIDELINES, AND PROCEDURES FOR EVALUATIVE TOOLS AND PROGRAMS

The following evaluative tools and programs, identified in the Consent Decree Section VI.B(x).35, will be used during the implementation of the PASARP:

- Private Lateral Investigations Specifications, Guidelines, and Procedures (Appendix D).
- Dyed Water Flooding Specifications, Guidelines, and Procedures (Appendix E).
- Corrosion Defect Identifications Specifications, Guidelines, and Procedures (Appendix F).
- Manhole Condition Assessment Specifications, Guidelines, and Procedures (Appendix G).
- Flow Monitoring. Guidelines Specifications, Guidelines, and Procedures (Appendix H).
- Closed Circuit Television ("CCTV") Inspection Specifications, Guidelines, and Procedures (Appendix I).
- Gravity Sewer Line and Force Main Defect Analysis Specifications, Guidelines, and Procedures (Appendix J).
- Smoke Testing Specifications, Guidelines, and Procedures (Appendix K).

3.1 Overview of WCTS Evaluative Tools and Programs and their Applicability to the PASARP

As indicated in Section 2 of this document, the WCTS infrastructure degrades with time based on several factors including age, pipe material, soundness of original construction, concentrations of wastewater constituents, type and duration of external loading, and types of surrounding soils. WCTS degradation can affect the structural integrity and/or hydraulic performance of the infrastructure. The level of degradation is determined by using several of the above-listed evaluative tools to determine the current condition and/or performance compared with the design or expected level or performance. The assessment of the Priority Areas will be performed in a manner so as to provide the information needed to identify and to prioritize rehabilitation measures based on consequence and likelihood of failure (risk) and cost effectiveness. The following are summary descriptions of the evaluative tools and programs that will be used to assess the Initial and Additional Priority Areas.

- *Private Lateral Investigations:* Private laterals can be inspected using a combination of technologies, the selection of which depends on site conditions and access. Access onto private property to confirm or gather defect data is a voluntary program and requires the property owner's permission in DeKalb County.

- *Dyed Water Flooding:* Dyed water testing is used in conjunction with smoke testing and CCTV to determine whether or not a smoke exit point is directly or indirectly connected to the sewer system. Dyed water testing is also used to investigate building sewer system connectivity.

- *Corrosion Defect Identification:* For gravity sewers, the simplest method to identify corrosion is by direct visual observation or CCTV inspection. For force mains, direct and indirect technologies may or may not be easy to apply depending on the force main's access. Combinations or tiered (levels of equipment and/or access to force mains) technologies are usually employed.

- *Manhole Condition Assessment:* Manhole condition assessment technologies are primarily by visual or camera imaging and can be performed from the surface or by physical entry depending on the desired level of precision of the collected data.

- *Flow Monitoring:* Flow monitoring is used to measure hydraulic performance. It helps identify areas of the system with excessive I/I. It is also used to determine the effectiveness of rehabilitation measures.

- *CCTV*: CCTV is used to provide a visual assessment of the interior of a manhole or pipe asset. The visual assessment is converted to a condition score. The asset is sometimes cleaned in advance of the inspection to provide a clearer structural image.

- *Gravity Sewer Line & Force Main Defect Analysis*: Gravity sewer and force main sewer (as well as other infrastructure assets) defects are given a code and score that, when aggregated, produce an asset condition score. When sewer line and force main defect data is properly linked to software and hardware applications, the analysis can enable subsequent selection and prioritization of rehabilitation measures.

- *Smoke Testing:* Smoke testing is used to identify potential locations of defects allowing the entry of I/I and, therefore, to prioritize CCTV Inspection and other assessment activities. Smoke testing is effective on both public and private property (laterals) and can locate cross connections or other illicit connections.

In traditional Sewer System Evaluation Surveys (SSES) the evaluative tools and programs are generally applied in the following sequence:

- Flow Monitoring.

- Smoke Testing.

- Dyed Water Testing.

- Manhole Condition Assessment.
- Closed circuit Television Inspection (CCTV).
- Private Lateral Investigation.
- Corrosion Defect Identification.
- Gravity Sewer Line and Force Main Defect Analysis.

Some combination of these evaluative tools and programs are utilized simultaneously based on the system size and needs. The most efficient combination of evaluative tools and programs will be used to assess the Initial and Additional Priority Areas. The selection of the most effective tools and programs, or combinations thereof, will ultimately be made on a case by case basis, based on Priority Area specific conditions and data available at the time additional assessment is performed. Detailed specifications, guidelines, and procedures for these assessment tools and programs are included in Appendices D through K. It should be noted that the specifications, guidelines, and procedures included in Appendices D through K are subject to change based on advancement in technology, effectiveness, and site specific conditions. Whenever revisions are made to the specifications, guidelines, and procedures, the revision date will be identified on the electronic and hard copy versions. Previous versions will also be maintained.

4 CRITERIA FOR IDENTIFYING AND PRIORITIZING REHABILITATION MEASURES

This section presents the criteria that the County will use to identify and prioritize rehabilitation measures that will be implemented in the Initial and Additional Priority Areas. Conditions associated with the occurrence of SSOs can generally be grouped into three (3) major categories: (1) capacity limitations, (2) structural defects, and (3) maintenance problems. The criteria presented in this document will be used to identify and prioritize rehabilitation measures that predominantly address capacity limitations and structural defects that are causing, or have the potential to cause, SSOs within and/or down gradient of the Initial and Additional Priority Areas. Although some of the rehabilitation measures may address maintenance problems that are causing or have the potential to cause SSOs, the County believes that CMOM Programs will more effectively address maintenance problems that are causing or have the potential to cause SSOs. In general, the County will identify and prioritize rehabilitation measures within the Priority Areas based on the following criteria:

- Hydraulic Modeling Analysis.
- Cost effectiveness analysis (to be performed on the whole or parts of each Priority Area).
- Likelihood and consequence of failure (risk).
- The frequencies and volumes of Non-FOG sanitary sewer overflows (SSOs) with specific emphases on those caused by capacity limitations and structural defects.
- Professional judgment of County personnel knowledgeable of the performance and maintenance requirements of the WCTS.
- SSO potential to impact human health and the environment.

It should be noted that some assessment and/or rehabilitation work has already been completed within some of the Initial and Additional Priority Areas. Therefore, the extent to which various Priority Areas will be assessed and/or rehabilitated will vary from Priority Area to Priority Area depending on the level of previous assessment and the effectiveness of completed rehabilitation measures.

4.1 Identification and Prioritization of Rehabilitation Measures

The process of identifying rehabilitation measures for a specific Priority Area will be initiated following the completion of the condition assessment within that Priority Area (or a portion thereof). As indicated in the guidelines for the various condition assessment techniques, the data obtained during sewer system condition assessment will be documented and archived in formats compatible with the County's mapping and work order systems. This approach will promote intelligent interface of various condition assessment data and the sewer system locational data (GIS). The condition assessment data will effectively become an attribute of the sewer system assets for which rehabilitation measures will be identified and prioritized. This will ensure reasonable data accuracy by eliminating multiple data entries, facilitate data analysis, and reduce duplication of effort; and therefore, advance cost effectiveness in data analysis, identification and prioritization of rehabilitation measures, and rehabilitation measures design and construction processes.

The Gravity Line and Force Main Defect Analysis Guidelines included in Appendix J of this document summarizes the process the County will use to analyze the defects identified during the sewer system condition assessment phase of the PASARP. Certain defects will be scheduled for rehabilitation immediately upon their discovery during the sewer system condition assessment. Such defects will include those that pose immediate or foreseeable danger to human health and welfare and those determined to be contributing to the occurrence of SSO, based on their severity. The determination as to whether a defect should be scheduled for rehabilitation will be made based on professional judgment and experience.

The defect analysis process will include estimating the volume of infiltration and/or inflow associated with defects not immediately scheduled for rehabilitation and the total for observed defects within specific manhole to manhole sections and the Priority Area as a whole for selected rainfall and groundwater conditions. The total estimated volume of extraneous flows within specific manhole to manhole sections will be used as a means of distributing and proportioning the extraneous I/I through the collection and transmission system within the Priority Area and then all the way to the wastewater treatment plant using the County's hydraulic model. The hydraulic model will of course account for flows originating from areas outside the Priority Area (these other flows will be obtained from flow monitoring data). The hydraulic model will provide the hydraulic profiles within the Priority Area and the sewers through which flows originating and upgradient of the Priority Area are transmitted to the wastewater treatment plant. Locations of sewer segments with capacity limitations, manhole surcharges, and SSOs, if any, will become evident once the hydraulic model is developed.

After the hydraulic model for each Priority Area is developed, the County will then integrate inspection findings and identify combinations of rehabilitation measures that can be implemented to remove selected percentages of the extraneous flows within a Priority Area (including the zero percent removal option). The County will then estimate the cost of implementing the various combinations of rehabilitation measures analyzed. The County will also estimate the cost of transmitting the extraneous flows not removed by the various combinations of rehabilitation measures analyzed. The most cost effective set of rehabilitation measures will then be selected for implementation.

One or more of the types of rehabilitation measures listed below will be utilized by the County. The listed rehabilitation measures have been tested and implemented extensively and effectively throughout the world and their applicability, effectiveness, and durability are well documented.

- Cured-in-place liner.
- Pipe bursting.
- Manhole lining.
- Manhole replacement.
- Open cut pipe replacement method.
- Point repairs.
- Manhole raising.
- Manhole ring and cover replacement.
- Service lateral rehabilitation.
- Installation of cleanouts.
- Disconnection of unauthorized connections.

The most cost effective combination or rehabilitation measures will be selected for implementation.

4.2 Procedures for Tracking and Inventorying Completed Rehabilitation Measures

The procedures discussed in this section will be used to track and inventory the rehabilitation measures completed as part of the PASARP. Ongoing and completed rehabilitation projects will be tracked and inventoried in Microsoft Excel spreadsheets. The following asset rehabilitation projects will be tracked during the implementation of the PASARP:

- Sewer gravity pipe rehabilitation (to be tracked in linear feet and type of rehabilitation project).
- Force mains and air release valves rehabilitation (based on the type of rehabilitation measure).
- Manhole rehabilitation (to be tracked by manhole identification number (ID), date started/date completed, type of manhole rehabilitation, and location).
- Lift station replacement and rehabilitation projects (to be based on the type of rehabilitation).

Once a rehabilitation project is completed, information regarding the project will be provided by the project manager to Geographic Information System (GIS) personnel for input into the ESRI ArcGIS database. This will allow for the tracking and inventorying of completed rehabilitation measures for the purpose of updating work on system assets and establishing a graphical representation of completed rehabilitation measures.

The County's work order system will be used for work activities performed in the field such as reactive maintenance and system repairs. A project will be defined as a collection of work orders assigned to a project number to track the cost and work involved. Service requests and work orders will be tracked in the Oracle *Utilities Work and Asset Management* (WAM) system. Data from the work order system that is related to or considered a rehabilitation type project will be summarized and submitted to the County's Department of Watershed Management Engineering and Technical Services personnel for entry and recording in the Microsoft Excel Project Summary Spreadsheet.

4.3 Key Performance Indicators (KPIs) for Determining the Effectiveness of Completed Rehabilitation Measures within Priority Areas

Table 4-1 presents the KPIs selected by the County to determine the effectiveness of completed rehabilitation measures. Consistent with the Consent Decree, these KPIs will focus on the Priority Areas. Data associated with these KPIs will be collected between, during, and after rehabilitation measures are implemented.

TABLE 4-1
Initial and Additional Priority Areas KPIs

KPI	Formula	Desired Result	Data Interval
SSOs per 100 miles of WCTS within the Priority Areas per year	(# SSOs in all the Priority Areas/ WCTS total miles within the Priority Areas) x 100	5% reduction per year beginning in 2014	Annual
SSOs per 100 miles of WCTS within the Priority Areas per year per inch of rain within the Priority Areas	(# SSOs in all the Priority Areas/ WCTS total miles within the Priority Areas / estimated total rainfall in inches per year) x 100	Monitor	Annual
Total volume of spills per 100 miles of WCTS within the Priority Areas	(Estimated total volume of spills within the Priority Areas/ WCTS total miles within the Priority Areas) x 100	5% reduction per year beginning in 2014	Annual
Total volume of spills per 100 miles per inch of rain within the Priority Areas	(Estimated total volume of spills within the Priority Areas/WCTS total miles within the Priority Areas/estimated total rainfall in inches per year) x 100	Monitor	Annual
# of dry weather SSOs within the Priority Areas	Total # of dry weather SSOs within the Priority Areas	10% reduction per year beginning in 2014	Annual
Annual average Treatment Plant Flow per inch of rain per year	Flow (MG)/inches of rain	Monitor	Annual

5 SCHEDULE FOR COMPLETING REHABILITATION MEASURES WITHIN THE INITIAL AND ADDITIONAL PRIORITY AREAS

The Consent Decree requires that the PASARP include the following information: (1) currently scheduled rehabilitation measures within the Initial and Additional Priority Areas; (2) schedules for completing any remaining sewer assessments and for identifying, prioritizing, and completing rehabilitation projects within the Initial Priority Areas; and (3) provide for the identification, delineation, assessment, and rehabilitation of all the Initial and Additional Priority Areas within eight and one-half (8½)years from the Date of Entry of the Consent Decree. Appendix L presents the scheduled (i.e., completed, ongoing, and scheduled) assessment and rehabilitation measures within the Initial and Additional Priority Areas. Some of these measures were completed during and since the Consent Decree negotiations, but some are not yet completed. Appendix M presents a General Schedule for Completing Additional Assessment and/or Prioritized Rehabilitation Measures within the Initial and Additional Priority Areas. The General Schedule presented in Appendix M includes the time frames within which the County anticipates to complete the major tasks associated with the assessment and completion of prioritized rehabilitation measures within the Initial and Additional Priority Areas. Following the EPA/EPD approval of the PASARP, the County will develop a Priority Areas Assessment and Rehabilitation Master Schedule as discussed in Section 5.1 below. As rehabilitation measures are identified and prioritized within the Initial and Additional Priority Areas, Project Schedules will be developed for specific assessment and rehabilitation projects as discussed in Section 5.2 below. The County is in the process of hiring an outside contractor experienced in managing the implementation of Consent Decree sewer system improvement programs to assist it in the implementation of the PASARP in the capacity of a Program Manager.

5.1 Priority Areas Assessment and Rehabilitation Master Schedule

The Priority Areas Assessment and Rehabilitation Master Schedule will be developed using commercially available software selected by the County. The Master Schedule will include the beginning and ending dates for anticipated major tasks and subtasks that the County will undertake during the assessment and rehabilitation of the Initial and Additional Priority Areas. The Master Schedule will be developed in such a manner so as to enable progress planning, progress reporting, and the identification of schedule variances for major tasks as the assessment and rehabilitation of the Initial and Additional Priority Areas progresses. The Master Schedule will be updated monthly to reflect work completed, work in progress, schedule variances, and any other changes encountered during the previous month. It should be noted that, as is the case with projects of this nature, intermediate task and subtask start and finish dates may change with time, but the Consent Decree deadline will stay the same.

5.2 Project Schedules

As specific assessment and rehabilitation projects are identified, the County will prepare project schedules. Project schedules will be developed using commercially available software selected by the County. The project schedules will be compatible with the Master Schedule to facilitate effective reporting of assessment and/or rehabilitation activities and to ensure accurate updates of the Master Schedule. The Project Schedules will include specific start and completion dates for specific projects by task and subtask and the critical path for the project. As indicated in Section 4 of this document, some of the defects identified during the assessment of the Initial and Additional Priority Areas will be scheduled for rehabilitation immediately upon their discovery. Such defects will include those that pose immediate or foreseeable danger to human health and welfare and those determined to be contributing to the occurrence of SSO, based on their severity. The County does not intend to develop schedules for the completion of projects associated with the rehabilitation of defects scheduled for rehabilitation immediately following their discovery. However, the work completed under such projects will be included in the subsequent update of the Master Schedule.

5.3 General Schedule

The time frame within which the additional assessment will be completed is shown in the General Schedule included in Appendix M.

The following are summary descriptions of the activities identified in the General Schedule for Completing the Assessment and Rehabilitation Measures within the Initial and Additional Priority Areas:

- Assessment of Priority Areas:
    - *Establish the Physical Boundaries of the Priority Areas*: This task will involve reviewing the GIS maps in the field and establishing the physical boundaries of the Initial and Additional Priority Areas. A reconnaissance of the Priority Areas boundaries will be performed to accomplish this effort. The establishment of physical boundaries will involve identifying physical land marks, road intersections, building addresses, manhole numbers, and other readily identifiable permanent physical features around the perimeter of each Priority Area. If any variances between the GIS maps and ground conditions are observed, the GIS maps will be revised to reconcile the variances. The physical boundaries, once established, will guide field personnel in ensuring that the assessment and rehabilitation work covers all sewers within the Priority Areas.
    - *Determine Optimization of Flow Monitors and Rain Gauges as Needed*: As indicated in the Flow Monitoring Specifications, Guidelines, and Procedures included in Appendix H of this document, additional flow and rainfall monitoring data, beyond that obtained through the System-Wide Flow and

Rainfall Monitoring Program, may be needed to characterize flows (including I/I), to prioritize other assessment activities, and to assess the effectiveness of rehabilitation measures completed within the Initial and Additional Priority Areas. During the early stages of the assessment phase, the County will review the System-Wide Flow and Rainfall Monitoring Program to determine the need and locations of additional flow monitors and/or rain gauges. The determination regarding the need and locations of additional flow monitors and/or rain gauges, beyond those available through the System-Wide Flow and Rainfall Monitoring Program, will be accomplished on a Priority Area by Priority Area basis.

    - *Relocate or Install Additional Flow Monitors and Rain Gauges as Needed*: This task will involve the relocation of existing flow monitors and/or rain gauges or the installation of additional flow monitors and/or rain gauges in the field as determined at the initial stages of the assessment phase.

    - *Perform the Assessment of Priority Areas*: This task will involve the completion of additional assessment of the Initial and Additional Priority Areas utilizing the evaluative tools and programs discussed in Section 3 of this document. It is anticipated that this task will start several months before rehabilitation starts and be completed at least one (1) year ahead of the completion of rehabilitation activities.

    - *Analyze Assessment Data and Identify and Prioritize Rehabilitation Measures*: This task will involve the analysis of condition assessment data and the identification and prioritization of rehabilitation measures to be implemented within the Priority Areas.

- Implement Rehabilitation Measures:

    - *Rehabilitate Severe Defects*: As indicated in Section 4 of this document, severe defects will be scheduled for rehabilitation immediately upon their discovery during the sewer system condition assessment. Such defects will include those that pose immediate or foreseeable danger to human health and welfare and those determined to be contributing to the occurrence of SSO, based on their severity. The determination as to whether a defect should be scheduled for rehabilitation will be made based on professional judgment and experience. This task will continue throughout the implementation of the PASARP.

    - *Complete Scheduled Rehabilitation Measures*: This task will involve the completion of currently scheduled rehabilitation measures within the Initial and Additional Priority Areas. The County anticipates bundling up one or more rehabilitation measures into individual rehabilitation projects to be completed either by County personnel or private contractors. The size and scope of various rehabilitation projects will be determined on a case by case basis.

    - *Implement Prioritized Rehabilitation Measures*: This task will involve the completion of prioritized rehabilitation measures within the Initial and

Additional Priority Areas. The County anticipates bundling up one or more rehabilitation measures into individual rehabilitation projects to be completed either by County personnel or private contractors. The size and scope of various rehabilitation projects will be determined on a case by case basis. This task is expected to continue throughout the implementation of the PASARP.

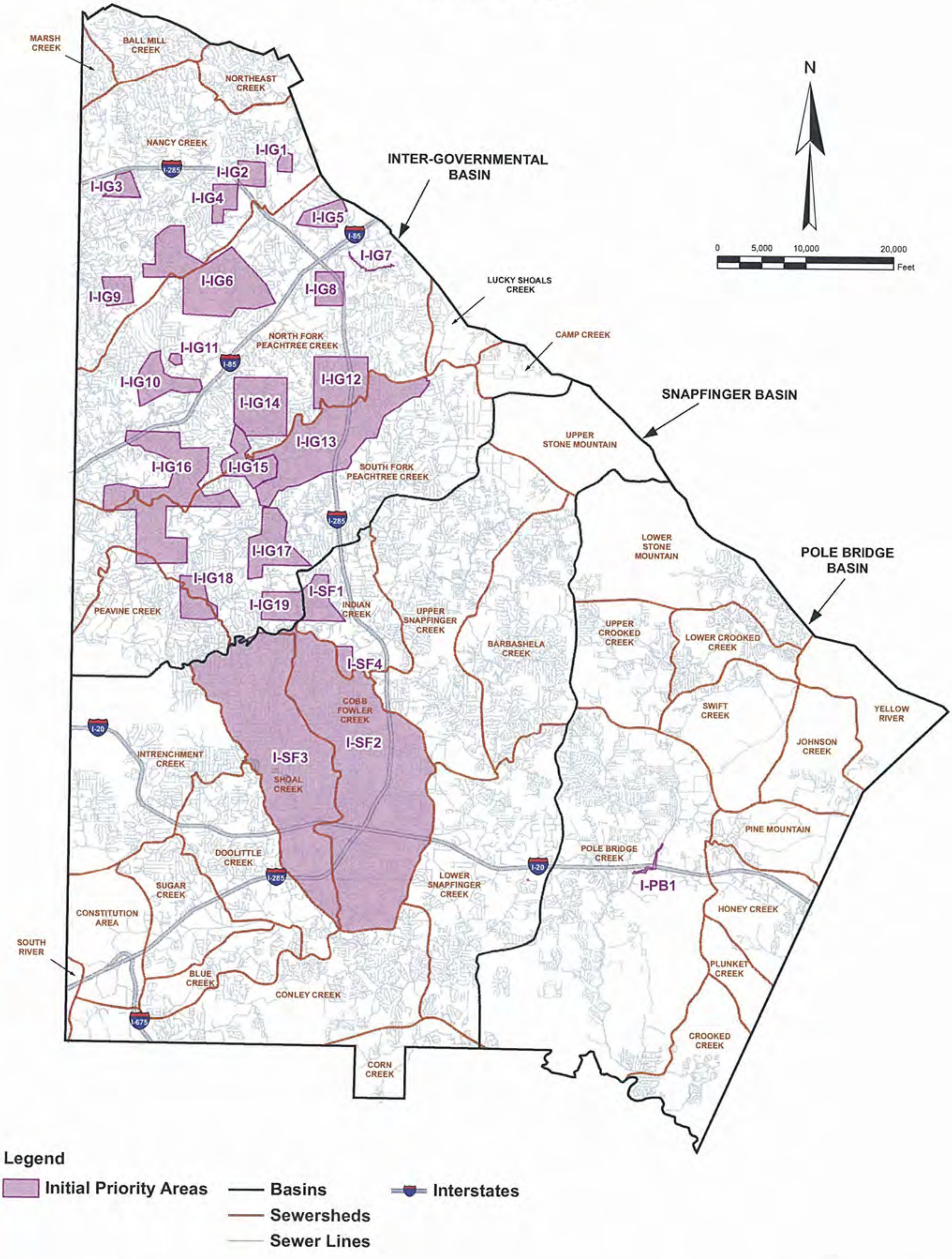
- *Track and Inventory Completed Rehabilitation Measures*: This task will involve tracking and inventorying the effectiveness of completed rehabilitation measures as discussed in Section 4 of this document. This activity is expected to start at the beginning of the implementation of the PASARP and continue throughout the PASARP implementation period.

APPENDICES

A. Initial Priority Areas Map.

DeKalb County
DEPARTMENT OF WATERSHED MANAGEMENT

Initial Priority Areas



State Plane Coordinate System
Georgia West, NAD 83, US Feet

DeKalb Water Partners

B. Additional Priority Areas Identification, Delineation, and Prioritization Process.

DeKalb County
Department of Watershed Management

Wastewater Collection and Transmission System (WCTS) Additional Priority Areas Identification, Delineation, and Prioritization Process

12/17/2012

Prepared by:

DeKalb Water Partners, a Jacobs and Cardozo Engineering, Inc., Joint Venture

Acronyms

303(d)	Section 303(d) of the Federal Clean Water Act and guidance from the U.S. Environmental Protection Agency requires States to submit a list of all impaired and threatened waters that are not meeting their designated uses.
APA	Additional Priority Areas
CAD	Computer Assisted Design
C&M	DeKalb County Department of Watershed Management Construction and Maintenance Division
DEM	Digital Elevation Model
DWM	DeKalb County Department of Watershed Management
DWP	DeKalb Water Partners (Jacobs and Cardozo Engineering, Inc. Joint Venture)
EPA	U.S. Environmental Protection Agency
EPD	Georgia Environmental Protection Division
FOG	Fats, Oils, and Grease
GIS	Geographical Information System
I/I	Infiltration and Inflow
IPA	Initial Priority Areas
LF	Linear Feet
MCA	Manhole Condition Assessment
RDI/I	Rainfall Dependent Infiltration and Inflow
SSO	Sanitary Sewer Overflow
USGS	United States Geological Survey
WAM	Work and Asset Management
WCTS	Wastewater Collection and Transmission System

I. INTRODUCTION

The DeKalb County Department of Watershed Management (DWM) tasked the DeKalb Water Partners (DWP) with identifying, delineating, and prioritizing Additional Priority Areas in its Wastewater Collection and Transmission System (WCTS) for further assessment and rehabilitation. This report is prepared in accordance with the requirements of Section VI.B(x).35 of the Consent Decree – DeKalb County, Civil Action File No. 1:10-cv-4039-WSD. The Additional Priority Areas identified in this document are in addition to the Initial Priority Areas identified in the Consent Decree.

II. BACKGROUND

DeKalb County's WCTS includes an estimated 2,600 miles of sanitary sewer lines, 66 lift stations, and 61,500 manholes. The County also has 155 flow meters, 16 billing flow meters (some of which measure flows from inter-jurisdictional partners), and 21 rain gauges strategically located throughout the County. The Consent Decree identifies twenty three (23) Initial Priority Areas within its WCTS for further assessment and rehabilitation. The Initial Priority Areas included in the Consent Decree, include approximately 463 miles of sewers (2,443,071 linear feet), which is approximately 18% of the WCTS. The Initial Priority Areas consist of areas determined by the County as having sewers that were constructed before 1960; areas with calculated "R Values" greater than three (3); and areas determined by the County, through its ongoing sewer system assessment and maintenance programs, as needing additional assessment and/or prioritized rehabilitation.

The Consent Decree requires the County to identify, delineate, and prioritize "Additional Priority Areas" (APA) within its WCTS for further assessment and rehabilitation utilizing criteria included in the Consent Decree. The prioritization criteria include: "(1) relative age of WCTS infrastructure; (2) estimated Rainfall Dependent I/I ("RDI/I") into the system; (3) proactive and reactive maintenance records data, including results from lift station inspections; (4) SSO records; (5) known structural defects, including known manhole defects; (6) relative risk that SSOs are likely to reach surface waters; (7) relative risk that SSOs are likely to present public health and welfare concerns based on proximity and access to population centers and water bodies; (8) information obtained from maintenance personnel knowledgeable of the conditions of the WCTS based on actual experience and historic investigations; (9) standard industry practices as documented in industry manuals, engineering textbooks, Environmental Protection Agency (EPA) publications (including EPA's Handbook: Sewer System Infrastructure Analysis and Rehabilitation, EPA/625/6-91/030, October 1991 and Water Environment Federation's Manual of Practice FD-6, Existing Sewer Evaluation & Rehabilitation, 1994 as revised) and lessons learned by the County and other sewer utilities; and (10) best professional judgment."[1]

III. IDENTIFICATION, DELINEATION, AND PRIORITIZATION PROCEDURES

This report documents the process followed to identify, delineate, and prioritize Additional Priority Areas within the WCTS. The procedures developed to identify, delineate, and prioritize Additional Priority Areas are discussed in detail in this report, and are summarized as follows:

- Data Gathering.
- Delineation of Ranking Areas.
- Definition of Criteria for Identifying, Delineating, and Prioritizing Additional Priority Areas
- Application of Prioritization Criteria to Ranking Areas
- Identification of Additional Priority Areas

IV. DATA GATHERING

The initial phase of this project involved gathering available relevant data that support the criteria used to identify, delineate, and prioritize Additional Priority Areas. The following is a list of data gathered:

- CAD files and GIS shapefiles of the WCTS.

[1]Consent Decree –DeKalb County, Civil Action File No. 1:10-cv-4039-WSD. Page 47.

- Sewer age polygons delineating estimated sewer age boundaries. The ages of the sewers in the various polygons were estimated by the DWM based on the known installation dates of the water mains located within the polygon areas. Three (3) age categories have been delineated (sewers constructed prior to and including 1960, sewers constructed between the time period of 1961 through 1984, and sewers constructed after 1984).

- Locations of sanitary sewage spills for the years 2007, 2008, 2009, and January 2010 to May 2010. This data was the latest and most complete data set available at the time the analysis was performed.

- GIS maps that included: sewershed and basin boundaries; land lots; streets; parks and schools; 303(d) listed streams; building footprints and paved areas; a USGS hydrological map; and locations of flow meters and rain gauges.

- Weighted "R-Values" and peaking factors for selected storm events during the years 2006, 2007, and 2009.

- Historical WCTS maintenance records, including: Oracle Work and Asset Management (WAM) records for reactive maintenance (January 2007 through May 2010), and Pierce List for proactive maintenance.

- Records of sanitary sewage spills reported to the Georgia Environmental Protection Division (EPD) that occurred during the time period of January 2007 through May 2010.

- Sewer system manhole condition assessment reports completed between the time period of 2007 through 2008.

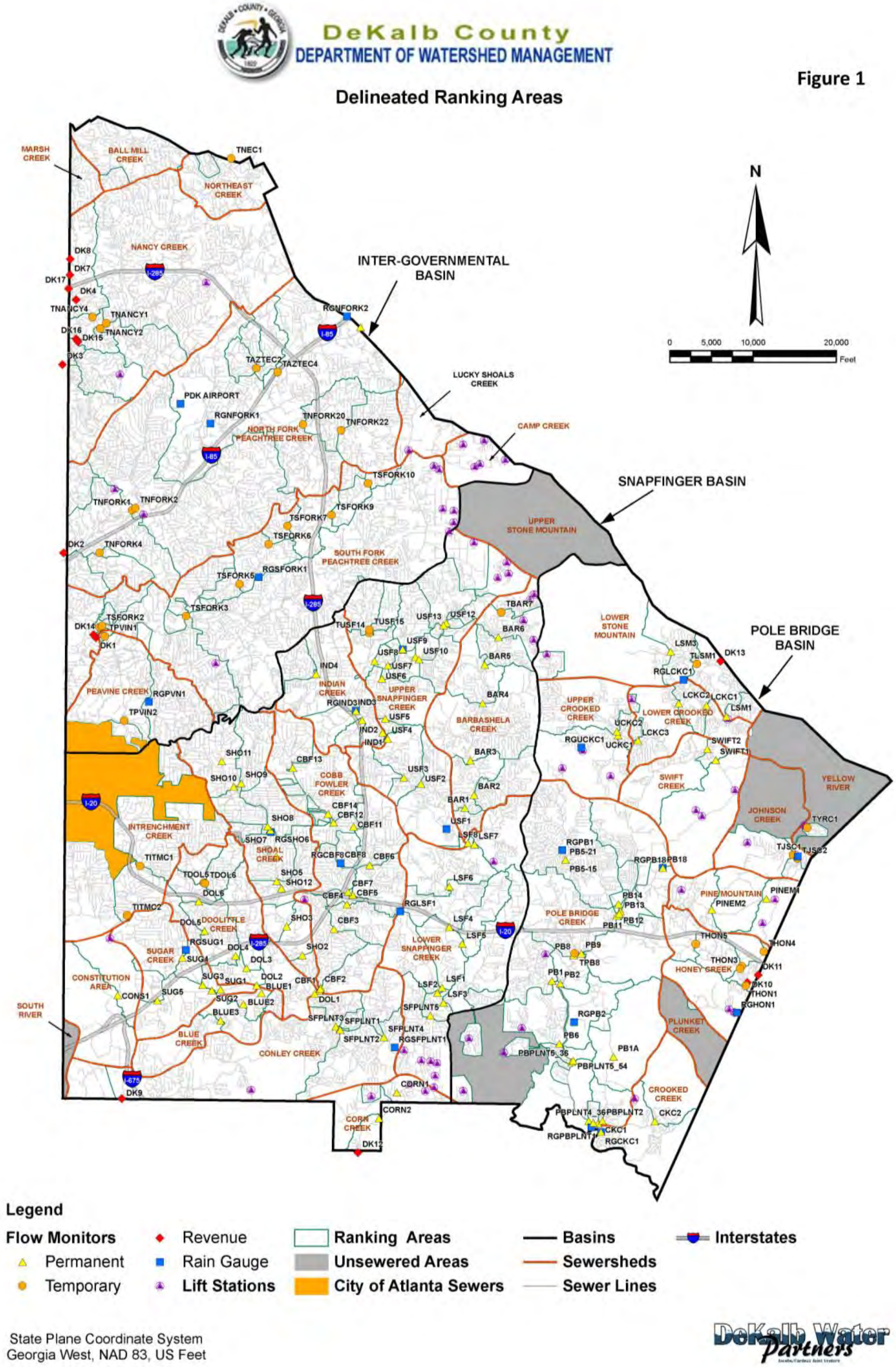
- Information obtained from maintenance personnel regarding known WCTS defects, including results from lift station inspections.

- Topographical data was converted from CAD ASCII files to a single DEM file compatible with GIS; including hydrological shapefiles of streams and creeks, 303d streams, and water bodies.

- 2007 and 2009 flow analysis summary data and comparison graphs for flow monitors. This was the latest and most complete data available at the time the analysis was performed. The 2007 data included a dry weather period and 2009 included a wet weather period.

V. DELINEATION OF RANKING AREAS

The DeKalb County WCTS consists of three (3) basins: Inter-Governmental, Snapfinger, and Pole Bridge. These three (3) basins contain a total of 35 sewersheds, two (2) of which do not currently contain any sewers. For purposes of this project, 171 Ranking Areas were delineated as shown in Figure 1. Inter-Governmental Basin is the northwestern basin in DeKalb County, serving an area approximately 88 square miles with approximately 1,136 miles of sewer lines. Snapfinger Basin is the southwestern basin serving an area approximately 110 square miles, with approximately 1,098 miles of sewer lines. Pole Bridge Basin is the southeastern basin serving an area approximately 72 square miles, with approximately 398 miles of sewer lines. The 171 Ranking Areas shown in Figure 1 were deemed to be of appropriate size and have readily identifiable boundaries. In addition, flow and other performance data for these areas have been gathered for several years and are readily available. 152 of the 171 Ranking Areas are essentially the areas contributing flows to 152 of the 155 flow monitors. These areas were delineated based on the sewer pipe networks flowing to the corresponding downstream flow monitors. 19 of the 171 Ranking Areas include: 6 areas served by billing flow monitors, 3 sewered areas that discharge directly to the DeKalb County wastewater treatment plants, and 10 sewered areas that discharge to Fulton County, Gwinnett County, Clayton County, and the City of Atlanta. The Areas that are not sewered or that are not owned by DeKalb County (private sewers and sewers owned by other governments, e.g., City of Atlanta) will not be assessed and/or rehabilitated by the County under this project.


DeKalb County
DEPARTMENT OF WATERSHED MANAGEMENT
Figure 1
Delineated Ranking Areas
INTER-GOVERNMENTAL BASIN
SNAPFINGER BASIN
POLE BRIDGE BASIN
N
0 5,000 10,000 20,000 Feet
Legend
Flow Monitors
Permanent
Temporary
Revenue
Rain Gauge
Lift Stations
Ranking Areas
Unsewered Areas
City of Atlanta Sewers
Basins
Sewersheds
Sewer Lines
Interstates
State Plane Coordinate System
Georgia West, NAD 83, US Feet
DeKalb Water Partners

VI. DEFINITION OF CRITERIA FOR IDENTIFYING, DELINEATING, AND PRIORITIZING ADDITIONAL PRIORITY AREAS

In order to facilitate the application of the technical criteria included in the Consent Decree in the ranking and prioritization of the Ranking Areas, it was necessary to further define these criteria in light of the data available to support each specific criterion. The following paragraphs present summaries of the various technical criteria.

A. Relative Age of WCTS Infrastructure

Three age categories have been identified and delineated by the DWM: sewers installed prior to and including the year 1960, sewers installed between the time period of 1961 through 1984, and sewers installed after 1984. The sewers constructed up to and including the year 1960 were assigned a score of 3. Sewers constructed between the time period of 1961 through 1984 were assigned a score of 2, and sewers constructed after 1984 were assigned a score of 0. This in effect is based on engineering judgment and experience indicating that sewers constructed after 1984 are structurally sound and should not need any rehabilitation based on age alone. Sewers constructed between the time period of 1961 and 1984 have passed half their usable life and are probably in need of inspection to determine if they are in need of rehabilitation. Sewers constructed prior to and including the year 1960 have already passed their design life and are probably three (3) times as likely to need some level of rehabilitation compared to sewers constructed between the time period of 1961 through 1984.

B. Estimated Rainfall Dependent Infiltration and Inflow (RDI/I) Into the System

Both the peaking factors and “R-Values” are important parameters in evaluating the quantity and type of RDI/I. For example, whereas relatively high peaking factors and “R-Values” may indicate a significant inflow problem, relatively low peaking factors and high “R-Values” may suggest a significant infiltration problem. RDI/I is defined as the portion of infiltration and inflow (I/I) that is directly influenced by the intensity and duration of a storm event. The response generated by this component of I/I is an increase in the system flow during and after a rainfall event. This extraneous water enters the sewer system in direct response to rainfall through storm drains and other inflow sources such as leaky manhole covers and defective sewers.

In an attempt to quantify RDI/I in the DeKalb County WCTS, the DWM has installed both permanent and temporary flow meters throughout the WCTS. Rain gauges have been strategically located to correlate rain events with flow meter data. The results of the County flow and rainfall monitoring program provide an indication of the relative levels of RDI/I.

“R-Values” and peaking factors were recorded as “Criteria Data Categories” under the Criteria: “Estimated Rainfall Dependent Infiltration and Inflow (RDI/I) Into the System”. Both “R-Values” and peaking factors were included as values for the applicable Ranking Area. This approach allowed the evaluation of two different parameters impacting the RDI/I and provided a better understanding of the conditions contributing to RDI/I within the County’s sewer system.

Peaking factors can be indicative of the mode of RDI/I entry into the system, while “R-Values” can be indicative of the amount of RDI/I entering the system. Higher peaking factors may suggest more inflow than infiltration and possibly concentrated structural problems such as holes, breaks, and missing manhole covers. High R-values may suggest the presence of RDI/I regardless of the mode of entry.

C. Proactive and Reactive Maintenance Records Data

The DWM Construction and Maintenance (C&M) Division is responsible for managing the County’s maintenance program. The C&M Division maintains an Excel spreadsheet known as the “Pierce List” to facilitate DWM’s proactive maintenance activities in areas with known or recurring problems. The “Pierce List” is periodically reviewed and updated by adding new problematic locations and removing locations after they have been rehabilitated.

The C&M Division also utilizes the Oracle WAM software to manage its reactive maintenance activities. This software allows the C&M Division to log all service calls, to code system problems, and to generate work orders. All sanitary sewer service calls are tracked and recorded by the date, time, address, cause, and action taken for each incident within the WCTS. The most common sanitary sewer complaint codes logged by the C&M Division are recorded in the following categories: manhole/pipe clean or inspect, vacuum, root cut, and spills.

For purposes of this project, all codes relevant to sanitary sewer structural and maintenance reported issues were extracted and analyzed from Oracle WAM for the time period of January 2007 through May 2010. The "Pierce List" data and the Oracle WAM data were considered as "Criteria Data Categories" under the Criteria: "Proactive and Reactive Maintenance Records Data, Including Results from its Lift Station Inspections". The data were quantified by number of occurrences or "count" for each Ranking Area. The raw scores for proactive and reactive maintenance data consisted of the count (or number of occurrences) of these events in each Ranking Area.

D. SSO Records

The DWM responds to, tracks, and monitors all spills that occur within the County's WCTS. Each spill is classified as either a structural-related defect spill or a service-related defect spill. Structural-related defects spills primarily include broken sewers and root intrusion. Service-related defect spills primarily are caused by accumulation of fats, oils, and grease (FOG) or debris blockages. Less common service-related defect spills occur when equipment fails or the sanitary sewer system is vandalized. Structural-related defect spills and service-related defect spills were recorded as "Criteria Data Categories" under the Criteria: "SSO Records" in the evaluation, ranking and prioritization of Ranking Areas. The DWM did not maintain separate records of Overflows and building backups; however, these records are addressed through the reactive maintenance program. DWM has begun to track such records separately to meet the Consent Decree requirements.

E. Known Structural Defects, Including Known Manhole Defects

Manhole Condition Assessment (MCA) technical memoranda are maintained by the DWM for sewersheds that were assessed in 2007 and 2008. The MCA technical memoranda include information on defects discovered during MCA inspections. The manhole defects are broken down into two categories: structural-related defects and service-related defects. In general, structural-related defects are defects associated with the presence of Infiltration and Inflow (I/I), corroded trough and bench, cracks, and holes. In quantifying structural-related defects, roots were also included as structural defects, since roots enter sewers through open joints or cracks and can lead to further structural deterioration. All structural-related defects were included by count in the applicable Ranking Areas in the prioritization matrix.

The MCA service-related defects were defined as the accumulation of debris on the bench, and the presence of FOG. Structural-related defects and service-related defects were entered as "Criteria Data Categories" under the Criteria: "Known Structural Defects, Including Known Manhole Defects". All service-related defects were included by count in the applicable Ranking Areas in the prioritization matrix. The raw scores for known structural and service-related defects consisted of the total count (or number of occurrences) of these defects in each Ranking Area.

F. Relative Risk that SSOs are Likely to Reach Surface Waters

Sewers are oftentimes constructed at low lying areas adjacent to streams. Sanitary sewer systems paralleling or crossing streams have relatively high potential to adversely impact surface waters if a spill occurs. This potential risk was evaluated by quantifying the linear footage of streams and the perimeter of water bodies, such as ponds and lakes, within each Ranking Area. The Ranking Areas that had the greatest linear footage of streams and perimeter of surface waters were rated higher than those with less linear footage. The reasoning is that all discharges from the sewer system could potentially reach water bodies through direct run-off or through the storm water network, which discharge to water bodies. The raw scores for this parameter consisted of the total linear footage of stream lengths and perimeters of lakes and ponds that were identified in the respective Ranking Areas.

G. Relative Risk that SSOs are Likely to Present Public Health and Welfare Concerns Based on Proximity and Access to Population Centers and Water Bodies

SSOs sometimes occur in close proximity to public places such as impaired streams (contact with polluted water poses a health hazard), parks, schools, and buildings. Each Ranking Area was evaluated to determine the potential risk for SSOs to discharge into 303(d) listed streams, near parks, schools, or buildings. Professional judgment was applied to rate the areas according to the relative density of 303(d) listed streams, parks, schools, and buildings in each Ranking Area. The rating scale used was 1 to 4; 1 representing the lowest potential risk and 4 the highest potential risk. Building footprints were used to determine the density of occupied areas. A high density of building footprints represents a greater risk to public health, therefore a higher score was assigned. Since spills can further impair degraded streams and since impaired streams pose a threat to human health in cases of body contact, Ranking Areas containing 303(d) streams were considered risky to the public. Therefore, the presence of impaired streams, schools, or parks were equated to a greater potential risk, and thus, received a higher score. Ratings were included for each Ranking Area in the prioritization matrices.

H. Information Obtained from Maintenance Personnel Knowledgeable of the Conditions of the WCTS Based on Actual Experience and Historic Investigations

DWM personnel have extensive knowledge of the WCTS. Interviews were conducted with DWM personnel to draw on their experience and knowledge of historic investigations and ongoing inspections of the WCTS. DWM personnel identified specific areas that have contributed to spills. These areas have been documented extensively in the “Pierce List”, Oracle WAM records, and in spill records. DWM personnel also review lift station inspections records and generate work orders through Oracle WAM on an ongoing basis. Any issues associated with lift stations have already been adequately documented in the Proactive Maintenance, Reactive Maintenance, Peaking Factor and RDI/I criteria. Information obtained from DWM personnel was valuable in the application of professional judgment and experience.

I. Standard Industry Practices, Lessons Learned, and Best Professional Judgment

Standard industry practices, lessons learned, and professional judgment were utilized throughout the scope of this project, from the planning phase through the analysis of data and reporting of results. Examples includes establishing 50 years as a probable design life for sewers. Other examples included the delineation of Ranking Areas, assigning of weights and scores to various criteria, and determining the basis for the relative risk that SSOs are likely to reach surface waters by quantifying the linear footage of streams and the perimeter of other water bodies.

VII. APPLICATION OF PRIORITIZATION CRITERIA TO RANKING AREAS

A. Overview

The prioritization criteria were incorporated into data spreadsheets and prioritization matrices that were developed to evaluate and prioritize the Ranking Areas in each of the three (3) sewer basins, Inter-Governmental, Snapfinger, and Pole Bridge. By evaluating each basin separately, this approach allowed the leveraging of each basin's unique characteristics, took into account the data that was available for each of the basins, promotes the protection of impaired [303(d)] streams throughout the County, and advances environmental justice concerns within the County. The differentiating characteristics for each basin include the following:

- The three basins are hydraulically independent of each other and discharge to different wastewater treatment plants.

- Manhole condition assessment data was not available for the Inter-Governmental Basin, but was available for most of the Ranking Areas within the Snapfinger and the Pole Bridge basins.
- The Snapfinger Basin has some of the oldest pipes in the system. Root intrusion issues are more prevalent as a result of the presence of mature trees. Moreover, development within this basin have been individually planned and implemented over a period of time, rather than being developed using a master plan. As a result, some of the sewers within this basin do not flow as smoothly as sewer systems that follow a master plan.

For each basin, the scores were normalized and weighted to ensure comparability and the emphasis of relative importance of each parameter in relation to the other parameters. A tiered approach of least significant, significant, and most significant was identified for establishing the weights. The application of this methodology to the County's Ranking Areas resulted in a prioritized listing of the Ranking Areas within each basin for performing WCTS assessment.

In order to achieve DWM's objective to eliminate SSOs, and since the County is implementing Capacity Management Operations and Maintenance (CMOM) programs to address FOG-related spills, the objective of this project is to develop an effective approach to address Non-FOG spills. The Ranking Areas were used as the basic building blocks for performing sewer system inspections and subsequent rehabilitation activities to address the sources of Non-FOG spills. As such, once the ranking within each basin was established, the percentage of Non-FOG spills was plotted against the percentage of sewers by linear footage to establish a curve representing the relationship between Non-FOG spills and Ranking Areas. Linear regression was then used to identify the knee of the curve at the point where the most significant change occurs in the amount of Non-FOG spills per linear footage of system. Further details are presented in Section C below.

B. Data Spreadsheets and Prioritization Matrices

Data spreadsheets and prioritization matrices were developed in Microsoft Excel spreadsheets. The Ranking Areas were entered into rows while the ranking criteria were entered into columns. The available data for each of the criteria was then entered for each of the Ranking Areas within each of the three (3) basins. Some data were unavailable for some of the Ranking Areas. Missing data were addressed by dropping the affected criterion and redistributing the criterion weight proportionally over the available criteria.

Initially, the data for each criterion was entered into the spreadsheets in raw form, e.g., using counts of Structural-Related Defect Spills. An example of the results of the initial score (raw data) for Ranking Areas in the Doolittle Creek Sewershed (Snapfinger Basin) are shown in Table 1. Raw data for other Ranking Areas are included in Appendix A. To ensure that scores were independent of the length of sewers in the Ranking Areas, where appropriate, the parameter scores were divided by the length of sewers in the associated Ranking Area. These parameters included the following:

a. Structural and Maintenance Spills Counts.
b. Structural and Service Manhole Defects Counts.
c. Reactive and Proactive Maintenance Counts.

As a result, for example, the Structural Related Defect Spills Count becomes a count per linear foot of sewers contained in the Ranking Area, which can then be compared across Ranking Areas containing different sewer lengths.

Furthermore, the scores were also normalized on a scale of 0 to 10 so they can be compared equally across the different criteria. For each criterion, the Ranking Area with the highest overall value within a basin received a score of 10. All other Ranking Areas within that basin were then rated relative to the Ranking Area with the highest score, thus receiving scores between 0 and 10. This was performed in a linear fashion, i.e., if the value of a criterion is half the value of the maximum score in a given category, it received a score of 5.

Table 1 – Example of Raw Scores for Ranking Areas

SEWERSHED	RANKING AREA	CRITERIA										
			Estimated RDI/I into System		Proactive/Reactive Maintenance		SS0 Records		Known Structural Defects			
		Relative Age of WCTS (rating)	Peaking Factor (value)	R-Value (value)	Proactive Maintenance (count)	Reactive Maintenance (count)	Structural -Related Defect Spills (count)	Service-Related Defect Spills (count)	Manhole Structural -Related Defects (count)	Manhole Service-Related Defects (count)	Relative Risk that SSOs Reach Surface Waters (linear foot of surface Waters)	Relative Risk that SSOs Present Public Health and Welfare Concerns (rating)
Doolittle Creek	DOL1	1	2.7	1.1%	0	145	0	10	6	6	26,722	1
	DOL2	1	2.9	1.7%	0	53	0	0	2	2	6,808	2
	DOL3	1	2.7	1.2%	5	200	0	1	18	16	15,263	3
	DOL4	1	3.7	2.8%	1	383	0	3	3	3	17,346	2
	DOL5	1	5.3	0.5%	0	58	0	0	3	3	7,102	3
	DOL6	1	4.1	2.7%	1	84	0	0	8	8	4,431	3
	TDOL5	1	9.5	5.5%	1	153	0	0	14	14	10,138	3
	TDOL6	1	3.5	1.8%	1	207	1	0	13	13	5,523	3

C. Criteria Weighting

After the scores were normalized across Ranking Areas and across parameters, weights were used to emphasize the importance of certain parameters relative to others as shown in Table 2. A consensus on the parameter weights was reached through workshop discussions involving consultants and DWM personnel, drawing on the group's collective knowledge, extensive experience, and professional judgment. A three-tiered approach was used to divide the criteria into low, medium, and high, with weights of 5%, 10%, and 15%, respectively. This approach is based on the understanding of the DeKalb County's WCTS and the relative potential for various criteria to advance the objective of time Consent Decree. For example, the relatively low "R-Values" and anecdotal evidence indicate that RDI/I is not a significant problem in the County's WCTS; as such, a weight of 5% was assigned for both the Peaking Factor and "R-Value". On the other hand, system age, structural-related defects, and reactive maintenance counts were determined to be directly associated with Non-FOG spills and as such, were assigned weights of 15% each. Structural-related defect spills also received a weight of 15% since they were determined to be directly associated with Non-FOG spills, while service-related spills received a low weight of 5% since they are effectively being addressed by the County-wide CMOM programs. In the medium category were proactive maintenance counts, these are known problem areas in the system but are addressed when they become known, and as such received a weight of 10%.

Table 2 – Parameter Weights

Criteria	*Percentage Weight*
Relative Age of WCTS	15%
Estimated RDI/I into System: Peaking Factor	5%
Estimated RDI/I into System: R-Value	5%
Proactive Maintenance	10%
Reactive Maintenance	15%
Structural-Related Defect Spills	15%
Service-Related Defect Spills	5%
Known Structural Defects: Manhole Structural-Related Defects	15%
Known Structural Defects: Manhole Service-Related Defects	5%
Relative Risk that SSOs Reach Surface Waters	5%
Relative Risk that SSOs Present Public Health and Welfare Concerns	5%

D. Matrix and Knee of the Curve Results

The Ranking Areas within each basin were ranked based on the Total Weighted Scores. The Total Weighted Scores were calculated by multiplying the 0 to 10 score for each criterion by the corresponding weight for that criterion. The resulting numbers were then summed to obtain the Total Weighted Score for each Ranking Area. The Total Weighted Scores were then ranked in descending order. A weighted ranking number of 1 indicates the highest ranking Priority Area (area with highest Total Weighted Score) in a basin. The results from the matrix are included in Appendix B.

It is the DWM's objective to eliminate SSOs from its WCTS. Since the County is implementing a comprehensive set of CMOM programs to address FOG-related spills, the objective of this analysis was to develop an effective approach to address Non-FOG spills. Non-FOG spills are spills by other causes, such as debris, roots, and structural defects. To identify the Ranking Areas where further sewer system assessment would achieve the greatest benefit, a knee of the curve analysis was performed on the Ranked Areas and Non-FOG spills within each basin**.**

A knee of the curve analysis is used as a tool for performing a cost-benefit analysis by identifying a point of diminishing return (or reduced return) on investment. In this case, since the objective is to develop an effective approach to address Non-FOG spills, the number of Non-FOG spills was evaluated versus the linear footage of sewers within the Ranking Areas. Since the areas have been ranked in each basin according to priority, the knee of the curve analysis helped determine the top ranked areas in each basin that should be further assessed and/or rehabilitated.

The percentage of Non-FOG spills that had occurred within the Ranking Areas in each basin were graphed versus the percentage of sewers by linear footage in the prioritized Ranking Areas for each basin. The knee of the curve for Inter-Governmental Basin, the Snapfinger Basin, and the Pole Bridge Basin are shown in Figures 2, 3 and 4, respectively. The knee of the curve represents the optimum, highest ranked Ranking Areas in a basin (by percentage of sewer system within the basin), that will yield the greatest benefit from further assessment and/or rehabilitation. The knee of the curve was identified for each basin using linear regression analysis.

Since the Ranking Areas are the building blocks for this analysis, the knee will always fall between two Ranking Areas. Professional judgment was utilized to determine whether the Ranking Area that falls to the left of the knee or the Ranking Area that falls to the right of the knee, should be included in defining the knee. Examples of this are as follows:

Inter-Governmental Basin: The knee falls between Ranking Area TAZTEC5 (on the left) and Ranking Area TNFORK1 (on the right). Ranking Area TNFORK1 was included, since this Ranking Area more than doubled the Non-FOG spills to be addressed. The number of Non-FOG spills increased from 19 to 41 when Ranking Area TNFORK1 was included.

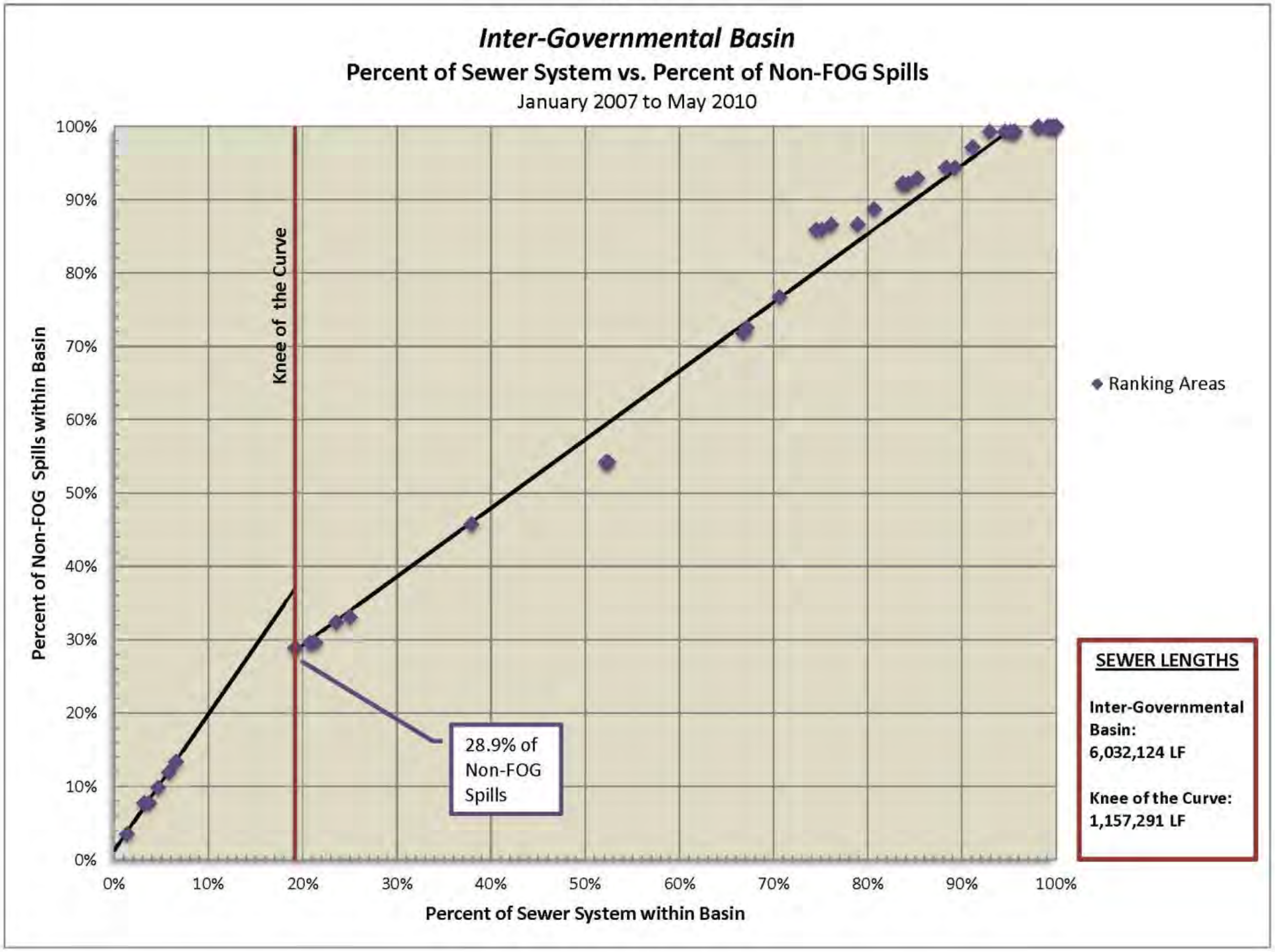
Snapfinger Basin: The knee falls between Ranking Area USF2 (on the left) and Ranking Area TITMC1 (on the right). Only Ranking Area USF2 was included. This resulted in addressing 33 Non-FOG spills. Adding Ranking Area TITMC1 would have added another 4 spills, a small percentage of spills for the relatively large size of this Ranking Area.

Pole Bridge Basin: The knee falls between Ranking Area TJSC1 (on the left) and Ranking Area THON4 (on the right). Ranking Area THON4 was included because this more than doubled the Non-FOG spills to be addressed. The number of spills increased from 5 to 11 when Ranking Area THON4 was added.

VIII. IDENTIFICATION OF ADDITIONAL PRIORITY AREAS

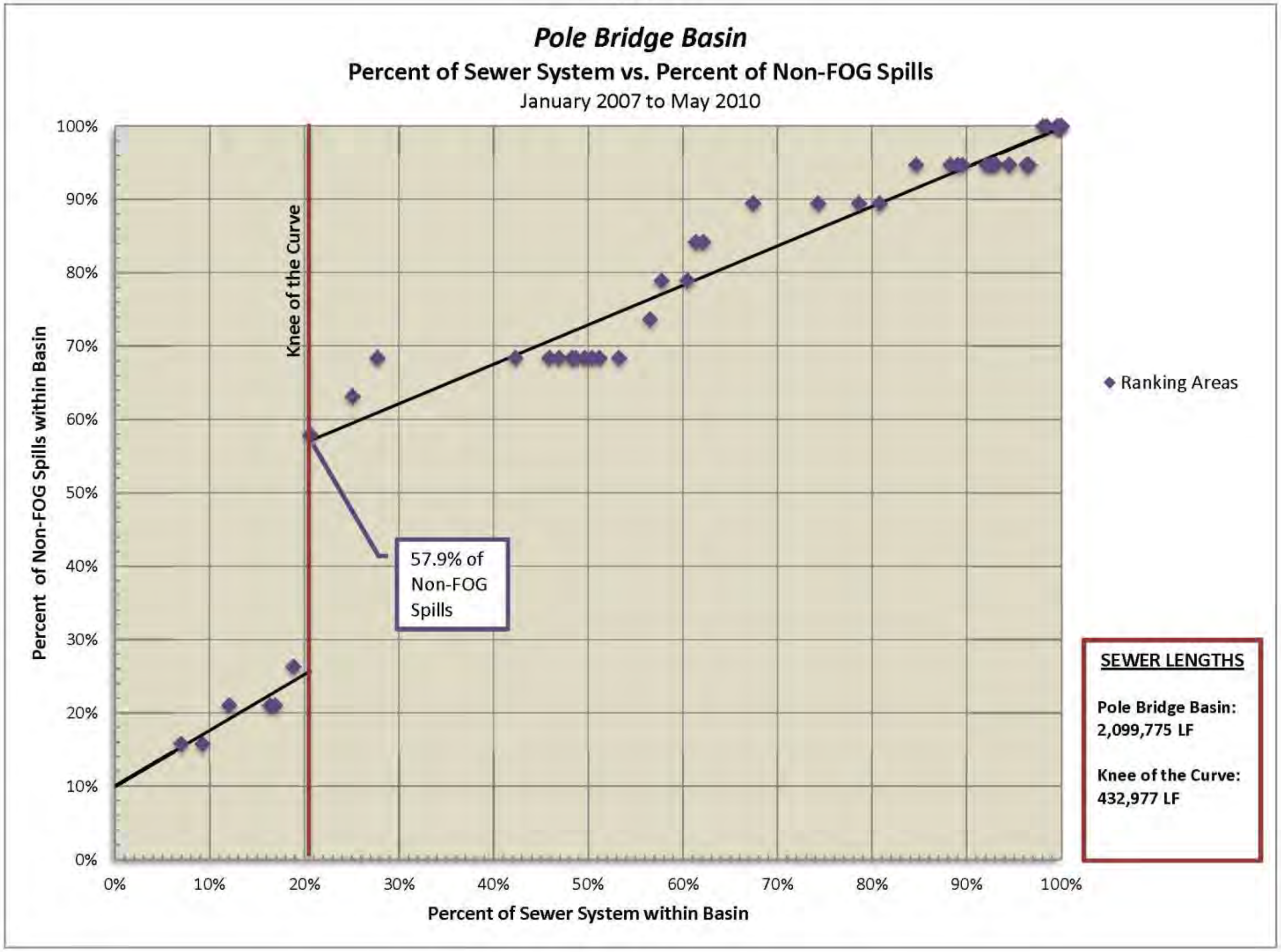
Once the top ranked areas in each basin that should be further assessed and/or rehabilitated cost effectively were identified based on the knee of the curve analysis, they were mapped to identify overlap with the Initial Priority Areas as shown in Figure 5. The portion of the top ranked areas not included in the overlap was identified as constituting the Additional Priority Areas. The Initial and Additional Priority Areas identified in the Inter-Governmental Basin, the Snapfinger Basin, and the Pole Bridge Basin are listed in Tables 3, 4, and 5, respectively. It should be noted that a new numbering system for the Priority Areas has been adopted by the County. The first letter in the Priority Areas numbers identifies whether the Priority Area is an Initial Priority Area (I) or an Additional Priority Area (A). The second two letters identifies the sewer basin where the Priority Area is located (IG for the Intergovernmental Basin, SF for the Snapfinger Basin, and PB for the Pole Bridge). A map depicting the Initial and Additional Priority Areas is shown in Figure 6. The combined Initial and Additional Priority Areas include approximately 776 miles of sewers. During the time period of January 2007 through May 2010, approximately 49% of all Non-FOG related spills occurred within the Initial and Additional Priority Areas.

Figure 2



*Non-FOG related spill causes include debris, roots, storm related, vandalism, and other unknown cause.

Figure 4



*Non-FOG related spill causes include debris, roots, storm related, vandalism, and other unknown cause.

Table 3 - Inter-Governmental Basin
Initial and Additional Priority Areas

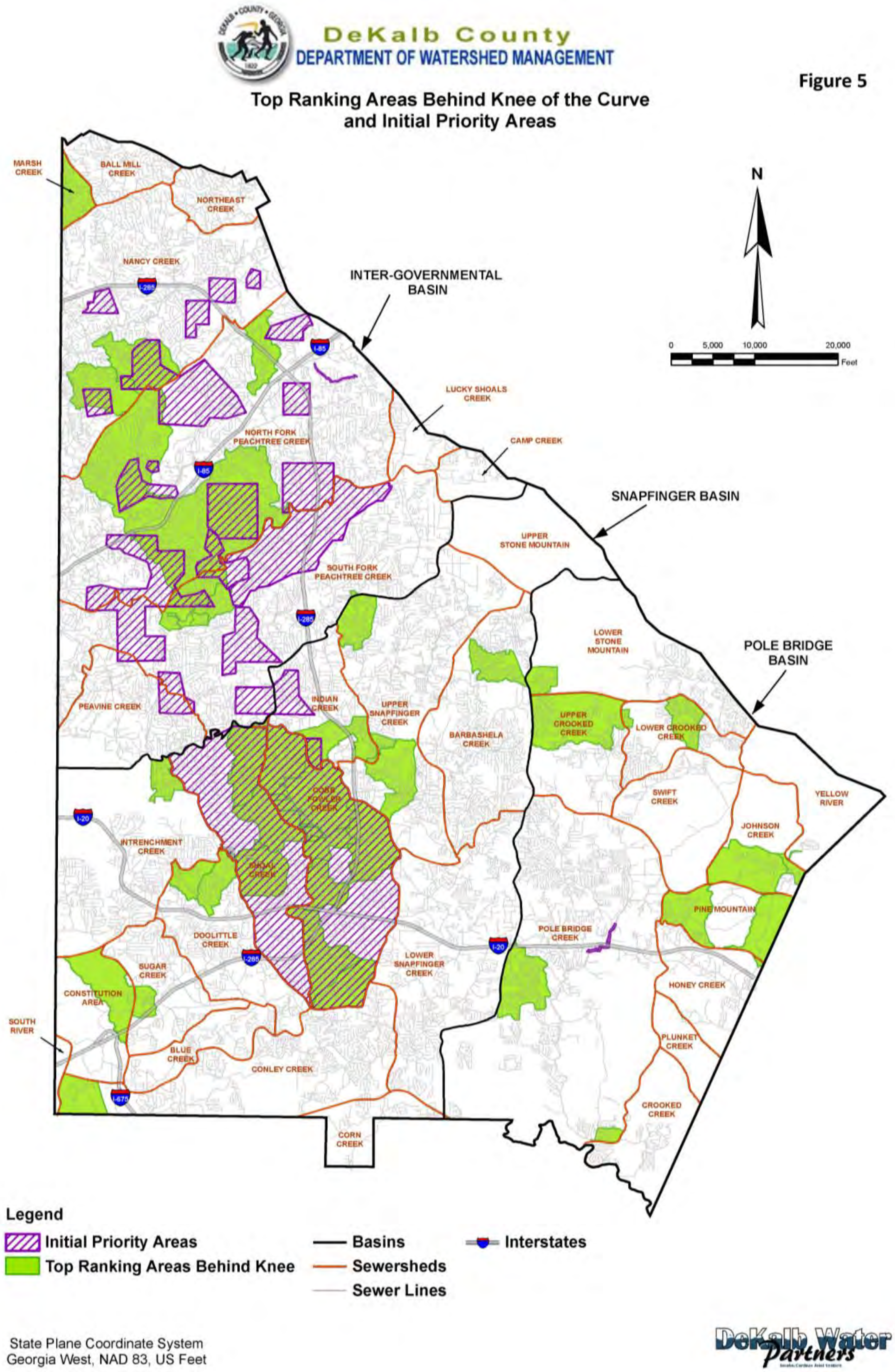
Consent Decree Number	New Priority Area Number	Area Description	Length of Sewers (LF)
		INITIAL PRIORITY AREAS	
2	I-IG1	Winters Chapel Rd at Homeland Drive	7,387
3	I-IG2	Carver Circle	12,401
1	I-IG3	Ashford Dunwoody-Nancy Creek	16,399
4	I-IG4	North Peachtree-North Shallowford	20,104
5	I-IG5	Oakcliff Road	23,232
6	I-IG6	City of Chamblee	144,915
16	I-IG7	Embry Circle Pipe Bursting	6,713
17	I-IG8	Embry Circle Relining	15,916
7	I-IG9	Windsor Parkway	22,557
9	I-IG10	Drew Valley Road subdivisions	52,231
8	I-IG11	Skyland Road	3,712
18	I-IG12	Henderson Mill Rd	83,783
23	I-IG13	Area contributing to TSFORK 5 monitor	188,775
19	I-IG14	Briarcliff Rd	90,215
11	I-IG15	Lavista - Oak Grove area	39,197
10	I-IG16	Lavista Rd-Clairmont Rd-Houston Mill Rd	176,260
12	I-IG17	North DeKalb Mall area	57,669
13	I-IG18	Scott Blvd-Clairmont Rd	37,969
14	I-IG19	Old Rockbridge Rd-Avondale (partial)	19,698
		SUBTOTAL:	*1,019,133*
		ADDITIONAL PRIORITY AREAS	
NA	A-IG1	Ranking Area MARSH-FUL (Marsh Creek)	56,651
NA	A-IG2	Ranking Area TAZTEC5 (Aztec)	41,324
NA	A-IG3	Ranking Area TNANCY2 (Nancy Creek)	50,937
NA	A-IG4	Ranking Area TNANCY5 (Nancy Creek)	57,976
NA	A-IG5	Ranking Area TNFORK1 (North Fork Peachtree Creek)	527,354
NA	A-IG6	Ranking Area TSFORK4 (South Fork Peachtree Creek)	46,778
NA	A-IG7	Ranking Area TSFORK3 (South Fork Peachtree Creek)	31,582
		SUBTOTAL:	*812,602*
		IPA AND APA TOTAL:	*1,831,735*

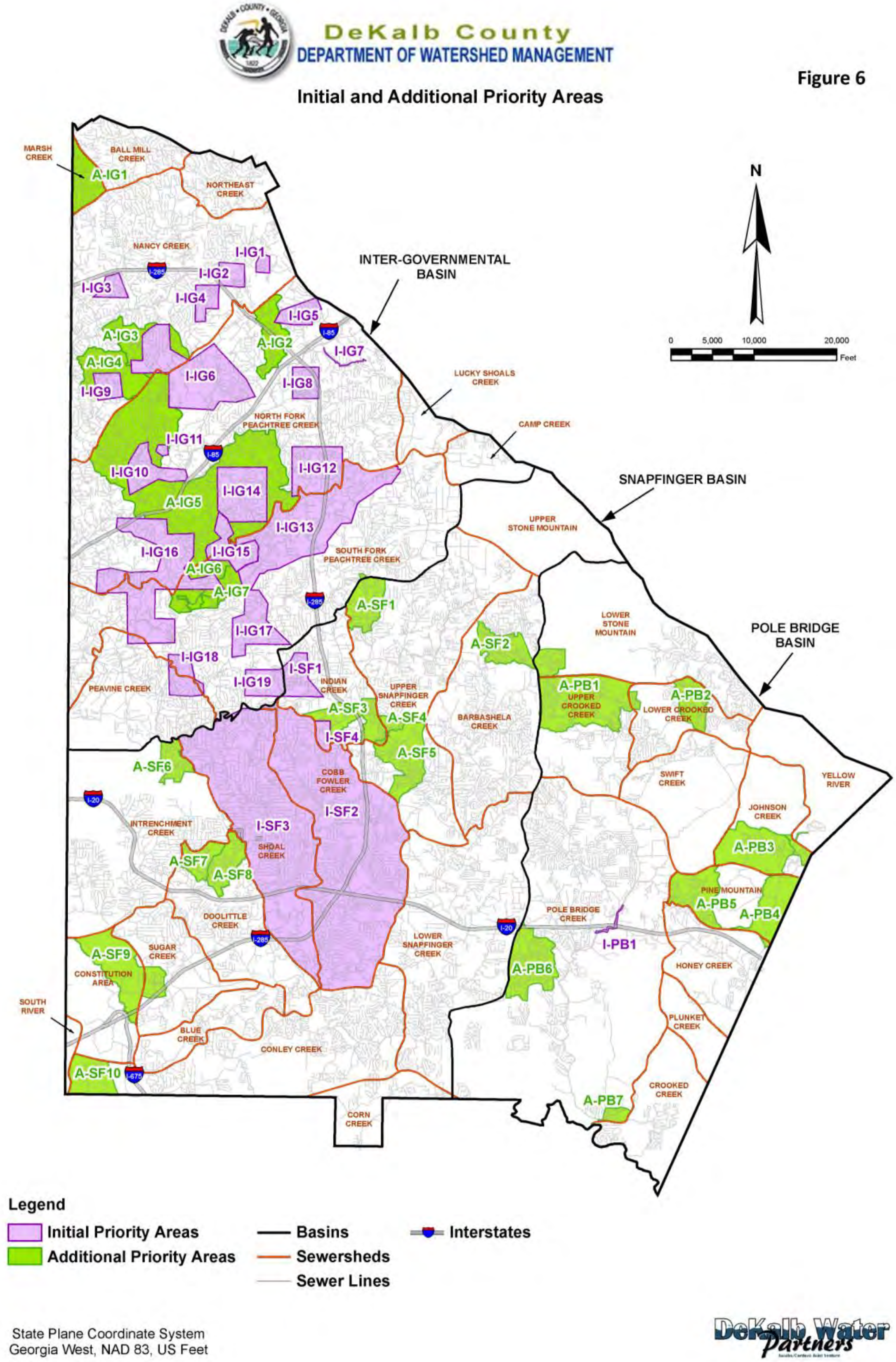
Table 4- Snapfinger Basin
Initial and Additional Priority Areas

Consent Decree Number	New Priority Area Number	Area Description	Length of Sewers (LF)
		INITIAL PRIORITY AREAS	
14	I-SF1	Old Rockbridge Rd-Avondale (partial)	46,897
15	I-SF2	Cobb Fowler Basin	733,145
20	I-SF3	Shoal Creek Basin	608,920
22	I-SF4	Covington Hwy at Kensington Rd	12,203
		SUBTOTAL:	*1,401,165*
		ADDITIONAL PRIORITY AREAS	
NA	A-SF1	Ranking Area TUSF14 (Upper Snapfinger Creek)	58,415
NA	A-SF2	Ranking Area BAR5 (Barbashela Creek)	60,730
NA	A-SF3	Ranking Area IND1 (Indian Creek)	46,221
NA	A-SF4	Ranking Area USF4 (Upper Snapfinger Creek)	11,531
NA	A-SF5	Ranking Area USF2 (Upper Snapfinger Creek)	75,491
NA	A-SF6	Ranking Area ITMC-ATL (Intrenchment Creek)	41,344
NA	A-SF7	Ranking Area TDOL5 (Doolittle Creek)	28,390
NA	A-SF8	Ranking Area TDOL6 (Doolittle Creek)	46,241
NA	A-SF9	Ranking Area SUG5 (Sugar Creek)	22,461
NA	A-SF10	Ranking Area CON-CLAY (Conley Creek)	17,005
		SUBTOTAL:	*407,829*
		IPA AND APA TOTAL:	*1,808,994*

Table 5– Pole Bridge Basin
Initial and Additional Priority Areas

Consent Decree Number	New Priority Area Number	Area Description	Length of Sewers (LF)
		INITIAL PRIORITY AREAS	
21	I-PB1	Lithonia Industrial Pkwy	22,773
		SUBTOTAL:	22,773
		ADDITIONAL PRIORITY AREAS	
NA	A-PB1	Ranking Area UCKC2 (Upper Crooked Creek)	146,424
NA	A-PB2	Ranking Area LCKC1 (Lower Crooked Creek)	59,278
NA	A-PB3	Ranking Area TJSC1 (Johnson Creek)	41,156
NA	A-PB4	Ranking Area THON4 (Honey Creek)	37,563
NA	A-PB5	Ranking Area PINEM2 (Pine Mountain)	46,939
NA	A-PB6	Ranking Area PB1 (Pole Bridge Creek)	90,167
NA	A-PB7	Ranking Area PBPLNT1 (Pole Bridge Wastewater Treatment Plant)	11,450
		SUBTOTAL:	*432,977*
		IPA AND APA TOTAL:	*455,750*


DeKalb County
DEPARTMENT OF WATERSHED MANAGEMENT
Figure 5
Top Ranking Areas Behind Knee of the Curve
and Initial Priority Areas
MARSH CREEK
BALL MILL CREEK
NORTHEAST CREEK
NANCY CREEK
INTER-GOVERNMENTAL BASIN
LUCKY SHOALS CREEK
CAMP CREEK
NORTH FORK PEACHTREE CREEK
SNAPFINGER BASIN
UPPER STONE MOUNTAIN
SOUTH FORK PEACHTREE CREEK
LOWER STONE MOUNTAIN
POLE BRIDGE BASIN
PEAVINE CREEK
INDIAN CREEK
UPPER SNAPFINGER CREEK
BARBASHELA CREEK
UPPER CROOKED CREEK
LOWER CROOKED CREEK
SWIFT CREEK
YELLOW RIVER
JOHNSON CREEK
INTRENCHMENT CREEK
PINE MOUNTAIN
POLE BRIDGE CREEK
DOOLITTLE CREEK
LOWER SNAPFINGER CREEK
SUGAR CREEK
HONEY CREEK
CONSTITUTION AREA
SOUTH RIVER
PLUNKET CREEK
BLUE CREEK
CONLEY CREEK
CROOKED CREEK
CORN CREEK
N
0 5,000 10,000 20,000 Feet
Legend
Initial Priority Areas
Top Ranking Areas Behind Knee
Basins
Sewersheds
Sewer Lines
Interstates
State Plane Coordinate System
Georgia West, NAD 83, US Feet
DeKalb Water Partners


DeKalb County
DEPARTMENT OF WATERSHED MANAGEMENT
Figure 6
Initial and Additional Priority Areas
MARSH CREEK
BALL MILL CREEK
A-IG1
NORTHEAST CREEK
NANCY CREEK
I-IG1
I-IG2
I-IG3
I-IG4
I-IG5
A-IG2
A-IG3
A-IG4
I-IG6
I-IG7
I-IG8
I-IG9
INTER-GOVERNMENTAL BASIN
LUCKY SHOALS CREEK
CAMP CREEK
NORTH FORK PEACHTREE CREEK
I-IG11
I-IG10
I-IG12
I-IG14
A-IG5
I-IG13
SNAPFINGER BASIN
UPPER STONE MOUNTAIN
I-IG16
I-IG15
A-IG6
SOUTH FORK PEACHTREE CREEK
A-IG7
A-SF1
LOWER STONE MOUNTAIN
I-IG17
A-SF2
POLE BRIDGE BASIN
I-IG18
I-SF1
I-IG19
PEAVINE CREEK
INDIAN CREEK
UPPER SNAPFINGER CREEK
A-PB1
UPPER CROOKED CREEK
A-PB2
LOWER CROOKED CREEK
A-SF3
A-SF4
BARBASHELA CREEK
I-SF4
A-SF5
A-SF6
COBB FOWLER CREEK
SWIFT CREEK
YELLOW RIVER
INTRENCHMENT CREEK
I-SF2
I-SF3
JOHNSON CREEK
SHOAL CREEK
A-PB3
A-SF7
A-SF8
PINE MOUNTAIN
A-PB5
A-PB4
POLE BRIDGE CREEK
DOOLITTLE CREEK
I-PB1
SUGAR CREEK
A-SF9
LOWER SNAPFINGER CREEK
A-PB6
HONEY CREEK
CONSTITUTION AREA
SOUTH RIVER
PLUNKET CREEK
BLUE CREEK
CONLEY CREEK
A-SF10
CROOKED CREEK
A-PB7
CORN CREEK
N
0 5,000 10,000 20,000 Feet
Legend
Initial Priority Areas
Additional Priority Areas
Basins
Sewersheds
Sewer Lines
Interstates
State Plane Coordinate System
Georgia West, NAD 83, US Feet
DeKalb Water Partners

IX. RESULTS

The process followed to identify, delineate, and prioritize Additional Priority Areas for further assessment and/or rehabilitation is presented in this report. The procedures used to identify, delineate, and prioritize the Additional Priority Areas were developed using best professional judgment and standard industry practices, in compliance with the requirements of the Consent Decree to advance the County's objective of eliminating SSOs and improving system performance.

The combined Initial Priority Areas and Additional Priority Areas, which represent approximately 29.5% of the WCTS by linear footage of sewers, were compiled based on the criteria included in the Consent Decree as discussed in this report, and the results of the ranking matrix and knee of the curve analysis. Approximately 49% of Non-FOG related spills occurred within the Initial and Additional Priority Areas during the time period of January 2007 through May 2010. The sewers in these Priority Areas will be further assessed and/or rehabilitated under the County's Priority Areas Sewer Assessment and Rehabilitation Program.

APPENDICES

Appendix A – Raw Data for Ranking Areas

Appendix B – Prioritization Matrix

APPENDIX A – Inter-Governmental Raw Data for Ranking Areas

SEWERSHED	RANKING AREA	CRITERIA											
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects				
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk SSOs that Reach Surface Waters (linear foot of surface waters)*	*Relative Risk SSOs that Present Public Health and Welfare Concerns (rating)*	*Length of Sewer (linear feet)*
Aztec	TAZTEC2	0	4.8	4.2%	3	113	0	1			3,125	4	33,116
	TAZTEC3	1	5.6	2.7%	2	32	0	1			5,060	3	21,258
	TAZTEC4	0	2.5	1.5%	0	11	0	0			777	3	4,948
	TAZTEC5	0	2.5	2.7%	3	94	3	0			8,285	2	41,324
Ball Mill Creek	BALL-FUL	1			11	196	0	6			26,247	4	169,576
Camp Creek	CAMP-GWIN	1			0	53	0	1			19,549	2	57,228
Lucky Shoals	LUCKY-GWIN	1			1	59	1	0			23,146	3	55,953
Marsh Creek	MARSH-FUL	1			4	129	1	5			3,342	4	56,651
Nancy Creek	TNANCY1	1	2.0	1.1%	25	1,574	22	27			112,672	4	861,424
	TNANCY2	3	3.4	1.1%	2	196	5	5			6,831	4	109,696
	TNANCY4	1	1.9	4.1%	0	67	1	4			13,584	4	109,490
	TNANCY5	3	3.1	2.4%	2	193	6	4			27,491	2	79,973
	NANCY-ATL	0			2	143	4	3			17,875	2	113,410
North Fork Peachtree Creek	TNFORK1	1	2.5	1.4%	34	1,814	24	14			112,058	3	764,952
	TNFORK2	1	2.5	1.4%	27	1,475	22	37			114,993	2	778,492
	TNFORK3	1	3.0	0.8%	0	151	0	1			10,329	4	57,967
	TNFORK4	1	5.8	1.0%	0	3	0	0			456	4	3,956
	TNFORK20	1	5.3	1.3%	1	149	0	2			20,549	2	98,501
	TNFORK22	1	3.3	0.9%	2	323	7	5			28,576	2	135,287
	NFORK-ATL	0			7	170	5	4			13,938	3	94,839
Northeast Creek	TNEC1	0			0	28	0	0			3,060	4	18,242
	NEC-FUL	0			3	212	1	0			41,649	3	147,261
Peavine Creek	TPVIN1	1	1.9	1.2%	6	258	5	2			25,831	2	182,094
	TPVIN2	1	5.2	3.3%	0	3	0	0			2,716	1	18,799
	TPVIN3	1			2	342	0	3			17,298	4	182,789

APPENDIX A – Inter-Governmental Raw Data for Ranking Areas

SEWERSHED	RANKING AREA	CRITERIA											
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects				
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk SSOs that Reach Surface Waters (linear foot of surface waters)*	*Relative Risk SSOs that Present Public Health and Welfare Concerns (rating)*	*Length of Sewer (linear feet)*
South Fork Peachtree Creek	TSFORK1	0	2.6	2.5%	30	2,291	24	27			127,442	3	864,970
	TSFORK2	0	2.6	2.5%	9	366	13	2			35,307	3	234,275
	TSFORK3	3	2.4	1.6%	2	80	0	3			14,030	3	33,162
	TSFORK4	3	2.4	1.6%	2	92	3	0			749	3	71,534
	TSFORK5	1	2.6	3.3%	6	237	2	0			9,172	2	87,172
	TSFORK6	0	3.4	1.9%	3	115	0	1			3,105	2	35,311
	TSFORK7	1	2.3	0.7%	4	60	1	2			8,471	4	59,777
	TSFORK9	1	6.9	2.3%	0	71	0	1			9,647	3	35,149
	TSFORK10	1	7.9	6.7%	1	27	0	0			3,319	4	15,542
	SFORK-ATL	0			2	154	5	1			12,043	4	106,288
Billing Monitors	DK1	1			0	13	0	0			868	1	3,076
	DK2	1	3.0	1.9%	6	343	5	20			25,970	3	210,093
	DK3	0			0	9	0	0			3,533	2	19,172
	DK14	1			0	1	0	0			0	1	1,374
	DK15	1	3.2	7.4%	0	21	0	0			2,764	3	24,805
	DK16	1	3.2	7.4%	0	40	0	0			7,393	2	33,197

APPENDIX A – Snapfinger Raw Data for Ranking Areas

SEWERSHED	RANKING AREA	CRITERIA											
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects				
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk SSOs that Reach Surface Waters (linear foot of surface waters)*	*Relative Risk SSOs that Present Public Health and Welfare Concerns (rating)*	*Length of Sewer (linear feet)*
Barbashela Creek	BAR1	1	2.6	0.9%	2	192	0	8			12,415	3	65,242
	BAR2	0	2.4	2.1%	5	196	1	0			8,978	4	85,600
	BAR3	1	2.4	0.8%	3	495	0	4			51,520	3	228,351
	BAR4	1	2.8	0.9%	2	205	1	5			22,892	3	62,294
	BAR5	1	2.9	0.9%	9	281	1	4			5,826	4	60,730
	BAR6	1	3.9	0.8%	5	162	0	3			8,513	3	75,373
	TBAR7	1			0	62	0	0			2,233	4	38,796
Blue Creek	BLUE1	0	3.1	1.0%	0	47	0	0			12,155	2	19,396
	BLUE2	0	3.7	0.8%	0	40	0	1			11,192	1	34,617
	BLUE3	0	4.5	0.6%	0	141	2	2			35,274	2	58,752
Cobb Fowler Creek	CBF1	1	3.9	3.3%	8	415	0	3	36	36	15,402	4	107,138
	CBF2	1	3.0	0.9%	4	184	1	1	23	22	13,800	4	48,842
	CBF3	1	3.7	2.0%	5	243	0	2	10	10	9,298	3	65,410
	CBF4	1	3.3	2.4%	0	2	0	0	0	0	2,275	1	7,326
	CBF5	1	2.6	2.3%	6	266	0	5	5	5	11,762	3	75,183
	CBF6	3	3.3	2.3%	6	369	1	3	14	14	9,882	3	92,478
	CBF7	3	4.2	2.0%	4	180	0	1	4	4	4,350	4	56,588
	CBF8	1	4.3	1.8%	3	132	0	0	0	0	4,681	3	24,308
	TCBF10	3	4.7	1.8%	1	150	0	4	3	3	1,109	3	33,782
	TCBF11	3	5.4	1.2%	4	589	6	7	8	8	12,693	4	156,416
	TCBF12	3	6.3	1.6%	0	232	2	1	22	22	11,121	4	100,716
Conley Creek	CON-CLAY	1			0	19	0	3	9	9	4,572	2	17,005
Constitution Creek	CONS1	1	2.2	0.4%	0	17	0	1			39,514	1	31,071
Corn Creek	CORN1	1	5.2	0.4%	0	12	0	0			11,041	1	21,091
	CORN2	1	3.2	0.7%	0	10	0	0			6,334	1	12,054

APPENDIX A – Snapfinger Raw Data for Ranking Areas

SEWERSHED	RANKING AREA	CRITERIA											
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects				
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk SSOs that Reach Surface Waters (linear foot of surface waters)*	*Relative Risk SSOs that Present Public Health and Welfare Concerns (rating)*	*Length of Sewer (linear feet)*
Doolittle Creek	DOL1	1	2.7	1.1%	0	145	0	10	6	6	26,722	1	67,641
	DOL2	1	2.9	1.7%	0	53	0	0	2	2	6,808	2	23,346
	DOL3	1	2.7	1.2%	5	200	0	1	18	16	15,263	3	73,449
	DOL4	1	3.7	2.8%	1	383	0	3	3	3	17,346	2	84,414
	DOL5	1	5.3	0.5%	0	58	0	0	3	3	7,102	3	28,668
	DOL6	1	4.1	2.7%	1	84	0	0	8	8	4,431	3	26,980
	TDOL5	1	9.5	5.5%	1	153	0	0	14	14	10,138	3	28,390
	TDOL6	1	3.5	1.8%	1	207	1	0	13	13	5,523	3	46,241
Indian Creek	IND1	1	2.1	0.9%	1	124	8	1	10	10	14,235	2	57,535
	IND2	1	1.7	0.9%	0	13	0	0	3	3	4,220	3	14,952
	IND3	1	2.3	1.3%	6	382	7	9	11	11	33,246	3	157,464
	IND4	3	4.0	1.3%	1	109	0	2	0	0	2,457	3	54,008
Intrenchment Creek	TITMC1	1	4.0	7.0%	8	651	3	10	26	26	35,848	3	216,237
	TITMC2	1	3.9	4.1%	2	126	2	5	15	15	13,838	3	75,752
	ITMC-ATL	1			3	196	1	1	6	6	2,567	4	41,344
	ITMC-WTP	1			5	277	4	4	24	24	31,068	3	125,823
Shoal Creek	SHO1	1	2.2	2.2%	0	18	0	0	4	4	3,842	1	19,219
	SHO2	1	3.9	2.7%	0	12	0	0	11	11	18,073	1	22,047
	SHO3	1	2.6	1.5%	0	22	0	0	5	5	3,729	2	22,051
	SHO4	1	3.6	1.6%	5	267	0	0	17	17	14,049	3	88,218
	SHO5	3	5.0	1.7%	7	317	3	7	7	7	14,450	4	93,208
	SHO6	3	4.0	1.8%	0	4	0	1	1	1	1,431	4	3,586
	SHO7	3	4.3	1.3%	1	260	0	1	4	4	8,948	4	87,559
	SHO8	1	4.9	2.1%	1	171	0	6	8	8	6,381	4	60,405
	SHO9	1	7.7	2.1%	3	203	0	0	35	35	9,588	4	93,022
	SHO10	1	6.2	2.3%	1	363	2	5	34	34	16,775	4	145,651
	TSHO4	1	1.9	2.8%	0	87	0	1	2	2	3,338	4	17,917

APPENDIX A – Snapfinger Raw Data for Ranking Areas

SEWERSHED	RANKING AREA	CRITERIA											
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects				
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk SSOs that Reach Surface Waters (linear foot of surface waters)*	*Relative Risk SSOs that Present Public Health and Welfare Concerns (rating)*	*Length of Sewer (linear feet)*
Lower Snapfinger Creek	LSF1	1	2.1	0.9%	1	101	1	0			16,231	3	42,742
	LSF2	1	3.7	0.3%	0	94	0	0			12,935	4	67,767
	LSF3	1	2.0	0.4%	1	129	1	0			16,644	3	97,631
	LSF4	1	2.1	0.6%	1	69	0	9			14,255	2	61,656
	LSF5	1	2.0	0.4%	0	53	1	4			15,438	2	40,209
	LSF6	1	2.0	1.0%	1	142	0	3			17,191	3	107,012
	LSF7	1	2.6	0.6%	3	169	0	1			8,831	3	80,364
	LSF8	1	2.1	1.0%	0	23	0	0			5,060	3	24,452
	TLSF3	1	2.7	0.9%	0	55	0	2	3	3	12,541	3	45,727
	LSF-WTP	1			7	677	4	7	25	25	55,948	2	359,163
Upper Snapfinger Creek	USF1	1	2.4	0.6%	7	429	1	4			17,521	2	121,639
	USF2	1	2.1	0.9%	4	337	1	0			15,605	3	75,491
	USF3	1	4.1	1.3%	0	131	0	3			7,163	3	43,069
	USF4	1	1.9	0.9%	4	31	0	0			3,101	4	11,531
	USF5	1	1.9	0.8%	1	294	1	4			13,505	3	87,415
	USF6	1	1.9	0.9%	0	33	0	0			4,316	3	14,933
	USF7	1	2.2	0.8%	0	97	1	0			5,148	4	34,185
	USF8	1	3.3	1.6%	1	76	0	2			6,699	4	41,252
	USF9	1	2.2	0.7%	3	231	0	5			10,324	4	62,697
	USF10	1	1.9	0.7%	4	193	1	0			10,832	4	58,597
	USF11	1	1.9	0.7%	0	42	0	2			3,049	2	28,928
	USF12	1	1.9	0.5%	2	85	1	3			15,040	3	64,354
	USF13	1	1.6	0.4%	10	371	1	1			20,570	4	122,571
	TUSF14	1			2	192	3	3			9,737	3	58,415
	TUSF15	1	1.9	2.0%	0	67	0	0			8,015	3	25,462

APPENDIX A – Snapfinger Raw Data for Ranking Areas

SEWERSHED	RANKING AREA	CRITERIA											
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects				
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk SSOs that Reach Surface Waters (linear foot of surface waters)*	*Relative Risk SSOs that Present Public Health and Welfare Concerns (rating)*	*Length of Sewer (linear feet)*
Snapfinger Wastewater Treatment Plant	SFPLNT1	1	2.8	3.1%	1	316	0	8	40	39	121,724	1	249,064
	SFPLNT2	1	2.8	3.1%	0	47	0	4	3	3	1,016	4	19,164
	SFPLNT3	1	2.8	3.1%	1	45	0	0	7	7	12,720	2	52,889
	SFPLNT4	1	2.6	1.5%	1	135	0	0	9	9	19,010	4	64,457
	SFPLNT5	1	2.4	0.8%	0	64	0	0	0	0	7,958	1	30,488
Sugar Creek	SUG1	1	2.3	1.2%	0	9	0	0	0	0	8,897	1	12,331
	SUG2	1	2.2	0.5%	2	118	0	1	20	21	23,048	2	65,193
	SUG3	1	2.7	0.7%	0	44	0	0	2	2	4,008	2	17,978
	SUG4	1	2.8	1.3%	4	303	0	1	11	10	22,909	3	110,465
	SUG5	1	2.0	0.7%	0	68	2	3	13	17	28,953	2	22,461

APPENDIX A – Pole Bridge Raw Data for Ranking Areas

SEWERSHED	RANKING AREA	CRITERIA											
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects				
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk SSOs that Reach Surface Waters (linear foot of surface waters)*	*Relative Risk SSOs that Present Public Health and Welfare Concerns (rating)*	*Length of Sewer (linear feet)*
Crooked Creek	CKC1	0	2.8	0.4%	0	95	0	2			31,642	1	75,635
	CKC2	0			0	25	0	0			33,637	1	16,379
Lower Crooked Creek	LCKC1	1	2.0	0.3%	0	82	1	0	55	58	13,391	3	59,278
	LCKC2	1	2.0	0.4%	1	69	0	1	39	42	23,054	2	75,604
	LCKC3	1	2.0	0.4%	0	19	0	0	15	9	3,397	3	28,177
Upper Crooked Creek	UCKC1	0	2.1	0.5%	0	73	1	1	30	11	56,741	1	80,700
	UCKC2	1	2.0	0.3%	1	187	3	2	178	115	49,357	2	146,424
Honey Creek	THON1	0	2.9	0.3%	0	4	0	0	0	0	4,796	1	23,117
	THON2	0	3.0	0.2%	0	5	0	0	0	0	953	2	5,896
	THON3	0	2.6	0.3%	0	4	0	1	1	1	7,231	1	30,490
	THON4	1	4.4	0.2%	0	20	6	1	0	0	23,570	1	37,563
	THON5	0	2.8	1.6%	0	102	0	3	10	9	2,735	2	42,999
Johnson Creek	TJSC1	1	10.9	1.4%	0	28	1	0			22,148	1	41,156
	TJSC2	1	1.9	0.2%	0	10	0	0			0	2	8,437
Pine Mountain	PINEM1	1	5.4	2.0%	0	4	0	0			18,336	1	15,832
	PINEM2	1	6.6	1.2%	0	89	0	2			4,490	2	46,939

APPENDIX A – Pole Bridge Raw Data for Ranking Areas

SEWERSHED	RANKING AREA	CRITERIA											
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects				
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk SSOs that Reach Surface Waters (linear foot of surface waters)*	*Relative Risk SSOs that Present Public Health and Welfare Concerns (rating)*	*Length of Sewer (linear feet)*
Pole Bridge Creek	PB1	1	3.0	0.7%	3	179	0	0	21	20	6,855	3	90,167
	PB2	0	3.4	0.7%	0	16	0	0	7	7	9,937	1	29,969
	PB11	0	2.5	0.6%	0	0	0	0	0	0	1,867	1	2,639
	PB12	0			1	100	0	0	30	28	28,191	2	90,537
	PB13	0			0	59	0	3	4	3	2,165	2	52,941
	PB14	0			0	0	0	0	0	0	1,488	1	3,428
	PB18	1	1.4	0.7%	0	18	1	0	0	0	48,137	3	25,800
	TPB1	0			1	22	0	0	2	2	21,693	2	38,329
	TPB4	0	1.9	0.7%	0	0	0	0	1	1	8,448	1	8,328
	TPB5	0	2.6	1.0%	17	630	1	4	127	128	41,281	4	306,176
	TPB6	0	2.1	0.9%	4	170	1	0	33	29	11,839	1	110,856
	TPB8	0	2.0	1.2%	0	155	0	8	41	44	30,024	1	144,446
	TPB9	0	1.4	0.7%	0	56	0	2	7	7	31,244	2	46,286
Pole Bridge Wastewater Treatment Plant	PBPLNT1	1			1	19	0	0	0	0	1,647	2	11,450
	PBPLNT2	1			0	19	0	0	0	0	3,648	2	16,554
	PBPLNT4_36	1			0	10	1	0	0	0	12,194	1	18,826
	PBPLNT4_54	1			1	25	0	0	2	1	9,812	1	21,306
	PBPLNT5_36	0			0	10	0	0	3	3	2,794	1	9,114
	PBPLNT5_54	0			0	0	0	0	0	0	0	2	3,924
	TPBPLNT3	0	2.5	0.6%	0	8	0	0	4	3	17,361	1	11,493
	PB-WTP	1			0	32	0	0	1	1	2,256	1	17,603
Lower Stone Mountain	LSM1	1	1.9	0.5%	0	49	1	0	22	23	40,121	1	68,763
	LSM3	1	3.0		0	15	0	0	5	3	168,094	1	20,318
	TLSM1	1	1.2	1.6%	0	38	0	0	4	4	8,480	2	56,613
Swift Creek	SWIFT1	1	2.0	0.5%	0	148	0	2	40	48	14,184	2	93,441
	SWIFT2	1	3.1	0.4%	0	84	0	1			21,237	1	54,920
Yellow River	TYRC1	0			0	14	0	0			0	3	10,923

APPENDIX B – Inter-Governmental Prioritization Matrix

SEWERSHED	RANKING AREA	CRITERIA											RANKING	
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects					
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk that SSOs Reach Surface Waters (linear foot of surface waters)*	*Relative Risk that SSOs Present Public Health and Welfare Concerns (rating)*	Weighted Score	Ranking in Basin
		Scores												
Aztec	TAZTEC2	0.0	6.1	5.6	9.6	8.1	0.0	3.2			0.2	10.0	4.29	9
	TAZTEC3	3.3	7.1	3.7	10.0	3.6	0.0	4.9			0.4	7.5	4.02	16
	TAZTEC4	0.0	3.1	2.1	0.0	5.3	0.0	0.0			0.1	7.5	1.78	36
	TAZTEC5	0.0	3.2	3.6	7.7	5.4	9.7	0.0			0.7	5.0	4.57	6
Ball Mill Creek	BALL-FUL	3.3			6.9	2.7	0.0	3.7			2.1	10.0	3.41	21
Camp Creek	CAMP-GWIN	3.3			0.0	2.2	0.0	1.8			1.5	5.0	1.78	37
Lucky Shoals	LUCKY-GWIN	3.3			1.9	2.5	2.4	0.0			1.8	7.5	2.70	28
Marsh Creek	MARSH-FUL	3.3			7.5	5.4	2.4	9.3			0.3	10.0	4.84	4
Nancy Creek	TNANCY1	3.3	2.6	1.5	3.1	4.3	3.4	3.3			8.8	10.0	4.10	13
	TNANCY2	10.0	4.3	1.5	1.9	4.2	6.1	4.8			0.5	10.0	5.37	2
	TNANCY4	3.3	2.5	5.5	0.0	1.4	1.2	3.8			1.1	10.0	2.56	30
	TNANCY5	10.0	3.9	3.2	2.7	5.7	10.0	5.3			2.2	5.0	6.37	1
	NANCY-ATL	0.0			1.9	3.0	4.7	2.8			1.4	5.0	2.57	29
North Fork Peachtree Creek	TNFORK1	3.3	3.2	1.8	4.7	5.6	4.2	1.9			8.8	7.5	4.51	7
	TNFORK2	3.3	3.2	1.8	3.7	4.5	3.8	5.0			9.0	5.0	4.14	12
	TNFORK3	3.3	3.8	1.1	0.0	6.2	0.0	1.8			0.8	10.0	2.87	26
	TNFORK4	3.3	7.4	1.4	0.0	1.8	0.0	0.0			0.0	10.0	2.14	34
	TNFORK20	3.3	6.7	1.8	1.1	3.6	0.0	2.1			1.6	5.0	2.51	31
	TNFORK22	3.3	4.2	1.2	1.6	5.7	6.9	3.9			2.2	5.0	4.21	10
	NFORK-ATL	0.0			7.8	4.2	7.0	4.4			1.1	7.5	4.47	8
Northeast Creek	TNEC1	0.0			0.0	3.6	0.0	0.0			0.2	10.0	1.51	39
	NEC-FUL	0.0			2.2	3.4	0.9	0.0			3.3	7.5	2.00	35
Peavine Creek	TPVIN1	3.3	2.4	1.6	3.5	3.4	3.7	1.2			2.0	5.0	3.14	23
	TPVIN2	3.3	6.7	4.5	0.0	0.4	0.0	0.0			0.2	2.5	1.56	38
	TPVIN3	3.3			1.2	4.4	0.0	1.7			1.4	10.0	2.76	27

APPENDIX B – Inter-Governmental Prioritization Matrix

SEWERSHED	RANKING AREA	CRITERIA											RANKING	
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects					
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk that SSOs Reach Surface Waters (linear foot of surface waters)*	*Relative Risk that SSOs Present Public Health and Welfare Concerns (rating)*	Weighted Score	Ranking in Basin
		Scores												
South Fork Peachtree Creek	TSFORK1	0.0	3.3	3.3	3.7	6.3	3.7	3.3			10.0	7.5	4.04	15
	TSFORK2	0.0	3.3	3.3	4.1	3.7	7.4	0.9			2.8	7.5	3.70	18
	TSFORK3	10.0	3.0	2.1	6.4	5.7	0.0	9.5			1.1	7.5	5.20	3
	TSFORK4	10.0	3.0	2.1	3.0	3.0	5.6	0.0			0.1	7.5	4.66	5
	TSFORK5	3.3	3.3	4.5	7.3	6.4	3.1	0.0			0.7	5.0	4.16	11
	TSFORK6	0.0	4.3	2.6	9.0	7.7	0.0	3.0			0.2	5.0	3.52	19
	TSFORK7	3.3	2.9	1.0	7.1	2.4	2.2	3.5			0.7	10.0	3.51	20
	TSFORK9	3.3	8.8	3.1	0.0	4.8	0.0	3.0			0.8	7.5	2.97	25
	TSFORK10	3.3	10.0	9.1	6.8	4.1	0.0	0.0			0.3	10.0	4.09	14
	SFORK-ATL	0.0			2.0	3.4	6.3	1.0			0.9	10.0	3.22	22
Billing Monitors	DK1	3.3			0.0	10.0	0.0	0.0			0.1	2.5	3.04	24
	DK2	3.3	3.8	2.5	3.0	3.9	3.2	10.0			2.0	7.5	3.94	17
	DK3	0.0			0.0	1.1	0.0	0.0			0.3	5.0	0.62	41
	DK14	3.3			0.0	1.7	0.0	0.0			0.0	2.5	1.26	40
	DK15	3.3	4.1	10.0	0.0	2.0	0.0	0.0			0.2	7.5	2.36	33
	DK16	3.3	4.1	10.0	0.0	2.9	0.0	0.0			0.6	5.0	2.39	32

APPENDIX B – Snapfinger Prioritization Matrix

SEWERSHED	RANKING AREA	CRITERIA											RANKING	
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects					
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk that SSOs Reach Surface Waters (linear foot of surface waters)*	*Relative Risk that SSOs Present Public Health and Welfare Concerns (rating)*	**Weighted Score**	**Ranking in Basin**
		Scores												
Barbashela Creek	BAR1	3.3	2.8	1.2	0.9	5.4	0.0	4.4			1.0	7.5	2.81	44
	BAR2	0.0	2.6	3.0	1.7	4.2	0.8	0.0			0.7	10.0	2.18	61
	BAR3	3.3	2.6	1.2	0.4	4.0	0.0	0.6			4.2	7.5	2.43	53
	BAR4	3.3	3.0	1.3	0.9	6.1	1.2	2.9			1.9	7.5	3.13	26
	BAR5	3.3	3.0	1.3	4.3	8.5	1.2	2.4			0.5	10.0	4.05	10
	BAR6	3.3	4.1	1.2	1.9	4.0	0.0	1.4			0.7	7.5	2.54	50
	TBAR7	3.3			0.0	2.9	0.0	0.0			0.2	10.0	2.07	66
Blue Creek	BLUE1	0.0	3.2	1.4	0.0	4.5	0.0	0.0			1.0	5.0	1.50	80
	BLUE2	0.0	3.9	1.1	0.0	2.1	0.0	1.0			0.9	2.5	0.99	87
	BLUE3	0.0	4.7	0.8	0.0	4.4	2.4	1.2			2.9	5.0	2.21	59
Cobb Fowler Creek	CBF1	3.3	4.1	4.8	2.2	7.1	0.0	1.0	5.8	4.4	1.3	10.0	3.94	11
	CBF2	3.3	3.2	1.2	2.4	6.9	1.5	0.7	8.1	6.0	1.1	10.0	4.33	3
	CBF3	3.3	3.9	2.8	2.2	6.8	0.0	1.1	2.6	2.0	0.8	7.5	3.05	31
	CBF4	3.3	3.5	3.5	0.0	0.5	0.0	0.0	0.0	0.0	0.2	2.5	1.06	86
	CBF5	3.3	2.8	3.3	2.3	6.5	0.0	2.4	1.1	0.9	1.0	7.5	2.77	45
	CBF6	10.0	3.5	3.4	1.9	7.3	0.8	1.2	2.6	2.0	0.8	7.5	4.21	5
	CBF7	10.0	4.4	2.9	2.0	5.9	0.0	0.6	1.2	0.9	0.4	10.0	3.73	12
	CBF8	3.3	4.6	2.5	3.6	10.0	0.0	0.0	0.0	0.0	0.4	7.5	3.11	29
	TCBF10	10.0	5.0	2.6	0.9	8.2	0.0	4.2	1.5	1.2	0.1	7.5	4.08	7
	TCBF11	10.0	5.7	1.7	0.7	6.9	2.8	1.6	0.9	0.7	1.0	10.0	4.20	6
	TCBF12	10.0	6.6	2.3	0.0	4.2	1.4	0.4	3.8	2.9	0.9	10.0	4.07	8
Conley Creek	CON-CLAY	3.3			0.0	2.1	0.0	6.3	9.1	7.0	0.4	5.0	3.46	19
Constitution Creek	CONS1	3.3	2.3	0.6	0.0	1.0	0.0	1.2			3.2	2.5	1.42	82
Corn Creek	CORN1	3.3	5.5	0.5	0.0	1.0	0.0	0.0			0.9	2.5	1.41	83
	CORN2	3.3	3.4	0.9	0.0	1.5	0.0	0.0			0.5	2.5	1.37	84

APPENDIX B – Snapfinger Prioritization Matrix

SEWERSHED	RANKING AREA	CRITERIA											RANKING	
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects					
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk that SSOs Reach Surface Waters (linear foot of surface waters)*	*Relative Risk that SSOs Present Public Health and Welfare Concerns (rating)*	Weighted Score	Ranking in Basin
		Scores												
Doolittle Creek	DOL1	3.3	2.8	1.6	0.0	3.9	0.0	5.3	1.5	1.2	2.2	2.5	2.10	64
	DOL2	3.3	3.0	2.4	0.0	4.2	0.0	0.0	1.5	1.1	0.6	5.0	1.96	72
	DOL3	3.3	2.9	1.8	2.0	5.0	0.0	0.5	4.2	2.9	1.3	7.5	2.92	35
	DOL4	3.3	3.9	4.0	0.3	8.4	0.0	1.3	0.6	0.5	1.4	5.0	2.68	47
	DOL5	3.3	5.6	0.7	0.0	3.7	0.0	0.0	1.8	1.4	0.6	7.5	2.12	63
	DOL6	3.3	4.3	3.9	1.1	5.7	0.0	0.0	5.1	3.9	0.4	7.5	3.23	24
	TDOL5	3.3	10.0	7.9	1.0	9.9	0.0	0.0	8.5	6.5	0.8	7.5	5.01	2
	TDOL6	3.3	3.7	2.6	0.6	8.2	1.6	0.0	4.9	3.7	0.5	7.5	3.66	16
Indian Creek	IND1	3.3	2.2	1.3	0.5	4.0	10.0	0.6	3.0	2.3	1.2	5.0	3.73	13
	IND2	3.3	1.8	1.4	0.0	1.6	0.0	0.0	3.5	2.7	0.3	7.5	1.94	74
	IND3	3.3	2.4	1.8	1.1	4.5	3.2	2.0	1.2	0.9	2.7	7.5	2.81	43
	IND4	10.0	4.3	1.8	0.5	3.7	0.0	1.3	0.0	0.0	0.2	7.5	2.87	38
Intrenchment Creek	TITMC1	3.3	4.2	10.0	1.1	5.5	1.0	1.7	2.1	1.6	2.9	7.5	3.29	22
	TITMC2	3.3	4.1	5.8	0.8	3.1	1.9	2.4	3.4	2.6	1.1	7.5	3.01	32
	ITMC-ATL	3.3			2.1	8.7	1.7	0.9	2.5	1.9	0.2	10.0	3.67	14
	ITMC-WTP	3.3			1.1	4.1	2.3	1.1	3.3	2.5	2.6	7.5	3.05	30
Shoal Creek	SHO1	3.3	2.4	3.1	0.0	1.7	0.0	0.0	3.6	2.7	0.3	2.5	1.85	76
	SHO2	3.3	4.1	3.9	0.0	1.0	0.0	0.0	8.6	6.6	1.5	2.5	2.87	37
	SHO3	3.3	2.8	2.2	0.0	1.8	0.0	0.0	3.9	3.0	0.3	5.0	2.03	68
	SHO4	3.3	3.8	2.2	1.6	5.6	0.0	0.0	3.3	2.5	1.2	7.5	2.86	40
	SHO5	10.0	5.3	2.4	2.2	6.3	2.3	2.7	1.3	1.0	1.2	10.0	4.32	4
	SHO6	10.0	4.3	2.6	0.0	2.1	0.0	10.0	4.8	3.7	0.1	10.0	4.06	9
	SHO7	10.0	4.5	1.8	0.3	5.5	0.0	0.4	0.8	0.6	0.7	10.0	3.38	20
	SHO8	3.3	5.2	3.0	0.5	5.2	0.0	3.6	2.3	1.7	0.5	10.0	2.88	36
	SHO9	3.3	8.2	3.0	0.9	4.0	0.0	0.0	6.5	5.0	0.8	10.0	3.52	18
	SHO10	3.3	6.6	3.4	0.2	4.6	1.0	1.2	4.0	3.1	1.4	10.0	3.24	23
	TSHO4	3.3	2.0	4.0	0.0	8.9	0.0	2.0	1.9	1.5	0.3	10.0	3.12	27

APPENDIX B – Snapfinger Prioritization Matrix

SEWERSHED	RANKING AREA	CRITERIA											RANKING	
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects					
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk that SSOs Reach Surface Waters (linear foot of surface waters)*	*Relative Risk that SSOs Present Public Health and Welfare Concerns (rating)*	Weighted Score	Ranking in Basin
		Scores												
Lower Snapfinger Creek	LSF1	3.3	2.2	1.2	0.7	4.4	1.7	0.0			1.3	7.5	2.61	49
	LSF2	3.3	3.9	0.4	0.0	2.6	0.0	0.0			1.1	10.0	2.06	67
	LSF3	3.3	2.2	0.5	0.3	2.4	0.7	0.0			1.4	7.5	1.98	70
	LSF4	3.3	2.2	0.9	0.5	2.1	0.0	5.2			1.2	5.0	1.97	71
	LSF5	3.3	2.1	0.6	0.0	2.4	1.8	3.6			1.3	5.0	2.20	60
	LSF6	3.3	2.1	1.4	0.3	2.4	0.0	1.0			1.4	7.5	1.95	73
	LSF7	3.3	2.8	0.8	1.1	3.9	0.0	0.4			0.7	7.5	2.25	57
	LSF8	3.3	2.2	1.4	0.0	1.7	0.0	0.0			0.4	7.5	1.67	79
	TLSF3	3.3	2.9	1.3	0.0	2.2	0.0	1.6	1.1	0.9	1.0	7.5	1.76	78
	LSF-WTP	3.3			0.6	3.5	0.8	0.7	1.2	0.9	4.6	5.0	2.15	62
Upper Snapfinger Creek	USF1	3.3	2.5	0.9	1.7	6.5	0.6	1.2			1.4	5.0	2.85	41
	USF2	3.3	2.2	1.4	1.5	8.2	1.0	0.0			1.3	7.5	3.31	21
	USF3	3.3	4.3	1.9	0.0	5.6	0.0	2.5			0.6	7.5	2.73	46
	USF4	3.3	2.0	1.2	10.0	5.0	0.0	0.0			0.3	10.0	3.65	17
	USF5	3.3	2.0	1.1	0.3	6.2	0.8	1.6			1.1	7.5	2.82	42
	USF6	3.3	2.0	1.3	0.0	4.1	0.0	0.0			0.4	7.5	2.09	65
	USF7	3.3	2.3	1.1	0.0	5.2	2.1	0.0			0.4	10.0	2.86	39
	USF8	3.3	3.4	2.2	0.7	3.4	0.0	1.7			0.6	10.0	2.47	51
	USF9	3.3	2.3	1.0	1.4	6.8	0.0	2.9			0.8	10.0	3.13	25
	USF10	3.3	2.0	1.1	2.0	6.1	1.2	0.0			0.9	10.0	3.11	28
	USF11	3.3	2.0	1.1	0.0	2.7	0.0	2.5			0.3	5.0	1.80	77
	USF12	3.3	2.0	0.8	0.9	2.4	1.1	1.7			1.2	7.5	2.23	58
	USF13	3.3	1.7	0.6	2.4	5.6	0.6	0.3			1.7	10.0	2.97	33
	TUSF14	3.3			1.0	6.1	3.7	1.8			0.8	7.5	3.67	15
	TUSF15	3.3	2.0	2.9	0.0	4.8	0.0	0.0			0.7	7.5	2.35	56

APPENDIX B – Snapfinger Prioritization Matrix

SEWERSHED	RANKING AREA	CRITERIA											RANKING	
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects					
		Relative Age of WCTS (rating)	***Peaking Factor (value)***	***R-Value (value)***	***Proactive Maintenance (count)***	***Reactive Maintenance (count)***	***Structural-Related Defect Spills (count)***	***Service-Related Spills (count)***	***Manhole Structural-Related Defects (count)***	***Manhole Service-Related Defects (count)***	***Relative Risk that SSOs Reach Surface Waters (linear foot of surface waters)***	***Relative Risk that SSOs Present Public Health and Welfare Concerns (rating)***	**Weighted Score**	**Ranking in Basin**
		Scores												
Snapfinger Wastewater Treatment Plant	SFPLNT1	3.3	2.9	4.4	0.1	2.3	0.0	1.2	2.8	2.1	10.0	2.5	2.43	52
	SFPLNT2	3.3	2.9	4.4	0.0	4.5	0.0	7.5	2.7	2.1	0.1	10.0	2.93	34
	SFPLNT3	3.3	2.9	4.4	0.5	1.6	0.0	0.0	2.3	1.7	1.0	5.0	1.89	75
	SFPLNT4	3.3	2.7	2.1	0.4	3.9	0.0	0.0	2.4	1.8	1.6	10.0	2.40	55
	SFPLNT5	3.3	2.6	1.2	0.0	3.9	0.0	0.0	0.0	0.0	0.7	2.5	1.43	81
Sugar Creek	SUG1	3.3	2.5	1.7	0.0	1.3	0.0	0.0	0.0	0.0	0.7	2.5	1.07	85
	SUG2	3.3	2.3	0.7	0.9	3.3	0.0	0.6	5.3	4.3	1.9	5.0	2.62	48
	SUG3	3.3	2.8	1.0	0.0	4.5	0.0	0.0	1.9	1.5	0.3	5.0	2.00	69
	SUG4	3.3	2.9	1.8	1.0	5.1	0.0	0.3	1.7	1.2	1.9	7.5	2.40	54
	SUG5	3.3	2.1	1.0	0.0	5.6	6.4	4.8	10.0	10.0	2.4	5.0	5.06	1

APPENDIX B – Pole Bridge Prioritization Matrix

SEWERSHED	RANKING AREA	CRITERIA											RANKING	
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects					
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk that SSOs Reach Surface Waters (linear foot of surface waters)*	*Relative Risk that SSOs Present Public Health and Welfare Concerns (rating)*	**Weighted Score**	**Ranking in Basin**
		Scores												
Crooked Creek	CKC1	0.0	2.5	1.7	0.0	5.3	0.0	3.8			1.9	2.5	1.77	29
	CKC2	0.0			0.0	6.4	0.0	0.0			2.0	2.5	1.70	30
Lower Crooked Creek	LCKC1	10.0	1.8	1.4	0.0	5.8	1.1	0.0	7.6	10.0	0.8	7.5	4.75	3
	LCKC2	10.0	1.8	2.2	1.5	3.8	0.0	1.9	4.2	5.7	1.4	5.0	3.76	11
	LCKC3	10.0	1.8	1.8	0.0	2.8	0.0	0.0	4.4	3.3	0.2	7.5	3.31	13
Upper Crooked Creek	UCKC1	0.0	1.9	2.3	0.0	3.8	0.8	1.8	3.1	1.4	3.4	2.5	1.81	28
	UCKC2	10.0	1.8	1.7	0.8	5.4	1.3	2.0	10.0	8.0	2.9	5.0	5.15	1
Honey Creek	THON1	0.0	2.6	1.2	0.0	0.7	0.0	0.0	0.0	0.0	0.3	2.5	0.44	40
	THON2	0.0	2.8	1.1	0.0	3.6	0.0	0.0	0.0	0.0	0.1	5.0	0.98	37
	THON3	0.0	2.4	1.5	0.0	0.6	0.0	4.7	0.3	0.3	0.4	2.5	0.72	38
	THON4	10.0	4.0	1.1	0.0	2.2	10.0	3.8	0.0	0.0	1.4	2.5	3.97	7
	THON5	0.0	2.6	7.9	0.0	10.0	0.0	10.0	1.9	2.1	0.2	5.0	3.18	18
Johnson Creek	TJSC1	10.0	10.0	7.1	0.0	2.9	1.5	0.0			1.3	2.5	4.01	6
	TJSC2	10.0	1.7	0.8	0.0	5.0	0.0	0.0			0.0	5.0	3.28	14
Pine Mountain	PINEM1	10.0	4.9	10.0	0.0	1.1	0.0	0.0			1.1	2.5	3.23	16
	PINEM2	10.0	6.1	6.2	0.0	8.0	0.0	6.1			0.3	5.0	4.85	2

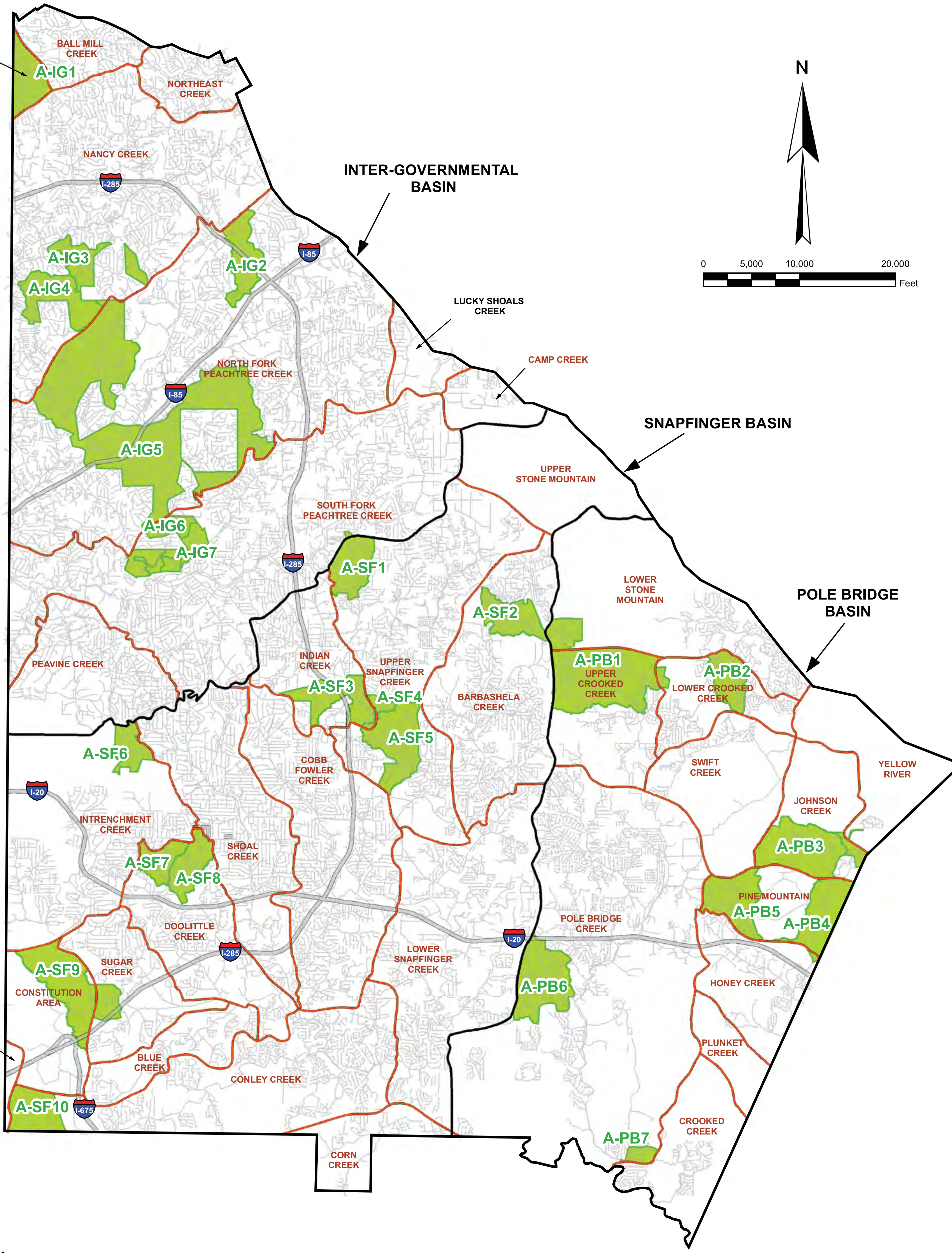
APPENDIX B – Pole Bridge Prioritization Matrix

SEWERSHED	RANKING AREA	CRITERIA											RANKING	
			Estimated RDI/I into System		Proactive / Reactive Maintenance		SSO Records		Known Structural Defects					
		Relative Age of WCTS (rating)	*Peaking Factor (value)*	*R-Value (value)*	*Proactive Maintenance (count)*	*Reactive Maintenance (count)*	*Structural-Related Defect Spills (count)*	*Service-Related Spills (count)*	*Manhole Structural-Related Defects (count)*	*Manhole Service-Related Defects (count)*	*Relative Risk that SSOs Reach Surface Waters (linear foot of surface waters)*	*Relative Risk that SSOs Present Public Health and Welfare Concerns (rating)*	Weighted Score	Ranking in Basin
		Scores												
Pole Bridge Creek	PB1	10.0	2.8	3.3	3.8	8.4	0.0	0.0	1.9	2.3	0.4	7.5	4.24	4
	PB2	0.0	3.1	3.6	0.0	2.3	0.0	0.0	1.9	2.4	0.6	2.5	1.23	35
	PB11	0.0	2.3	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.5	0.39	41
	PB12	0.0			1.3	4.7	0.0	0.0	2.7	3.2	1.7	5.0	1.92	26
	PB13	0.0			0.0	4.7	0.0	8.1	0.6	0.6	0.1	5.0	1.65	32
	PB14	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.5	0.14	43
	PB18	10.0	1.3	3.2	0.0	2.9	2.4	0.0	0.0	0.0	2.9	7.5	3.05	20
	TPB1	0.0			3.0	2.4	0.0	0.0	0.4	0.5	1.3	5.0	1.19	36
	TPB4	0.0	1.7	3.2	0.0	0.0	0.0	0.0	1.0	1.2	0.5	2.5	0.61	39
	TPB5	0.0	2.4	4.7	6.4	8.7	0.2	1.9	3.4	4.3	2.5	10.0	3.77	10
	TPB6	0.0	2.0	4.4	4.1	6.5	0.6	0.0	2.4	2.7	0.7	2.5	2.45	24
	TPB8	0.0	1.8	5.8	0.0	4.5	0.0	7.9	2.3	3.1	1.8	2.5	2.18	25
	TPB9	0.0	1.3	3.2	0.0	5.1	0.0	6.2	1.2	1.5	1.9	5.0	1.91	27
Pole Bridge Wastewater Treatment Plant	PBPLNT1	10.0			10.0	7.0	0.0	0.0	0.0	0.0	0.1	5.0	4.23	5
	PBPLNT2	10.0			0.0	4.8	0.0	0.0	0.0	0.0	0.2	5.0	2.76	23
	PBPLNT4_36	10.0			0.0	2.2	3.3	0.0	0.0	0.0	0.7	2.5	2.77	22
	PBPLNT4_54	10.0			5.4	4.9	0.0	0.0	0.8	0.5	0.6	2.5	3.41	12
	PBPLNT5_36	0.0			0.0	4.6	0.0	0.0	2.7	3.4	0.2	2.5	1.56	33
	PBPLNT5_54	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.28	42
	TPBPLNT3	0.0	2.3	3.2	0.0	2.9	0.0	0.0	2.9	2.7	1.0	2.5	1.45	34
	PB-WTP	10.0			0.0	7.7	0.0	0.0	0.5	0.6	0.1	2.5	3.20	17
Lower Stone Mountain	LSM1	10.0	1.7	2.7	0.0	3.0	0.9	0.0	2.6	3.4	2.4	2.5	3.12	19
	LSM3	10.0	2.8		0.0	3.1	0.0	0.0	2.0	1.5	10.0	2.5	3.27	15
	TLSM1	10.0	1.1	8.1	0.0	2.8	0.0	0.0	0.6	0.7	0.5	5.0	2.78	21
Swift Creek	SWIFT1	10.0	1.8	2.6	0.0	6.7	0.0	3.1	3.5	5.3	0.8	5.0	3.96	8
	SWIFT2	10.0	2.8	1.8	0.0	6.4	0.0	2.6			1.3	2.5	3.77	9
Yellow River	TYRC1	0.0			0.0	5.4	0.0	0.0			0.0	7.5	1.69	31

C. Additional Priority Areas Map.

DeKalb County
DEPARTMENT OF WATERSHED MANAGEMENT

Additional Priority Areas



Legend

- Additional Priority Areas
- Basins
- Sewersheds
- Sewer Lines
- Interstates

State Plane Coordinate System
Georgia West, NAD 83, US Feet

DeKalb Water Partners
Jacobs/Cardozo Joint Venture

D. Private Lateral Investigations Specifications, Guidelines, and Procedures.

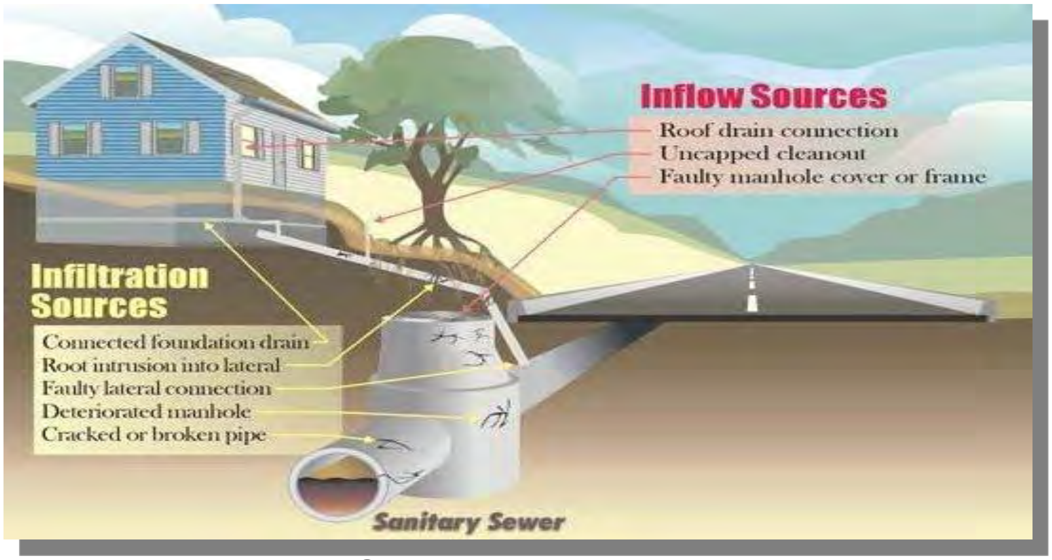
PRIVATE LATERAL INVESTIGATIONS SPECIFICATIONS, GUIDELINES, AND PROCEDURES

The Department of Watershed Management (DWM) Private Lateral Investigation Program is designed to identify sources of Infiltration/Inflow (I/I) originating from private property and conveyed to the Wastewater Collection and Transmission System (WCTS). Private lateral I/I is often a significant contributor to increased wastewater flow and sanitary sewer overflows (SSOs) in mainlines and wastewater backups in private properties. Note, however, that the County is legally limited with respect to any activity it conducts on private property. For instance, the County is prohibited from using Public Funds for private purpose. These and other legal limitations will be taken into account during implementation. This guideline and procedure presented below will be evaluated and revised as needed as the program is implemented.

Private laterals are typically connected to the public sewer mainlines in public rights of way or sewer lines in easements on private property. Figure 1 depicts potential sources of I/I on private laterals. Private laterals have unique features compared to public sewer mainlines including:

- Relatively smaller pipe diameters (4 and 6 inches), which makes them relatively more vulnerable to increased frequency of clogging by items disposed of by homeowner such as excess paper, grease, toys, kitty litter, etc.
- Relatively shallow burial depths, which makes them susceptible to damage and easier to connect to.
- Relatively mild slopes and, therefore, relatively slower wastewater flow velocities.
- Some contain multiple bends with multiple fittings for cleanouts due to lack of uniform design and construction standards. This results in relatively greater head losses and tortuous flow regimes.
- Defects in joint connections at the building and to the mainline pipe including misaligned or open pipe joints which provide I/I entry points.
- Limited access to lateral pipes which creates maintenance challenges.
- Tree root impacts which causes lateral misalignment and damage.

Figure 1 – Private Lateral I/I Sources



Source: © 2012 King County

Determination as to where private lateral assessment will be performed will be made based on a review of flow monitoring data, cost effectiveness, professional judgment, and previous experience of personnel knowledgeable of field conditions. Smoke testing will be the primary assessment method utilized in private lateral assessment. Smoke testing will be supplemented with other assessment methods, as needed to confirm specific I/I sources. Table 1 below lists common tiered or progressive inspection techniques used to provide comprehensive inspections as described in Steps 1 and 2 below.

Table 1 – Optional Testing Methods for Private Lateral Investigation

	Testing Methods		
Type of Defect	**Smoke**	**Dye**	**CCTV**
Uncapped Cleanout	✓		
Downspout	✓	✓	
Area Drain	✓	✓	
Sump Pump		✓	
Foundation Drain	✓	✓	
Stair Well Drain	✓	✓	
Service Lateral Connection	✓	✓	✓
Private Lateral	✓	✓	✓

Step 1 – Smoke Testing

Service lateral investigation (Step 1) will involve the use of smoke testing to determine if there are I/I sources or illegal connections on private properties within the area being tested. Non-toxic smoke will be blown into the public sewer at pressures above atmospheric pressure. Observation of smoke exiting the ground and/or other surfaces or inside the buildings, residences, or structures will be evidence of potential sources of I/I.

Common private property sources revealed by the smoke detection process include connected downspouts, open cleanouts, area drains, and defective laterals. If a building's plumbing system is structurally tight and operating properly, smoke should not enter a building and should only be visible from a building's plumbing vent.

Smoke testing guidelines and procedures are provided in Appendix K of the PASARP. Should results of smoke testing indicate no visible evidence of potential I/I sources or illegal connections, then the private lateral investigation will be deemed complete. Should results of smoke testing indicate visible evidence that there is an I/I source or illegal connection then Step 2 activities will be considered for further investigation, otherwise repairs of I/I sources will be recommended (repairs will either be performed by the property owner or the County based on ownership of the lateral). Repairs may include downspout disconnection from the sewer system or repair of a broken cleanout. In some cases, a repair may be required to bring the home owner's private lateral up to County code standards to meet public health requirements.

The following is a list of actions that may be performed based on the results of smoke testing:

- A - Plumbing vent only – no further action, indicates the connections are in working order.
- B - Garden and around trees – indicates cracked line – note whether smoke is emanating from public or private property or both; conduct additional testing as needed (Step 2 below).
- C - Downspout – conduct exterior building inspection as needed (Step 3 below).
- D - Near foundation – conduct additional testing as needed (Step 2 below).
- E – Requirements of a back water valve to meet code requirement, if applicable to prevent spills or backups for those buildings located at a lower topography of the sewer main.

Step 2 –Dye Testing and CCTV Inspections

Step 2 of service lateral assessment will include dye testing, and/or closed-circuit television (CCTV) activities to identify the specific source of I/I in the private lateral. Dye-water testing can be introduced above private laterals or at foundation drains by using a jetting device. Crews will then inspect down-gradient sanitary sewer manholes for the presence of the dye.

CCTV inspection may be used to directly view the private lateral to determine whether there are pipe defects and/or other potential sources of I/I. Prior to CCTV inspection, laterals will be cleaned to remove debris and other obstructions (fats, oil, and grease, FOG) that may be blocking defects from view of the camera. The County will only clean the County maintained portion of the lateral. The private property lateral will not be accessed, cleaned, or maintained. The private lateral may be comprised of fragile clay pipe and its structural integrity will not withstand jet cleaning pressure.

Dye-water testing and CCTV inspection guidelines and procedures are included in Appendix E and I of the PASARP respectively.

Step 3 –Building Inspections

Step 3 of service lateral assessment includes exterior building inspections to determine if downspouts, area drains, and/or stairway drains are connected to the sanitary sewer, or if there are open cleanouts on the property. Dye may be introduced above private laterals or at foundation drains by using a jetting device. Crews will then inspect down-gradient sanitary sewer manholes for the presence of the dye.

Building inspections can be performed to identify State plumbing code or municipal sewer-use ordinance violations. Building inspections may involve a physical inspection of the interior basement or crawl space and the outside perimeter of the building.

An interior inspection of a building will be conducted only if all other inspection techniques have been exhausted to determine if the building is a significant source of I/I to the County system. For instance, if the building is suspected to have an illegal foundation drain or sump pump connected to the sanitary sewer, this would need to be verified through an interior inspection, <u>only if approved in the County ordinance and by the County Legal Department</u>.

As part of the interior inspection, dye-water testing will involve introducing dye directly into suspect sump pumps or drains. This will allow crews to determine if the fixture is connected to the sanitary sewer system by the visible presence of dye in manholes down-gradient of the building fixture. The existence of a Palmer Valve (a one way check valve connecting basement floor drains to the sanitary sewer system installed between the years of 1920 to 1950) or other connections to the sewer system is proof of foundation drains connections to the sanitary sewer.

PRIVATE LATERAL ASSESSMENT PROCEDURE

Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION

Private lateral assessment will be performed to identify sources of Infiltration/Inflow (I/I) and illegal sewer connections from private properties.

ACTIVITY GOALS AND OBJECTIVES

The objective of private lateral assessment is to identify sources if I/I such as downspouts; stairwell, yard, driveway, patio, and area drains; foundation drains; broken or un-capped clean-outs; pipe defects; and illegal connections. The goal of the private lateral assessment will be to identify repair, rehabilitation, and replacement projects that can be performed cost effectively to eliminate I/I sources from private properties.

SAFETY ANALYSIS - Specific to job site conditions

Safety	Potential Hazards
• Safety Program • Protective Clothing and Equipment (Personal Protection Equipment) • Gases and other Hazardous Atmospheres Analysis (Confined Space Entry) • Overhead Power Lines (Electrical Safety) • Traffic Safety Requirements (Traffic Safety)	• Infectious Diseases • Slip, Trip, and Fall • Lifting • Poisonous Snakes, Pests • Confined Spaces (Confined Space Entry) • Traffic • Vehicle Operation • Mechanical Tools • Electrical Hazards (Electrical Safety) • Flooding and Inundation (Confined Space Entry)

PRIVATE LATERAL INVESTIGATION CHECKLIST - Specific to job site conditions

SAFETY

- Traffic Cones
- Yellow Vests (for each crew member)
- Flashing Beam (mounted on the vehicle)
- Fire Extinguisher
- Traffic Signs
- Arrow Bar/Board (for heavy traffic areas, only)
- First-Aid Kit (fully stocked) and Safety Manual
- Cellular Telephone/2-way Radio
- Drinking Water and Disposable Cups
- Hand Cleaner (Alcohol, waterless, towel-less cleaner, paper towels)

CLERICAL

- Step 1: Smoke Testing Clerical Supplies
- Step 2: Dye Water and CCTV Clerical Supplies
- Digital camera

WORKING

Step 1 – Smoke Testing Checklist Items
Step 2 – Dye Water and CCTV Working Checklist item
Step 3 – Building Inspection Items: Stock of booties to cover work shoes when entering a building

SERVICE LATERAL INSPECTION PROCEDURE STEP 1

ACTIVITY/SUBTASK

SMOKE TESTING

Refer to Smoke Testing Procedures in Appendix K of the PASARP. Smoke testing is most effective in sewers with diameters equal to or less than 18 inches. Smoke testing shall be performed during dry weather, no wind, and low soil moisture level conditions. Written documentation and photographs of smoke testing results will be maintained. Smoke testing procedures include public notification using direct mail, door hangers, verbal communications with property owners or building managers, notice placed in DeKalb County newspapers, and notice on the DeKalb County Government channel.

DOCUMENTATION

1. **Record Results:** Crews shall record Step 1 results based on smoke testing procedures protocol.

SERVICE LATERAL INSPECTION PROCEDURE STEP 2 and 3

ACTIVITY/SUBTASK

PRE-WORK ACTIVITIES

Building Owner Notification and Appointment: Contacts with building owner or manager to schedule the building inspection, as needed, will follow the following steps:

Note: County permission is required to perform work outside of designated business hours.

a. Prior to beginning Step 2 of the Service Lateral Inspection Procedure, a "general notification for private lateral investigation" letter will be mailed to each owner or building manager (Attachment A). The letter will identify a date and time of the building inspection. If the owner or building manager cannot be at building at the scheduled time, the letter will provide information as to how to re-schedule the appointment. In general, appointments will be scheduled on non-holiday weekdays and Saturdays based on the convenience of the owner or building manager.

b. If the owner or building manager does not respond within the requested time period, an attempt will be made to contact them by telephone. If the resident refuses entry for an inspection, the inspector or scheduler will politely disengage and refer the matter to DWM Supervisor *or* for further action as presented in Step e below.

c. If the owner or building manager cannot be contacted by telephone, a "request for access to building" letter will be mailed by the DWM (Attachment B) requesting the owner or building manager to contact DWM or its designee to schedule a building inspection. If, after 15 days, an appointment for an inspection has still not been made, an attempt to make contact by knocking on the door will be made. If no one answers, a Door Hanger (Attachment C) will be left requesting the owner or building manager to call within five (5) days to schedule an inspection. If contact is made with the owner or building manager, he/she will be asked to sign a "permission to CCTV lateral from the main sewer" form (Attachment D). Permission to CCTV the private lateral will be requested regardless of whether the owner or building manager agrees to schedule a building inspection. If contact still is not made, someone will be dispatched to knock on the door again. If the resident refuses entry for an inspection, the inspector or scheduler will politely disengage

SERVICE LATERAL INSPECTION PROCEDURE STEP 2 and 3

ACTIVITY/SUBTASK

and refer the matter to the DWM or its designee for further action.

d. If after five (5) days, no contact has been made, a “Request for access to building” letter will be sent certified mail (Attachment B). The owner or building manager will be notified to contact DWM *or its designee* within seven (7) days. If the building is determined to be vacant, the county records will be researched by the DWM to locate the owner. After the owner is determined, a “Request for access to building” letter shall be mailed by the DWM *or its designee* to the owner. If there is no response within the allotted time, the “Request for access to building” letter (Attachment B) will be sent by certified mail. After the certified mail receipt is returned, the owner will be contacted by telephone. If occupant “refuses” or is a “no-contact” then the matter will be referred to the County Law Department.

e. For “refusals” and “no-contact” buildings the matter will be referred to the County Law Department.

BUILDING, DYE WATER AND CCTV INSPECTION

1. Approach to House/Building:

a. Inspectors will be neat in appearance and wearing a uniform. They will carry photo ID and a copy of the “general notification” letter. They will approach the front door using the driveway and sidewalks (inspectors must avoid walking in home/building owner’s yard when approaching the structure).

2. Introduction and Identification:

a. Inspector will present identification (photo ID) to owner/building manager for examination. In general, each 2 - 3 person inspection crew will perform the inspection.

b. Consent to an inspection must be provided by someone 18 years or older (owner, building manager, or their designee.

c. Introduction Speech: Hello, my name is _________________. I am an inspector with the DeKalb County Department of Watershed Management [or I am working on behalf of the DeKalb County Department of Watershed Management (*designated contractor*). We are in the process of performing building inspections to locate possible sources of groundwater or stormwater entry into the sanitary sewer system. We would like permission to inspect your home/building plumbing.

3. Topics to Discuss with Building Owner or Manager:

a. Purpose of the inspection: To locate and inspect stormwater drainage and sanitary sewer I/I connections.

b. Explanation of inspection procedures:
- Visual inspection of outside property, checking for area drains, basement entry drains, driveway drains, and roof drains or downspouts piped underground.
- Visual inspection inside the home/building basement drainage. Check for sump pump and/or sump pit in basement.

SERVICE LATERAL INSPECTION PROCEDURE STEP 2 and 3

ACTIVITY/SUBTASK

- Photographs will be taken of all observed defects.

c. Dyed-water testing procedures for suspect sources: Dyed-water testing procedures should be explained to owner/building manager: explain purpose of test and assure owner/building manager that dye is non-toxic and biodegradable.

d. Explanation of Lateral CCTV procedures:
- Removal/replacement of cleanout cap.
- Cleanup/housekeeping. Note – crews will wear disposable booties to prevent tracking into house.
- Possible need, and permission, to CCTV from main if the occupant has consented to a building inspection, but CCTV from the house cannot physically be accomplished. (Refer to Attachment D)

4. **Conduct Dyed-water Testing as Needed:** Testing procedures shall be followed in accordance with the Dye-water Testing Guidelines and Procedures (Appendix E of the PASARP).

5. **Conduct CCTV Inspection as Needed:** Inspection procedures shall be followed in accordance with the CCTV Inspection Guidelines and Procedures (Appendix I of the PASARP).

6. **Follow-up with Owner/Building Manager:** Thank the owner/building manager for their cooperation; replace any sump covers and draining grates disturbed during testing. Clean-up any dye residue and leave the property in the same or better condition than you found it. Inform the occupant that no further action will be needed on their part at this time and that based on the results of the testing, they may receive a call or letter from DWM *or contractor*.

7. **Completing the Building Inspection Form:** The Building Inspection form and accompanying procedures for completing the form are included as Attachment E.

8. **Documentation:** Complete the Private Lateral Building Inspection Form: This form and accompanying procedures for completing the form are included as Attachment E.

9. **Refused Entries:** If the resident refuses entry for inspection or testing, the inspector will politely thank the resident and leave the premises. **Do not attempt entry or argue with any uncooperative occupant!** Forward information to the DWM Supervisor *or contractor* for further action.

RISK MANAGEMENT PLAN

11. Damage to private property must be avoided at all times. Great care should be exercised to avoid damage to yard, trees, bushes, flowers, etc.

12. Care must be exercised when dye testing suspect inflow sources to prevent dye from staining gutters, downspouts, siding, trim, or any sidewalk or paved surfaces both in and around the property.

13. Care must be taken during CCTV inspections to make sure no damage to the lateral is incurred.

14. Care must also be taken if pets are encountered during inside or outside inspections. If you feel that there is a possibility of being bitten or that the yard or house can't be entered safely, request that the homeowner/tenant restrain the pet during inspection and testing.

SERVICE LATERAL INSPECTION PROCEDURE STEP 2 and 3

ACTIVITY/SUBTASK
15. Correction of any damage to private property resulting from negligence on behalf of the DWM inspection crew(s) *or contractor* will be DWM's *or contractor's* responsibility and will be corrected immediately.
16. If care is taken and unavoidable damage occurs, then the following procedure will be followed: a. If damage to the building plumbing occurs (not related to service laterals), a plumber will be contacted to make repairs. The plumber will invoice DWM *or contractor* (and the contractor will apply for reimbursement from DWM). b. If a service lateral needs to be repaired, DWM staff *or contractor* will evaluate the repair site. c. DWM crews *or contractor* will provide the following information to DWM Supervisor: • Address. • Location (front/back). • Pipe Diameter. • Pipe Material. • Estimated Length of Repair. • Estimated Depth. • Pertinent Surface Features (Driveway, Trees, etc.) d. The DWM will dispatch a crew to evaluate the repair site. This work may also be performed in coordination with a designated contractor. The contractor will perform the repair and coordinate with DWM on reimbursement for repair costs and the contractor will provide documentation, including photos, of any repair work completed.] e. In all cases, the first concern will be to restore the customer's service (the contractor will work with DWM on adjustments to costs).
17. Homeowners will be asked to be present during inspection activities. The homeowner will be informed by the inspection crew if the house lateral is blocked or in need of repair.
18. For any issue with the customer's lateral that cannot be repaired by the DWM *or contractor*, a report form will be completed that describes the issue and the action to be taken.
19. If a homeowner contacts the DWM *or contractor* with a potential claim during or after the inspection, the DWM will investigate the potential claim based on data provided by the homeowner. If appropriate, the issue will be resolved "under the project" and a release obtained. If not, the issue will proceed through DWM's claim process, and the DWM will advise the homeowner how to file a claim.
20. Upon completion of the inspection, the owner/building manager will be requested to sign the Building Inspection Form that is thoroughly completed by the DWM *or contracted inspectors*. These forms will include a box to be checked in the event the owner/building manager declines to sign the form. Note reason for refusal on form, if provided. The owner/building manager will be provided with a copy of the form which will include contact information should further contact be warranted.

Attachment A – Sample "General Notification for Private Lateral Investigation" Letter

(on DWM Letterhead)
Date

Mr./Mrs. ______________
Street
City, State, ZIP

Re: Upcoming Sanitary Sewer Assessment in Your Neighborhood

Dear DeKalb County Resident

The DeKalb County Department of Watershed Management (DWM) is performing a sanitary sewer assessment in your area that will lead to improvements of the sanitary sewer system. The purpose of the assessment is to determine whether there are sanitary sewer defects and/or unauthorized stormwater/other connections that are allowing the entry of ground water and/or rain water into the sanitary sewer and to repair those defects and disconnect the unauthorized connections. The entry of groundwater and stormwater into sanitary sewers can cause the sanitary sewer's capacity to be exceeded resulting in sanitary sewer overflows and spills into rivers and lakes. It can also cause basement flooding or backups of sewage into your home or building creating a health hazard. The ultimate goal is to repair the sewers in order to prevent the entry of groundwater and stormwater, to eliminate sanitary sewer overflows and spills into rivers and lakes, and to eliminate sewage backups and basement flooding in homes / buildings.

Over the next several months, teams of engineers, inspectors, and surveyors representing the DWM will be working in your area. They will inspect external building sewer connections, televise building service and main sewer lines, and inspect manholes. They will carry a signed copy of this letter as well as photo identification during the course of these inspections. Part of the program involves inspection of sewer connections outside of your residence or business to allow DWM to verify connections to the sewer system. This program may include a televised inspection of your building service line which you will have the opportunity to view while the inspection is being conducted.

To schedule an inspection of your residence or business at a time convenient for you, please call DWM *or Contractor* at __________for an appointment. You may also schedule an inspection via email at __________. Since the inspction program must be completed promptly, please call or email us within five (5) days of receipt of this letter. Your cooperation is necessary in order for this program to be successful.

In addition to building and service line inspections, a related evaluation procedure, known as "smoke testing," will be performed in your area. This involves pumping a non-toxic smoke into the sewer lines to detect leaks in the system. During smoke testing, you may observe smoke seeping from the ground around your house and possibly escaping from plumbing vents. You will be notified in advance when smoke testing will take place in your neighborhood, and you will be provided a more detailed explanation of what to expect at that time. We will do our best to keep you informed as this program progresses.

Sincerely,
XXX (Name); XXX (Title)

Attachment B – Sample "Request for Access to Building" Letter

(on DWM Letterhead)
Date

Mr./Mrs. ______________
Street
City, State, ZIP

Re: Request for Building Access - Sanitary Sewer Assessment in Your Neighborhood

Dear DeKalb County Resident,

The DeKalb County Department of Watershed Management (DWM) *or* ___*Designated Contractor*___ sent you a letter dated ____________ requesting you to make an appointment for an inspection of your building; as of the date of the writing of this letter, no response has been received. We subsequently attempted to obtain your telephone number so we could call you to set up an appointment, but were unable to do so. The cooperation of all DeKalb County residents is required so that the assessment of the sanitary sewer system, including connections on private property, can be performed successfully.

A physical inspection of each building is required to provide accurate information on sewer capacity requirements, as well as information on any past flooding or back-up problems you may have experienced. The inspection consists of an inside and outside survey performed by DWM *or* ____*Designated Contractor*____.

To schedule an appointment for a building inspection, you may contact us at __________, during regular business hours (8:00 a.m. - 5:00 p.m. Weekdays).

Your cooperation is requested to ensure the success of this beneficial project currently underway in DeKalb County.

If you have any questions regarding this inspection, please contact DWM *or* ____*Designated Contractor*___ at the number listed above.

Cordially,

DWM Representative

cc: ______________________________
____

Attachment C – Sample "Private Lateral Investigation" Door Hanger" Notification

DeKalb County DWM

ATTENTION

DeKalb County Wastewater is investigating the sanitary sewer system in your area and need to gather information on and/or in reference to your property. **Specifically, we need to schedule an appointment with you to inspect your property for the presence of sources of surface runoff or groundwater entering the sanitary sewer. This is called Infiltration and Inflow (I/I). We have been unable to reach you by letter or telephone.**

Please call within five (5) days to schedule an appointment for an inspection, at:

XXXX

Your cooperation is greatly appreciated.

Field Technician

DeKalb County DWM

ATTENTION

DeKalb County Wastewater is investigating the sanitary sewer system in your area and need to gather information on and/or in reference to your property. Specifically, we need to schedule an appointment with you to inspect your property for the presence of sources of surface runoff or groundwater entering the sanitary sewer. This is called Infiltration and Inflow (I/I). We have been unable to reach you by letter or telephone.

Please call within five (5) days to schedule an appointment for an inspection, at:

XXXX

Your cooperation is greatly appreciated.

Field Technician

Attachment D – Sample "Permission to CCTV Lateral from the Main Sewer" Form

DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT (DWM)
Permission to Televise Lateral from Main

Name: ____

Status: Owner___Tenant___ Building Manager___ (Must be 18 or older to provide consent)

Site Address: ____

Date: ____________________

Permission Granted to CCTV Lateral from Main: Yes ______ No ______

Occupant Signature: ____

□ Check here if occupant declines to provide signature.

Inspector Signature: ____

Attachment E – Sample Private Lateral Building Inspection Form

Note: A building interior inspection will be conducted only if necessary and meets the County Ordinances and codes.

BUILDING INSPECTION

DeKalb County Department of Watershed Management (DWM)

Line Segment: ____________ (Upstream MH) **To** ____________ (Downstream MH) **Basement Floor to Top of Foundation:** ______.___ (ft.)

☐ **Owner** / ☐ **Occupant:** ____________ **Address:** ____ (Bldg #) ____ (Apt #) ____ (Direction) ____________ (Street) ____ (Suffix)

Phone: ____________ **City:** ____________ **State:** ______ **Zip:** ________

Entry Allowed By: ____________ **# of Occupants:** ______ **Years:** ______

Inspection Date	Time	Crew	Status	Comments	Building Photo
___/___/___	___:___	___, ___, ___	___	___	______.JPG ______.JPG

Status: 1 – Complete 2 – Not at Home 3 – Vacant 4 – Refusal 5 – Call Back 6 – External Only 7 – Not Inspected 8 – Other ______

BUILDING INTERIOR INSPECTION

History of Flooding: ______ 1 – None 2 – Sewer Backup 3 – Storm Water

Flood Year	Season	Rain	Source	Maximum Depth	Action
______	______	______	______	____.___ (ft.)	______
______	______	______	______	____.___ (ft.)	______
______	______	______	______	____.___ (ft.)	______
______	______	______	______	____.___ (ft.)	______

Source:
1 – Sanitary Backup
2 – Stairwell Stormwater
3 – Window Well Stormwater
4 – Wall Seepage
5 – Private Line Blockage
6 – Floor Drain
7 – Other

Action Taken:
1 – Called Plumber
2 – Installed Sump Pump
3 – Eliminated Source
4 – Removed Blockage
5 – Called City
6 – None
7 – Other

Season: 1 – Spring 2 – Summer 3 – Fall 4 – Winter

Rain: 1 – Light 2 – Medium 3 – Heavy

Comments: ____________

Building Type: ____ **Basement Finished:** ____ **Foundation Type:** ____ **Basement Wall Type:** ____ **Wall Condition:** ____

Building Type			Basement Finished	Foundation Type	Basement Wall Type	Wall Condition
1 – Ranch	5 – Duplex	9 – Industrial	1 – No	1 – Slab	1 – Poured	1 – Good
2 – Raised Ranch	6 – Townhouse	10 – Institutional	2 – Partial By Sump	2 – Crawl	2 – Block	2 – Cracked
3 – Split Level	7 – Apt. Building	11 – Vacant Lot	3 – Full	3 – Partial 4'- 5'	3 – Stone	3 – Repaired
4 – Two-Story	8 – Commercial	12 – Other ____		4 – Basement		

Backflow Preventer ☐ **Building Age:** ____ (yrs) **Floor Drain Existing:** ______ 1 – No 2 – Yes 3 – Unknown 4 – Hole

Serviced by Crew ☐ **Elevation of Service Pipe:** ______ 1 – Below Floor 2 – Above Floor 3 – Overhead

Comments: ____________

BUILDING SUMP PIT(S) **Comments:** ____________

Pit #	Type	Condition	Sealed	Drain	Foundation	Basement	Laundry	Comment	Photo
1	___	___	___	___	___	___	___	______	______.JPG ______.JPG
2	___	___	___	___	___	___	___	______	______.JPG ______.JPG
3	___	___	___	___	___	___	___	______	______.JPG ______.JPG
4	___	___	___	___	___	___	___	______	______.JPG ______.JPG

Type: 1 – Sanitary 2 – Storm 3 – Combination 4 – Unknown
Condition: 1 – Dry 2 – Wet 3 – Active Water
Sealed/Drain/Foundation/Basement/Laundry: 1 – No 2 – Yes 3 – Unknown

EXISTING SUMP PUMP(S) **Comments:** ____________

Pump #	Location	Capacity (GPM)	Pump Discharge	Active	Source of Water	Diverter	Comment	Photo
1	___	___	___	___	___	___	______	______.JPG ______.JPG
2	___	___	___	___	___	___	______	______.JPG ______.JPG
3	___	___	___	___	___	___	______	______.JPG ______.JPG
4	___	___	___	___	___	___	______	______.JPG ______.JPG

Location: 1 – Inside 2 – Outside
Discharge: 1 – Sanitary 2 – Outside 3 – Sump Drain 4 – Unknown
Source of Water: 1 – Foundation Drain 2 – Sanitary 3 – Combination 4 – Storm 5 – None
Active/Diverter: 1 – No 2 – Yes 3 – Unknown

BUILDING EXTERIOR INSPECTION

Defect #	Defect Type	Length	Width	Comments	RECOMMENDED Test Type: Dye	CCTV	Defect Photo	
1	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG
2	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG
3	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG
4	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG
5	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG
6	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG
7	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG
8	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG
9	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG
10	______	______ (ft.)	______ (ft.)	______________	☐	☐	______.JPG	______.JPG

Comments:

____

____

____

Defect Type:

1 – Service Laterals	7 – Downspout
2 – Transition Joint	8 – Downspout Connect
3 – Driveway Drain	9 – Foundation Drain
4 – Window Well Drain	10 – Crawl Space Drain
5 – Stairwell Drain	11 – Uncapped Cleanout
6 – Area Drain	

Diagram:

N

Address: ______________________

E. Dyed Water Flooding Specifications, Guidelines, and Procedures.

DYED WATER FLOODING SPECIFICATIONS, GUIDELINES, AND PROCEDURES

Dye-water testing is used to identify specific points of entry of inflow and infiltration (I/I) into the sanitary sewer, cross connections between the sanitary sewer and storm sewer, and to identify the path of pipes (mains and laterals). Dye-water testing is also used to determine if a pipe has been abandoned.

The procedure consists of injecting non-toxic fluorescent dye into defects that are identified during smoke testing and manhole inspection, or directly inserted into suspected inflow sources without the aid of smoke testing. The path of the dye is then documented, and leaks in the sewer lines or interconnections with storm sewers or service laterals may be located.

When dye-water testing is used to confirm rain or groundwater entry points into the sanitary sewer, the dye is introduced to roof drain leaders, driveway drains, or area drains. The downstream manhole or cleanout is checked for the presence of dyed water. Dye-water testing may also include flooding ground surfaces via “Top Side” drenching, wherein ground surfaces such as depressions are flooded with water sufficient to verify sources of infiltration.

When verifying whether a service connection to the main line is active or out of service, the dye is added to the service connections and the flow is visually observed. If required, dye may be observed using Closed Circuit Television (CCTV) inspection. Moreover, if a flow path in a sewer system is not known, the dye can be used to determine the direction of flow.

In order to promote safety, minimize risk, and mitigate potential environmental impact, man-entry into manholes is prohibited without an entry permit. The DWM’s preferred method of performing dye water testing is a Top Side procedure at ground level.

DYE - WATER TESTING OF SEWERS

Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION

Dye-water testing is used to study the flow of water from one area to another. Dye-water testing is useful in verifying discharge locations of storm sewer lines, checking for illicit connections between storm and sanitary sewers, and verifying the integrity of sewer lines. The dye is brightly colored, and may cause concern to the public when it becomes visible downstream. Therefore, public notification 72 hours before dye-water testing and interaction during and after the process is critical.

ACTIVITY GOALS AND OBJECTIVES

Goals and objectives for this activity include identifying cross connections between sanitary sewers and storm sewers, documenting I/I entry points into the sanitary sewer system, and confirming the path of laterals and mains. Testing is also used to determine if a main or lateral has been abandoned.

SAFETY ANALYSIS – Specific to job site conditions

Safety	Potential Hazards
• Job Site Analysis for Potential Hazards • Safety Program • Protective Clothing and Equipment (Personal Protection Equipment) • Gases and other Hazardous Atmospheres Analysis (Confined Space Entry) • Underground Services Utilities Locations (If required) • Traffic Safety Requirements (Traffic Safety)	• Infectious Diseases • Slip, Trip, and Fall • Poisonous Snakes, Pests • Confined Spaces (Confined Space Entry) • Traffic • Vehicle Operation • Mechanical Tools • Flooding and Inundation (Confined Space Entry) • Lifting

MANHOLE INSPECTION CHECKLIST

SAFETY – Specific to job site conditions

- Traffic cones
- Yellow vests (for each crew member)
- Hard hats, steel toed boots and gloves (for each crewmember)
- Face shield or goggles
- MSDS for dye
- Flashing beam (mounted on the vehicle)
- Fire extinguisher
- Traffic signs
- Arrow bar/board (for heavy traffic areas, only)
- First-aid kit (fully stocked) and safety manual
- Directions and telephone number to the nearest hospital or medical care facility
- Cellular telephone/2-way radio
- Drinking water and disposable cups
- Hand cleaner – alcohol, waterless, towel-less cleaner, paper towels

CLERICAL

- Work Order
- Maps – street and sanitary sewer
- Confined Space Entry Permit (if required)

- Small note pads (for each crew member)
- Pencils and pens (for each crew member)
- County ID or Vendor/Contractor Name badges (for each crew member)
- Small white board and markers

WORKING

- Calibrated gas & air quality monitor
- Ventilation blower(s) (if required)
- Extra spark plugs for gas powered ventilation blower(s) (if required)
- Florescent dye
- Digital camera
- Digital Closed Circuit Televised (CCTV) Inspection rig
- Lateral inspection camera
- Portable or fixed water source for flooding
- Properly sized pipe plugs, air hose &fittings
- Appropriately sized air compressor
- 15'- 20' ropes
- Extra rope
- 50' or 100' measuring tape
- Manhole-hook
- Pick
- Shovels
- Sledge hammers
- Locator/probe
- Flashlights
- Measuring wheel
- Marking paint
- Manhole marking flags (for use off-road)
- Tool box with necessary tools for routine equipment maintenance

SPECIFICATIONS FOR DYE-WATER TESTING

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

PRE-WORK ACTIVITIES

1. **Permits for Right of Ways:** The supervisor will obtain work permits for all work to be performed in State and/or County Right-of-Ways. The supervisor will also plan for traffic control measures and other terms and conditions of the permits in advance.

2. **Weather, Ground, and Ground Water Condition Requirements:** Dye-water testing will not be conducted when weather conditions inhibit the introduction of dye into the sewer system or where typical system flow cannot be observed. Dye-water testing will be suspended if weather conditions make Dye-water testing unsafe and/or inefficient/ineffective.

3. **Manhole Surcharge and Flow Control:** Dye-water testing may not be performed during a manhole or line segment surcharge condition. The sewer will be relieved before testing can be undertaken.

4. **Public Notification:** The public in affected areas will be notified about the testing utilizing the local paper, web site, letters, and/or door hangers. Notification will be done 72 hours before dye-water testing and will include dates and times of dye-water testing, brief description of activities, and contact number for any questions or concerns.

SITE PREPARATION

1. **Review Work Order:**

    a. The supervisor will review the work order with the dye-water testing crew(s).

    b. The supervisor will review all safety procedures with the crew.

    c. The supervisor will ensure that all necessary material and equipment are on hand and available at the site.

    d. The supervisor will ensure that each critical equipment unit is in proper working order and that a backup unit is on site.

    e. Vehicle operation safety procedures will be followed throughout the testing period.

2. **System Evacuation / Preparation:** Prior to the introduction of dye into a manhole or storm inlet, crews will first monitor the manhole atmosphere with the appropriate gas detection devices to determine whether explosives or other gases is present in concentrations above action limits as established by OSHA standards. If gases or odor are detected, the manhole's atmosphere will be ventilated. Ventilation will be accomplished by removing all manhole covers in the run, then placing a vacuum on the manhole where the blower is located, and/or blowing air into the manhole until acceptable levels of gas and odor are achieved.

ACTIVITY/SUBTASK

3. **Site Security:** Secure the work site by placing traffic control signs and safety devices at the work site.

   a. Follow traffic safety procedures.

   b. Wear all required safety equipment, such as safety vests, hardhats, safety glasses, and steel toe boots.

   c. Isolate one or more lanes of traffic with flags, cones, traffic control signs, etc. where work takes place in or immediately adjacent to roads.

   d. Alert the closest fire department/Emergency Medical Services (EMS) as to the location of the day's work and ask them to stand by for potential emergencies and inquiries.

4. **General Procedures:**

   a. Determine the location of the manhole on the Geographic Information System (GIS) map. Mobilize to testing site.

   b. Once on site, secure the site with safety devices such as directional boards, cones, barricades, flags, and signs.

   c. Use metal detection if manhole is not visible. If the manhole is buried, report its location to Emergency Dispatch immediately and coordinate with other DWM crews for excavation. If the manhole is covered by 18 inches or less of sod or soil, inspection crews may uncover it by hand.

   d. Lift the manhole cover using the hook. Drag the cover with the hook; avoid bending over and using hands whenever possible.

   e. For heavier manholes, use a truck-mounted winch.

   f. Follow confined space procedures if man entry is required. Only trained and certified personnel are allowed to enter a confined space after receiving an entry permit.

   g. Follow OSHA personal protective equipment (PPE) program.

   h. **DO NOT** place your face near the manhole opening. Let the manhole 'breathe" for 10 minutes before looking in.

   i. **DO NOT SMOKE** near manholes regardless of whether the cover is on or off.

   j. **DO NOT STAND** on a removed manhole cover.

   k. **USE IMPERVIOUS GLOVES** when working with an open manhole.

   l. **USE DISPOSABLE TYVEK COVERALLS** to keep sewage off of your uniform.

m. Ensure proper operation of blower.

5. **Confined Space Entry:** Crews will minimize the physical entry of personnel into the sewer facilities. If required, manhole entry will be performed in accordance with Federal, State, local, and any other regulations for confined space entry. Only trained crews and staff may conduct confined space entry after obtaining an entry permit. Staff must use safety required equipment for manhole entry operations, including harnesses, ventilation equipment, etc.

6. **Safe Work Area:** The work area will be protected at all times by an adequate number of cones, barricades, flags, flaggers, and other measures necessary to meet the Manual for Uniform Traffic Control Devices (MUTCD) standards and to properly and safely protect both vehicular and pedestrian traffic. Flag men will work to secure all affected streets. Further requirements for traffic control may be imposed by the specific agency having jurisdiction. All traffic control measures will comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by US DOT / FHWA.

7. **Unsafe Conditions:** Any condition deemed to be an unsafe condition will be immediately reported to the supervisor. Unsafe conditions will require all work to be stopped immediately and an inspection will be performed by the safety officer of the entity performing the work.

8. **Scheduling Time:** Crews will begin inspections after 8:00 am and terminate testing no later than 5:00 pm each day. Any scheduling outside of these designated times will require crews to obtain approval from the County. Work should be performed in timeframes that will allow compliance with the County's noise ordinance.

9. **Storm or Sanitary Sewer Testing Procedure:**

   a. Remove manhole cover and move it away from traffic flow without impacting the work area. Broken or missing manhole covers will be replaced immediately upon discovery.

   b. The supervisor will instruct the crew to apply water to storm drain inlet, manhole, or other access point by use of a water pressure machine or from a pre-approved fixed source.

   c. Dye will be applied directly into the existing flow of the upstream storm drain inlet, manhole, or other access point. Allow 20-30 minutes for the dye to disperse and travel, (in accordance with dye manufacturer's recommendations).

   d. The crew will observe the downstream manhole or other observation location to determine if dye is present.

   e. If the dye is detected at the downstream manhole or observation location, CCTV inspection will be performed to precisely identify the location of the defect.

   f. The supervisor will position the camera in proximity to the assumed cross connection or defect spot and the dye-water testing procedure will be performed again.

   g. The supervisor will leave the camera at the defect location for dye to be applied then observe the defect location for signs of dye.

h. When the dye is detected, a mark on the ground or pavement will be made with marking paint or a flag indicating the location of the defect above ground.

i. The work order map will be marked with the location, type, and severity of the defect.

j. CCTV video recording of the defect will be coded in compliance with NASSCO's Pipe Assessment Certification Program (PACP) and turned over to appropriate DWM authorities for rehabilitation.

10. Infiltration Detection in Creek Main (Dry Weather Only):

a. The supervisor's job assignment will include maintaining a map and address for the inspection.

b. The supervisor will assess the information, gather the equipment and tools needed for the job, and mobilizes to the job site.

c. Once on site, the crew will secure the site with safety devices such as directional boards, cones, barricades, flags, and signs.

d. The crew will initiate plugging of the main downstream of flow. If manhole entry is required, confined space entry procedures will be followed using only trained and certified personnel with an entry permit.

e. The crew will apply dye to the flow line from the upstream manhole.

f. The crew will allow 20-30 minutes for travel and proper dilution of dye.

g. The crew will inspect the line between the two manholes for signs of dye in the creek.

h. The crew will monitor flow line back-ups by inspecting laterals and upstream manholes from the plugged manhole.

i. When the dye is detected in the sewer, a mark will be made on the ground with marking paint or flag indicating the location of the defect above ground.

j. As appropriate, the supervisor will perform a CCTV inspection as prescribed in the CCTV Procedures, Guidelines, and Specifications Appendix I.

k. If no dye is detected, the supervisor will exercise best professional judgment as to whether other evaluative tools should be applied.

11. Lateral Service Testing *(For additional information on private laterals, refer to Private Lateral Assessment Guidelines in Appendix D of the PASARP)*:

ACTIVITY/SUBTASK

a. The supervisor will assess the information, gather the equipment, and tools needed for the job and mobilize to the site.

b. Once on site, the crew will secure the site with safety devices such as directional boards, cones, barricades, flags, and signs.

c. The supervisor will speak with the resident of the property and ask for permission to enter and perform a dye-water test. If the location is an abandoned lot and a cleanout is present, it will be located and used for applying the dye.

d. The crew will add dye to a toilet. (For proper detection in the sewer system, allow 20-30 minutes for dilution and flow travel).

e. The crew will observe the manhole directly downstream of the tested lateral.

f. When dye is detected at the downstream line segment, the path between the sanitary sewer and the private property will have been established. This information will be used to determine if service is still being provided.

g. If the dye is not detected, a lateral camera may be inserted in the cleanout and pushed to review the lateral service line. The dye-water testing procedure will be performed again to verify a possible cross connection between two properties or an abandoned lateral.

h. If no cleanout exists, laterals may be inspected from inside the sewer main.

i. If a problem is detected on private property, the resident will be notified. It is the resident's responsibility to correct any deficiencies identified.

j. If CCTV is required, the CCTV video recording of the defect will be coded in accordance with NASSCO's Pipe Assessment Certification Program (PACP).

12. Sewer Main Testing: (Determine Live/Abandoned Status)

a. The supervisor's job assignment for sewer main testing will include specifying precise locations, including a map and address for the inspection.

b. The supervisor will assess the information, gather the equipment and tools needed for the site and mobilize to the job site.

c. Once on site, the crew will secure the site with safety devices such as directional boards, cones, barricades, flags, and signs.

d. The crew will apply dye directly into flow of upstream manhole or other access location of the suspected abandoned line. (Allow manhole time to ventilate prior to applying dye).

e. The crew will allow 20-30 minutes for travel and proper dilution of dye.

ACTIVITY/SUBTASK

f. The crew will observe the downstream manhole or access location flow for signs of dye.

g. If dye is detected, the flow line will have been established and the main will be considered live.

h. If no dye is detected, CCTV will be performed on the main.

i. Dye-water testing will then be performed and monitored using CCTV.

j. If no dye is detected and no lateral services are located, the line segment will be considered abandoned.

13. Equipment Removal and Breakdown:

a. Upon completion of the dye-water testing, tools, plugs, loose dirt, stones, and other foreign material will be removed from the mating surface of the rim before replacing the manhole cover. When replacing the manhole cover, the supervisor will ensure that the cover is seated properly. The cover will also be adjusted if necessary. If the cover cannot be seated correctly, a notation will be made on the manhole log and Emergency Dispatch will also be notified.

b. Traffic control devices will be secured before the crew proceeds to the next test site.

14. Data Evaluation:

NASSCO PACP/LACP ASSESSMENT

a. Consistency is necessary in all aspects of the investigation. All defects should reviewed closely and observations should be well documented. NASSCO's Manhole Assessment and Certification Program (MACP), Pipe Assessment and Certification Program (PACP), and Lateral Assessment and Certification Program (LACP) are valuable tools in the sewer system assessment process. These programs allows for consistency of documentation and a repeatable process for evaluation.

b. The goals of MACP, PACP, and LACP coding are: define attributes and features of the structure, document and explain defects, develop ratings for each applicable component of a pipe segment or service lateral (structural rating, O&M rating, and I/I rating), and record dimensional data that can be used for selecting rehabilitation methods. This standardized methods for reporting the results of condition assessment ensures consistency, promotes cost efficiency, and avoids unnecessary rehabilitation work.

c. Following the completion of the field data gathering, the data will be reviewed by qualified technicians to record the defects. Priority grades will be assigned to all defects using the appropriate NASSCO assessment certification and grading system.

SPECIFICATIONS FOR DYE-WATER TESTING

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

DOCUMENTATION

As indicated in the preceding paragraphs, defect inspection documentation will be carried out in accordance with NASSCO's MACP, PACP, and LACP by trained personnel. Data will be recorded on a paper form and entered into a database, using the required file format in Microsoft ACCESS® Version 2003 or higher. The dye-water test database will include the following information at a minimum, and a sample paper form is included. The supervisor will ensure that, at a minimum**,** the following information is recorded.

1. Date, time, and weather condition.
2. Names of testing personnel
3. Location, including reference to the relevant manhole segment (upstream and downstream manholes ID numbers) and the nearest street address.
4. Description of the dye-water test results.
5. Status of structure tested (private or public).
6. Source type.
7. Ponding of affected area (length and width in feet).
8. Percent of area that is paved (run-off).
9. CCTV utilization.
10. Digital color photographs of the results of each test with precise description of photo content and location (refer to photographic documentation procedures).
11. A schematic layout of the manholes and sewer mains being tested noting the location of sandbags and/or plugs, address and location, manhole ID numbers, photo number and direction taken, dimensional ties and offsets to the documented inflow, and area and type of surface drained. (Note geographical orientation relative to north.)

PHOTOGRAPHIC DOCUMENTATION PROCEDURES

Each dye-water test will be photographed using high-resolution digital photography. Digital photographs will be provided in jpeg (jpg) format. The resolution of the photographs will be a minimum of 72 x 72 dpi and minimum dimension of 640 x 480 pixels. The photographs will be referenced in the database by filename along with the location of the dye-water test.

Photographs will be taken in such a way that the dye test is clearly visible in the foreground and a distinct fixed reference is visible in the background. When possible, a placard will be placed in the photo referencing the test number. For example, if the dye-water test is on a private service main in front of a house, the photograph will include a sufficient image of the house so that a person can re-visit the site and identify the defect point, using only the photograph and address. This method of

ACTIVITY/SUBTASK
referencing will support QA/QC to ensure that dye-water tests, and their associated data, can be confirmed by a person other than the original testing crew. Digital photographs will be orientated so that the long side of the photograph is horizontal and that 4"x 6" printed copies can be incorporated in the hard copy of the dye-water testing report. The digital photographs will incorporate references including the date the photograph was taken. Each picture will have clearly annotated text using the following naming convention: [UPSTREAMMANHOLEID#]D[PHOTOID#].JPG.

Attachment A – SAMPLE DYE TEST FORM

DYE TEST FORM

1. DYE CREW:_______________________________ DYE DATE:_______/_______/_______
2. UPSTREAM MANHOLE:_____________________ DOWNSTREAM MANHOLE:______________________
3. WEATHER CONDITIONS:____

OBS #	SOURCE ADDRESS/LOCATION (ALL POSITIVE AND SUSPECT)	DYE RESULT	STATUS	SOURCE TYPE	AREA		RUN-OFF	TV	TIME		ROLL/ PHOTO#
					LENGTH FT	WIDTH FT		Y/N	START	END	
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

RESULT CODES
POSITIVE
NEGATIVE
CANNOT TEST

STATUS CODES
PRIVATE
PUBLIC

SOURCE TYPE CODES
SERVICE LATERALS
TRANSITION JOINT
DRIVEWAY DRAIN
WINDOW WELL DRAIN
STAIRWELL DRAIN
AREA DRAIN
DOWNSPOUT
DOWNSPOUT CONNECT
FOUNDATION DRAIN
BUILDING INSIDE
CATCH BASIN
STORM DITCH
STORM MANHOLE
MAIN SEWER
UPSTREAM MANHOLE
CLEANOUT
OTHER

RUNOFF CODES
0% PAVED
25% PAVED
50% PAVED
75% PAVED
100% PAVED

N

COMMENTS____
____

Attachment B – Sample Public Flyer

Date Visited:______________

DeKalb County Department of Watershed Management

Notice to Residents
Dye-Water Testing of Sewer Collection System

In the next few days the DeKalb County Department of Watershed Management will be conducting dye-water tests within your neighborhood as part of an ongoing program to detect leaks within the sewer collection system. Dye that you may see is **non-toxic and will not harm children, pets, or plants**.

Please help us notify shut-ins in your area that may not receive this notice.

If dye enters your house, you should report it to the crews conducting the test so that they can help you locate the source while the test is still in progress. Repairs to your internal plumbing are your responsibility. We are only testing for problems on the sewer mains outside.

Please accept our apologies for any inconvenience this may cause. If you should have any questions regarding these tests, please call DeKalb County, Department of Watershed Management Customer Service at 770-621-7226 or the *Contractor conducting the testing at xxx-xxx-xxxx*. Thank you for your assistance with this project.

Attachment B – Sample Letter

:

Date
TO WHOM IT MAY CONCERN

This letter is to notify you that the DeKalb County Department of Watershed Management and its contractors will be working on the sanitary sewer system in your area. DeKalb County is in the process of investigating sewers and manholes in order to identify repairs that are needed to improve the performance of the sewers and to eliminate sanitary sewer overflows. In the next several months, some residents will notice that fluorescent dye is injected into drains and sanitary sewers or is noticeable in nearby streams. This is part of the testing program to find leaks in the system. The dye is non-toxic, and will not harm people, pets, or plants.

The dye-water testing program and necessary repairs of sewer pipes are part of the County's multi-million dollar planned investment over the next seven (7) years to repair sewer pipes and to make improvements to the overall sewer system. This investment is in addition to regular operations; maintenance, and routine capital projects and is the beginning of a major investment in the aging infrastructure. This investment by ratepayers is not funded by taxes but rather is funded by the rates paid for sewer service on the utility bill.

Work will begin in your area in the next few weeks. Dye-water testing teams typically have one (1) to four (4) people. Their trucks will have the DeKalb County logo or DeKalb County's contractor logo displayed on the door panels for easy identification. In addition, each inspector will be wearing an identification badge. Their work will occur during the day from 8:00 A.M. – 5:00 P.M. Monday through Friday.

- During the process of dye-water testing, it is normal for dye to be injected into drains and sewers.
- The dye is not harmful, and should not enter buildings.

If you have questions or concerns, please contact us at:

DeKalb County, Department of Watershed Management
Phone Number 7:00 am to 5:30 pm weekdays
Phone Number after hours
www.dekalbcounty.gov

Sincerely,

Name,

Collection System Supervisor

END OF GUIDELINES

F. Corrosion Defect Identifications Specifications, Guidelines, and Procedures.

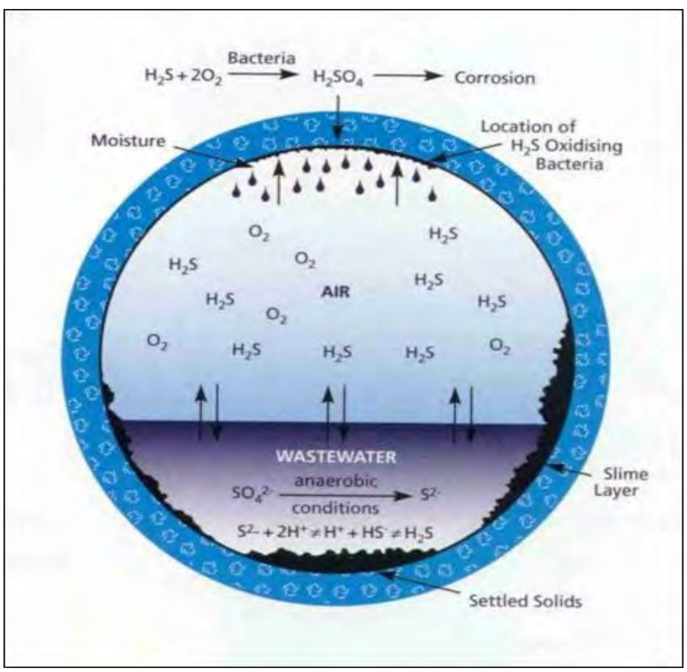
CORROSION DEFECT IDENTIFICATIONS, AND GUIDELINES

The Department of Watershed Management (DWM) Corrosion Defect Identification Program is designed to provide a mechanism for identifying and inspecting segments/components of the wastewater collection and transmission system (WCTS) within the Initial and Additional Priority Areas that are already corroded or are at risk of corrosion and then prioritizing identified corrosion defects for repairs. This document provides an overview of the causes of corrosion and a three step process for identifying, inspecting, and repairing sewer infrastructure that is corroded.

Background

One of the products of wastewater degradation is Hydrogen Sulfide (H_2S) gas. H_2S causes odor and can lead to corrosion in gravity sewers, manholes, force mains, and components of lift stations that are vulnerable to corrosion. H_2S is heavier than air and can be detected by the human sense of smell at very low concentrations (average threshold of 0.02 parts per million) and is hazardous and lethal in higher concentrations. H_2S generation involves a biological process that occurs in the submerged portion of the sanitary sewer and is dependent on the growth of a slime layer and affected by organic food source concentration, temperature, pH, and the velocity of wastewater flow. Figure 1 below depicts the biological and chemical interaction in the development of H_2S gas in a sewer pipe [Water Environment Research Foundation (WERF) *Minimization of Odor and Corrosion in Collection Systems – Phase I*, 2007].

Figure 1 – Hydrogen Sulfide Gas Generation



Segments/components of sewer infrastructure with relatively high potential for H_2S accumulation include the following:

- Flat, low velocity/long retention time gravity sewers areas where solids can accumulate.
- Lift stations.
- Turbulent areas, drop manholes, force mains, and force main discharge points.
- Inverted siphon discharge points.
- Areas with odor complaints.
- Exposed pipes in creeks.
- Lines that cross major petroleum or gas transmission pipelines (risk of stray current).
- Industrial areas where corrosive chemical discharges may be occurring.

Vitrified clay, fiberglass, high density polyethylene, and PVC pipes are very resistant to H_2S corrosion, while concrete, steel, composite, and iron pipes are susceptible to H_2S corrosion.

Corrosion Defects Identification Guideline

Step 1: Data and Information Review Process to Identify Infrastructure Corroded or at Risk of Corrosion

Activities to be considered for the identification of sewer infrastructure that is already corroded or at risk of corrosion within the Initial and Additional Priority Areas will include the following:

- Use of Geographic Information System (GIS), asset databases, as-built drawings, and information obtained from DWM personnel knowledgeable of the condition of the sewer system to identify potential locations of the following where feasible:
    - Metallic and concrete sewers.
    - Force mains/force main discharge points (additional detail provided below under Force Mains).
    - Inverted siphon discharge points.
    - Exposed metallic or concrete pipes in creeks.
    - Pipes that cross major petroleum or gas transmission pipelines.
    - Lift stations.
    - Drop manholes.
    - Manholes with structural defects susceptible to corrosion.
- Review and documentation of locations of odor complaints and identify the areas around odor complaints for further assessment/review.
- Identification of industrial areas where corrosive chemical discharges may be occurring.

- Interviewing Construction and Maintenance (C&M) supervisors and field crews to identify areas where odor is prevalent and areas where corrosion has been visually identified.
- Review of flow monitoring data to identify areas of low velocity/relatively long retention times.
- Review of the hydraulic model or components thereof to identify areas of low velocities/long retention times (once the hydraulic model is completed).

Once assets are screened and listed for each identified Initial and Additional Priority Area, proceed to Step 2.

Step 2: Inspection of Infrastructure at Risk of Corrosion Manholes

Manhole condition assessments for those assets identified in Step 1 will be completed using inspection technologies such as visual and/or pole camera inspections. For manholes that have already been inspected, inspection data will be reviewed for corrosion defects. The procedure for manhole inspections is provided in Appendix G of the PASARP, Manhole *Condition Assessment Guidelines*. The Manhole Condition Assessment Guidelines include a form to be completed in the field that includes defect codes for corrosion using the National Assessment of Sewer Service Companies (NASSCO) Manhole Assessment and Certification Program (MACP) guidelines.

During routine sewer system maintenance activities, field crews from the DWM regularly make note of areas suspected to the accumulation of H_2S. The presence of a "rotten egg" sulfur odor is a reliable indicator of the presence of H_2S gas. Crews from the DWM are equipped with portable gas detectors that alert them of the potential presence of H_2S gas above preset concentration levels. The presence or absence of H_2S will be recorded on the form provided in the *Manhole Condition Assessment Guidelines* in Appendix G of the PASARP.

Manholes which have severely compromised structural integrity and that pose a hazard to personnel or the general public will immediately be scheduled for replacement or rehabilitation. Manhole corrective actions will be documented in the DWM work order system.

Gravity Sewers

After a list of pipe segments (manhole to manhole segments) or components have been identified in Step 1, these segments and/or components of gravity sewers will be inspected by Closed Circuit Television (CCTV). DWM's *Closed Circuit Television (CCTV) Inspection Guideline* (Appendix I of the PASARP) provides forms and instructions that include corrosion defect identification using NASSCO Pipeline Assessment and Certification Program (PACP) guidelines.

CCTV for segments and components identified as being at risk of corrosion will be completed where CCTV has not already been performed as part of the sewer system condition assessment within the Initial and Additional Priority Areas. Previous CCTV results will be reviewed to identify corrosion defects.

Should CCTV inspection results not provide sufficient information regarding the extent of corrosion defects, other inspection tools will be used as appropriate for the type of pipe to be inspected. Lasers and sonar are also used in gravity and surcharge sewers, respectively, and can provide useful information particularly when there is measureable wall thickness loss. Should additional assessment be required, contractors and vendors who specialize in sewer system corrosion will be engaged to perform appropriate sewer system assessment. Soil corrosivity analysis, where applicable and determined effective and necessary, will be used to quantify corrosion risk. Soil corrosivity analysis will be performed in accordance with ASTM G187 standard procedure or other appropriate method. The results obtained from soil corrosivity analysis will be recorded on the form provided in Attachment A and then archived in the DWM GIS to facilitate further analysis and future maintenance efforts.

Also r*efer to Appendix J of the PASARP, Gravity Sewer Line and Force Main Defect Analysis Guideline.*

Force Mains and Force Main Discharge Locations

Prior to engaging in Step 2 activities, additional data and information topics will be reviewed in preparation for inspection of force main routes, air release valves, and force main discharge locations. These preliminary inspection data and information reviews are more relevant for metal pipe materials but can be applied to other pipe materials because of their metal appurtenances. The data and information review will include topics such as:

- Historical maintenance records (leak, repair, and excavation records).
- Available construction and as-built drawings.
- Pipe material and characteristics (wall thicknesses, pressure rating, flow rates, and air release valve points, operational status, coatings, and linings).
- GIS records to confirm the force main route.
- Above ground crossing location.
- High point locations.
- Air valve locations.
- Soil sample conditions (corrosivity, pH, moisture, and resistivity, see soil analysis below).
- Backfill and bedding material.
- Force main discharge locations (outfall).

After data and information review is completed, the overall force main length will be subdivided into shorter segments, if necessary, to best represent groupings of common factors that would differentiate individual segments from adjoining segments and therefore be represented by different condition scores. The establishment of segment boundaries will be based on factors such as locations of valves and locations of piping intersection locations.

Once the force main segments are established, external visual inspections of pipes will be performed at points exposed or easily exposed. Force main routes will also be walked to identify readily apparent visual indications of pipe breaks or dips in the ground. Visual inspections will be performed to identify defects particularly around air release valves and connections to open air discharge points from the force main to the manhole. A Force Main

Inspection Form (Attachment B) will be used to document results and attributes of each particular pipe segment. This form will not be used to generate condition scores. Condition scores will be developed for each force main segment (and gravity sewer segment) as discussed in Step 3.

Progressive non-destructive and destructive inspection tests will be performed when the physical integrity and internal condition of the force main is determined to require further assessment based on preliminary results obtained from visual inspections and records review. Various non-destructive and destructive assessment methods are available and may include, but are not limited to, acoustics, ultrasonics, electromagnetic current, and/or pit-depth measurement. The selection of the most effective technology or combination of technologies to use will be on a case-by-case basis.

Also refer to Appendix J of the PASARP, Gravity Sewer Line and Force Main Defect Analysis Guideline.

Lift Stations

Lift Station assessment will be completed using visual inspection process first. Upon completion of visual inspections, the presence or potential presence of H_2S will be confirmed using portable gas detectors. The presence or absence of H_2S will be recorded on the form provided in the Lift Station Inspection procedure below. Wet wells will be visually inspected and the general appearance noted prior to cleaning. Wet well retention times will also be noted to determine if retention times are too long (zoom camera inspection can be undertaken to obtain visual results within the pipe or force main interface with the lift station without entering the structure). Inspection results will be recorded on the Lift Station Inspection Form provided below. Results of lift station inspections will be assessed in Step 3, to prioritize repair/rehabilitation corrective actions for lift stations. Best professional judgment will be used in the scoring process to catalog the severity of defects.

Step 3: Corrosion Defect Analysis and Prioritization

Corrosion defects will be analyzed to determine if the source of the corrosion is readily apparent: e.g. H_2S related, corrosive wastewater influent, or operations or maintenance related activities. This determination will be based on the categories of deficiencies or defects identified such as:

- Presence of H_2S during inspections of manholes, gravity pipes, force mains, and lift stations
- Corrosion defects that are identified in areas with no presence of H_2S will be investigated further to determine the source of the corrosion. This process will include identification of upstream industrial dischargers and review of Industrial Pretreatment waste sampling reports. Reports will be reviewed for low pH and the presence of potentially corrosive chemicals.
- Retention times of wastewater in wet wells may be a major component of H_2S and slime build up that causes the generation of H_2S gas. Operations and maintenance changes to reduce the impact of H_2S gas on infrastructure will be evaluated.

Prioritization of repair of corrosion defects will be an inclusive process that will be a part of the PASARP process.

CORROSION INSPECTION PROCEDURES AND SPECIFICATIONS

Date of Revision: December 12, 2012

ACTIVITY DESCRIPTION

Corrosion inspection procedures are designed to provide for a mechanism for identifying and inspecting sewer infrastructure that is corroded or at risk of corrosion. The corrosion inspection procedures presented below include inspection procedures and forms, as applicable, for external visual inspection of force mains and lift station inspection.

- Inspection of manholes procedure for corrosion is provided in Appendix G of the PASARP, *Manhole Condition Assessment Guidelines*.
- Gravity pipe CCTV inspection procedure for corrosion is provided in Appendix I of the PASARP, *CCTV Inspection Guideline*.
- Force Main Corrosion Inspection Procedures and Form are included in this document.
- Soil corrosivity analysis for gravity sewers and force mains shall be performed in accordance with ASTM G187 standard procedure or other appropriate method. Soil corrosivity results for gravity sewers and force mains shall be recorded on the form provided in Attachment A below.

ACTIVITY GOALS AND OBJECTIVES

The objective of the Corrosion Inspection Procedures is to provide a mechanism for identifying and inspecting infrastructure that is corroded or at risk of corrosion. The goal of Corrosion Inspection Procedures is to identify corrosion related sewer defects.

SAFETY ANALYSIS - Specific to job site conditions

Safety	Potential Hazards
• Safety Program • Protective Clothing and Equipment (Personal Protection Equipment) • Gases and other Hazardous Atmospheres Analysis (Confined Space Entry) • Overhead Power Lines (Electrical Safety) • Traffic Safety Requirements (Traffic Safety)	• Infectious Diseases • Slip, Trip, and Fall • Poisonous Snakes, Pests • Confined Spaces (Confined Space Entry) • Traffic • Vehicle Operation • Mechanical Tools • Electrical Hazards (Electrical Safety) • Flooding and Inundation (Confined Space Entry) • Lifting

CORROSION INSPECTION TESTING CHECKLIST - Specific to job site conditions

SAFETY

- Hydrogen Sulfide Gas Detector
- Traffic Cones
- Yellow Vests (for each crew member)
- Flashing Beam (mounted on the vehicle)
- Fire Extinguisher
- Traffic Signs
- Arrow Bar/Board (for heavy traffic areas, only)
- First-Aid Kit (fully stocked) and Safety Manual
- Cellular Telephone/2-way Radio
- Drinking Water and Disposable Cups
- Hand Cleaner – Alcohol, waterless, towel-less cleaner, paper towels

CORROSION INSPECTION PROCEDURES AND SPECIFICATIONS

Date of Revision: December 12, 2012

CLERICAL

- Supply of Inspection Forms
- Supply of Field Photo Forms
- Clipboards
- Scotch Tape
- Maps – Street and Sanitary Sewer
- Small Note Pads (for each crew member)
- Pencils and Pens (for each crew member)
- Contractor ID and Vendor/Contractor Name Badges (for each crew member)
- Carpenter's Aprons (for each crew member)
- Small white board and markers

WORKING

- Camera and supplies
- Locator/probe
- Flashlights
- Hydrogen sulfide detection badges
- Soil corrosivity equipment as required by ASTM G187 standard procedure
- Lift Station Wet Well Cleaning Equipment (vacuum truck, bypass pumping equipment, hoses, etc.)

EXTERNAL INSPECTION OF FORCE MAINS

1. Force main routes, air release valves, and force main discharge points will be walked and visually inspected for evidence of corrosion or corrosion induced leaks where applicable.
2. The visual inspections will be performed after a review of the record drawings to confirm the force main's route, high points or special crossings, air valve locations, and point of discharge.
3. The soil corrosivity will be performed as needed on a case by case basis. Results shall be documented on the Form included as Attachment A to this document.
4. **Permits for Right of Ways**: The Supervisor shall obtain work permits for all work to be performed in State and/or County Right-of-Ways. All other insurances, traffic control measures, and other terms of the permit shall be obtained and planned for in advance.
5. Photographic Documentation:

   a. Crews shall document each corrosion defect using a digital camera supplied by the supervisor.

   b. A close up picture shall be taken to show a detailed view of the defect.

   c. The digital photographs shall incorporate references including the date the photograph was taken.

d. Digital photographs shall be horizontally oriented (4x6 inch) and attached to the form in Attachment B.

LIFT STATION INSPECTION

1. Lift stations shall be visually inspected for evidence of corrosion. Wet well retention times and condition shall be documented prior to cleaning. Review plans and field measurements to determine wet well retention times and condition as part of the determination for the release of H_2S from solution to atmosphere prior to cleaning or as part of the assessment process.
2. Wet well inspections will be coordinated with wet well cleaning.
    a. Influent shut-off valve and/or upstream manholes shall be checked for suitable plug locations. Use of flow diversion pumping equipment, if needed, will be coordinated with all parties involved.
    b. To the extent feasible, wet wells shall be cleaned at the same time as the lift station is being dewatered.
    c. If heavy grease deposits are present, a degreaser solution shall be used.
    d. To facilitate a thorough inspection, shut-off valves shall be closed or a plug shall be installed in the upstream manhole.
    e. Upstream flow shall be monitored continuously. If flows approach depths that would cause a sanitary sewer overflow, the manhole plug shall be released or the shut-off valve shall be opened to allow the flows into the lift station for pumping.
    f. The bottom of wet well shall be vacuumed with extension tubes to remove debris and sediment.
    g. If dewatering of truck is necessary, the manhole plug shall be opened or the shut-off valve shall be opened. The back of the truck shall then be dewatered back into wet well (liquid only) and the process shall be repeated until sludge & debris is removed from the truck.
    h. Remove plug or open shut-off valve to restore flow to the wet well.
    i. Repeat “f.” if necessary.
    j. Dewater truck at next station and dispose of grit, grease and debris at an approved facility in accordance with all applicable local, state and federal regulations.
3. Once wet well is cleaned and in a dewatered state visual and zoom camera inspections of wet well shall be performed.

4. Observations made on the wet well shall be recorded on the Lift Station Inspection Form (Attachment C).

Attachment A – Soil Corrosivity Form

Soil Corrosivity Form

Location: ____

Pipe Segment (Manhole to Manhole ID for gravity sewers, lift station for force mains): ______________________________

Date: ____________ **By:** ________________

Pipe Information

Pipe Diameter: _____ inch

Installation Date: _____

Pipe Type

☐ Galvanized ☐ Copper

☐ Cast Iron ☐ Steel

☐ Ductile Iron ☐ CCP

☐ Other: _____

External Coating: _____

Soil Condition

Dept of Cover: _____ feet

Principal Soil Type

☐ Clay ☐ Gravel ☐ Mixed

☐ Loam ☐ Rocky

☐ Sand ☐ Glacial Till

Groundwater at _____ feet

Soil Resistivity _____ ohm-cm

☐ Soil Box ☐ Single Probe ☐ Wenner 4-pin

Depth of Test Measurement _____ feet

Notes:

Attachment B – External Force Main Inspection Form

Force Main Pipeline Inspection Report

Inspector name:	Date:	Address of pipeline inspection:		Leak? ☐ Yes ☐ No		File Number:	
1. Type of Pipe:	☐ Cast iron	☐ Ductile iron	☐ Carbon steel	☐ Copper	☐ Non-metallic	☐ Concrete	Other:
2) Diameter of pipe in.	Pipeline Name:		Service Type: ☐ Water ☐ Wastewater		Estimated date of pipe installation:		Depth of pipe ft.
3) Type of Pipe:	☐ Distribution	☐ Transmission	☐ Service	☐ Hydrant	☐ Mechanical joint	☐ Fasteners	Other ☐ Unknown
4) Type of Coating:	☐ Polyethylene encased	☐ Shop applied coating	☐ No coating	☐ Tape wrap	☐Unable to determine		
5) External Pipe Condition:	☐ Very Good	☐ Good	☐ Poor	Comments:			
6) Ultrasonic Thickness Measurements and comment (if applicable):	Internal lining present? ☐ Yes ☐ No	Comments:					
7) Is corrosion pitting evident? ☐ Yes ☐ No	Number of pits:	Typical size of pits:	Quantity of pits:				
8) Is graphitization evident (longitudinal or circumferential breaks)? ☐ Yes ☐ No							
9) The pipe is installed in (check appropriate items):	☐ Industrial area	☐ Residential area	☐ Rural area	☐ Near street or road			
	☐ Near creek or waterway	☐ In reclaimed land	☐ Near oil or gas pipelines	☐ Near high-voltage lines			
10) Describe soil conditions where inspection occurred:	☐ Wet	☐ Dry	☐ Clay soil	☐ Rocky soil	☐ Cinders	☐ Other	
11) Were soil samples obtained, sealed, and analyzed for chlorides, moisture content, pH, sulfides, and resistivity? ☐ Yes ☐ No	If yes, results were:						
12) Were previous repairs made on the pipeline (leak clamps, etc.)? ☐ Yes ☐ No	Was new pipe installed? ☐ Yes ☐ No						
13) Was a repair clamp installed on the pipe during inspection? ☐ Yes ☐ No							
14) Was a galvanic anode installed as part of the inspection process? ☐ Yes ☐ No	If yes size and quantity:						
15) Please relay additional comments:							
16. Plan of Action:							
17. Insert Digital Photo below:							

Attachment C – Lift Station Inspection Form

Lift Station Inspection Form For Corrosion

Location: ____

Station No. ____________________ **Date:** ____________ **By:** ____________________

Station Information

Wet Well Depth:	_____	Lift Station Capacity:	_____
Wet Well Capacity:	_____	Hydrogen Sulfide Reading (atmosphere):	_____
Hydraulic Detention Time:	_____	Hydrogen Sulfide Reading (solution)	_____
Note turbulence of wastewater coming into the wet well:	_____		

Condition Ratings
(for Lift Station Corrosion Table below)

1	Like New
2	Minor Corrosion
3	Pitting and Some Metal Loss
4	Significant Metal Loss
5	Severe Pitting

Lift Station – Evidence of Corrosion: ***Use Condition Ratings above (1 through 5)***

Lift Station Element	**Condition Rating**
Condition of wet well:	
Condition of pump/motor:	
Condition of electrical /HVAC equipment:	
Condition of pipe:	
Condition of motor control center:	
Condition of building	
Record condition with photographs	

Attachment D – Gravity Sewer and Force Main Scoring Criteria

Wastewater Condition: Gravity & Force Main					
System	Condition Score				
	1	2	3	4	5
Gravity	Excellent (NASSCO Pipe Rating Index 1 or SCREAM 1-25 inspection scores). New or nearly new. Ten or less years old. Ferrous pipe that has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths > 10 feet. Little to no infiltration/inflow. No interior wall surface corrosion or material etching. Good pipe alignment; no offset or open joints; no or few minor cracks; good service lateral connections; and no root intrusions.	Good (NASSCO Pipe Rating Index 2 or SCREAM 26-50 inspection scores). Ten to twenty five years old. Ferrous pipe has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths > 10 feet. No to minor infiltration/inflow. Minor, quick fix type defects. No to some areas of interior wall surface corrosion or material etching. Generally good pipe alignment; no to few minor offset or open joints; no or few minor to moderate cracks; generally good service lateral connections; and no to some root intrusions.	Fair (NASSCO Pipe Rating Index 3 or SCREAM 51-75 inspection scores). Twenty five to fifty years old. Ferrous pipe may not have internal or external corrosion protection. Cast iron, concrete, vitrified clay, or PCCP pipe material. Pipe segment lengths less than 10 feet. Noticeable infiltration/inflow but has not caused known problems. Few moderate severity defects or lots of minor severity defects. Evidence of some areas of interior wall surface corrosion or material etching. Possibly some aggregate loose in cementous pipes. Generally good pipe alignment but some sections not aligned; several minor to moderate offset or open joints; few to several moderate cracks or broken pieces of pipe; generally good service lateral connections but several hammer taps; and some to frequent root intrusions.	Poor (NASSCO Pipe Rating Index 1 or SCREAM 76-90 inspection scores). Fifty to seventy five years old. Ferrous, clay, or cementous pipe material. Corrosion protection deteriorated. Within 600 ft of force main discharge. Pipe segment lengths less than 10 feet. Other than rubber gasketed joints or welded joints. Significant infiltration/inflow and causing capacity problems. Several moderate severity defects. Interior wall surface shows uniform corrosion or material etching. Areas of aggregate and wall thickness loose in cementous pipes. Generally good pipe alignment but some sections not aligned; several minor to moderat offset or open joints but a few sever; few to several moderate cracks or broken pieces of pipe but several more sever; generally good service lateral connections but several hammer taps; and some to frequent root intrusions.	Very poor (NASSCO Pipe Rating Index 5 or SCREAM 90-100 inspection scores). Greater than seventy five years old. Ferrous, cementous, or brick pipe material. Corrosion protection deteriorated. Within 100 ft of force main discharge. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints. Severe infiltration/inflow and causing regular capacity problems. Interior wall surface shows uniform corrosion or material etching. One or more major severity defects. Areas of significant aggregate and wall thickness loose in cementous pipes. Generally good pipe alignment but some sections not aligned; several minor to moderat offset or open joints but a few sever and may impede inspection; few to several moderate cracks or broken pieces of pipe but several more sever or even to the point of collaspe; broken pieces or pipe or bricks missing with soil or bedding visible; generally good service lateral connections but several hammer taps with poor connections; and some to frequent root intrusions.
Force Main	Excellent (NASSCO Pipe Rating Index 1 or SCREAM 1-25 inspection scores). New or nearly new. Ten or less years old. Ferrous pipe that has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths > 10 feet. No evidence of exterior wall pitting or corrosion. No pipe wall thickness loss. Air valves operational and generally in good condition.	Good (NASSCO Pipe Rating Index 2 or SCREAM 26-50 inspection scores). Ten to twenty five years old. Ferrous pipe has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths > 10 feet. No to some evidence of exterior wall pitting or corrosion. No to some pipe wall thickness loss. Design pressure (including surge) factor of safety above 2. Air valves operational and generally in good condition.	Fair (NASSCO Pipe Rating Index 3 or SCREAM 51-75 inspection scores). Twenty five to fifty years old. Few moderate severity defects or lots of minor severity defects. Ferrous or cementous pipe may not have internal or external corrosion protection. Pipe segment lengths less than 10 feet. Evidence of some exterior wall pitting or corrosion. Some areas of pipe wall thickness loss. Design pressure (including surge) factor of safety above but close to 2. Air valves generally in fair condition.	Poor (NASSCO Pipe Rating Index 1 or SCREAM 76-90 inspection scores). Fifty to seventy five years old. Several moderate severity defects. Ferrous or cementous pipe material. Corrosion protection deteriorated or non existant. Pipe segment lengths less than 10 feet. Other than rubber gasketed joints or welded joints. Evidence of agressive exterior wall pitting or corrosion. Wide spread areas of pipe wall thickness loss. Design pressure (including surge) factor of safety between 1 and 2. Air valves generally in fair to poor condition.	Very poor (NASSCO Pipe Rating Index 5 or SCREAM 90-100 inspection scores). Greater than seventy five years old. One or more major severity defects. Ferrous or cementous pipe material. Corrosion protection deteriorated or non existant. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints. Evidence of agreessive exterior wall pitting or corrosion. Areas of significant pipe wall thickness loss. Design pressure (including surge) factor of safety below 1. Air valves generally poor condition.

Attachment E – Likelihood of Failure for Gravity Sewer

Likelihood of Failure: Wastewater Gravity						
Category	**Wt**	**Negligible = 1**	**Unlikely = 2**	**Possible = 4**	**Likely = 7**	**Very Likely = 10**
Physical Factors		Very good (Condition Grade 1). New or nearly new. Ten or less years old. Ferrous pipe that has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths > 10 feet. Little to no infiltration/inflow.	Good (Condition Grade 2). Minor defects. Ten to twenty five years old. Ferrous pipe has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths > 10 feet. No to minor infiltration/inflow.	Fair (Condition Grade 3). Twenty five to fifty years old. Few moderate severity defects or lots of minor severity defects. Ferrous pipe may not have internal or external corrosion protection. Pipe segment lengths less than 10 feet. Noticeable infiltration/inflow but has not caused known problems.	Poor (Condition Grade 4). Fifty to seventy five years old. Several moderate severity defects. Ferrous or cementous pipe material. Corrosion protection deteriorated. Pipe segment lengths less than 10 feet. Other than rubber gasketed joints or welded joints. Significant infiltration/inflow and causing capacity problems.	Very poor (Condition Grade 5). Greater than seventy five years old. One or more major severity defects. Ferrous, cementous, or brick pipe material. Corrosion protection deteriorated. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints. Severe infiltration/inflow and causing regular capacity problems.
Operational Factors		Sufficient capacity to meet peak wet weather flow requirements. No leaks or breaks in past five years. Have maintenance SOPs and structured training. Good work order system. Perform scheduled inspections and expeditious, prioritized subsequent maintenance and rehab. Maps updated. No to very few odor complaints.	Sufficient capacity to meet peak wet weather flow requirements. Avg less than one leak or break per 1000 feet in past five years. Have maintenance SOPs and structured training. Good work order system. Perform scheduled inspections and reasonably quick but prioritized subsequent maintenance and rehab. Maps updated. No to very few odor complaints.	Just enough capacity to meet peak wet weather flow requirements. Avg less than one leak or break per 1000 feet in past five years. May or may not have maintenance SOPs and informal, more on-job-training. May or may not have functional work order system. Perform mostly scheduled inspections, others to resolve questions. Subsequent maintenance and rehab performed but no formal prioritization. Maps infrequently updated. A few odor complaints.	At or slight exceed capacity to meet peak wet weather flow requirements. Leaks or breaks in past five years avg about 1 or slightly more per 1000 feet. No or outdated maintenance SOPs and training. Perform reactive inspections and subsequent maintenance. Map accuracy is poor and not updated. Periodic to regular odor complaints.	Insufficient capacity to meet peak wet weather flow requirements. Leaks or breaks in past five years > 1 per 1000 feet. No maintenance SOPs and training. Perform reactive inspections and subsequent maintenance. Map accuracy is poor and not updated. Frequent odor complaints.
Environmental Factors		Does not traverse or not exposed to landfills, peat bogs, road de-icing, salt water or cinders. Granular backfill. Normal low moisture and below water table, medium pH soil, and high resistivity soils.	Does not traverse or not exposed to landfills, peat bogs, road de-icing, salt water or cinders. Granular or clay backfill. Normal low moisture and below water table, medium pH soil, and high resistivity soils.	May traverse or be exposed to landfills, peat bogs, road de-icing, salt water or cinders. Sand/silt backfill. Seasonal moisture or at water table, medium pH soil, and medium to low resistivity soils.	May traverse or be exposed to landfills, peat bogs, road de-icing, salt water or cinders. Mostly organic and moist backfill. Normally below water table, medium pH soil, and medium to low resistivity soils.	Traverses or exposed to landfills, peat bogs, road de-icing, salt water or cinders. Organic backfill. Normal high moisture, low pH soil, and low resistivity soils.
Mechanical Factors		No vibration from surface activity. Accessible by walking and vehicle/equipment. Cover depth of generally between 4 and 12 feet. Line locating service required. Rarely third party damage.	No or minor vibration from surface activity. Accessible by walking and vehicle/equipment. Cover depth generally between 0 and 12 feet. Line locating service required. Rarely third party damage.	Some vibration from surface activity. Accessible by walking and vehicle/equipment but some obstacles or traffic congestion. Can have trench depths of up to 20 feet. Line locating service required. Rarely third party damage.	Subject to vibration from surface activity. Mostly accessible by walking only and only very limited to vehicle/equipment. Can have trench depths of up to 30 feet. Line locating service not required or loosely enforced. Some third party damage.	Subject to frequent or substantial surface vibration. Not accessible by walking or vehicle/equipment without significant effort. Can have trench depths greater than 30 foot depth. No line location required. Some third party damage.

Attachment F – Likelihood of Failure for Force Mains

Likelihood of Failure: Wastewater Force Main						
Category	**Wt**	**Negligible = 1**	**Unlikely = 2**	**Possible = 4**	**Likely = 7**	**Very Likely = 10**
Physical Factors		Very good (Condition Grade 1). New or nearly new. All diameter ranges. Ten or less years old. Ferrous pipe that has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths > 10 feet.	Good (Condition Grade 2). All diameter ranges. Ten to twenty five years old. Ferrous pipe has internal and external corrosion protection or is corrosive resistant material. Rubber gasketed compression joints. Segment lengths > 10 feet.	Fair (Condition Grade 3). All diameter ranges. Twenty five to fifty years old. Ferrous pipe may not have internal or external corrosion protection. Pipe segment lengths may be less than 10 feet.	Poor (Condition Grade 4). Fifty to seventy five years old. All diameter ranges. Ferrous or cementous pipe material with no, worn, or ineffective corrosion protection. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints.	Very poor (Condition Grade 5). Greater than seventy five years old. Ferrous, cementous, or brick pipe material. No or deteriorated corrision protection. Pipe segment lengths less than 10 feet. Other than rubber gasketed or welded joints.
Operational Factors		No leaks or breaks in past five years. Have maintenance SOPs and structured training. Exercise isolation valves. Have air release/vac valves and inspection program. Planned and regular systemwide flow and pressure measurement. Good work order system. Expediously perform maintenance or rehab. Maps accurate and updated. No on/off surging or high system pressures.	Avg less than one leak or break per 1000 feet in past five years. Have maintenance SOPs and structured training. Usually exercise isolation valves. Have air release/vac valves and inspection program. Regularly measure flows and pressures. Good work order system. Perform scheduled inspections and reasonably quick but prioritized subsequent maintenance and rehab. Maps accurate and updated. No on/off surging or high system pressures.	Avg less than one leak or break per 1000 feet in past five years. May or may not have maintenance SOPs and informal, more on-job-training. Sporadically exercise isolation valves. May or may not have air release/vac valves and inspection program. Measure flows and pressures spordically or not at all. May or may not have functional work order system. Perform mostly scheduled inspections, others to resolve questions. Subsequent maintenance and rehab performed but no formal prioritization. Maps not always accurate and are infrequently updated. Some on/off surging or high system pressures.	Leaks or breaks in past five years avg about 1 or slightly more per 1000 feet. No or outdated maintenance SOPs and training. Do not regularly exercise isolation valves. May or may not have air release/vac valves and inspection program. Generally do not measure flows and pressures. Perform reactive inspections and subsequent maintenance. Map accuracy is poor and not updated. Regular on/off surging or high pressures.	Leaks or breaks in past five years > 1 per 1000 feet. No maintenance SOPs and training. Do not exercise isolation valves. No air release/vac valve inspection and maintenance program. No measurement of flows and pressures. Perform reactive inspections and subsequent maintenance. Map accuracy is poor and not updated. Regular to frequent on/off surging or high pressures.
Environmental Factors		Does not traverse or not exposed to landfills, peat bogs, road de-icing, salt water or cinders. Granular backfill. Normal low moisture and below water table, medium pH soil, and high resistivity soils.	Does not traverse or not exposed to landfills, peat bogs, road de-icing, salt water or cinders. Granular or clay backfill. Normal low moisture and below water table, medium pH soil, and high resistivity soils.	May traverse or be exposed to landfills, peat bogs, road de-icing, salt water or cinders. Sand/silt backfill. Seasonal moisture or at water table, medium pH soil, and medium to low resistivity soils.	May traverse or be exposed to landfills, peat bogs, road de-icing, salt water or cinders. Mostly organic and moist backfill. Normally below water table, medium pH soil, and medium to low resistivity soils.	Traverses or exposed to landfills, peat bogs, road de-icing, salt water or cinders. Organic backfill. Normal high moisture, low pH soil, and low resistivity soils.
Mechanical Factors		No vibration from surface activity. Accessible by walking and vehicle/equipment. Cover depth of generally less than 12 feet. Line locating service required. Rarely experienced third party damage.	No or minor vibration from surface activity. Accessible by walking and vehicle/equipment. Cover depth generally less than 12 feet. Line locating service required. Rarely experienced third party damage.	Some vibration from surface activity. Accessible by walking and vehicle/equipment but some obstacles or traffic congestion. Can have trench depths greater than 12 feet. Line locating service required. Experienced some third party damage.	Subject to vibration from surface activity. Mostly accessible by walking only and only very limited to vehicle/equipment. Can have segments with trench depths of up to 20 feet. Line locating service not required or loosely enforced. Experienced some third party damage.	Subject to frequent or substantial surface vibration. Not accessible by walking or vehicle/equipment without significant effort. Can have segments with trench depths greater than 20 foot depth. No line location required. Experience regular third party damage.

Attachment G – Consequence of Failure

Consequence of Failure: WASTEWATER Gravity and Force Main Sewers					
Category	**Wt.**	**Negligible = 1**	**Low = 4**	**Moderate = 7**	**Severe = 10**
Financial Viability and Impact		Corrective action costs could be absorbed in O&M budget. A low percentage of unplanned $ versus planned $ improvements.	Corrective action costs could be absorbed in O&M budget or may require budget tranfers from other accounts. May have to postpone other projects. A low to moderate percentage of unplanned $ versus planned $ improvements.	Corrective action costs could not be absorbed in O&M budget or would not be covered by acceptable budget tranfers from other accounts. Would require Board/Council approval. A moderate to high percentage of unplanned $ versus planned $ improvements.	Corrective action costs would require Board/Council approval, possibly new borrowing, delay in other capital improvements, or cause rates to increase. A major percentage of unplanned $ versus planned $ improvements.
Customer Satisfaction		No to minimal loss of service or impact on other services. Only local and temporary traffic interruption. Easily accessibility. Less than five structure or basement backups.	Minimal to some loss of service or impact on other services for several hours. Moderate accessibility. Generally local and temporary traffic interruption. Less than five structure or basement backups.	Some loss of service or impact on other services several hours but less than a day. Difficult accessibility. Generally local but possibly major traffic interruption for days or weeks. Greater than five structure or basement backups.	Will cause loss of service or impact on other services for several hours or more than a day. Difficult accessibility. Generally local but major extended traffic interruption for weeks or months. Greater than five structure or basement backups.
Compliance/Health		No state permit violations. No potential adverse health effects. Any overflows can be contained without reaching U.S. waters.	Technical violation. Possible notice of violation but enforcement action is unlikely. No to minor potential health effects. Any SSO < 1,000 gals.	Probable enforcement action but fines unlikely. Any SSO ≥ 1,000 gals and < 30,000 gals.	Enforcement action with fines likely. Likely to cause "boil water" notice. Any SSO > 30,000 gals.
Public Service and Image		Would not trigger complaints or media coverage. Isolated incident for area; e.g. first in 10 years. Affects less than 50 customers and no major customers.	Might trigger wide spread complaints or media coverage. Isolated incident for area; e.g. one or two in 5 years. Affects 50 to 250 customers or one or two major customers.	Likely to trigger wide spread complaints or media coverage. Fairly regular incident for area; e.g. one or two in 3 years. Affects 250 to 1,000 customers or several major customers.	Most certain to trigger wide spread complaints or media coverage. Regular incide for area; e.g. about one per year. Affects > 1,000 customers or multiple major customers.

Attachment H –Risk Calculation

ASSETS (Hierarchy Levels or Pipe Segments)									CONSEQUENCE					LIKELIHOOD				
									Financial Viability and Impact	Customer Satisfaction	Compliance/Health	Public Service and Image	Consequence Score	Physical Factors	Operational Factors	Environmental Factors	Mechanical Factors	Likelihood Score
1	2	3	4	5	6	7		**Weight --->**										
													0.0					**0.0**
													0.0					**0.0**
													0.0					**0.0**
													0.0					**0.0**
													0.0					**0.0**
													0.0					**0.0**
													0.0					**0.0**
													0.0					**0.0**
													0.0					**0.0**
													0.0					**0.0**
													0.0					**0.0**

G. Manhole Condition Assessment Specifications, Guidelines, and Procedures.

MANHOLE CONDITION ASSESSMENT SPECIFICATIONS, GUIDELINES, AND PROCEDURES

The Department of Watershed Management (DWM) Manhole Condition Assessment Program includes locating manholes, documenting all incoming and outgoing sewer pipes, and determining physical dimensions, materials, structural condition, maintenance concerns, and sources of inflow and infiltration (I/I).

In order to promote safety, minimize risk, and mitigate potential environmental impact, man-entry is prohibited without an entry permit. The DWM's method of performing manhole inspection is a "Top Side" ground level procedure utilizing a "down-hole" pan & tilt camera with zoom capability. Man-entry may be required for manholes that are twenty (20) feet deep and greater or with offset manholes overflow weirs, or other unique features precluding effective ground level assessment. Man-entry inspections require manual inspection using high-level illumination and documentation of defects using high-resolution digital photographs.

This guideline includes the requirements and procedures for assessing manholes through manhole inspections and televising via zoom technology using a wide-angle, truck mounted or secure-pole telescoping boom camera. The high-resolution camera is used to record the condition of the manhole features: the frame, chimney, cone, walls, bench, invert, and steps. The camera pans as it is lowered to the bottom to allow for a clear inspection of the following parts of the manhole:

- Walls
- Joints
- Pipe Inlets & Outlets
- Lateral Service Breeches
- Benches
- Channels & Inverts

Data collection software is used to capture and record information pertaining to the inspected manhole. The data fields and formats used are consistent with the National Association of Sewer Service Companies' (NASSCO) Manhole Assessment and Certification Program (MACP) specification. Manholes with structural defects are ranked from least to most defects utilizing the MACP rating system or other nationally recognized scoring system that can convert MACP defect codes. Manhole condition scores are recorded in InfoWorks™ and the InfoNET™ databases. As manholes are located they are assigned a permanent, unique Manhole Facility identification (ID) number. This unique ID number is referenced in data systems containing information on manholes, including the CMMS, InfoWorks™, InfoNET™, and the GIS.

Manhole Condition Assessment Forms are included at the back of this guideline. Data gathered in the field will be captured within the MACP compliant software. Hard copies of individual manhole inspections and summary spreadsheets will be generated for the County's files.

MANHOLE CONDITION ASSESSMENT PROCEDURES

Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION

Sewer manhole condition assessment is performed to document the physical condition of manholes, including the structural condition, locations of defects causing the entry of I/I, and improper grades. The data gathered during manhole condition assessments are used to establish priorities for sewer system improvement programs.

ACTIVITY GOALS AND OBJECTIVES

The objectives of manhole condition assessment are to locate and document sources of I/I and structural defects such as cracks; missing brick/mortar; root intrusion; misaligned rings and covers; negative grade rims; aggregate loss in walls, benches and inverts; loss of sealing materials in proximity to pipe inlets; and manhole step conditions.

SAFETY ANALYSIS - Specific to job site conditions

Safety	Potential Hazards
• Job Site Analysis for Potential Hazards • Safety Program • Protective Clothing and Equipment (Personal Protection Equipment) • Gases and other Hazardous Atmospheres Analysis (Confined Space Entry) • Overhead Power Lines (Electrical Safety) • Traffic Safety Requirements (Traffic Safety)	• Infectious Diseases • Slip, Trip, and Fall • Poisonous Snakes, Pests • Confined Spaces (Confined Space Entry) • Traffic • Vehicle Operation • Mechanical Tools • Electrical Hazards (Electrical Safety) • Flooding and Inundation (Confined Space Entry) • Lifting • Pressurized Plug Malfunction

MANHOLE INSPECTION CHECKLIST - Specific to job site conditions

SAFETY

- Traffic cones
- Yellow vests (for each crew member)
- Hard hats (for each crew member)
- Gloves
- Steel toed boots (each crew member)
- Flashing beam (mounted on the vehicle)
- Fire extinguisher
- Traffic signs
- Arrow bar/board (for heavy traffic areas only)
- First-Aid Kit (fully stocked) and Safety Manual
- Directions and telephone number to the nearest hospital or medical care facility
- Cellular telephone/2-way radio
- Drinking water and disposable cups
- Hand Cleaner – Alcohol, waterless, towel-less cleaner, paper towels

MANHOLE CONDITION ASSESSMENT PROCEDURES

Date of Revision: December 17, 2012

CLERICAL

- Work Order
- Confined Space Entry Permit
- Maps – street and sanitary sewer
- Small note pads (for each crew member)
- Pencils and pens (for each crew member)
- County ID and Vendor/Contractor Name badges (for each crew member)
- Small white board and markers
- Digital camera

WORKING

- Calibrated gas & air quality monitor
- Ventilation blower(s)
- Extra spark plugs for ventilation blower(s)
- High resolution truck or secure-pole mounted camera, coaxial leads, backup light-head and all appurtenances
- Sand bags (4-5 per vehicle) with 15'- 20' ropes
- Extra rope
- Properly sized pipe plug with fittings and pressure hose
- Extra pressure hose and fittings
- Air compressor (suitably sized for appropriate pipe plug)
- 50' or 100' measuring tape
- Manhole-Hook
- Pick
- Shovels
- Sledge hammers
- Metal locator/probe
- Flashlights
- Measuring wheel
- Marking paint
- Manhole marking flags (for use off-road)
- Tool box with necessary tools for routine equipment maintenance

MANHOLE CONDITION ASSESSMENT SPECIFICATIONS

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

PRE-WORK ACTIVITIES

1. **Permits for Right of Ways:** The supervisor shall obtain work permits for all work to be performed in State and/or County Right-of-Ways. The supervisor shall also plan for all other insurances, traffic control measures, and other terms of the permit in advance.

2. **Weather, Ground, and Ground Water Condition Requirements:** Manhole inspection shall not be performed when weather conditions preclude the acquisition of high resolution video and digital recording in a safe and efficient manner.

3. **Manhole Surcharge and Flow Control:** Manhole inspection will normally be accomplished without the need for bypass pumping. Crews shall set up temporary plugs or flow barriers as required to allow for a complete viewing of manhole inverts, benches, walls, cones, and chimneys. Crews shall coordinate with other DWM field staff if a line is to be plugged as part of the inspection. Crews shall monitor the resulting surcharged sewer at the manhole up-gradient of the manhole being assessed, or at another location, if so directed by the supervisor, and prevent overflow conditions from occurring by diverting flows to a down-gradient manhole in a timely manner.

SITE PREPARATION

1 **Review Work Order:**

   a. The supervisor shall review work orders with manhole inspection crews.

   b. The supervisor shall review all safety procedures with crews.

   c. The supervisor shall ensure that all necessary material and equipment is on hand and available at the site.

   d. The supervisor shall ensure that each critical equipment unit is in proper working order and that a backup unit is on site.

   e. The manhole inspection personnel shall follow vehicle operation safety procedures.

2. **System Evacuation / Preparation:** Prior to inspecting a manhole, crews shall first monitor the manhole atmosphere with the appropriate gas detection device to determine if explosive gas and odor is present. If explosive gas or odor is detected, the manhole's atmosphere shall be ventilated. Ventilation is accomplished by removing all manhole covers in the run, then placing a vacuum on the manhole where the blower is located, and/or blowing air into the manhole until acceptable levels of gas and odor are achieved.

3. **Site Security: The crews shall** secure the work site by placing traffic control signs and safety devices at the appropriate places:

a. Follow all applicable state and local traffic safety procedures.

b. Wear all required safety equipment, such as safety vests, hardhats, safety glasses, and steel toe boots.

c. Isolate one or more lanes of traffic with flags, cones, traffic control signs, etc. where work takes place in or immediately adjacent to roads.

d. Look for overhead power lines that may hit the truck or equipment. If lines are above the work area, contact the power utility to de-energize or shield the lines. Equipment must be kept at least 20 feet from the overhead lines.

e. Alert closest fire department/ Emergency Medical Services (EMS) as to the location of the day's work and to stand by for emergencies and inquiries.

4. General Procedures:

a. Determine the location of the manhole on the Geographic Information System (GIS) map. Use metal detection if manhole is not visible.

b. If the manhole is buried, report its location immediately and coordinate with other DWM crews for excavation. If the manhole is covered by 18 inches or less of sod or soil inspection crews may uncover it by hand.

c. Lift the manhole cover using the hook. Drag the cover with the hook; avoid bending over and using hands whenever possible.

d. For heavier manholes, use a truck-mounted winch.

e. Follow confined space entry procedures if man-entry is required. Only trained and certified personnel may enter a manhole after obtaining an entry permit.

f. Follow personal protective equipment (PPE) protocol.

g. **DO NOT** place your face near the manhole opening. Let the manhole 'breathe" for 10 minutes before looking in.

h. **DO NOT SMOKE** near manholes regardless of whether the cover is on or off.

i. **DO NOT STAND** on the removed manhole cover.

j. **USE IMPERVIOUS GLOVES** when working with an open manhole.

k. **USE DISPOSABLE TYVEK COVERALLS** to keep sewage off of your uniform.

l. Ensure proper operation of blower.

m. Isolate sections if necessary with sandbags, baffles, or other approved method to allow for inspection of walls, benches, inverts chimneys, cones, rings and covers.

5. **Confined Space Entry:** Crews shall minimize the physical entry into the manhole. If required, manhole entry shall be performed in accordance with Federal, State local, and any other regulations for confined space entry. Only trained crews and staff may perform confined space entry after obtaining an entry permit. Staff must use safety required equipment, including harnesses, ventilation equipment, etc.

6. **Safe Work Area:** The work area shall be protected at all times with an adequate number of cones, barricades, flags, flaggers, and other measures necessary to meet the Manual for Uniform Traffic Control Devices (MUTCD) standards and to properly and safely protect both vehicular and pedestrian traffic. Flagmen shall work to secure that all affected streets. Further requirements for traffic control may be imposed by the specific agency having jurisdiction. All traffic control measures shall comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by US DOT / FHWA.

7. **Unsafe Conditions:** Any condition deemed to be an unsafe condition shall immediately be reported to the Supervisor. Unsafe conditions shall require all work to be stopped immediately and an inspection will be performed by the Safety Officer of the entity performing the work.

8. **Scheduling Time:** Crews shall begin inspections after 8:00 am and terminate inspections no later than 5:00 pm each day. County authorization should be obtained if work is to be performed outside of the designated hours. Work should be performed in timeframes that will allow compliance with the County's noise ordinance.

9. **Start the Inspection Procedure:**

a. Remove manhole cover and move it away from traffic flow without impacting the work area. If cover is defective, take a photograph that clearly shows the defect. Broken or missing covers will be scheduled for replacement immediately.

b. Position the inspection vehicle so the camera is directly above the manhole for optimal camera movement for inspection.

c. Lower a surveyor's elevation rod into the manhole. Place the elevation rod in front of the outgoing pipe but as far from the camera as possible. The rod shall be used for rotation and depth reference during inspection so it should be touching the bottom of the channel for accuracy.

d. The camera head shall pan until it is facing in the direction of the downward pipe. Reset rotation reader to 0.0. No video recording should occur during this procedure.

e. Lower the telescopic boom so that the camera head is approximately 1 foot above frame and ground surface. No video recording shall occur during this procedure.

f. Power on the camera mounted light-head.

g. Tilt camera head down to 90 degree angle (flush with the manhole) to document the entire manhole as a top down view. Begin video recording of the manhole once the camera has been positioned and shows a clear top down view. Lower the telescopic boom if necessary to obtain a clear picture of the entire manhole and pipe configuration.

h. Wait until the manhole identification Q-card has been recorded (first 6 seconds).

i. The top down view shall have a minimum duration of five (5) seconds. Continue recording.

j. If a defect is found at any point in the inspection the camera shall be held over the defect for a minimum of 10 seconds. In all cases, the camera pan will be stopped and zoom capability used to inspect any defect or abnormality observed.

10. Cover, Frame, and Chimney Inspection:

k. Position the telescopic boom so that the camera head is approximately 1 foot above the frame and ground surface. Adjust the camera head angle to 30 to 45 degrees below horizontal and perform a 360 degree inspection of the manhole showing the cover and pavement surrounding the manhole frame.

l. The camera shall be positioned and adjusted to 0-15 degrees to closely view the frame/chimney joint area. Care shall be taken to adjust the camera angle to assure a detailed view of the entire joint area.

m. Once a 360 degree inspection is completed, the camera shall remain at a 0 to 15 degree angle as the camera is lowered to the next inspection point within the chimney area. Do not pan camera as it is lowered. Rod measurements shall be visible onscreen as the camera is lowered. It may be necessary to offset the rod to the side of the picture to reduce glare and improve clarity.

n. Lower the camera in one (1) foot intervals according to the rod while in the chimney area. A 360 degree rotation is achieved when the camera starts panning at the rod and ends at the point it began.

11. Cone and Wall Inspection:

a. Once the camera is lowered into the cone area, the angle can be adjusted to 25-30 degrees to obtain a detailed view of the cone area.

b. For manholes with concrete walls, every joint shall require a 360 degree inspection. Ideally, the camera shall be positioned so that any joint is in the center of the viewed area.

c. For brick manholes, the manhole shall be inspected 360 degrees once every 2 feet - refer to the measuring rod to determine 2 foot intervals.

d. Care shall be taken to ensure that the entire surface of the manhole is visible in the images. A slight overlap of area between vertical adjustments needed to provide full camera coverage.

a. For manholes with slab type cones, the camera shall be lowered past the slab with the camera tilted upward to allow the inspection of the underside of the slab. The camera shall be lowered sufficiently so that it doesn't cast a shadow on the slab.

12. Bench and Channel Inspection:

a. At the bottom of the manhole (2 feet indicated on the rod), the camera shall be positioned to inspect pipe connections, inverts, and bench using a 30 to 45 degree angle which is maintained until the camera is facing the outlet manhole.

b. The camera shall be paused at each pipe connection with the entire visible area of the pipe connection photographed.

c. If additional lighting is required for the inspection of this area, additional spot lights can be powered on to allow inspection of the channel in one final pan.

d. Care shall be taken to assure that glare from the light does not obscure the video. The inspection will be finalized with the camera facing the outlet of the manhole. Recording can then be stopped.

13. Equipment Removal and Breakdown:

a. After the recording has stopped, all connecting pipeline diameters shall be verified with the measuring rod and the zoom camera.

b. Upon completion of the manhole inspection, carefully raise telescopic boom to remove camera from the manhole then turn off lights.

c. Remove loose dirt, stones, and other foreign material from the mating surface of the rim before replacing the manhole cover. When replacing the manhole cover, be sure the cover is seated properly. Adjust if necessary. If cover cannot be seated correctly, make a notation on manhole log and inform DWM of location.

d. If a critical service (blockage) or structural (cracked/broken cover, collapsing wall) condition is found, notify DWM immediately of condition and location.

e. Secure camera and boom, pick up traffic control devices, and proceed to next manhole.

14. Data Evaluation:

NASSCO MACP ASSESSMENT

a. Consistency is necessary in all aspects of manhole condition assessment. The inspector shall closely review all defects and document their visual observations. NASSCO's Manhole Assessment Certification Program (MACP) is a valuable tool in the assessment process. This program allows for consistency of documentation and a repeatable process for evaluation.

b. The goals of the MACP coding are: define attributes and features of the structure, document and explain defects, develop ratings for each applicable component of a manhole – structural rating, O&M rating, I/I rating – and record dimensional data that can be used for selecting rehabilitation methods. This standardized method for reporting the results of condition assessments allows for consistency, promotes cost efficiency and avoids unnecessary rehabilitation work.

c. Following the completion of the field data gathering, the videos shall be reviewed by qualified technicians to record the defects. Priority grades shall be assigned to all defects using the NASSCO MACP manhole condition assessment and grading system.

DOCUMENTATION

For contractors, defect inspection documentation shall be accomplished in compliance with NASSCO's Manhole Assessment Certification Program by trained certified personnel. As such, paper logs are not necessary. The MACP operator shall ensure that **AT A MINIMUM,** the following information fields are recorded in electronic form.

1. Manhole Facility ID number
2. Clock reference of each main (outgoing main at 6:00 o'clock)
3. Date of condition assessment and weather
4. Status of the manhole as inspected, buried, or un-located manhole
5. Type of manhole lid, frame, and chimney
6. Number and size of holes, if any, in manhole cover
7. Deficiencies in the ring and cover
8. Whether or not the manhole is subject to ponding and the size of the runoff/ponding area.
9. Location of manhole (street address, cross streets, etc.)
10. Depth to manhole invert from rim (nearest 0.1 foot)
11. Manhole construction materials and conditions of the walls, steps, benches, troughs
12. Clock reference of each manhole defect (outgoing main at 6:00 o'clock)

MANHOLE CONDITION ASSESSMENT SPECIFICATIONS

Date of Revision: December 17, 2012

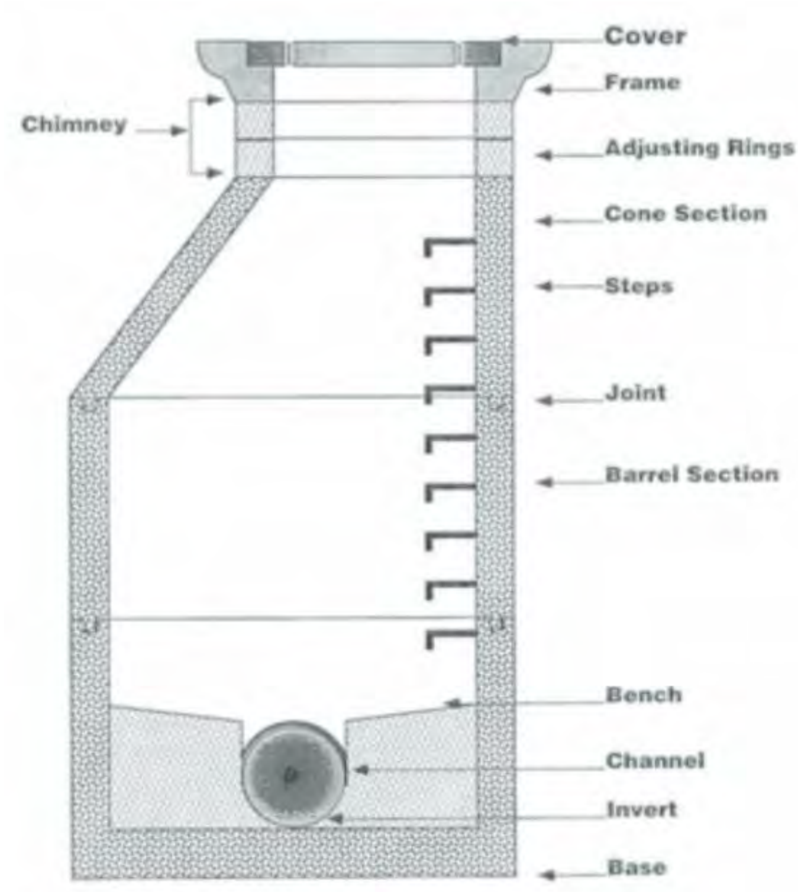
ACTIVITY/SUBTASK

13. Size, material, condition, and depth of each main
14. Location and nature of visible defects and obstructions, i.e., indication of structural conditions or special problems in the main/manhole
15. Root growth and type in manhole wall/base, if any
16. Evidence of leaks and locations, along with measured or estimated sources of extraneous flows, i.e., identification and quantification of visible I/I source
17. Special problems and conditions, such as overflows
18. Plan and profile drawings of the manhole. Include the invert showing direction of flow of the incoming and outgoing main(s), defects, etc.
19. Presence of any water flushing valves
20. Type and depth of debris and deposition in the manhole
21. Evidence of surcharge and the level of the surcharge
22. Manhole environment (abnormal features, detected gases, etc.)
23. Surface type (asphalt, grass, etc.)
24. Shape, dimension, material, and type of cover
25. Rim height or depression from roadway surface measured by placing a straight edge over manhole frame
26. Material, depth, and diameter of riser, extension rings
27. Material and diameter of manhole barrel
28. Material of bench, invert or floor
29. Deficiencies observed on the ground surface, cover, frame, chimney, cone, walls, bench, invert and steps
30. Additional connections to the manhole other than those indicated on the plan
31. Look for the presence of lining and record type, if applicable
32. Validate function and sub-function of main sewer line
33. Depth of flow

MANHOLE CONDITION ASSESSMENT SPECIFICATIONS

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK



Attachment A –Sample Manhole Condition Assessment Forms

1. INSPECTION CREW:	2. DATE: / /	3. TIME:	4. MANHOLE ID:
5. GENERAL LOCATION:			6. LAND LOT:
7. NEAREST STREET ADDRESS:			8. SUB-BASIN NAME:

OBSERVATION		CODE NO.	CODE DESCRIPTION
9. INSPECTION TYPE:			1-INTERNAL 2-SURFACE 3-NOT INSPECTED 4-BURIED 5-NOT FOUND 6-COULD NOT OPEN
10. STRUCTURE TYPE:			1-STANDARD MANHOLE 2-CLEAN OUT 3-END OF LINE 4-TEE 5-WET WELL 6-FLUSH TANK
11. LOCATION:			1-STREET 2-ALLEY 3-SIDEWALK 4-DRIVEWAY 5-PKWY 6-GRASS 7-STORM DITCH
12. SURFACE TYPE:			1-ASPHALT 2-CONCRETE 3-GRAVEL 4-DIRT/GRASS
13. MAHHOLE NEED TO CLEAN			1-NO 2-YES
		CODE NO	CODE DESCRIPTION
COVER	14. TYPE		1-PICK 2-CONCEALED PICK 3-GASKETED 4-VENTED 5-STORM 6-BOLT DOWN
	15. FIT		1-GOOD 2-WEDGED 3-LOOSE 4-ROCKING 5-BOLTS MISSING 6-GASKET DEFECT
	16. # OF HOLES		(BOLT HOLES WITHOUT BOLTS, VENTING, ETC.)
	17. PONDING DEPTH (IN)		
	18. PONDING TYPE		1-NONE 2-SHEET FLOW 3-LOW POINT
	19. GRADE +/- (IN)		(FROM GROUND SURFACE)
	20. SIZE		1-24" 2-24.5" 3-23" 4-23.5" 5-OTHER (PLEASE SPECIFY): ________
	21. INFLOW DISH		1-NO 2-YES
FRAME	22. OFFSET (IN)		(IF MORE THAN 6 INCHES, CONTACT COUNTY)
	23. RISER HEIGHT (IN)		
	23A. REDUNDANT FRAME WITH NO COVER (MEXICAN HAT)		1-NO 2-YES
GRADE ADJ.	24. TYPE		1-NONE 2-PRECAST 3-BRICK 4-BLOCK 5-POURED 6-PVC 7-LINED 8-STONE
	25. DEPTH (IN)		
	26. MIN DIA (IN)		
CONE/TOP	27. TYPE		1-NONE 2-PRECAST 3-BRICK 4-BLOCK 5-POURED 6-BRICK&CONCRETE 7-CLAY 8-PVC 9-STONE 10-LINED
	28. SHAPE		1-CONCENTRIC 2-ECCENTRIC 3-FLAT TOP
WALL	29. MATERIAL		1-NONE 2-PRECAST 3-BRICK 4-BLOCK 5-POURED 6-BRICK&CONC 7-VCP 8-PVC 9-STONE&MORTAR 10-LINED
	29A. LINING TYPE		1-NONE 2-CEMENTITIOUS 3-CAST-IN-PLACE 4-CURED-IN-PLACE 5-EPOXY
30. BENCH TYPE			1-NONE 2-PRECAST 3-BRICK 4-POURED
31. TROUGH TYPE			1-NONE 2-PRECAST 3-POURED 4-VCP 5-PVC 6-BRICK 7-STONE
32. PIPE SEAL TYPE			1-NONE 2-MORTAR 3-GASKET
STEPS	33. TYPE		1-NONE 2-BAR 3-CAST IRON 4-PLASTIC 6-BRICK
	34. CONDITION		1-FAIR 2-CORRODED 3-MISALIGNED 4-BROKEN 5-MISSING
35. MANHOLE DEPTH (FT)			(MEASURED FROM RIM TO INVERT OF OUTGOING PIPE)
36. EVIDENCE OF SURCHARGE (FT)			(STAINS, RAGS, ETC.)

DEFECTS

	OBS		BROKEN		CORROSION/ STAINING		ROOTS	
	FLOW CODE (A)	INFLOW (GPM) (B)	SEVERITY (C)	DENSITY (D)	SEVERITY (E)	DENSITY (F)	SEVERITY (G)	DENSITY (H)
37. COVER								
38. FRAME								
39. FRAME SEAL								
40. GRADE ADJ.								
41. CONE								
42. WALL								
43. BENCH								
44. TROUGH/CHANNEL								

CODE DESCRIPTION

FLOW CODE
1 –NONE/LIGHT
2 –MINOR/LOW
3 –MODERATE
4 –HEAVY
5 –SEVERE

SEVERITY CODE	DENSITY CODE
1 –GOOD	1 <5%
2 –FAIR	2 5% - 10%
3 –POOR	3 10%-25%
4 –DETERIORATED	4 25% - 50%
5 –SEVERE	5 >50%

45. CREEK CROSSING		1-NONE 2-AERIAL 3-BURIED

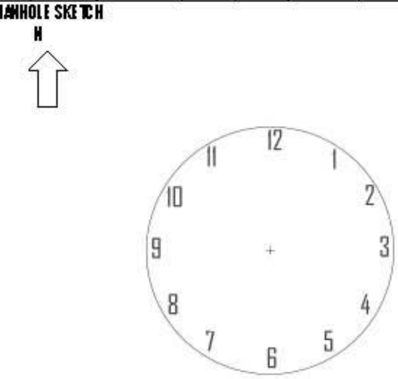
46. MANHOLE COMMENTS:

LAMPING DATA FORM

PIPE #	(1)	(2)	(3)	(4)	(5)	(6)	CODE DESCRIPTION
47. UPSTREAM MANHOLE #							ENTER APPROPRIATE NUMBER OF "SERV" OR "STUB"
48. DOWNSTREAM MANHOLE #							CONNECTING ACCESS STRUCTURE
49. INSPECTED MANHOLE #							1-UPSTREAM 2-DOWNSTREAM
50. PIPE DIRECTION							1-12 CLOCK POSITION
51. SHAPE OF PIPE							1-ROUND 2-ELLIPTICAL 3-BOX 4-HORSESHOE 5-OTHER
52. PIPE DIAMETER/HEIGHT (IN)							
53. PIPE MATERIAL							1-VCP 2-PVC 3-CONCRETE 4-RCP 5-DIP 6-CIP 7-CMP 8-TILE 9-BRICK 10-TRUSS 11-HDPE 12-CIPP
54. RIM TO CROWN (FT)							
55. RIM TO INVERT (FT)							

	PIPE # (A)	FOOTAGE (B)	LOC. (C)	DEF. (D)	RATING (E)	INFLT(GPM) (F)	COMMENTS (G)		PIPE # (A)	FOOTAGE (B)	LOC. (C)	DEF. (D)	RATING (E)	INFLT(GPM) (F)	COMMENTS (G)
56.								66.							
57.								67.							
58.								68.							
59.								69.							
60.								70.							
61.								71.							
62.								72.							
63.								73.							
64.								74.							
65.								75.							

MANHOLE SKETCH



LOCATION:	DEFECTS: 0-N/A	DEFECTS: 0-N/A CONT'D.
1-US MANHOLE	1-CRACK - RADIAL	16-INFILTRATION
2-DS MANHOLE	2-CRACK - HORIZONTAL	17-NEW MANHOLE
3-CAMERA BLOCKED	3-BROKEN PIPE	18-PIPE SEAL
4-JOINT	4-COLLAPSED PIPE	19-OTHER
5-WYE SERVICE	5-WYE SERVICE	
6-BREAK-IN CONN.	6-BREAK-IN CONN.	
7-EXTENDED TAP	7-EXTENDED TAP	
8-UPPER RIGHT	8-OFFSET	**RATING:**
9-LOWER RIGHT	9-GAPPED JOINT	1-GOOD (<5%)
10-LOWER LEFT	10-ROOTS	2-FAIR (5% - 10%)
11-UPPER LEFT	11-DEBRIS	3-POOR (10% - 25%)
12-CROWN	12-GREASE	4-DETERIORATED (25%-50%)
13-INVERT	13-CORROSION	5-SEVERE (>50%)
14-CAMERA SUBMERGED	14-SCALING	
15-CAMERA EMERGED	15-SAG	

76. LAMPING COMMENTS:

POLE CAM INSPECTION WAS PERFORMED ON SITE: YES / NO BY:

PICTURE DESCRIPTION	PHOTO / VIDEO NUMBERS
77. MANHOLE LOCATION	
78. INSIDE OF THE MANHOLE	
79. SITE VIDEO ID	

OVERALL REVIEW	CODE NO.	CODE DESCRIPTION	
80. URGENT NEED TO CONTACT COUNTY		1-YES	WHY-
81. COUNTY NOTIFIED		1-YES	WHO AND DATE-
82. MANHOLE REVISIT REQUEST		1-YES	WHY-
83. LAMPING REVISIT REQUEST		1-YES	WHY-

H. Flow Monitoring Specifications, Guidelines, and Procedures.

FLOW MONITORING SPECIFICATIONS, GUIDELINES, AND PROCEDURES

The Department of Watershed Management (DWM) has developed a System-Wide Flow and Rainfall Monitoring Program as required under Section IV B (vi) of the Consent Decree. The System-Wide Flow and Rainfall Monitoring Program is a continuous monitoring program. Data from rain gauges and the permanent and temporary flow meters have been recorded and analyzed since the year 2007. The flow and rainfall monitoring data includes both dry weather and wet weather periods, and is used to characterize base flows, to estimate I/I rates, and to identify potential sources of relatively high I/I. The flow monitoring guidelines presented in this document will be used in conjunction with the System-Wide Flow and Rainfall Monitoring Program to characterize base flows and I/I rates within the Initial and Additional Priority Areas, to aid in the identification of sewer segments susceptible to I/I within the Initial and Additional Priority Areas, to support the assessment of the Initial and Additional Priority Areas, to support the evaluation and analysis of the data gathered during the assessment of the Initial and Additional Priority Areas, to aid in the prioritization of sewer cleaning and other ongoing maintenance programs within the Initial and Additional Priority Areas, to aid in the identification and prioritization of rehabilitation measures, and to aid in the assessment of the effectiveness of rehabilitation measures implemented as a part of the Priority Areas Assessment and Rehabilitation Program (PASARP).

The System-Wide Flow and Rainfall Monitoring Program includes a description of the County's current flow and rainfall monitoring program and proposed enhancements to the program. DWM's network of flow meters and rain gauges includes the following:

- One hundred and six (106) permanent flow meters.
- Sixteen (16) inter-jurisdictional billing flow meters.
- Forty-nine (49) temporary flow meters.
- Twenty-one (21) rain gauges.

In addition, the County has access to:

- Thirty-five (35) Weather Bug stations to provide rainfall data.
- Fifteen (15) USGS rain gauges.

The DWM's enhancements to its current flow monitoring program as described in the System-Wide Flow and Rainfall Monitoring Program includes the procedures that will be used to identify locations of additional permanent and temporary flow meters and additional temporary rain gauges as needed to support the development and calibration of the hydraulic model, to characterize flows within the entire wastewater collection and transmission system (WCTS), to aid in the prioritization of DWM's proactive maintenance activities (especially sewer system cleaning), and to support the prioritization of DWM's ongoing sewer assessment and rehabilitation program.

As indicated in the Criteria for Identifying and Prioritizing Rehabilitation Measures within the Initial and Additional Priority Areas, rehabilitation measures will be identified and prioritized based on a variety of factors including (1) cost effectiveness analysis and (2) likelihood and consequence of failure (risk). Some of the data gathered through the System-Wide Flow and Rainfall Monitoring Program will undoubtedly be used in the cost benefit analysis and in the assessment of likelihood and consequence of failure of assets within the Initial and Additional Priority Areas. However, the cost effectiveness analysis and the assessment of the likelihood and consequence of failure for some of the Initial and Additional Priority Areas will require the gathering of flow and rainfall monitoring data that is more specific to the Initial and Additional Priority Areas. The gathering of data specific to various Initial and/or Additional Priority Areas may require the installation of flow monitors and probably rain gauges (permanent and/or temporary) in strategic locations to meet the intended purpose. The determination regarding the need and location of additional flow meters and/or rain gauges beyond those available through the System-Wide Flow and Rainfall Monitoring Program will be accomplished on a case by case basis.

FLOW MONITORING SPECIFICATIONS

Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION

Flow monitoring will be used to characterize dry and wet weather flows within the Initial and Additional Priority Areas, to identify potential sources of I/I, to prioritize the smoke and dyed-water testing programs, to prioritize the closed circuit television inspection (CCTV) program, to aid in the distribution and proportioning of I/I through the collection and transmission system within the Initial and Additional Priority Areas and then all the way to the wastewater treatment plant using the DWM hydraulic model, to prioritize the sewer cleaning program, and to identify and prioritize the sewer system rehabilitation measures.

ACTIVITY GOALS AND OBJECTIVES

Goals and objectives for this activity include identifying and characterizing flows within the Initial and Additional Priority Areas and to identify potential locations of I/I.

SAFETY ANALYSIS – Specific to Job Site Conditions

Safety	Potential Hazards
• Safety Program • Protective Clothing and Equipment (Personal Protection Equipment) • Gases and other Hazardous Atmospheres Analysis (Confined Space Entry) • Traffic Safety Requirements (Traffic Safety)	• Infectious Diseases • Slip, Trip, and Fall • Poisonous Snakes, Pests • Confined Spaces (Confined Space Entry) • Traffic • Vehicle Operation • Mechanical Tools • Flooding and Inundation (Confined Space Entry) • Lifting

FLOW MONITORING CHECKLIST – Specific to Job Site Conditions

SAFETY

- Traffic cones
- Yellow vests (for each crew member)
- Hard hats, steel toed boots and gloves (for each crewmember)
- Face shield or goggles
- MSDS for dye
- Flashing beam (mounted on the vehicle)
- Fire extinguisher
- Traffic signs
- Arrow bar/board (for heavy traffic areas, only)
- First-aid kit (fully stocked) and safety manual
- Directions and telephone number to the nearest hospital or medical care facility
- Cellular telephone/2-way radio
- Drinking water and disposable cups
- Hand cleaner – alcohol, waterless, towel-less cleaner, paper towels

CLERICAL

- Maps – street and sanitary sewer
- Small white board and markers
- Confined Space Entry Permit (if required)

- Small note pads (for each crew member)
- Pencils and pens (for each crew member)
- County ID or Vendor/Contractor Name badges (for each crew member)
- Small white board and markers

WORKING

- Calibrated gas &air quality monitor
- Ventilation blower(s)
- Extra spark plugs
- Digital camera
- Flow meters and rain gauges
- Properly sized pipe plugs, air hose &fittings
- Appropriately sized air compressor
- 15'- 20' ropes
- Extra rope
- 50' or 100' measuring tape
- Manhole-hook
- Pick
- Shovels
- Sledge hammers
- Locator/probe
- Flashlights
- Measuring wheel
- Marking paint
- Manhole marking flags (for use off-road)
- Tool box with necessary tools for routine equipment maintenance

FLOW MONITORING SPECIFICATIONS

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

1. MONITORING EQUIPMENT

a. The sanitary sewer flow meter shall be manufactured by ISCO, or equal. The flow monitor installed on the pipe lines shall be equipped with pressure, velocity, and temperature sensors. The instruments shall be self-contained and record qualitative data. The sensors shall be utilized to measure the velocity and depth above the pipe invert and determine the flow using the continuity equation. Accuracy shall be +/- 5 percent of actual flow or better. Each meter shall be field calibrated prior to installation.

b. For flow monitoring sites with flumes, ultrasonic depth sensors shall be used to measure the depth for flow. Accuracy of depth shall be +/- 0.029 feet or better. Each meter shall be field calibrated prior to installation.

c. Rainfall data shall be recorded using a tipping-bucket rain gauge. Rain gauges shall be manufactured by ISCO, or equal. The rain gauge shall provide real time data synchronized to computer type memory bank, and shall be of the solid-state type. The instruments shall be self-contained and record qualitative data. Whenever 0.01 inches of rain is collected, the tipping-bucket shall empty, triggering an electronic counter. The intensity, duration, and time of day of rainfall shall be recorded synchronously.

d. Groundwater level data shall be recorded digitally and continuously utilizing groundwater piezometers. Each piezometer shall be fitted with a recording pressure transducer or other type of sensor that will automatically sense the height of water above the sensor. Each sensor shall be calibrated and the relationship of the sensor elevation to the invert of the sewer main being monitored shall be established.

e. All monitoring equipment installed within sewer manholes shall be capable of withstanding the conditions associated with sewer systems. These conditions include turbulent flows, sewer gases, and surcharging.

f. The data shall be reported on the same daily time clock that shall begin at 00:00 military time (12:00 midnight). Time shall be recorded in military time.

2 MONITORING INTERVALS

a. The permanent and temporary flow monitors shall be maintained and monitored for the length of time needed to accomplish the intended purpose.

b. Each flow monitor shall record data at an interval of five (5) minutes when close to a downstream or upstream lift station. All other flow meters shall record data at intervals of fifteen (15) minutes unless data needs dictate otherwise.

c. Each rain gauge shall record data at an interval of fifteen (15) minutes.

3 DATA RETRIEVAL INTERVAL

ACTIVITY/SUBTASK

a. Data from the monitoring sites without real-time access shall be retrieved at least once per week.

b. Data from the monitoring sites with real-time access shall be reviewed at least once per day to ensure the data uptime and quality.

4 FLOW MONITOR PLACEMENT

a. Flow Meter
   1. The optimal number and placement of flow meters will vary from Priority Area to Priority Area and will be dependent on several factors including the adequacy of the System-Wide Flow and Rainfall Monitoring Program, the physical layout of the sewer system, and the condition of manholes within the area most suitable for the placement of flow meters.
   2. A potential flow monitor location must have the proper hydraulic conditions to ensure that accurate data is obtained. The location must be suitable for either capturing flows outside the priority area or a targeted part or capturing partial or total flows leaving the Priority Area or a targeted part. Only experienced and trained personnel shall determine hydraulic suitability for accurate flow measurement.
   3. The flow meter shall be installed in accordance with the manufacturer's recommendations to ensure data accuracy.
   4. The location of each flow meter shall be surveyed and mapped in accordance with the Sewer Mapping Program.

b. Rain Gauge
   1. Rain gauge locations must be proper for accurate rain measurements that can be correlated with flow monitoring. The rain gauge shall be placed in open spaces to minimize the effects of trees and buildings. Windshields shall be installed if wind interference is suspected to minimize the effect of the wind.
   2. The locations of rain gauges shall be surveyed and mapped in accordance with the Sewer Mapping Program.

c. Groundwater Piezometer
   1. The optimal placement of groundwater piezometers will vary and will be dependent on the physical layout of the sewer system, soil classifications, and locations of flow monitors and rain gauges.
   2. A potential groundwater piezometer site must have the proper conditions to ensure accurate monitoring of the groundwater level. Only experienced and trained personnel shall determine suitability of a site for groundwater monitoring. Each piezometer shall be properly installed to obtain accurate data and to avoid damage.
   3. The locations of piezometers shall be surveyed and mapped in accordance with the Sewer Mapping Program.

5 TRAINED FIELD CREWS

a. Flow meter field crews shall be adequately trained and capable of determining the proper flow monitoring techniques required for each location under various flow conditions.

b. The sensors shall be installed securely in the sewer lines by appropriate mounting devices to continuously record velocity of flow.

6 SEWER FLOW METER SENSOR CALIBRATION

a. The manufacturer's calibration procedures shall be followed to ensure that the depth of flow is measured and recorded at accuracies of ±0.25 inch (or better) for area-velocity sensors placed in the pipe line and ±0.029 ft (or better) for the flume site.

b. The area-velocity sensors shall also undergo comprehensive testing prior to use in the sewer pipe. The meter sensors shall be securely installed according to the manufacturer's instructions to ensure accuracy.

7 CALIBRATION OF SEWER FLOW METERS

a. All flow meters shall be calibrated based on the manufacturer's procedures.

b. The calibration shall be performed every three (3) months for flume sites with ultrasonic sensors and once per month for the area-velocity sensors.

c. In addition to the routine calibration, individual flow meters shall be calibrated if their performance is questionable, bad, or if they malfunction.

8 QUALITY ASSURANCE/QUALITY CONTROL

a. A rigorous quality assurance/quality control program shall be implemented to ensure data integrity and accuracy. A Quality Assurance/Quality Control Plan shall be developed and implemented to ensure that dedicated personnel and detailed procedures lead to proper implementation of the Quality Assurance/Quality Control Plan.

END OF GUIDELINE

I. Closed Circuit Television ("CCTV") Inspection Specifications, Guidelines, and Procedures.

CLOSED CIRCUIT TELEVISION (“CCTV”) INSPECTION SPECIFICATIONS, GUIDELINES AND PROCEDURES

The Department of Watershed Management (DWM) Closed Circuit Television (CCTV) Inspection Program is designed to document the condition of the Wastewater Collection and Transmission System (WCTS) in support of sewer maintenance and rehabilitation activities. CCTV is used to document specific locations of defects allowing or having the potential to allow the entry of inflow and infiltration (I/I) into a sewer; locations of debris in a sewer; obstructions such as those caused by fats, oils, and greases (FOG) and roots; pipe misalignments; offset joints; cracked and broken pipes; and other defects within the WCTS. CCTV inspection also aids in locating illegal connections to the WCTS; defective connections; and defective and uncharted manholes.

CCTV inspection is performed by lowering a remotely controlled crawler camera into a sewer through an open manhole. The camera is controlled by an operator located in an on-site CCTV truck, capturing video and other data as it progresses through the sewer. The CCTV operator may stop the camera to inspect defects in greater detail, using specialized software to record the location, type, and severity of the defect. The CCTV crew is usually accompanied in the field by a sewer cleaning crew, which cleans the sewer lines prior to inspection when necessary. Cleaning a sewer before CCTV assures a clear inspection of the structural condition of the sewer, and removes silt, debris, grease, and roots that could obstruct the view of the camera. The cleaning/CCTV sequencing is reversed when the rate of silt deposits, grease, or root growth needs to be established.

The camera operator conducts the first inspection visually while he is recording the video. The video itself allows others to verify his assessment. Each observed defect is coded to facilitate data analysis and the subsequent selection of the most effective rehabilitation or maintenance methods.

It is very important that all CCTV operators collect data in a consistent manner. The National Association of Sewer Service Companies (NASSCO) created the Pipeline Assessment and Certification Program (PACP) to standardize inspection procedures and defect coding. All contracted CCTV operators must be trained and certified in PACP. All vendors that produce software for CCTV data collection use the same PACP coding system. This allows defects to be cataloged and prioritized in a consistent manner. The inspection data collected is integrated with other software systems that will be used to make accurate decisions on the rehabilitation and/or maintenance solutions. CCTV may be used in conjunction with dye-water testing as discussed in the DWM Dye-Water Testing Guidelines (see Appendix E).

There are no serious impediments to CCTV inspection other than limited access to manholes and high levels of flow in the sewer line. Most small diameter sewer lines are located in the street and right of way (ROW), but larger trunk lines are typically located along streams and other waterways, and may require special access provisions. Routine mowing of sewer easements, access road building, security gates, and other provisions may be needed depending on local conditions.

If certain lines are inaccessible during high flow periods (rain events and peak flow periods) the CCTV operation can be redirected to lower flow areas. Inaccessible areas may also set up a flow diversion system if the inspection of the particular sewer line is time critical. Flow diversion operations are risky and greatly increase the potential for sewer spills and should be used only when absolutely necessary. In cases where wastewater flow diversion is not practical, other sewer inspection methods should be used to document the condition of the sewer. Such methods include sonar or CCTV/sonar inspection.

The general public is normally not inconvenienced by CCTV operations. In most cases the CCTV truck can locate over a manhole in the street without having much, if any impact on traffic in the area. If traffic will be affected, DWM traffic control procedures must be used. In those situations where trunk sewers cross private property, care will be taken to gain access through appropriate means. The County easement only provides access along the length of the pipe, not across private property to access the easement, so crossing private property to gain access to an easement should be minimized whenever possible and should only be done with written permission from the property owner.

CLOSED CIRCUIT TELEVISION INSPECTION PROCEDURES

Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION

CCTV inspection is designed to document the condition of the WCTS in support of sewer maintenance and rehabilitation activities. CCTV inspection documents structural defects, maintenance concerns, and actual and potential sources of I/I in mainline sewers, service laterals, and manholes. It can also be used to document cross connections to storm drainage facilities when used in conjunction with dyed-water testing. CCTV inspection is effective in all pipe sizes. CCTV may be performed at any time, with consideration to access issues and the amount of flow in the sewer. The deliverables from CCTV inspection are video recordings and electronic data.

ACTIVITY GOALS AND OBJECTIVES

The goals and objectives of CCTV inspection are to document locations of sewer system defects; maintenance concerns; actual and potential sources of I/I (such as broken sewer pipes; offset joints; root intrusion; or faulty service connections); storm sewer cross connections; pipe defects in creek crossings; defective manholes; and abandoned building sewers. Data obtained through CCTV inspection is used to prioritize maintenance and select the appropriate sewer rehabilitation methodology.

SAFETY ANALYSIS – Specific to job site conditions

Safety	Potential Hazards
• Job Site Analysis for Potential Hazards • Safety Program • Protective Clothing and Equipment (Personal Protection Equipment) • Gases and other Hazardous Atmospheres Analysis (Confined Space Entry) • Overhead Power Lines (Electrical Safety) • Traffic Safety Requirements (Traffic Safety)	• Infectious Diseases • Slip, Trip, and Fall • Poisonous Snakes, Pests • Confined Spaces (Confined Space Entry) • Traffic • Vehicle Operation • Mechanical Tools • Electrical Hazards (Electrical Safety) • Flooding and Inundation (Confined Space Entry) • Lifting

CCTV INSPECTION CHECKLIST

SAFETY – Specific to job site conditions

- Traffic cones
- Reflective vests; hardhats; ear and eye protection; gloves (all for each crew member)
- Flashing beam (mounted on the vehicle)
- Fire extinguisher
- Traffic signs
- Arrow bar/board (for heavy traffic areas, only)
- First-aid kit (fully stocked) and safety manual
- Confined space entry equipment; tripod, winch, harness, gas monitor, blower
- Cellular telephone/2-way Radio
- Drinking water and disposable cups
- Hand cleaner – alcohol, waterless, towel-less cleaner, paper towels

CLERICAL

- General Supplies; pens; highlighters; paper; blank DVDs, labels and envelopes; etc.
- Maps (with area to be inspected indicated)
- Small white board and markers

WORKING

- Fully outfitted CCTV Inspection vehicle
- Extra camera
- Extra transporter
- Extra bulbs for camera
- Tools and supplies for repairs and maintenance of camera and transporter system
- Fully operation CCTV inspection software suite
- PACP manual for reference
- Flashlights with extra batteries
- Shovels
- 300' tape measure
- 25' tape measure
- Manhole pulling tools
- Hammer
- Screwdriver set
- Sewer plugs, sized appropriate for assigned work
- Marking paint
- Metal detector
- General tool box
- Lowering ropes for cameras

SPECIFICATIONS FOR CLOSED CIRCUIT TELEVISION INSPECTION

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

SCOPE

A. Internal sewer condition assessment will be used to determine the structural and service condition of sewers prior to abandonment, preconditioning, or rehabilitation. Assessment will be performed using pan and tilt color camera CCTV. In those circumstances where depth of flow is too great for CCTV, sonar or a combination of sonar and CCTV will be used.

B. Two (2) forms of internal condition assessment will be required:

1. Sewer Survey: Detailed viewing of the sewer ("survey") either manually or with the aid of CCTV and/or sonar equipment, to assess internal structural condition, service condition, and identify and locate miscellaneous construction features as well as assess the structural and service condition of laterals. Data logging is required.

2. Sewer Inspection: Viewing the sewer ("pull-through") pursuant to investigative work possibly incorporating a radio-sonde transmitter for locating purposes and/or following other operational activity including:

   a. Locating manhole(s) and/or lateral(s) with or without radio-sonde.

   b. Sewer preconditioning and cleaning activities.

   c. Sewer rehabilitation including point repairs.

   d. Such other similar purposes as may be required by the Engineer.

   e. Sewer inspection will be carried out manually or with the aid of CCTV and/or sonar equipment, to assess overall condition. No data logging is required.

APPLICATION OF INSPECTION TYPE

A. The following guidelines concerning the use of CCTV and sonar will be followed:

1. Generally CCTV alone will be used for internal condition assessment

where the depth of flow of sewage is less than twenty-five (25) percent of overall sewer diameter at the start of the survey. A case-by-case determination will be made whether to use CCTV where the depth of flow is more than twenty-five (25) percent level but no greater than forty (40) percent of overall sewer diameter at any time throughout the length.

2. Generally CCTV combined with sonar will be used for internal condition assessment where depth of flow of sewage varies from twenty-five (25) percent to seventy-five (75) percent of overall sewer diameter for sewers greater than twenty-four (24) inches in diameter. Where the sewer is less than twenty-four (24) inches in diameter and depth of flow of sewage exceeds twenty-five (25) percent but is less than seventy-five (75) percent of overall sewer diameter one of the following actions may be taken based on professional judgment: (a) continue using CCTV (where depth of flow is only marginally greater than twenty-five (25) percent of overall diameter) or (b) use sonar (by damming or plugging the sewer so that the depth of flow exceeds seventy-five (75) percent of overall diameter).

3. Generally sonar alone will be used where depth of flow in the sewer exceeds seventy-five (75) percent of overall diameter and the level of the flow will be artificially increased, without the risk of flooding, to ensure that the pipe is completely surcharged.

SURVEY/INSPECTION VEHICLE

A. For contractors, the survey/inspection vehicle will comprise two (2) distinct separate areas. One (1) of these, designated as the viewing area, will be insulated against noise and extremes in temperature, include the provision for air conditioning, and will be provided with means of controlling external and internal sources of light in a manner capable of ensuring that the monitor screen display is in accordance with the requirements of this specification. Seating/and or space accommodations will be available to enable additional workers to clearly view the on-site monitor, which will display the survey/inspection as it proceeds.

B. The working area will be reserved for equipment, both operational and stored, and no equipment utilized within the sewer will be allowed to be stored in the viewing area.

C. The vehicle will be suitable for carrying the survey team and laborers and will be equipped with the following:

1. Equipment for easing and lifting manhole covers

2. Sewer safety equipment

3. Road safety equipment

4. Protective clothing for the survey/inspection teams comprising coveralls, boots, gloves, hard hats, etc.

CCTV SURVEY/INSPECTION AND OPERATIONAL EQUIPMENT REQUIREMENTS

A. The surveying/inspecting equipment will be capable of surveying/inspecting a length of sewer up to at least one-thousand five-hundred (1,500) feet when entry onto the sewer may be obtained at each end and up to one-hundred (100) feet by rodding or up to seven-hundred and fifty (750) feet where a self-propelled unit is used, where entry is possible at one (1) end only. This equipment will be maintained in full working order.

B. Each survey/inspection unit will contain a means of transporting the CCTV camera and/or sonar equipment in a stable condition through the sewer under survey and/or inspection. Such equipment will ensure the maintained location of the CCTV camera or sonar equipment when used independently on or near to the central axis of a circular shaped sewer when required in the prime position.

C. Where the CCTV camera and/or sonar head are towed by winch and bond through the sewer, all winches will be stable with either lockable or ratcheted drums. All bonds will be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera and/or sonar equipment. All winches will be inherently stable under loaded conditions.

D. Each unit will carry sufficient numbers of guides and rollers such that, when surveying or inspecting, all bonds are supported away from pipe and manhole structures and all CCTV/sonar cables and/or lines used to measure the CCTV camera's/sonar head location within the sewer are maintained in a taut manner and set at right angles where possible, to run through or over the measuring equipment.

E. Each unit will carry a range of flow control plugs or diaphragms for use in controlling the flow during the survey/inspection. A minimum of one (1) item of each size of plug or diaphragm ranging from six (6) inches to two (2) feet diameter inclusive will be carried.

F. Each survey/inspection unit will have on-call equipment available to carry out the flushing, rodding, and jetting of sewers when such procedures are deemed to be necessary.

SEWER CLEANING UNITS AND EQUIPMENT

A. Sufficient sewer cleaning units and equipment will be provided. Contractors will provide standby units in the event of breakdown, in order to complete cleaning operations.

REASONS FOR CLEANING OF SEWERS

A. Light cleaning of sewers means the removal of minor quantities of silt and debris preventing observation of sewer condition and defects.

B. Heavy cleaning means the removal and extraction of silt, debris, and obstructions from the sewer which actually prevent entry and use of CCTV equipment, or the completion of the sewer run and/or manned-entry inspection of sewers.

EXTENT OF LIGHT CLEANING

A. Light cleaning is considered to be cleaning of the sewer prior to CCTV or manned-entry survey or inspection, requiring the removal and extraction of minor quantities of silt and debris from the sewer. Light cleaning will only be required when the level of silt is deemed prohibitive to the accurate assessment of the sewer under survey or inspection.

CCTV/SONAR - GENERAL

A. CCTV Camera/Sonar Head Prime Position: The CCTV camera/sonar head will be positioned to reduce the risk of picture distortion. In circular sewers the

CCTV camera lens and/or sonar head will be positioned centrally (i.e. in prime position) within the sewer. In non-circular sewers, picture orientation will be taken at mid-height, unless otherwise agreed, and centered horizontally. In all instances the camera lens/sonar head will be positioned looking along the axis of the sewer when in prime position. A positioning tolerance of ± 10% of the vertical sewer dimension will be allowed when the camera is in prime position.

B. CCTV Camera/Sonar Head Speed: The speed of the CCTV camera in the sewer will be limited to six (6) inches per second for surveys to enable all details to be extracted from the hard drive or DVD recording. Similar or slightly higher speed may be used on a case-by-case basis. Stop, for a minimum of 5 seconds at every lateral, defect, or adversity. The speed of scanning sonar will be limited to four (4) inches per second.

C. CCTV Color Camera: A color pan and tilt camera(s) will be provided to facilitate the survey and inspection of all laterals, including defects such as hydrogen sulfide corrosion in the soffit of sewers and benching or walls of manholes over and above the standard defects that require reporting. These will be carried out as part of the normal CCTV assessment as the survey or inspection proceeds. A three-hundred sixty (360) degrees rotational scan indicating general condition must be implemented at every fifty (50) feet interval (min.) along sewers, and at manholes and any salient, specified, defect features. The tilt arc must not be less than two-hundred twenty-five (225) degrees.

D. Data Transfer: Upon completion of CCTV inspection, transfer inspection data to an external hard drive (HD) or DVD of sufficient capacity and compatibility with Owner's equipment; include code required for proper playback of video file.

1. Labeling:

   a. Provide printed label on outside of HD or DVD that indicates the following:

      1) Name of owner

      2) Project title

      3) Date of inspection

4) Inspection company

5) Deliverable number

6) Range of pipe structure identification numbers or asset feature, IDs included

2. Media:

a. Video:

1) Inspections completed, with a unique filename per inspection

2) Encoded in .MPG (preferred), .WMV, or .AVI format

3. Audio:

a. Embedded in video file

b. Operator will include description of inspection setup, including related information from log form and unusual conditions

c. Operation changes (for example, remove roots and restart inspection at footage prior to root removal)

d. Verbal description and location of each defect

e. Verbal description and location of each service connection

4. Still Photographs:

a. Provide digital photographs showing inspection image whenever observation or defect has a moderate or major severity, unless otherwise instructed by the Owner or Engineer;

b. Each with unique filename;

c. Encoded in .JPEG format;

d. Minimum 640 x 480 resolution; and

e. Provide label on front of photograph with structure identification number, footage (if not visible on photograph), and defect code.

5. Database:

a. Include all inspections. Creating a database per inspection is not acceptable.

b. Provide database of collected data including:

1) Asset information

2) Inspection information, where each inspection includes no more than one manhole-to-manhole segment

3) Defect codes

4) Start and stop footages for continuous defects

c. File Type: MS Access, .MDB, .ACCDB

d. Database Format: NASSCO PACP data will be exported into standard PACP Exchange database.

e. List inspection media names in corresponding asset/inspection/defect information field within database.

E. Linear Measurement:

1. The CCTV/sonar monitor display will incorporate an automatically updated record in feet and tenths of a foot of the footage of the camera or center point of the transducer, whichever unit is being metered, from the cable calibration point. The relative positions of the two (2) center points will also be noted.

2. A suitable metering device will be used to enable the cable length to be accurately measured; this will be accurate to ± 1% or three (3) inches whichever is the greater.

F. Data Display, Recording and Start of Survey/Inspection:

SPECIFICATIONS FOR CLOSED CIRCUIT TELEVISION INSPECTION

Date of Revision: December 17, 2012

ACTIVITY/SUBTASK

1. At the start of each sewer length being surveyed or inspected and each reverse set-up, the length of pipeline from zero (0) footage, the entrance to the pipe, up to the cable calibration point will be recorded and reported in order to obtain a full record of the sewer length. Only one (1) survey will be indicated in the final report. All reverse set-ups, blind manholes, and buried manholes will be logged on a separate log. Video digits will be recorded so that every recorded feature has a correct tape elapsed time stamp. Each log will make reference to a start (ST) and finish (FH) manhole unless abandonment took place because of blockage. Manhole number will be indicated in the remark's column of the detail report.

2. The footage reading entered on to the data display at the cable calibration point must allow for the distance from the start of the survey/inspection to the cable calibration point such that the footage at the start of the survey is zero (0).

3. In the case of surveying through a manhole where a new header sheet must be completed, the footage will be set at zero (0) with the camera focused on the outgoing pipe entrance.

4. At the start of each manhole length a data generator will electronically generate and clearly display on the viewing monitor and subsequently on the CD-ROM recording a record of data in alpha-numeric form containing the following minimum information:

   a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0)

   b. Sewer dimensions

   c. Manhole/pipe length reference numbers

   d. Date of survey

   e. Road name/location

   f. Direction of survey

g. Time of start of survey

h. Sewer use (SS - Sanitary Sewer)

i. Material of construction of the pipe

5. The size and position of the data display will be such as not to interfere with the main subject of the picture.

6. Once the survey of the pipeline is under way, the following minimum information will be continually displayed:

a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0).

b. Sewer dimensions in inches.

c. Manhole or pipe length reference number (PLR). General convention allows upstream manhole number to be designated PLR.

d. Direction of survey, i.e., downstream or upstream.

7. Correct adjustment of the recording apparatus and monitor will be demonstrated by use of the test tape or other appropriate device. Satisfactory performance of the camera will be demonstrated by the recording of the appropriate test device at the commencement of each day for a minimum period of thirty (30) seconds.

8. Footage and corresponding time elapsed video digit will be given throughout survey/inspection for all relevant defects and construction features encountered unless otherwise agreed.

9. Where silt encountered is greater than ten (10) percent of the diameter of the pipe, the depth of silt will be measured and recorded at approximately fifty (50) foot intervals.

10. All continuous defects will incorporate a start and finish abbreviation in

the log report.

G. Coding: Defect Coding, as well as material, shape, and lining coding, and conventions used will comply with PACP formats and compatible with the County GIS.

MAN ENTRY SURVEY - GENERAL

A. Photographic Camera Position - General Illustration of Sewer Interior:

1. The hand-held photographic camera or CCTV camera will be positioned to reduce the risk of picture distortion. In circular sewers the camera lens will be positioned centrally looking along the axis of the sewer. In non-circular sewers picture orientation will be taken at mid-height, unless otherwise agreed, and centered horizontally.

2. The hand held photographic camera or CCTV camera will be positioned so that the long side of the photograph or CD-ROM frame is horizontal.

B. Photographic Camera Position - Laterals/Specific Defect: A means of accurately locating the photographic or camera's footage and any recorded lateral or defect, along the sewer will be provided, to an accuracy of ± 1% or six (6) inches whichever is greater.

C. Photographic Quality: The in-sewer photographic camera or hand held CCTV system and suitable illumination will be capable of providing an accurate, uniform and clear record of the sewer's internal condition.

CCTV, MAN ENTRY, AND SONAR SURVEY DATA SPECIFICATION

A. Survey Reporting: Following the completion of a sewer survey/inspection, a hard copy of all details, i.e. typed "Full English" report including summary statistical breakdown of all defects encountered and a CD-ROM will be generated.

B. Site Coding Sheets: Each sewer length, i.e. the length of sewer between two (2) consecutive manholes, will be entered on a separate coding sheet or entered separately electronically. Thus where a "pull through" a manhole during a CCTV and/or sonar survey or "walk through" during a “man entry” survey is performed, a new coding sheet will be started at the manhole "pulled or walked through" and the footage re-set to zero (0) on the coding sheet. Where a length of sewer between consecutive manholes is surveyed from each end (due to an obstruction) two (2) coding sheets will be used. Where a length of sewer between two (2) consecutive manholes cannot be surveyed or attempted for practical reasons a (complete header) coded sheet will be made out defining the reason for abandonment. At uncharted manholes a new coding sheet will be started and the footage re-set to zero (0).

C. Measurement Units: All dimensions will be in feet and inches. Measurement of sewers will be to the nearest inch.

D. CCTV and Man-Entry Photographs:

1. Photographs will be taken of all defective laterals and pipeline defects. Where a defect is continuous or repeated the photographs will be taken at the beginning of the defect and at not less than ten (10) foot intervals thereafter.

2. CCTV photographs must clearly and accurately show what is displayed on the monitor, and will be in proper adjustment.

3. Photographs must be durable and 4 inch x 6 inch size and will be supplied in a suitable album or storage drawer.

4. Still photographs will be durable and clearly identified in relation to the photograph number (cross referenced to the site survey sheet) street location, sewer dimensions, manhole start and finish numbers, survey direction, footage and date when the photograph was taken.

5. The annotation will be clearly visible and in contrast to its background, will have a figure size no greater than fourteen (14) point, and be type printed in upper case.

6. The annotation will be positioned so as not to interfere with the subject of the photograph.

7. Color photographs will be taken using a digital camera.

CCTV/SONAR PERFORMANCE

A. Color CCTV/Sonar: All CCTV and/or sonar work will use color CCTV/sonar reproduction.

B. CCTV Picture Quality:

1. A test device will be maintained on-site of the work area at all times.

2. The test card will be *Marconi Regulation Chart No. 1* or equivalent with a color bar, clearly differentiating between colors, with no tinting, to show the following: White, Yellow, Cyan, Green, Magenta, Red, Blue, and Black.

3. At the start of each and every working shift, the camera will be positioned centrally and at right angles to the test card at a distance where the full test card just fills the monitor screen. The Contractor will ensure that the edges of the test card castellations coincide with the edges of the horizontal and vertical scan (raster). The card will be illuminated evenly and uniformly without any reflection. The illumination will be to the same color temperature as the color temperature of the lighting that recorded for subsequent use, the recording time will be at least thirty (30) seconds. The type of camera used will be identified on the test recording. The recording must show the camera being introduced into the test device and reaching its stop position.

C. Shades of Gray: The gray scale will show equal changes in brightness ranging from black to white with a minimum of five (5) clearly recognizable stages.

D. Color: With the monitor adjusted for correct saturation, the six (6) colors plus black and white will be clearly resolved with the primary and complementary colors in order of decreasing luminance. The gray scale will appear in contrasting shades of gray with no tint.

E. Linearity: The background grid will show squares of equal size, without convergence/divergence over the whole picture. The center circle will appear round and have the correct height/width relationship (± 5%).

F. Resolution: The live picture will be clearly visible with no interference and capable of registering a minimum number of TV lines/pictures height lines. The resolution will be checked with the monitor color turned down. In the case of tube cameras this will be six-hundred (600) lines.

G. Color Constancy: To ensure the camera will provide similar results when used with its own illumination source, the lighting will be fixed in intensity prior to commencing the survey. In order to ensure color constancy, generally no variation in illumination will take place during the survey.

H. CCTV Focus/Iris/Illumination: The adjustment of focus and iris will allow optimum picture quality to be achieved and will be remotely operated. The adjustment of focus and iris will provide a minimum focal range from six (6) inches in front of the camera's lens to infinity. The distance along the sewer in focus from the initial point of observation will be a minimum of twice the vertical height of the sewer. The illumination must allow an even distribution of the light around the sewer perimeter without the loss of contrast picture, flare out, or shadowing.

I. Sonar Survey Requirements:

1. Sonar will provide a complete structural and service assessment equivalent to that obtained through conventional CCTV imagery.

2. Sonar assessment will provide for a continuous output on conventional annotated CD-ROM format of all sewers surveyed, supported by complete defect code sheets. Additionally, silt levels will be assessed as a percentage depth of sewers at twenty-five (25) foot intervals for each pipeline surveyed. To facilitate this requirement, and in addition, to assist in diametrical measurement particularly where a sewer is deformed and/or where a sewer has suffered hydrogen sulfide corrosion; screen graphic facilities will be made available to enable measurements to be taken in any position across the diametrical profile of the sewer as the Sonar survey proceeds and where specifically directed by the Engineer.

3. Where combined CCTV and sonar imagery is used the output will display combined CCTV and sonar images of the sewer being surveyed. The sonar image will be superimposed on the real CCTV image as a combined operation.

4. A comprehensive final report will be provided on the findings concerning major defects, including fractures, displaced joints, deformation, corrosion, and lateral intrusions, as well as dominant surface features, including encrustation and silt depths.

5. The monitor display resolution will be a minimum of 512 x 512 pixels. The color palette will have a minimum of sixteen (16) colors with text.

6. The picture update speed will not compromise compliance with Sub-clause A (1) or result in unsatisfactory picture resolution.

7. The range of resolution will be ± $^{1}/_{10}$ inch.

8. The maximum beam width of sonar energy pulse will be no greater than two (2) degrees from the center of the transducer.

9. The transducer will be of the continuous scanning type.

J. Data Quality Control Procedure:

1. A quality control system will be implemented to effectively gauge the accuracy of all survey reports produced. The system will be such that the accuracy of reporting is a function particularly of:

   a. The number of faults not recorded (omissions)

   b. The correctness of the coding and classification of each fault recorded

2. The minimum levels of accuracy to be attained under the various survey headings are as follows:

   a. Header Accuracy: ninety-five (95) percent

   b. Detail Accuracy: eighty-five (85) percent

K. Data accuracy: The minimum acceptable accuracy of the data will be eighty-five (85) percent.

Attachment A - PACP Work Header Form from NASSCO and Codes

C.C.T.V. Inspection Form

Surveyors name (1) and Certificate number (1a) | System Owner (2) | Survey Customer (3) | Drainage Area (4) | Sheet No. (5)

P/O No. (6) | Pipeline Segment Reference (7) | Date (8) CCYY/MM/DD | Time (9) | Location (Street Number and Number) (10) | Locality (10a)

Further Location details (11) | Upstream Manhole Number (12) | Rim to Invert (13) | Grade to Invert (14) | Rim to Grade (15)

Downstream Manhole Number (16) | Rim to Invert (17) | Grade to Invert (18) | Rim to Grade (19) | Use of Sewer (20) | Direction (21) | Flow Control (22) | Height (23)

Width (24) | Shape (25) | Material (26) | Ln. Method (27) | Pipe Joint Length (28) | Total Length (29) | Length Surveyed (30) | Year Laid (31) | Year Rehabilitated (32) | Tape / Media Number (33)

Purpose (34) | Sewer Category (35) | Pre-Cleaning (36) | Cleaned 36a) CCYY/MM/DD | Weather (37) | Location Code (38) | Additional Information (39)

Distance (feet) (meters)	Video Ref.	Code		Continuous defect	Value				Joint	Circumferential Location		Image Ref.	Remarks
		Group/ Descriptor	Modifier/ severity		S/ M/ L	Inches (mm)		%		At/ From	To		
						1st	2nd						
•													
•													
•													
•													
•													
•													
•													
•													
•													

Pipeline Assessment Certification Program version 4.2

2-16
2001, NASSCO

C.C.T.V. Inspection Continuation Form

Surveyors name (1)	System Owner (2)	Date (8)	Upstream Manhole Number (12)	Pipe Segment Ref (If Applicable) (7)	Sheet No (5)
		CCYY/MM/DD			

Distance (feet) (meters)	Video Ref.	Code		Continuous defect	Value				Joint	Circumferential Location		Image Ref.	Remarks
		Group/ Descriptor	Modifier/ severity		S/ M/ L	Inches (mm)		%		At/ From	To		
						1st	2nd						
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Attachment A

Field Name	Data Type	Field Size	Required*	Sample	Description/Instructions
Surveyed_Name	Text	20	Y	all UC User's First Initial and Last Name - KTRAN	Name of individual conducting survey
Certificate_Number	Text	15	Y	U-907-4396	NASSCO PACP # of Surveyor
Owner	Text	30	Y	DEKALB DWM	Owner of collection system surveyed
Customer	Text	30	Y	District & Map Landlot number	Entity commissioning the survey
Drainage_Area	Text	15	Y	10 ch limit- Basin Name- 2 ch assigned	Abbreviated Name of Basin- see attached list
PO_Number	Text	15	Y	Contract Number	Contract number you are working under
Pipe_Segment_Reference	Text	25	Y	Pipe ID	LL-USMHDSMH
Date	Date/Time	N/A	Y	YYYYMMDD	Inspection Date
Time	Date/Time	N/A	Y	Military Time format	Time Inspection Started
Street	Text	64	Y	Number and Street Name - all UC	Enter nearest street number and name/If not known, enter nearest place name and general description
City	Text	64	Y	City name - all UC	City name where sewer located
Location_Details	Text	64/255*	Y	Example: BACK YARD IN MULCHED FLOWER BED - or BIG DOG - all UC	Descriptive explanation of sewer location
Upstream_MH	Text	25	Y	USMH ID	Client provided designation for upstream manhole
Up_Rim_to_Invert	Number	Single	Y	Ft and 10th's of ft. Measure rim to invert of pipe being surveyed. If rim not level, measure from lowest point on top of frame.	Distance (ft and tenths of ft) or (meters to 2 decimal places max)from rim to invert of upstream manhole
Up_Grade_to_Invert	Number	Single	Y	Ft and 10th's of ft. Measure depth between ground level and invert of pipe being surveyed. If ground not level, measure from ground space above pipe being surveyed.	Distance (ft and tenths of ft)or (meters to 2 decimal places max) from average grade to invert of upstream manhole
Up_Rim_to_Grade	Number	Single	Y	Ft and 10th's of ft. Measure distance between Rim and and ground level. If ground not level, mesure from ground space above pipe being surveyed. If rim not level, measure from lowest point of rim.	Distance (ft and tenths of ft)or (meters to 2 decimal places max) from rim to average grade of upstream manhole
Downstream_MH	Text	25	Y	DSMH ID	Client provided designation for downstream manhole
Down_Rim_to_Invert	Number	Single	Y	Ft and 10th's of ft. Measure rim to invert of pipe being surveyed. If rim not level, measure from lowest point on top of frame.	Distance (ft and tenths of ft) or (meters to 2 decimal places max)from rim to invert of downstream manhole

Field Name	Data Type	Field Size	Required*	Sample	Description/Instructions
Down_Grade_to_Invert	Number	Single	Y	Ft and 10th's of ft. Measure depth between ground level and invert of pipe being surveyed. If ground not level, measure from ground space above pipe being surveyed.	Distance (ft and tenths of ft)or (meters to 2 decimal places max) from average grade to invert of downstream manhole
Down_Rim_to_Grade	Number	Single	Y	Ft and 10th's of ft. Measure distance between Rim and and ground level. If ground not level, mesure from ground space above pipe being surveyed. If rim not level, measure from lowest point of rim	Distance (ft and tenths of ft)or (meters to 2 decimal places max) from rim to average grade of downstream manhole
Sewer_Use	Text	List-defined	Y	See Valid List - Sanitary	Purpose of sewer
Direction	Text	List-defined	Y	Upstream or Downstream	Direction of survey, Upstream or Downstream. All inspections should be performed Downstream where possible
Flow_Control	Text	List-defined	Y	See Valid List- Not controlled, Dewatered, Plugged If WL is 25% or greater, level must be controlled. No inspection should occur in an line with more than 25% water level.	Type restriction of flow used
Height	Number	Integer	Y	Diameter	Diameter of sewer (or height if non-circular) to nearest inch(999) or nearest mm (99999)
Width	Number	Integer	Y	required for non-circular sewers	Width of non-circular sewer to nearest inch(999) or nearest mm (99999)
Shape	Text	List-defined	Y	See Valid List - Circular	Sewer shape
Material	Text	List-defined	Y	See Valid List. Polyvinyl Chloride	Type of pipe material
Lining_Method	Text	List-defined	Y	See Valid List. Cured in Place	Type of process used to line the host pipe
Pipe_Joint_Length	Number	Single	Y	Nearest 10th of a ft	Length of pipe joint sections measured to one decimal place whether in feet or meter
Total_Length	Number	Single	Y	Estimated distance/wheeled or GIS estimate	Distance between the exit of the start manhole and the entrance of the finish measured to one decimal place whether it is feet or meter
Length_Surveyed	Number	Single	Y	Actual length surveyed	If the survey is abandoned, enter the actual length surveyed to one decimal place whether it is feet or meter
Year_Laid	Number	Integer		4 digit year	Year sewer surveyed was constructed
Year_Renewed	Number	Integer		4 digit year	Year sewer surveyed was renewed
Media_Label	Text	64	Y	Directory location of video file - DVD Name or Harddrive Name	Unique identifier for tape/media
Purpose	Text	List-defined	Y	See Valid List	Reason for conducting survey

Field Name	Data Type	Field Size	Required*	Sample	Description/Instructions
Sewer_Category	Text	List-defined			Importance of sewer, to be provided by client
Pre-Cleaning	Text	List-defined	Y	See Valid List- J-Jetting, H - Heavy Clean	Type of preparatory cleaning conducted prior to survey
Date_Cleaned	Date/Time	N/A	If Pre-Cleaning field has Jetting or Heavy Cleaning, then this field must also be populated	YYYYMMDD	Date when sewer was cleaned prior to survey
Weather	Text	List-defined	Y	See Valid List - 1-Dry	Weather conditions when survey conducted
Location_Code	Text	List-defined	Y	See Valid List - D- Easement. Do not include easement as part of the Street Name and Number. Remember, if any portion of the pipe crosses underneath a road, enter codes A,B, or C. Otherwise, enter code that best describes predominant ground cover.	General description of ground cover of surveyed segment
Additional_Info	Text	255	Y	Any necessary additional information regarding pipe or inspection	Supplemental info regarding survey or segment
Video Location	Text	64/255*	Y	Name of Inspection video/See Media Naming convention list	For digital recordings, path of video file relative to corresponding data file
Persistent Video Display should be at the bottom of the screen. USMH and DSMH should be displayed, along with Footage counter.					

Tables below are valid codes to be used in the PACP process

Codes Sorted Alphabetically by Code

Code	Type	Description
ACB	Construction	Access Point, Catch Basin
ACOH	Construction	Access Point, Cleanout House
ACOM	Construction	Access Point, Cleanout Mainline
ACOP	Construction	Access Point, Cleanout Property line
ADP	Construction	Access Point, Discharge Point
AEP	Construction	Access Point, End of Pipe
AJB	Construction	Access Point, Junction Box
AM	Construction	Access Point, Meter
AMH	Construction	Access Point, Manhole
AOC	Construction	Access Point, Other Special Chamber
ATC	Construction	Access Point, Tee Connection
AWA	Construction	Access Point, Wastewater Access Device
AWW	Construction	Access Point, Wet Well
B	Structural	Broken
BSV	Structural	Broken, Soil Visible
BVV	Structural	Broken, Void Visible
CC	Structural	Crack Circumferential
CH2	Structural	Crack Longitudinal Hinge, 2
CH3	Structural	Crack Longitudinal Hinge, 3
CH4	Structural	Crack Longitudinal Hinge, 4
CL	Structural	Crack Longitudinal
CM	Structural	Crack Multiple
CS	Structural	Crack Spiral
D	Structural	Deformed (non-brick)
DAE	O & M	Deposits Attached Encrustation
DAGS	O & M	Deposits Attached Grease
DAR	O & M	Deposits Attached Ragging
DAZ	O & M	Deposits Attached Other
DB	Structural	Displaced Brick
DH	Structural	Deformed Horizontal (Brick)
DI	Structural	Dropped Invert
DNF	O & M	Deposits Ingressed Fine
DNGV	O & M	Deposits Ingressed Gravel
DNZ	O & M	Deposits Ingressed Other
DSC	O & M	Deposits Settled Compacted
DSF	O & M	Deposits Settled Fine
DSGV	O & M	Deposits Settled Gravel
DSZ	O & M	Deposits Settled Other
DV	Structural	Deformed Vertical (Brick)
FC	Structural	Fracture Circumferential
FH2	Structural	Fracture Longitudinal Hinge, 2
FH3	Structural	Fracture Longitudinal Hinge, 3
FH4	Structural	Fracture Longitudinal Hinge, 4

Code	Type	Description
FL	Structural	Fracture Longitudinal
FM	Structural	Fracture Multiple
FS	Structural	Fracture Spiral
GRT		Grout done at Location
GTFJ		Grout Air Test Fail Joint
GTFL		Grout Air Test Fail Lateral
GTPJ		Grout Air Test Pass Joint
GTPL		Grout Air Test Pass Lateral
GTUJ		Grout Air Test Unable Joint
GTUL		Grout Air Test Unable Lateral
H	Structural	Hole
HSV	Structural	Hole, Soil Visible
HVV	Structural	Hole, Void Visible
ID	O & M	Infil Dripper
IG	O & M	Infil Gusher
IR	O & M	Infil Runner
IS	O & M	Infil Stain
ISGT	Construction	Intruding Sealing Grout
ISSR	Construction	Intruding Sealing Ring
ISSRB	Construction	Intruding Sealing Ring Broken
ISSRH	Construction	Intruding Sealing Ring Hanging
ISSRL	Construction	Intruding Sealing Ring Loose/Poorly Fitting
ISZ	Construction	Intruding Sealing Other
IW	O & M	Infil Weeper
JAL	Structural	Joint Angular Large
JAM	Structural	Joint Angular Medium
JOL	Structural	Joint Offset Large
JOM	Structural	Joint Offset Medium
JSL	Structural	Joint Separated Large
JSM	Structural	Joint Separated Medium
LD	Construction	Alignment Down
LFAC	Structural	Lining Failure Abandoned Connection
LFAS	Structural	Lining Failure Annular Space
LFB	Structural	Lining Failure Blistered
LFBK	Structural	Lining Failure Buckled
LFBU	Structural	Lining Failure Bulges
LFCS	Structural	Lining Failure Connection Cut Shifted
LFD	Structural	Lining Failure Detached
LFDC	Structural	Lining Failure Discoloration
LFDE	Structural	Lining Failure Defective End
LFDL	Structural	Lining Failure Delaminating
LFOC	Structural	Lining Failure Overcut Connection
LFPH	Structural	Lining Failure Pinhole
LFRS	Structural	Lining Failure Resin Slug
LFUC	Structural	Lining Failure Undercut Connection
LFW	Structural	Lining Failure Wrinkled

Code	Type	Description
LFZ	Structural	Lining Failure Other
LL	Construction	Alignment Left
LLD	Construction	Alignment Left Down
LLU	Construction	Alignment Left Up
LR	Construction	Alignment Right
LRD	Construction	Alignment Right Down
LRU	Construction	Alignment Right Up
LU	Construction	Alignment Up
MB	Structural	Missing Brick
MCU	Miscellaneous	Camera Underwater
MGO	Miscellaneous	General Observation
MGP	Miscellaneous	General Photo
MJL	Miscellaneous	Joint Length Change
MLC	Miscellaneous	Lining Change
MMC	Miscellaneous	Material Change
MML	Structural	Mortar Missing Large
MMM	Structural	Mortar Missing Medium
MMS	Structural	Mortar Missing Small
MSA	Miscellaneous	Abandoned Survey
MSC	Miscellaneous	Shape or Size Change
MWL	Miscellaneous	Water Level
MWLS	Miscellaneous	Water Level Sag
MWM	Miscellaneous	Water Mark
MYN	Miscellaneous	Dye Test Not Visible
MYV	Miscellaneous	Dye Test Visible
OBB	O & M	Obstacle Brick
OBC	O & M	Obstacle Thru Connection
OBI	O & M	Obstacle Intruding Thru Wall
OBJ	O & M	Obstacle In Joint
OBM	O & M	Obstacle Pipe Material
OBN	O & M	Obstacle Construction Debris
OBP	O & M	Obstacle External Pipe or Cable
OBR	O & M	Obstacle Rocks
OBS	O & M	Obstacle Built Into Structure
OBZ	O & M	Obstacle Other
RBB	O & M	Roots Ball Barrel
RBC	O & M	Roots Ball Connection
RBJ	O & M	Roots Ball Joint
RBL	O & M	Roots Ball Lateral
RFB	O & M	Roots Fine Barrel
RFC	O & M	Roots Fine Connection
RFJ	O & M	Roots Fine Joint
RFL	O & M	Roots Fine Lateral
RMB	O & M	Roots Medium Barrel
RMC	O & M	Roots Medium Connection
RMJ	O & M	Roots Medium Joint

Code	Type	Description
RML	O & M	Roots Medium Lateral
RPL	Structural	Repair Localized Liner
RPLD	Structural	Repair Localized Liner Defective
RPP	Structural	Repair Patch
RPPD	Structural	Repair Patch Defective
RPR	Structural	Repair Point
RPRD	Structural	Repair Point Defective
RPZ	Structural	Repair Other
RPZD	Structural	Repair Other Defective
RTB	O & M	Roots Tap Barrel
RTC	O & M	Roots Tap Connection
RTJ	O & M	Roots Tap Joint
RTL	O & M	Roots Tap Lateral
SAM	Structural	Surface Aggregate Missing
SAMC	Structural	Surface Aggregate Missing Chemical
SAMM	Structural	Surface Aggregate Missing Mechanical
SAMZ	Structural	Surface Aggregate Missing Unknown
SAP	Structural	Surface Aggregate Projecting
SAPC	Structural	Surface Aggregate Projecting Chemical
SAPM	Structural	Surface Aggregate Projecting Mechanical
SAPZ	Structural	Surface Aggregate Projecting Unknown
SAV	Structural	Surface Aggregate Visible
SAVC	Structural	Surface Aggregate Visible Chemical
SAVM	Structural	Surface Aggregate Visible Mechanical
SAVZ	Structural	Surface Aggregate Visible Unknown
SCP	Structural	Surface Corrosion Metal Pipe
SMW	Structural	Surface Missing Wall
SMWC	Structural	Surface Missing Wall Chemical
SMWM	Structural	Surface Missing Wall Mechanical
SMWZ	Structural	Surface Missing Wall Unknown
SRC	Structural	Surface Reinforcement Corroded
SRCC	Structural	Surface Reinforcement Corroded Chemical
SRCM	Structural	Surface Reinforcement Corroded Mechanical
SRCZ	Structural	Surface Reinforcement Corroded Unknown
SRI	Structural	Surface Roughness Increased
SRIC	Structural	Surface Roughness Increased Chemical
SRIM	Structural	Surface Roughness Increased Mechanical
SRIZ	Structural	Surface Roughness Increased Unknown
SRP	Structural	Surface Reinforcement Projecting
SRPC	Structural	Surface Reinforcement Projecting Chemical
SRPM	Structural	Surface Reinforcement Projecting Mechanical
SRPZ	Structural	Surface Reinforcement Projecting Unknown
SRV	Structural	Surface Reinforcement Visible
SRVC	Structural	Surface Reinforcement Visible Chemical
SRVM	Structural	Surface Reinforcement Visible Mechanical

Code	Type	Description
SRVZ	Structural	Surface Reinforcement Visible Unknown
SSS	Structural	Surface Spalling
SSSC	Structural	Surface Spalling Chemical
SSSM	Structural	Surface Spalling Mechanical
SSSZ	Structural	Surface Spalling Other
SZ	Structural	Surface Other
SZC	Structural	Surface Other Chemical
SZM	Structural	Surface Other Mechanical
SZZ	Structural	Surface Other Unknown
TB	Construction	Tap Break-in
TBA	Construction	Tap Break-in Active
TBB	Construction	Tap Break-in Abandoned
TBC	Construction	Tap Break-in Capped
TBD	Construction	Tap Break-in Defective
TBI	Construction	Tap Break-in Intruding
TF	Construction	Tap Factory
TFA	Construction	Tap Factory Active
TFB	Construction	Tap Factory Abandoned
TFC	Construction	Tap Factory Capped
TFD	Construction	Tap Factory Defective
TFI	Construction	Tap Factory Intruding
TR	Construction	Tap Rehabilitated
TRD	Construction	Tap Rehabilitated Defective
TRI	Construction	Tap Rehabilitated Intruding
TS	Construction	Tap Saddle
TSA	Construction	Tap Saddle Active
TSB	Construction	Tap Saddle Abandoned
TSC	Construction	Tap Saddle Capped
TSD	Construction	Tap Saddle Defective
TSI	Construction	Tap Saddle Intruding
VC	O & M	Vermin Cockroach
VR	O & M	Vermin Rat
VZ	O & M	Vermin Other
WFC	Structural	Weld Failure Circumferential
WFL	Structural	Weld Failure Longitudinal
WFM	Structural	Weld Failure Multiple
WFS	Structural	Weld Failure Spiral
WFZ	Structural	Weld Failure Other
XB	Structural	Collapse Brick Sewer
XP	Structural	Collapse Pipe Sewer

Pipe Material Codes

Code	Description
AC	Asbestos Cement
BR	Brick
CAS	Cast Iron
CMP	Corrugated Metal Pipe
CP	Concrete Pipe (non-reinforced)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
CT	Clay Tile
DIP	Ductile Iron Pipe
FRP	Fiberglass Reinforced Pipe
GRC	Glass Reinforced Cement
OB	Pitch Fiber (Orangeburg)
PCCP	Pre-stressed Concrete Cylinder Pipe
PE	Polyethylene
PP	Polypropylene
PSC	Plastic/Steel Composite
PVC	Polyvinyl Chloride
RCP	Reinforced Concrete Pipe
RPM	Reinforced Plastic Pipe (Truss Pipe)
SB	Segmented Block
SP	Steel Pipe
TTE	Transite Pipe
VCP	Vitrified Clay Pipe
WD	Wood
XXX	Not Known
ZZZ	Other

Pipe Shape Codes

Code	Description
A	Arched, with flat bottom
B	Barrel, beer-barrel shape
C	Circular
E	Egg Shaped
H	Horseshoe, inverted U
Z	Other, state in remarks
O	Oval (elliptical)
R	Rectangular
S	Square
T	Trapezoidal
U	U-Shaped, with flat top

Lining Codes

Code	Description

CP	Cured in Place
FF	Fold and Form or Deform/Reform
ZZ	Other
SN	Segmented Panel
SP	Segmented Pipe
SW	Spiral Wound

Direction Codes

Code	Description
D	Downstream
U	Upstream

Note: Where practical all PACP surveys should be conducted with the flow.

Location Codes

Code	Description
A	Main Highway - Urban
B	Main Highway - Suburban/Rural
C	Light Highway
D	Easement/Right of Way
E	Woods
F	Sidewalk
G	Parking Lot
H	Alley
I	Ditch
J	Building
K	Creek
L	Railway
M	Airport
Y	Yard
Z	Other

Note: If any portion of the pipe crosses underneath a road described by A, B, or C, enter that code. Otherwise enter the code that best describes the predominate ground cover over the pipe segment.

Sewer Use Codes

Code	Description
CB	Combined
FM	Force Main
ZZ	Other
PR	Processes
SS	Sanitary
SW	Stormwater

Weather Codes

Code	Description
1	Dry
2	Heavy Rain
3	Light Rain
4	Snow
5	Saturated
6	Damp
7	Very Dry

Pre-cleaning Codes

Code	Description
H	Heavy Cleaning
J	Jetting
N	No Pre-Cleaning
Z	Not Known

Purpose of Survey Codes

Code	Description
A	Maintenance Related
B	Infiltration/Inflow Investigation
C	Post Rehabilitation Survey
D	Pre-Rehabilitation Survey
E	Pre-Acceptance
F	Routine Assessment
G	Capital Improvement Program Assessment
H	Resurvey
V	Reversal
Z	Not Known

Flow Control Codes

Code	Description
B	Bypassed
D	De-Watered using Jetter
L	Lift Station
N	Not Controlled
P	Plugged

DeKalb County Basin Name Abbreviation

Basin Name	Work Order Abbreviation
Ball Mill Creek	BallMill
Barbashela Creek	Barbashela
Blue Creek	Blue
Camp Creek	Camp
Cobb Fowler Creek	CobbFowler
Conley Creek	Conley
Constitution Area	Constitution
Corn Creek	Corn
Crooked Creek	Crooked
Doolittle Creek	Doolittle
Honey Creek	Honey
Indian Creek	Indian
Intrenchment Creek	Intrenchment
Johnson Creek	Johnson
Lower Crooked Creek	LowerCrooked
Lower Snapfinger Creek	LowerSnap
Lower Stone Mountain	LowerStone
Lucky Shoals Creek	LuckyShoals
Marsh Creek	Marsh
Nancy Creek	Nancy
North Fork Creek	NorthFork
Northeast Creek	Northeast
Peavine Creek	Peavine
Pine Mountain	PineMount
Plunket Creek	Plunket
Pole Bridge Creek	PoleBridge
Shoal Creek	Shoal
South Fork Creek	SouthFork
South River	SouthRiver
Sugar Creek	Sugar
Swift Creek	Swift
Upper Crooked Creek	UpperCrooked
Upper Snapfinger Creek	UpperSnap
Upper Stone Mountain	UpperStone
Yellow River	Yellow

J. Gravity Sewer Line and Force Main Defect Analysis Specifications, Guidelines, and Procedures.

GRAVITY SEWER LINE AND FORCE MAIN DEFECT ANALYSIS GUIDELINES

The purpose of assessing the condition of a sewer system infrastructure (sewers, manholes, service laterals, etc.) is to characterize service conditions; identify locations of defects; and facilitate the identification and prioritization of rehabilitation measures needed to reduce and/or eliminate its likelihood of failure, improve its service conditions, and extend its usable life. The Department of Watershed Management (DWM) gravity sewer line and force main defect analysis program establishes standard procedures for the analysis of gravity sewer line and force main defects identified during the assessment of the Initial and Additional Priority Areas. In developing its sewer line and force main defect analysis program, the County has utilized technological advancements in technology, lessons learned during the last several years by other entities, and knowledge and experience gained by County personnel in their day-to-day maintenance and operation of the County's WCTS. A variety of techniques are typically utilized to evaluate the condition of force mains and their likelihood of failure. The County will determine the most appropriate techniques on a case by case basis.

The gravity sewer line defect analysis program will utilize the data obtained from various condition assessment tools and programs (manhole condition assessment, smoke testing, Closed Circuit Television (CCTV), dyed-water testing, and corrosion defect identification programs, etc.) to identify and prioritize rehabilitation measures within the County's WCTS. During the assessment of the Initial and Additional Priority Areas, defects will be identified and cataloged using standard National Association of Sewer Service Companies (NASSCO) Manhole Assessment and Certification Program (MACP), Pipeline Assessment Certification Program (PACP), and Lateral Assessment and Certification Program (LACP) defect codes. Whenever feasible, data collection software will be used to capture and record data pertaining to the inspected sewer lines, manholes, and service laterals. The data fields and formats used will be consistent with the NASSCO PACP specification (matrices for the applicable NASSCO codes are listed in the CCTV Inspection Guidelines). To the extent feasible, data and scores will be recorded in InfoWorks™ and the InfoNET™ databases. Assets will be assigned a permanent, unique identification (ID) number. This ID number will be referenced in data systems containing data on that asset, including the CMMS, InfoWorks™, InfoNET™, and the Geographic Information System (GIS). The grades assigned to various assets will be used as a tool to identify and to prioritize rehabilitation measures within the Initial and Additional Priority Areas.

The internal condition grade descriptions included below will generally be used as a guide to categorize defects from 1 to 5 (least to greatest defect condition). Examples of common defects are shown in the table below along with a logical thought progression for remedial action.

Summary Internal Condition Grade Descriptions		
Internal Condition Grade	**Typical Defect Condition**	**Typical Renewal Solution**
5	Pipe/BS[1] already collapsed; or Pipe/BS deformation >10% and broken; or Extensive areas of missing pipe or brickwork; or Pipe/BS fractured with deformation >10%; or Concrete/Mortar loss extreme[2]	Replace – On-line or Off-line *Immediate Action*
4	Pipe/BS broken; or Pipe/BS deformation <10% and broken; or Pipe/BS fractured with deformation 5-10%; or Multiple pipe fracture; or Serious loss of gradient; or Severe concrete corrosion[2]; or Many displaced bricks	Renovate (lining) or Repair *Rehabilitation Program*
3	Pipe/BS fractured with deformation <5%; or Longitudinal cracking or multiple cracking; or Severe joint defects; or Badly made connections; or Moderate concrete corrosion[2]; or Some displaced bricks	Possibly Renovate, Repair or *Monitor*
2	Light corrosion[2]; or Circumferential pipe/BS cracking; or Moderate joint defects	Do Nothing
1	No corrosion or structural defects	Do Nothing

[1]BS = Brick Sewers
[2]Expressed as percentage of wall thickness (not inches)

GRAVITY SEWER LINE DEFECT ANALYSIS PROCEDURE

Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION

The analytical evaluation of gravity sewers and force mains using a standardized, methodical approach by assigning values in order to devote the appropriate level of resources to inspect, maintain, and rehabilitate different areas of the system.

ACTIVITY GOALS AND OBJECTIVES

Goals and objectives for this activity are to identify gravity sewer and force main defects for rehabilitation or repair to maintain the required level of service.

SAFETY ANALYSIS

Safety	Potential Hazards
• N/A	• N/A

DEFECT ANALYSIS CHECKLIST

- N/A

ACTIVITY/SUBTASK

PRE-WORK ACTIVITIES

Assemble all Condition Assessment data including:

- Flow Monitoring Data
- Manhole Condition Assessment Data and Associated Analysis
- Smoke Testing Data
- Dyed-Water Testing Data
- GIS Shapefiles (Right-of Ways, Easements, and Sewer System Maps)
- Topographical Maps of Basin
- Current SSES CCTV Videos (NASSCO PACP, MACP, LACP Compliant)
- Data from Corrosion Defect Program

SITE PREPARATION

N/A

GENERAL PROCEDURES

1. Prioritization Process Overview

As indicated in the DWM *Criteria for Identifying and Prioritizing Rehabilitation Measures* within the Initial and Additional Priority Areas, conditions associated with the occurrence of sanitary sewer overflow (SSOs) can generally be grouped into three (3) major categories: (1) capacity limitations, structural defects, and maintenance problems. Capacity limitations may result from one or more of the following conditions: excessive I/I entering the County's wastewater collection and transmission system (WCTS) through sewer defects, manhole defects, and/or unauthorized connections; sewers and/or lift stations whose capacities are not adequate to handle dry-weather peak flows; and maintenance problems. Structural defects may result from deterioration of pipe construction material due to age; material corrosion (internal or external); poor construction (bedding, compaction, loading, etc.); excessive external loads (hydrostatic head, dead loads, tree roots, and live loads); and internal hydraulic load. Maintenance problems are predominantly associated with the accumulation of fats, oils, and grease (FOG) and other debris into the sewer system and root intrusion from vegetation around the sewer.

Sewer system rehabilitation measures within the DeKalb County WCTS will be identified and prioritized based on several factors including their potential to advance the objectives of the Consent Decree (elimination of SSOs), cost effectiveness of various rehabilitation measures or combinations thereof, and the assessed risk associated with various defects or system conditions [consequence (impact) and likelihood (condition) of failure].

As indicated in the DWM *Criteria for Identifying and Prioritizing Rehabilitation Measures* within the Initial and Additional Priority Areas, certain defects will be scheduled for rehabilitation immediately upon their discovery during the sewer system condition assessment. Such defects will include those that pose danger to humans, animals, and/or the environment; those determined to be contributing to the occurrence of SSO, based on their severity; and those that are determined to have the potential to pose danger to humans, animals, and/or the environments and/or have a great potential to cause SSOs if left unattended. The determination as to whether a defect should be scheduled for rehabilitation will be made based on professional judgment and experience.

To ensure consistency in data collection, defect analysis, and identification and prioritization of effective rehabilitation measures, DWM has adopted methods consistent with the standards established by the NASSCO MACP, PACP, and LACP.

2. Applying the NASSCO Standards

a. The MACP, PACP, and LACP were developed by NASSCO to provide a means of providing a reliable mechanism to evaluate and describe pipe conditions.

b. The DWM considers consistency as of paramount importance in the data gathering, data evaluation and analysis, and identification of rehabilitation measures processes. Field crews will be required to look closely at all defects and document visual observations clearly. Designers and engineers will evaluate and analyze data based on adopted consistent standards ensuring that rehabilitation measures selected and implemented achieve the desired results consistently throughout the implementation of the Priority Areas Sewer Assessment and Rehabilitation Program (PASARP) and beyond. The MACP, PACP, and LACP allow for consistency of documentation and a repeatable process for evaluation. In this way, a long-term approach to sewer system rehabilitation will be undertaken rather than simply reacting when problems arise.

c. The objectives of the MACP, PACP, and LACP coding are to define attributes and features of structures; document and explain defects; develop ratings for each applicable component of a manhole, pipe segment, or service lateral [structural rating, operations and maintenance (O&M) rating, I/I rating]; and record dimensional data that can be used for selecting rehabilitation measures. This standardized method for reporting the results of condition assessments ensures consistency, promotes cost efficiency, and avoids unnecessary rehabilitation work.

d. Following the completion of condition assessment, the assessment data shall be reviewed by qualified individuals and priority grades shall be assigned to all defects using the appropriate

NASSCO assessment certification and grading system.

Note: DWM has the option of evaluating other nationally recognized scoring systems that can convert defect codes as this program progresses.

3. Program Value Standards - Approach

a. Using the MACP, PACP, and LACP Code Matrix, each defect code will be assigned a condition grade of 1 to 5. Grades will be assigned based on potential for further deterioration, I & I contribution, or pipe failure. The MACP, PACP, and LACP define failure as when the manhole, pipeline, or lateral failure can no longer meet its design objectives. Grades will be assigned in two categories, Structural and O&M defects. Grades are as follows:

Grade	Priority Guideline	General Grade Description
5	Immediate Attention	Defects requiring immediate attention
4	Poor	Severe defects that will become Grade 5 in foreseeable future
3	Fair	Moderate defects that will continue to deteriorate
2	Good	Defects that have not begun to deteriorate
1	Excellent	Minor defects

b. The following general guidelines are provided in the MACP and PACP by totaling individual defects within a manhole or pipe segment to estimate the amount of the infrastructure's remaining service life. The DWM will be guided by these guidelines in its identification and prioritization of rehabilitation measures. Prevailing local conditions will be a major factor.

Grade	Estimated PACP System Timeline
5	Failure has occurred or is imminent
4	Failure likely in foreseeable future
3	Failure unlikely in near future
2	Minimal failure risk
1	Acceptable structural condition

END OF GUIDELINE

K. Smoke Testing Specifications, Guidelines, and Procedures.

SMOKE TESTING SPECIFICATIONS, GUIDELINES AND PROCEDURES

The Department of Watershed Management (DWM) smoke testing program is designed to provide evidence of the presence of sewer system defects that have the potential to allow the entry of I/I and to confirm the locations of unauthorized connections from buildings, residences, and structures to the Wastewater Collection and Transmission System (WCTS).

Smoke testing is performed by placing a blower over a centrally located manhole and blowing non-toxic smoke-filled air through a sewer line. Smoke is created using either a smoke bomb or liquid smoke. The fans create a pressure differential that forces the smoke into the sewer at a pressure above atmospheric. The smoke under pressure fills the main line plus any lateral service connections. When the smoke fills the pipe and service connections, it then finds exit points (cracks, offset joints, unauthorized connections, etc.). It then navigates its way to the ground surface, buildings, residences, or structures revealing the evidence of sewer system defects and confirming locations of unauthorized connections.

After placing the blower and filling the lines with smoke, the field crews perform visual inspections of the area being tested and mark the locations where smoke is observed exiting the ground, buildings, residences, and/or structures. If smoke rises from the street or the ground, this is an indication of a potential entry point for surface water. Locations of smoke exit points are mapped using a global positioning system or conventional survey methods to aid in the analysis of sewer system condition assessment data.

Smoke testing is an efficient way to determine if buildings are properly connected to the wastewater collection and transmission system. It is normal for the smoke to rise from the plumbing vent stack of a building, residence, or structure which has a properly connected plumbing system. However, the entry of smoke into a building, residence, or structure, is an indication of a plumbing problem that could be allowing the entry of sewer gasses into the building, residence, or structure; posing a health hazard to humans and the environment.

Possible causes for smoke entering buildings, residences, and structures include the following:

- The vents connected to the building's sewer lateral are inadequate, defective, or installed improperly.
- The traps under sinks, tubs, basins, showers, floor drains, etc., are dry, defective, installed improperly, or missing.
- The pipes, connections, and seals of the building's sewer system are damaged, defective, have plugs missing, or are installed improperly.

For optimum results, smoke testing should be performed during periods of relatively dry weather conditions. Following a period of rain, two to three lines should be re-smoked as sample test lines to ensure ground conditions are dry enough to continue smoke testing. The results from the test are compared to the results of the original smoke test. Occasionally, after a rainfall event, fewer defects may be encountered than during dry weather because smoke is less able to maneuver through moist soil conditions. If this is the case, smoke testing should be delayed further. If it were to begin raining during smoke testing, testing must be discontinued.

A public relations and notification program must be implemented to minimize public concerns raised by smoke testing. Such activities include the notification of residents, businesses, and institutions within the area to be smoke tested (through door hangers, door to door verbal notifications, etc.), publication of public notices in the newspaper, and daily communication with the fire, police, and emergency response departments. Special circumstances may necessitate the adjustment of smoke testing schedules to accommodate critical facilities such as hospitals and schools. Also, facilities may wish to have their own personnel present during testing so that testing may be stopped quickly if necessary.

SMOKE TESTING PROCEDURE

Date of Revision: December 17, 2012

ACTIVITY DESCRIPTION

Smoke testing is performed to gather evidence of the presence of sewer system defects that have the potential to allow the entry of I/I and to confirm the locations of unauthorized connections from buildings, residences, and structures to the WCTS. Smoke testing results are only reliable when the test is performed during periods of dry weather conditions, with relatively low to no wind, and when the soil moisture content is low to non-existent. Smoke testing results are documented with photographs, in writing, and GPS and conventional surveying.

ACTIVITY GOALS AND OBJECTIVES

The objective of smoke testing the County's sewer system is to gather evidence of the presence of indirect sources of infiltration (such as broken sewer pipes, offset joints, and other sewer defects) and to confirm locations of direct inflow (such as connections from roof leaders, stairwells, yard drains, driveways, patios, area drains, foundation drains, broken or un-capped clean-outs, defective manholes, and abandoned building sewers).

SAFETY ANALYSIS - Specific to job site conditions

Safety	Potential Hazards
• Safety Program • Protective Clothing and Equipment (Personal Protection Equipment) • Gases and other Hazardous Atmospheres Analysis (Confined Space Entry) • Overhead Power Lines (Electrical Safety) • Underground Services Utilities Locations • Traffic Safety Requirements (Traffic Safety)	• Infectious Diseases • Slip, Trip, and Fall • Poisonous Snakes, Pests • Confined Spaces (Confined Space Entry) • Traffic • Vehicle Operation • Mechanical Tools • Electrical Hazards (Electrical Safety) • Flooding and Inundation (Confined Space Entry) • Lifting

SMOKE TESTING CHECKLIST - Specific to job site conditions

SAFETY

- Traffic Cones
- Yellow Vests (for each crew member)
- Flashing Beam (mounted on the vehicle)
- Fire Extinguisher
- Traffic Signs
- Arrow Bar/Board (for heavy traffic areas, only)
- First-Aid Kit (fully stocked) and Safety Manual
- Cellular Telephone/2-way Radio
- Drinking Water and Disposable Cups
- Hand Cleaner – Alcohol, waterless, towel-less cleaner, paper towels

CLERICAL

- Supply of Smoke Test Forms
- Supply of Field Photo Forms
- Supply of Smoke Test Notices (Letters and Door Hangers)

- Clipboards
- Scotch Tape
- Maps – Street and Sanitary Sewer
- Small Note Pads (for each crew member)
- Pencils and Pens (for each crew member)
- County ID and Vendor/Contractor Name Badges (for each crew member)
- Carpenter's Aprons (for each crew member)
- Small white board and markers

WORKING

- Smoke Blowers
- Full Gas Cans for Smoke Blowers
- 2 Cycle Engine Oil
- 30 Weight Motor Oil
- Carburetor Cleaner/WD-40
- Extra Spark Plugs for Smoke Blowers
- Sand Bags (4-5 per vehicle) with 15'- 20' Ropes
- Extra Rope
- Supply of Smoke Bombs or liquid smoke
- Lighters for Smoke Bombs
- 50' or 100' Measuring Tape
- J-Hook
- Pick
- Shovels
- Sledge Hammers
- Camera and supplies
- Probing rod
- Flashlights
- Measuring Wheels
- Marking Paint
- Pin Flags
- Tool Box with spark plug, wrench and large socket set with breaker bar, bucket for used bombs

SMOKE TESTING SPECIFICATIONS

ACTIVITY/SUBTASK

PRE-WORK ACTIVITIES

1. **Public Notification**: Residents, institutions, and businesses in the area to be smoke tested shall be notified prior to initiation of smoke testing. Various methods shall be used to notify residents and businesses including door hangars, signs, and verbal discussions where feasible. Notifications will be performed as follows:

   a. Crews shall distribute pre-approved advance notice flyers forty eight (48) to seventy two (72) hours before smoke testing. If smoke testing is delayed, crews shall re-distribute flyers forty eight (48) to seventy two (72) hours prior to the rescheduled time of smoke testing. The flyer shall contain the following information at a minimum;

      - The reason for the testing.
      - The date of testing.
      - The location and area affected by the testing.
      - The time of the testing.
      - The contractor's name.
      - Contact telephone/County representative for further information

   b. Twenty-four (24) hours prior to the test, crews shall notify the Dispatch, Fire and Police Departments closest to the area to be tested.

   c. Crews shall identify a contact person at the appropriate Police Department and notify them daily as to the area, start time, and ending time of the smoke test.

   d. The Fire Department shall be notified about the exact locations where the tests would be performed; the specific time frames when the tests would be performed; the date/time when fliers were distributed to residents, businesses, and institutions; and that Right-of-Way signs, as described below, are in position.

   e. Two (2) hours prior to the test, crews shall make personal contact with a responsible person at schools, hospitals, nursing homes, and all other institution/public facilities in the immediate area of the smoke testing.

   f. Crews shall keep a daily log of the distribution of the flyers and the Fire, Police, and institutional/public facilities contacts made with responsible persons noted.

   g. Crews shall place “Right-of-Way” signs in prominent locations where testing is planned twenty four (24) hours in advance of commencing the tests. Signs shall be a minimum of twenty four (24) inches wide by eighteen (18) inches high with letters a minimum of two (2) inches high. Signs shall be supported a minimum of twelve (12) inches above grade by integral metal frames. Wording on the signs shall be similar to the following:

      SEWER SMOKE TESTING WILL BE CONDUCTED ON “date” and “time". Contact “person” with “company” at “phone number” for additional information.

2. **Permits for Right of Ways:** The Supervisor shall obtain work permits for all work to be performed in State and/or County Right-of-Ways. All other insurances, traffic control measures, and other terms of the permit shall be obtained and planned for in advance.

3. **Weather, Ground, and Ground Water Condition Requirements**: Smoke testing shall not be performed on rainy days, on cloudy days following rain, or when saturated soil conditions exist. Rainy days are defined as days where greater than 0.25 inches of rain fall in any consecutive twenty four-(24) hour period. Additionally, smoke testing shall only be performed when the groundwater level is low enough to provide accurate smoke testing results. Testing shall be closely monitored on windy days. If smoke coming out of the ground is blown away so quickly as to escape accurate detection

and/or photo documentation, testing shall cease until such time that weather conditions permit an accurate record of smoke testing results.

Any standing water indicates that additional drying out time is necessary. Drying time is affected by temperature and rainfall recurrence intervals. The Supervisor shall make the final determination as to when it is dry enough to continue smoke testing. Previously notified residents, businesses, and institutions shall be re-notified if smoke test date ranges have expired before completion.

4. **Flow Control:** Smoke testing shall normally be accomplished without the need for bypass pumping. Crews shall set up temporary plugs or flow barriers as required to contain an adequate volume of smoke within the section of sewer being tested. Crews shall coordinate with other DWM field staff if a line is to be plugged as part of the smoke test. Crews shall monitor the resulting surcharged sewer at the manhole upstream of the section of sewer being tested, or at another location if so directed by the Supervisor, and prevent overflow conditions from occurring by removing the flow barriers in a timely manner.

SITE PREPARATION

5. **Review Work Order:**
   a. The Supervisor shall review Work Order with Smoke Testing Crew(s).
   b. The Supervisor shall ensure that all necessary material and equipment have been gathered before leaving the yard.
   c. Vehicle Operation Safety Procedures shall be followed at all times.

6. **System Evacuation / Preparation:** When crews open a manhole cover during the smoke testing procedures, prior to placing any smoke into the manhole – crews should check gas readings. If the gas readings are above a safe level, crews should evacuate the system with a blower to ensure that any collection of explosive gas and any odor that may be introduced into the homes and businesses have been dispersed prior to pressurizing the sewer with smoke. Evacuation is accomplished by removing the manhole covers of all manholes in the run, then placing a vacuum on the manhole where the blower is located, and/or blowing air into the manhole.

7. **Site Security:** The work site shall be secured by placing traffic control signs and safety devices at the boundary of the work site.
   a. Traffic Safety Procedures shall be adhered to.
   b. Safety vests, hardhats, safety glasses, and steel toe boots shall be donned.
   c. One or more traffic lanes shall be isolated with flags, cones, traffic control signs, etc. where work is on the roads or immediately adjacent to roads.
   d. Equipment shall be kept away from overhead power lines, otherwise, the corresponding utility shall be contacted to de-energize or shield the power lines before equipment is placed near the power lines.
   e. The closest Fire Department shall be notified daily to stand by in case of emergencies.

SMOKE TESTING SPECIFICATIONS

ACTIVITY/SUBTASK

8. General Procedures:

a. Determine the location of the manhole on GIS the map. Use metal detection if manhole is not visible.

b. Check sewer main by removing manhole lids in the vicinity of the home/business until a free flowing manhole is found.

c. Lift the manhole cover using a hook. Drag the cover with the hook; avoid bending over and using hands whenever possible.

d. For heavier manholes, use a truck-mounted winch.

e. Follow OSHA Confined Space Entry Procedures after obtaining an entry permit (only if trained and certified)

f. Follow OSHA Personal Protection Equipment (PPE) Program.

g. DO NOT place your face near the manhole opening. Let the manhole 'breathe" for 10 minutes before looking in.

h. DO NOT SMOKE near manholes regardless of whether the cover is on or off.

i. DO NOT STAND on a removed manhole cover.

j. USE IMPERVIOUS GLOVES when working with an open manhole.

k. USE DISPOSABLE TYVEK COVERALLS to keep sewage off of your clothes.

l. Ensure proper operation of blower.

m. Isolate sections if necessary with sandbags, baffles, or other approved method.

n. Set up blower over an open manhole on the sewer segment to be inspected.

9. Start the smoke testing procedure:

a. Review Work Order with details on area (including linear feet and pipe size of sewer mains and laterals) identified for smoke testing.

b. Start the blower and force air into the line at least 5-10 minutes prior to setting off the smoke bombs.

c. Stand upwind of the smoke to avoid breathing the smoke.

d. Light one or more smoke bombs or canisters and lower into the sewer segment to be inspected or use the liquid smoke.

e. Force smoke through the sewer segment with the blower.

f. Intensified smoke testing techniques are used - include at least one blower capable of a free air delivery of at least three thousand (3,000) cubic feet per minute (cfm) and smoke generation for a minimum of nine (9) minutes.

g. Up to three (3) main segments but no more than nine hundred (900) feet of sewer main may be tested at one time. Main sections shall be adequately isolated if necessary by using sandbags, baffles, or other methods approved by the Supervisor.

h. Smoke emanating from vents on building or adjacent manholes will determine the extent of successful smoke testing.

i. Only clearly visible, dense smoke will qualify the sewer main tested for acceptance.

j. The perimeter of each residence or commercial building shall be inspected for sources of smoke. If inaccessible during testing, inspection will be noted for rescheduling at a later date. The inspection shall include yard drains, catch basins, etc. that might be connected to the sewer system. The roofs of each building shall be visually inspected for evidence of roof drains connected to sanitary drains.

k. Each smoke leak shall be documented as a defect, catalogued, and marked with a flag and a clearly visible paint mark made with non-permanent paint mark on public ground surfaces only. Flags only should be utilized on private property.

l. Excess smoke emitting from the blower can cause a traffic hazard and can obscure the field of view for nearby traffic. Smoke testing may need to be halted until sewer lines can be cleaned or testing can be performed at low flow periods of the day.

10. **Observe and record evidence of smoke escaping from the sewer through leaks, breaks, and other I/I sources:**

a. Walk the surrounding area to visually detect sources of smoke emissions.

b. Record the smoke testing results and document each defect with photographs labeled with date, time, and location. [Refer to Attachment A (Smoke Testing Form and Instructions)]

c. Code enforcement will be notified of any private property defect and the property owner will be given a notice letter.

d. Visually inspect manholes suspected of having direct inflow connections into sanitary sewers.

e. Identify direct inflow connections to sewers and interconnections between sanitary and storm sewer systems.

f. Survey all smoke exit points with a global positioning system (GPS) or conventional survey methods if GPS survey is not feasible.

11. **Confined Space Entry:** Crews shall minimize the physical entry of personnel into the sewer facilities. If required, manhole entry shall be performed in accordance with Federal state, and local laws, regulations, policies, requirements, and standards especially those promulgated by OSHA. Only trained crews and staff should conduct confined space entry after obtaining an entry permit. Staff must use safety equipment required for manhole entry operations, including harnesses, ventilation equipment, etc.

SMOKE TESTING SPECIFICATIONS

ACTIVITY/SUBTASK

12. Safe Work Area: The work area shall be protected at all times by means of an adequate number of cones, barricades, flags, flaggers, and other measures necessary to meet Manual for Uniform Traffic Control Devices (MUTCD) standards to properly and safely protect both vehicular and pedestrian traffic. Flag men shall work to secure all affected streets. Further requirements for traffic control may be imposed by the specific agency having jurisdiction. All traffic control measures shall comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by US DOT / FHWA.

13. Unsafe Conditions: Any condition deemed to be an unsafe condition shall be immediately reported to the Supervisor. Unsafe conditions shall require all work to be stopped immediately and a Safety Officer shall inspect the site.

14. Scheduling Time: Crews shall begin testing after 8:00 am and terminate testing no later than 5:00 pm each day. County authorization should be obtained if work is to be performed outside of the designated hours. Work should be performed in timeframes that will allow compliance with the County's noise ordinance.

DOCUMENTATION

15. Record Data: Crews shall record data on the Smoke Testing Report Form (Refer to Attachment A) and enter codes into the Smoke Testing database (using Microsoft Access).

a. **Smoke testing data collected includes:**

- Description of the smoke leak, including intensity of smoke code and amount [(i.e. equivalent gallons per minute (gpm)].
- Date and time of the test.
- Location, including reference to the relevant manhole (upstream and downstream manholes ID numbers) and the nearest street address.
- Area and type of surface drained at the location of the smoke leak.
- Weather conditions.
- Testing personnel.
- Digital color photographs of the results of each test.
- Defect source type.

b. **Schematic Layout**: Crews shall draft out a schematic layout of the manholes and sewer mains under testing including address and location, manhole ID numbers, photo number and direction taken, defect source type, accurate location of defect within the test area and type of surface drained. (Note geographical orientation relative to north)

c. All smoke exit locations shall be surveyed using a GPS or conventional survey methods if GPS survey is not feasible.

d. **Documentation for Each Sewer Segment**: A separate Smoke Test Report shall be submitted for each sewer main segment tested regardless if a defect is found or not.

e. **Further Investigation**: Any defects that need further investigation to pinpoint the location shall be recommended for dye flooding or CCTV inspection.

f. **Public vs. Private Side Defects**: Main line defects and service lateral defects will be carefully scrutinized to ensure that a conservative determination of public vs. private side defects is made. If on the private side, code enforcement will be notified and notice will be provided to the property owner.

16. Photographic Documentation:

a. Crews must document each smoke leak or series of leaks using digital camera supplied by the Supervisor. Each photograph shall be referenced in the database by filename along with the location of the smoke leak.

b. Photographs shall be taken to show the smoke leak as clearly visible in the foreground and a distinct fixed reference is visible in the background (such as a house).

c. A placard shall be placed in the photo referencing the smoke leak number.

d. A close up picture shall be taken to show a detailed view of the defect.

e. Digital photographs shall be horizontally oriented (4x6 inch) in Report.

f. The digital photographs shall incorporate references including the date the photograph was taken. Each picture shall have clearly annotated text that shall follow this naming convention: [LandLot][ManholeID]S[PhotoIncrementalNumber].jpg

WORK SITE BREAK DOWN

17. Break down work site and report the work completed:

a. Remove tools, sandbags, plugs and any other materials.

b. Replace manhole cover by dragging it with the hook.

c. When manhole cover is in place, remove Tyvek coveralls and place in garbage bag for disposal. Wash down and disinfect outside of boots. Remove gloves.

d. Complete clean up of work site and any sewage spills in the work site. Disinfect and sanitize area affected by sewage contamination if any.

e. Clean equipment and place in truck.

f. Complete /fill out Work Order information. Record linear feet of sewer line inspected and document all photographs and videos.

Attachment A – Inspection Form and Instructions

Date: ____/____/____
Crew: ____, ____, ____
Crew No. ________

SMOKE TESTING

Project No. ________
Sub-Basin No. ____________

Line Segment: ( ) ________________ **To** ( ) ________________
Upstream **Downstream**

Weather Conditions: ________________
1 = 110-90°, 2 = 90-80°, 3 = 80-70°, 4 = 70°-below
Ground Conditions: ________________
1 = dry, 2 = moist, 3 = wet, 4 = saturated
Precipitation: ________________
1 = dry, 2 = drizzle, 3 = rain
Last Rain Event: ____/____/____

Pipe Length (ft.): ____________
Pipe Diameter (in.): ____________
Status Code: ____________
Measure Code: ____________

Status Code:
1=C.N.L. 4=Line too long
2=D.N.E. 5=Diameter too large
3=Buried 6=Complete

Measure Code:
1=Scaled from Map 4=Total Station
2=Walking Wheel 5=Estimated
3=Tape Measure

PART A: PRIVATE SECTOR

Smoke Defect No.	Bldg. Defect No.	Address	Defect Type	*Optional:* Footage (0=DS MH)	Offset (L/R)	Offset Footage	Tributary Area (sq. ft.)	Smoke Intensity	Photo ID
A									
B									
C									
D									
E									
F									
G									
H									
I									
J									

Defect Type:
1 = Downspout
2 = Uncapped Cleanout
3 = Driveway Drain
4 = Stairwell Drain
5 = Foundation Drain
6 = Area Drain
7 = Service Lateral
8 = Window Well
9 = Plumbing Defect

Smoke Intensity:
1 = Light
2 = Medium
3 = Heavy

PART B: PUBLIC SECTOR

Defect No.	Defect Type	Footage (0=DS MH)	*Optional:* Offset (L/R)	Offset Footage	Tributary Area (sq. ft.)	Smoke Intensity	Photo ID	Comments
S								
T								
U								
V								
W								
X								
Y								
Z								

Defect Type:
1=Curb Inlet
2=Area Drain
3=Line Defect
4=Indirect Storm
5=Manhole Defect
6=Drainage Crossing
7=Water Valve
8=Direct Storm

Smoke Intensity:
1=Light
2=Medium
3=Heavy

Additional Comments: ________________

Smoke Test Diagram

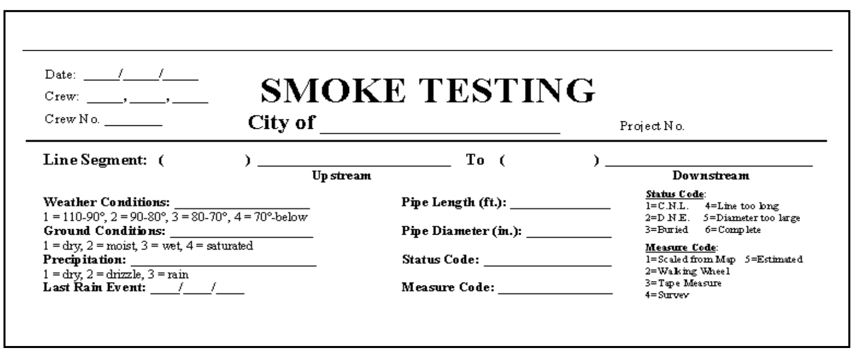
N

INSTRUCTION FOR COMPLETING THE SMOKE TESTING FORM

Note: Include the Smoke Diagram Form for documenting the defects encountered during smoke testing including locations with reference to permanent structures in the area.

The smoke testing form is divided into three (3) separate sections. The top portion of the form includes general information about the inspection including the date, sewer line being tested, and weather conditions. The middle section provides specific information about private sector defects located during smoke testing. Private sector defects found during building inspections can be cross-referenced with private sector smoke defects. Finally, the bottom portion of the form provides specific information about public sector defects detected during smoke testing. Included in the public sector portion of the sheet is a section that cross-references smoke defects with dye test results.

The top portion of the Smoke Testing Form:


Date: ____/____/____
Crew: ____, ____, ____
Crew No. ______

SMOKE TESTING

City of ____________________ Project No.

Line Segment: ( ) ____________ To ( ) ____________
Upstream **Downstream**

Weather Conditions: __________
1 = 110-90°, 2 = 90-80°, 3 = 80-70°, 4 = 70°-below
Ground Conditions: __________
1 = dry, 2 = moist, 3 = wet, 4 = saturated
Precipitation: __________
1 = dry, 2 = drizzle, 3 = rain
Last Rain Event: ____/____/____

Pipe Length (ft.): __________
Pipe Diameter (in.): __________
Status Code: __________
Measure Code: __________

Status Code:
1=C.N.L. 4=Line too long
2=D.N.E. 5=Diameter too large
3=Buried 6=Complete

Measure Code:
1=Scaled from Map 5=Estimated
2=Walking Wheel
3=Tape Measure
4=Survey

Date: Enter the date on which the smoke test was completed.

Crew: Enter the initials of the smoke test crew, beginning with the crew leader.

Crew No.: Enter the crew number.

City of : Enter the City where the smoke test is being conducted.

Work Order No.: Enter the Work Order Number.

Line Segment: Enter the upstream sewershed number in the parentheses and the upstream manhole number on the first line. Enter the downstream sewershed number in the parentheses and the downstream manhole number on the next line. Manhole numbers shall have the same convention as the Manhole Inspection Form.

Weather Conditions: Enter the code that describes the current temperature.

Ground Conditions: Enter the current ground conditions.

Precipitation: Enter current weather conditions.
Last Rain Event: Enter the estimated date of the last measurable rain event in the area, generally greater than 0.25”.

Pipe Length: Enter the length of the pipe as measured on the ground from the upstream manhole to the downstream manhole. Measurement is normally recorded using a measuring wheel. It is approximate.

Pipe Diameter: Enter the insides diameter of the pipe.

Status Code: Enter the number code that describes the status of the line and/or manhole being smoke tested.

1 = C.N.L.: Cannot Locate
2 = D.N.E.: Does Not Exist
3 = Buried
4 = Line too long
5 = Diameter too large
6 = Complete

Measure Code: Enter the number code that describes the method used to measure the pipe length.

1 = Scaled from Map
2 = Walking Wheel
3 = Tape Measure
4 = Survey
5 = Estimated

The middle portion of the Smoke Testing Form:

PART A: PRIVATE SECTOR

Smoke Defect No.	Bldg. Defect No.	Address	Defect Type	*Optional:* Footage (0=DS MH)	Offset (L/R)	Offset Footage	Tributary Area (sq. ft.)	Smoke Intensity	Comments:
A									
B									
C									
D									
E									
F									
G									
H									
I									
J									

Defect Type:
1 = Downspout
2 = Uncapped Cleanout
3 = Driveway Drain
4 = Stairwell Drain
5 = Foundation Drain
6 = Area Drain
7 = Service Lateral
8 = Window Well
9 = Plumbing Defect

Smoke Intensity:
1 = Light
2 = Medium
3 = Heavy

PART A: PRIVATE SECTOR

Bldg. Defect No.: Enter the building defect number that corresponds with the defect located during smoke testing. Omit filling out this section in the field. Wait till the results can be crossed referenced with the Building Inspection record.

Address: Enter the street address of the property where the smoke defect was located.

Defect Type (DT): Enter the code number that corresponds with the type of private sector defect located.

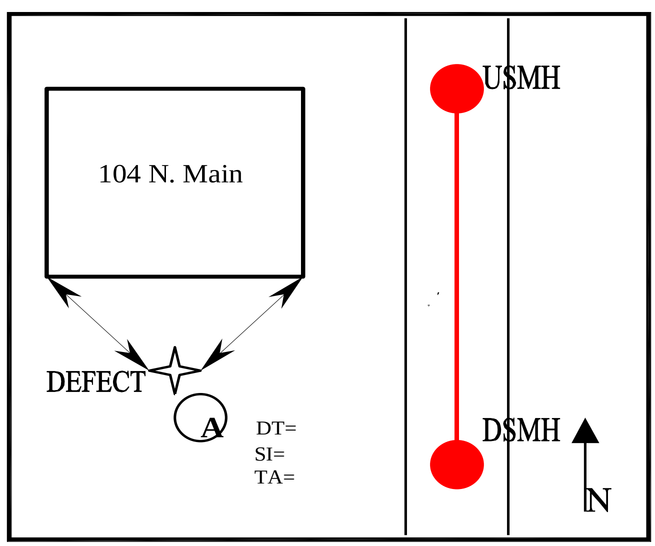
1 = Downspout
2 = Uncapped Cleanout
3 = Driveway Drain
4 = Stairwell Drain
5 = Foundation Drain
6 = Area Drain
7 = Service Lateral
8 = Window Well
9 = Plumbing Defect

Optional:

Footage: Enter the distance measured from the downstream manhole to the defect located (and flagged).

Offset (L/R): Direction (left or right) of the defect from the downstream manhole, looking upstream.

Offset Footage: The perpendicular distance from the defect to the sewer line.



Tributary Area (TA): Estimated area draining to the defect.

Smoke Intensity (SI): Enter the code number that best describes the intensity of smoke coming from the defect.

Comments: Write any comments about the manholes or the sewer line being smoke tested.

The bottom portion of the Smoke Testing Form:

PART B: PUBLIC SECTOR

Defect No.	Defect Type	Footage (0=DSMH)	*Optional:* Offset (L/R)	Offset Footage	Tributary Area (sq. ft.)	Smoke Intensity	DYED WATER TEST: Dyed:	Result: Pos.	Neg.	Sus.	Date:	Comments:
S	___	___	___	___	___	___	☐	☐	☐	☐	__/__/__	___
T	___	___	___	___	___	___	☐	☐	☐	☐	__/__/__	___
U	___	___	___	___	___	___	☐	☐	☐	☐	__/__/__	___
V	___	___	___	___	___	___	☐	☐	☐	☐	__/__/__	___
W	___	___	___	___	___	___	☐	☐	☐	☐	__/__/__	___
X	___	___	___	___	___	___	☐	☐	☐	☐	__/__/__	___
Y	___	___	___	___	___	___	☐	☐	☐	☐	__/__/__	___
Z	___	___	___	___	___	___	☐	☐	☐	☐	__/__/__	___

Defect Type:
1=Curb Inlet
2=Area Drain
3=Line Defect
4=Indirect Storm
5=Manhole Defect
6=Drainage Crossing
7=Water Valve
8=Direct Storm

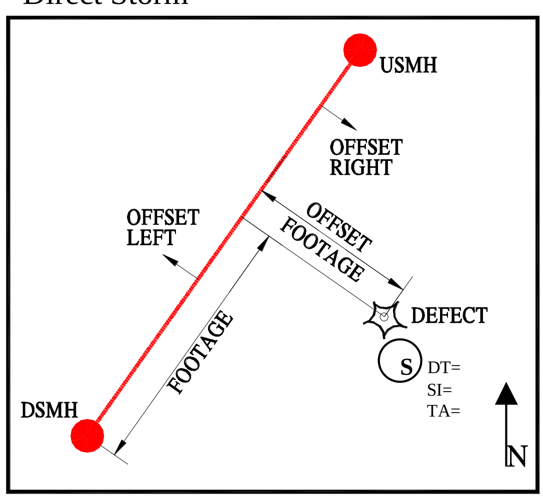
Smoke Intensity:
1=Light
2=Medium
3=Heavy

Additional Comments: ______________________

PART B: PUBLIC SECTOR

Defect Type (DT): Enter the code number that corresponds with the type of public sector defect located.

1 = Curb Inlet
2 = Area Drain
3 = Line Defect
4 = Indirect Storm
5 = Manhole Defect (always write as upstream defects)
6 = Drainage Crossing
7 = Water Valve
8 = Direct Storm



Optional:

Footage: Enter the distance measured from the downstream manhole to the defect located (and flagged).

Offset (L/R): Direction (left or right) of the defect from the downstream manhole, looking upstream.

Offset Footage: The perpendicular distance from the defect to the sewer line.

Tributary Area (TA): Estimated area draining to the defect.

Smoke Intensity (SI): Enter the code number that best describes the intensity of smoke emanating from the defect.

Comments: Write any comments about the manholes or the sewer line being smoke tested.

Additional Comments: Write any general comments about the manholes or the sewer line being smoke tested.

Smoke Test Diagram: Field sketches of all observed sources must be drawn on the Smoke Test Diagram form showing adjacent streets, location and distance of defect with respect to the upstream or downstream manholes, and measured distances from permanent structures to facilitate easier future identification of the source. *The field sketch should be drawn such that the top of the page is always north.*

Smoke Photo: All observed defects must be photographed, whether by Polaroid cameras, 35mm cameras, digital cameras, or another device that can capture a permanent record of the location of the defect and the intensity of smoke so that it may be traced back at a later time for follow-up rehabilitation. Photographs must show smoke coming from the defect and a permanent landmark such as a building, tree or power pole for reference. Each Polaroid photograph shall be labeled with the line ID smoke defect number, street address, if known, smoke intensity, type of defect, and estimated drainage area to the defect. Photographs shall be mounted on the Smoke Photo Form labeled with the corresponding sewer line segment. When using a 35mm or digital cameras, a log sheet must be created to track all photographs taken. All data required for Polaroid shall also be included on the log sheet in addition to the photograph and film roll number.

Attachment B – Sample Public Flyer

IMPORTANT NOTICE

DeKalb County Department of Watershed Management

Notice of Smoke Testing Work

DeKalb County Department of Watershed Management will soon begin Smoke Testing in your neighborhood. Information collected during Smoke Testing will be used to improve and repair the wastewater collection system. The Department of Watershed Management has contracted with "Contractor's Name" to perform this work.

- Smoke testing is a way of finding defects or improper connections in sewer lines. The smoke is forced into the line and comes out of cracks, holes, and other defects in the sewer system.
- **It is normal to see smoke exit the vent stacks on your home or building.** Smoke can enter the home through defects that may exist in your home's plumbing. If smoke comes out of the gutter, you may have an illegal cross connection. Call your plumber if smoke is detected inside your home. **<u>Remember: The smoke is non-toxic, creates no fire hazard, and will not harm children, pets, or plants.</u>** Persons with severe asthma should avoid breathing any smoke to avoid irritation

Upon receiving this notice, please run or pour water in all drains that are not often used such as garage/basement floor drains.

Material Safety Data Sheet (MSDS) for smoke agent is available through the contacts below.

We appreciate your cooperation. This testing is an important "tool" used in the evaluation of sanitary sewer lines and will result in substantial savings to DeKalb County and its rate payers. Should you have any questions regarding the smoke testing, please contact "contact person" at "Contact's phone number" or contact's 2nd phone number."

Attachment C – Sample Letter

:

Date
TO WHOM IT MAY CONCERN

This letter is to notify you that the DeKalb County Department of Watershed Management and its contractors will be working on the sanitary sewer system in your area. DeKalb County is in the process of investigating sewers and manholes in order to identify repairs that are needed to improve the performance of the sewers and to eliminate sanitary sewer overflows. In the next several months, some residents will notice smoke coming from their sanitary sewers. This is part of a testing program to find leaks and unauthorized connections into the sewer system. The non-toxic, odorless smoke is blown into sewer manholes in the street, goes through the pipes, and comes out where there are broken pipes and where roof downspouts, outside area drains, or foundation drains are connected to the sanitary sewers.

The smoke testing program and necessary repairs of sewer pipes are part of the County's multi-million dollar planned investment over the next seven (7) years to repair sewer pipes and to make improvements to the overall sewer system. This investment is in addition to regular operations; maintenance, and routine capital projects and is the beginning of a major investment in the aging infrastructure. This investment by ratepayers is not funded by taxes but rather is funded by the rates paid for sewer service on the utility bill.

Work will begin in your area in the next few weeks. Smoke testing teams typically have one (1) to four (4) people. Their trucks will have the DeKalb County logo or DeKalb County's contractor logo displayed on the door panels for easy identification. In addition, each inspector will be wearing an identification badge. Their work will occur during the day from 8:00 A.M. – 5:00 P.M. Monday through Friday.

During the process of smoke testing, it is normal for smoke to come out of your roof vents. The smoke is not harmful, and should not enter buildings unless there are leaks or defects in your plumbing which could be allowing harmful sewer gases into your house or building.

In order to help keep smoke from entering your building, please pour 24 ounces of water into your basement floor drains and all drains in sinks, bathtubs, showers. If smoke enters your building, the room can be easily ventilated through an open window or door. Let the field technician outside know there is smoke or call *Name and Number*.

If you are disabled, have respiratory problems, or are aware of any shut-ins, please call our office. If you have questions or concerns, please contact us at:

DeKalb County, Department of Watershed Management
Phone Number 7:00 am to 5:30 pm weekdays
Phone Number after hours
www.dekalbcounty.gov

Sincerely,

Name,

Collection System Supervisor

L. Scheduled Assessment and Rehabilitation Measures within the Initial and Additional Priority Areas.

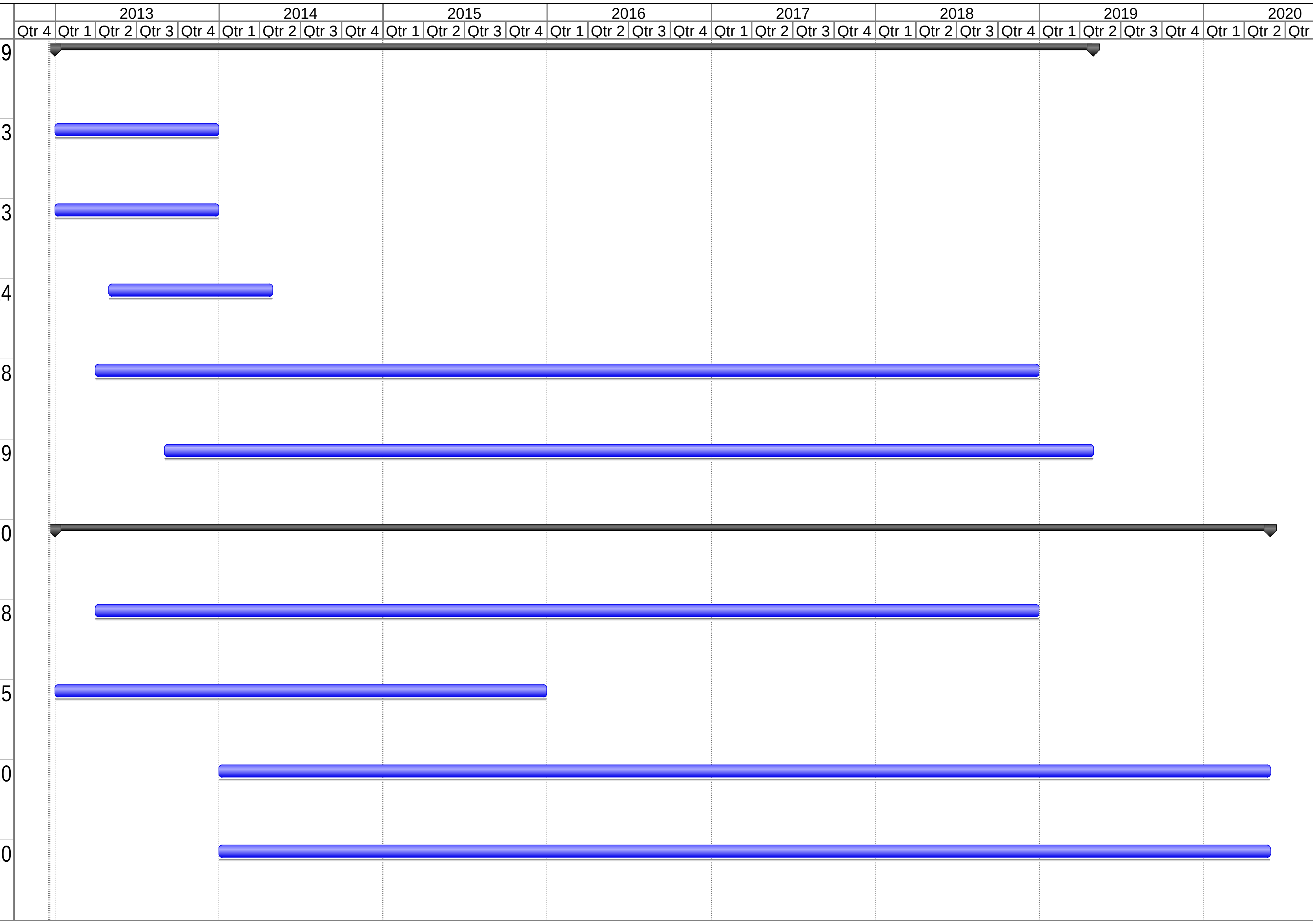
COMPLETED, ONGOING, AND SCHEDULED ASSESSMENTS AND REHABILITATION MEASURES WITHIN THE INITIAL AND ADDITIONAL PRIORITY AREAS							
Consent Decree Priority Area Number	**New Priority Area Number**	**Project Name**	**Project Description**	**Total Quantity**	**Quantity in Priority Area**	**Date Started**	**Completion Date**
2	I-IG1	Nancy Creek - Winters Chapel Rd.	Cleaning & CCTV	21447.2 LF	2200 LF	11/12/08	07/06/09
			Cleaning & CCTV	3583 LF	2000 LF	8/1/10	10/29/10
3	I-IG2	Winters Chapel	Cured-in-Place Liner Rehabilitation	3583 LF	2000 LF	8/1/10	10/29/10
		Manhole Assessment	Manhole Assessment	103 MHs	103 MHs	2009	2011
5	I-IG5	Oakcliff-Pleasantdale Road	Cleaning & CCTV	3262.8 LF	300 LF	3/20/2012	4/17/2012
		London Drive	Cleaning, CCTV, Pipe Bursting Rehabilitation	273 LF	273 LF	8/29/2011	9/21/2011
		Manhole Assessment	Manhole Assessment	430 MHs	430 MHs	2009	2011
		Munday Drive	Cleaning & CCTV	10673.3 LF	10673.3 LF	2/1/2012	2/29/2012
		Munday Drive - Burk Drive	Sewer Point Repair	353 LF	353 LF	10/22/2012	10/24/2012
		Munday Drive - Hood Avenue	Sewer Point Repair	316 LF	316 LF	10/15/2012	10/18/2012
		Munday Drive	Cleaning & CCTV	10673 LF	10673 LF	2/1/2012	2/29/2012
6	I-IG6	Johnson Ferry	Cleaning & CCTV	14471.4 LF	14471.4 LF	5/2/2011	12/31/2013
8	I-IG11	Manhole Assessment	Manhole Assessment	21 MHs	21 MHs	2009	2011
			CCTV, Cured-in-Place Liner Rehabilitation	16118 LF	15137 LF	12/01/07	03/17/09
			Manhole Assessment	283 MHs	283 MHs	2009	2011
9	I-IG10	Buford Highway	Sewer Point Repair	1 Point Repair	1 Point Repair	12/01/07	03/17/09
		Alderbrook Rd	Relining, CCTV & Cleaning of Lower Snapfinger Basin	1490 LF	1490 LF	10/30/2010	6/1/2012
10	I-IG16	Manhole Assessment	Manhole Rehabilitation	449 MHs	449 MHs	2009	2011
10,12, 23	I-IG13, I-IG16, I-IG17	Southfork Peachtree Creek Basin Improvements	Engineering Study	1543180 LF	422704 LF	10/1/2012	6/30/2013
11	I-IG15	Manhole Assessment	Manhole Assessment	122 MHs	122 MHs	2009	2011
			Manhole Assessment	237 MHs	237 MHs	2009	2011
14	I-IG19	Northern Ave.	Cleaning & CCTV	8565.3 LF	3300 LF	12/02/08	01/09/09
	I-SF1	Farnham Court	Cleaning & CCTV	21000 LF	21000 LF	11/26/2012	2013
		Columbia Drive	Lift Station Rehabilitation	1 Lift Station	1 Lift Station	2012	2013
			Manhole Rehabilitation	27 MHs	27 MHs	5/23/2012	10/5/2012
15	I-SF2	Cobb Fowler Basin	Manhole Rehabilitation	15 MHs	15 MHs	10/29/2012	12/15/2012
15 & 20	I-SF2, I-SF3	Cobb Fowler and Shoal Creek	Cleaning & CCTV	45059.5 LF	45059.5 LF	6/10/2011	8/30/2011
		Manhole Assessment	Manhole Assessment	90 MHs	90 MHs	2009	2011
		Chamblee Tucker Road	Sewer Point Repair	122 LF	122 LF	06/01/09	06/03/09
			Cleaning & CCTV	65052.11 LF	15916 LF	04/13/09	07/17/09
			Cleaning, pre CIPP CCTV inspection	12000.2 LF	12000.2 LF	6/12/2012	7/20/2012
17	I-IG8	Embry Circle	Cleaning, CCTV, Cured-in-Place Liner Rehabilitation	12000.2 LF	12000.2 LF	7/30/2012	2012
18	I-IG12	Manhole Assessment	Manhole Assessment	130 MHs	130 MHs	2009	2011
		Manhole Assessment	Manhole Assessment	395 MHs	395 MHs	2009	2011
19	I-IG14	Braircliff Road	Cleaning & CCTV	12260.9 LF	12260.9 LF	3/1/2011	7/6/2011
		Manhole Assessment	Manhole Assessment	12 MHs	12 MHs	2009	2011
		Miriam Lane	Creek Crossing Repair	14 LF	14 LF	10/06/09	10/06/09
		Miriam Lane	Cleaning & CCTV	19430.5 LF	19430.5 LF	9/22/2011	12/13/2011
		Miriam Lane - Welika Drive Location 1	Sewer Point Repair	74 LF	74 LF	6/18/2012	6/20/2012
		Miriam Lane - Welika Drive Location 2	Sewer Point Repair	35 LF	35 LF	11/7/2012	11/30/2012
20	I-SF3	Shoal Creek Basin Manhole Rehabilitation	Manhole Rehabilitation	40 MHs	40 MHs	2013	2013
21	I-PB1	Manhole Assessment	Manhole Assessment	1 MH	1 MH	2009	2011
22	I-SF4	Manhole Assessment	Manhole Assessment	60 MHs	60 MHs	2009	2011
NA	A-IG2	Manhole Assessment	Manhole Assessment	169 MHs	169 MHs	2009	2011
NA	A-IG3	Will Ross Court	Sanitary Sewer Re-routing	400 LF	400 LF	2013	2015

COMPLETED, ONGOING, AND SCHEDULED ASSESSMENTS AND REHABILITATION MEASURES WITHIN THE INITIAL AND ADDITIONAL PRIORITY AREAS - CONT'D							
Consent Decree Priority Area Number	New Priority Area Number	Project Name	Project Description	Total Quantity	Quantity in Priority Area	Date Started	Completion Date
		Manhole Assessment	Manhole Assessment	1824 MHs	1824 MHs	2009	2011
		Drew Valley (Briar Wood Pool)	Pipe Bursting Rehabilitation	240 LF	240 LF	4/12/2012	5/14/2012
		Caladium Drive	Cured-in-Place Liner Rehabilitation	600 LF	600 LF	1/1/2013	3/31/2012
			Cured-in-Place Liner Rehabilitation	700 LF	700 LF	11/26/2012	3/31/2013
NA	A-IG5	Skyland Drive	Relining, CCTV & Cleaning	700 LF	700 LF	11/26/2012	3/31/2013
NA	A-IG6	Caladium Drive	Relining, CCTV & Cleaning	600 LF	600 LF	2013	2015
NA	A-SF3	Manhole Assessment	Manhole Assessment	240 MHs	240 MHs	2009	2011
NA	A-SF4	Rowland Rd (Aerial Creek Crossing)	Sewer Point Repair	1 Point Repair	1 Point Repair	2/1/2010	2/1/2010
NA	A-SF9	Manhole Assessment	Manhole Assessment	14 MHs	14 MHs	2009	2011
NA	A-PB3	Manhole Assessment	Manhole Assessment	17 MHs	17 MHs	2009	2011
		Lithonia I Pump station	Constuction of the new pump station. Demolition of existing Lithonia I & II pump stations	1 Lift Station	1 Lift Station	2013	2014
		Manhole Assessment	Manhole Assessment	23 MHs	23 MHs	2009	2011
NA	A-PB4	Stonecrest Sanitary Sewer and Force Mains	Pipeline Replacement	Gravity: 15,400 LF Force Main: 5,900 LF	Gravity: 15,400 LF Force Main: 5,900 LF	2013	2015
NA	A-PB5	Manhole Assessment	Manhole Assessment	70 MHs	70 MHs	2009	2011
		Manhole Assessment	Manhole Assessment	4 MHs	4 MHs	2009	2011
NA	A-PB6	Fairington	Future Lift Station Project	1 Lift Station	1 Lift Station	2012	2013

M. General Schedule for Completing Additional Assessment and/or Prioritized Rehabilitation Measures within the Initial and Additional Priority Areas.

General Schedule for Completing the Assessment and/or Rehabilitation Measures within the Initial and Additional Priority Areas

ID	Task Number	Task Name	Calendar Days	Start	Finish
1		Assessment of Priority Areas	2101	Tue 1/1/13	Wed 5/1/19
2	001	Establish the Physical Boundaries of the Priority Areas	365	Tue 1/1/13	Tue 12/31/13
3	002	Determine Optimization of Flow Monitors and Rain Gauges	365	Tue 1/1/13	Tue 12/31/13
4	003	Relocate or Install Additional Flow Monitors and Rain Gauges as Needed	365	Wed 5/1/13	Wed 4/30/14
5	004	Perform the Assessment of Priority Areas	2101	Mon 4/1/13	Mon 12/31/18
6	005	Analyze Assessment Data and Identify and Prioritize Rehabilitation Measures	2068	Mon 9/2/13	Wed 5/1/19
7		Implement Rehabilitation Measures	2341	Tue 1/1/13	Fri 5/29/20
8	006	Rehabilitate Severe Defects	2101	Mon 4/1/13	Mon 12/31/18
9	007	Complete Scheduled Rehabilitation Measures	1095	Tue 1/1/13	Thu 12/31/15
10	008	Implement Prioritized Rehabilitation Measures	2341	Wed 1/1/14	Fri 5/29/20
11	009	Track and Inventory Completed Rehabilitation Measures	2341	Wed 1/1/14	Fri 5/29/20



Project: PASARP - General Schedule
Date: 12/20/12

Task | Progress | Summary

APPENDIX B: REVISED TOTAL MAXIMUM DAILY LOAD EVALUATION FOR SEVENTY-NINE STREAM SEGMENTS IN THE CHATTAHOOCHEE RIVER BASIN FOR FECAL COLIFORM

Revised

Total Maximum Daily Load

Evaluation

for

Seventy-Nine Stream Segments

in the

Chattahoochee River Basin

For

Fecal coliform

Submitted to:

The U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

Submitted by:
The Georgia Department of Natural Resources
Environmental Protection Division
Atlanta, Georgia

November 2008

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Appendix

EXECUTIVE SUMMARY

The State of Georgia assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are placed into three categories, supporting, partially supporting, or not supporting their designated uses, depending on water quality assessment results. These water bodies are found on Georgia's 305(b) list as required by that section of the CWA that defines the assessment process, and are published in *Water Quality in Georgia* every two years.

Some of the 305(b) partially and not supporting water bodies are also assigned to Georgia's 303(d) list, also named after that section of the CWA. Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard. The TMDL process establishes the allowable pollutant loadings or other quantifiable parameters for a water body based on the relationship between pollutant sources and in-stream water quality conditions. This allows water quality-based controls to be developed to reduce pollution and to restore and maintain water quality.

The State of Georgia has identified seventy-nine (79) stream segments located in the Chattahoochee River Basin as water quality limited due to fecal coliform. A stream is placed on the partial support list if more than 10% of the samples exceed the fecal coliform criteria and on the not support list if more than 25% of the samples exceed the standard. Water quality samples collected within a 30-day period that have a geometric mean in excess of 200 counts per 100 milliliters during the period May through October, or in excess of 1000 counts per 100 milliliters during the period November through April are in violation of the bacteria water quality standard. In addition, a single sample in excess of 4000 counts per 100 milliliters during the period November through April can also provide a basis for adding a stream segment to the 303(d) listing. The water use classifications of all of the impacted streams are Fishing, Recreation, and Drinking Water.

An important part of the TMDL analysis is the identification of potential source categories. Sources are broadly classified as either point or nonpoint sources. A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Nonpoint sources are diffuse, and generally, but not always, involve accumulation of fecal coliform bacteria on land surfaces that washoff as a result of storm events.

The process of developing fecal coliform TMDLs for the Chattahoochee River Basin listed segments includes the determination of the following:

- The "current" critical fecal coliform load to the stream under "current" conditions;
- The TMDL for similar conditions under which the "current" load was determined; and
- The percent reduction in the "current" critical fecal coliform load necessary to achieve the TMDL.

The calculation of the fecal coliform load at any point in a stream requires the fecal coliform concentration and stream flow. The availability of water quality and flow data varies considerably among the listed segments. Two different approaches were used depending on data availability: Loading Curve Approach and Equivalent Site Approach. The fecal coliform loads and required reductions for each of the listed segments are summarized in the table below.

Fecal Loads and Required Fecal Load Reductions

Stream Segment	Current Load (cnts/30 days)	TMDL Components					Percent Reduction
		WLA (cnts/30 days)	WLA_{SW} (cnts/30 days)	LA (cnts/30 days)	MOS (cnts/30 days)	TMDL (cnts/30 days)	
Anneewakee Creek	3.95E+12	6.69E+11		2.38E+12	3.39E+11	3.39E+12	14%
Arrow Creek	6.87E+12		4.48E+11	1.99E+11	7.19E+10	7.19E+11	90%
Ball Mill Creek	2.49E+12		2.08E+11	1.01E+11	1.23E+11	1.23E+12	51%
Balus Creek	5.17E+12			1.70E+12	1.89E+11	1.89E+12	64%
Big Creek - Headwaters to Cheatham Creek	7.73E+12	2.12E+11		5.34E+12	1.39E+11	1.39E+12	82%
Big Creek - Hwy 400 to Chattahoochee River	1.01E+13		2.43E+11	1.00E+12	6.17E+11	6.17E+12	39%
Bishop Creek	2.04E+11		6.64E+10	2.97E+10	1.07E+10	1.07E+11	48%
Blue John Creek	2.34E+12			1.14E+12	1.27E+11	1.27E+12	46%
Bubbling Creek	2.87E+12		1.23E+11	5.49E+10	1.97E+10	1.97E+11	93%
Bull Creek	2.86E+12		1.65E+11	4.43E+11	6.75E+10	6.75E+11	76%
Burnt Fork Creek	1.02E+13		9.27E+11	4.56E+11	1.54E+11	1.54E+12	85%
Buttermilk Creek	5.67E+11		1.43E+11	1.07E+11	2.78E+10	2.78E+11	51%
Camp Creek	9.86E+14		4.41E+13	1.04E+14	1.64E+13	1.64E+14	83%
Chattahoochee River - Ga Hwy 17, Helen	2.97E+14			4.08E+13	4.54E+12	4.54E+13	85%
Chattahoochee River - Morgan Falls Dam to Peachtree Creek	3.16E+14	5.15E+12	5.68E+13	8.57E+13	1.64E+13	1.64E+14	48%
Chattahoochee River - Peachtree Creek to Utoy Creek	4.54E+14	2.73E+13	5.78E+13	7.07E+13	1.78E+13	1.78E+14	61%
Chattahoochee River - Utoy Creek to Pea Creek	2.02E+15	8.50E+12	1.07E+14	1.81E+14	3.29E+13	3.29E+14	84%
Chattahoochee River - Pea Creek to Wahoo Creek	2.28E+15	8.65E+10	9.33E+13	2.21E+14	3.50E+13	3.50E+14	85%
Chattahoochee River - Wahoo Creek to Franklin	1.26E+16	2.39E+18		3.59E+17	3.99E+16	3.99E+17	83%
Chattahoochee River - North Highland Dam to Upatoi Creek	5.11E+15	5.73E+12	1.60E+12	3.40E+14	3.86E+13	3.86E+14	92%
Chattahoochee River - Upatoi Creek to Railroad	1.26E+15	3.41E+11		4.40E+14	4.90E+13	4.90E+14	61%
Chattahoochee River - Downstream W.F. George Dam	3.14E+14	9.10E+09		2.70E+14	3.00E+13	3.00E+14	5%
Clear Creek	3.38E+13	Q*200[a]	2.25E+11	1.05E+11	3.66E+10	3.66E+11	99%
Cracker Creek	1.11E+12			3.41E+11	3.79E+10	3.79E+11	66%
Crawfish Creek	6.40E+12			3.78E+12	4.20E+11	4.20E+12	34%
Crooked Creek	3.62E+12		4.68E+11	2.85E+11	8.36E+10	8.36E+11	77%
Flat Creek	1.49E+13	1.57E+12		6.75E+11	2.49E+11	2.49E+12	83%
Foe Killer Creek	7.72E+11		3.93E+11	2.69E+11	7.35E+10	7.35E+11	5%
Foxwood Branch	9.75E+10		4.08E+10	1.75E+10	6.48E+09	6.48E+10	34%
Hilly Mill Creek	5.60E+12			2.46E+12	2.74E+11	2.74E+12	51%
Hog Waller Creek	2.69E+11		1.38E+11	7.45E+10	2.36E+10	2.36E+11	12%

Stream Segment	Current Load (cnts/30 days)	TMDL Components					Percent Reduction
		WLA (cnts/30 days)	WLA_{SW} (cnts/30 days)	LA (cnts/30 days)	MOS (cnts/30 days)	TMDL (cnts/30 days)	
Johns Creek	3.26E+12		5.86E+11	5.46E+11	1.26E+11	1.26E+12	61%
Kelly Mill Branch	4.23+11			3.47E+11	4.12E+10	4.12E+11	3%
Level Creek	2.72E+13		1.36E+12	2.15E+12	3.90E+11	3.90E+12	86%
Long Cane Creek	6.40E+12			3.16E+12	4.84E+11	4.84E+12	24%
Long Island Creek	5.69E+11		1.67E+11	8.02E+10	2.75E+10	2.75E+11	52%
Lullwater Creek	3.45E+12		4.76E+11	2.58E+11	8.16E+10	8.16E+11	76%
Marsh Creek	9.64E+11		2.22E+11	1.24E+11	3.85E+10	3.85E+11	60%
Mobley Creek	4.38E+12			1.85E+12	2.05E+11	2.05E+12	53%
Mountain Oak Creek	1.76E+12			1.52E+12	1.68E+11	1.68E+12	5%
Mud Creek	8.47E+11			6.43E+11	7.14E+10	7.14E+11	16%
Mud Creek	3.23E+12		6.23E+11	8.85E+11	1.68E+11	1.68E+12	48%
Mulberry Creek	1.69E+12			1.37E+12	1.53E+11	1.53E+12	10%
Nancy Creek	2.70E+13		2.57E+12	1.26E+12	4.25E+11	4.25E+12	84%
New River	1.59E+12			4.26E+11	4.73E+10	4.73E+11	70%
Nickajack Creek	3.59E+12	4.10E+11	1.18E+11	9.93E+10	6.97E+10	6.97E+11	81%
North Fork Balus Creek	9.55E+11			4.23E+11	4.70E+10	4.70E+11	51%
North Fork Peachtree Creek	1.68E+14		9.32E+12	4.54E+12	1.54E+12	1.54E+13	91%
North Utoy Creek	1.60E+12		1.23E+11	8.15E+10	2.28E+10	2.28E+11	86%
Olley Creek	1.20E+12		3.28E+11	2.27E+11	6.17E+10	6.17E+11	49%
Orr Creek	5.02E+12	2.56E+11		1.41E+11	4.42E+10	4.42E+11	91%
Pataula Creek	1.58E+13			1.35E+13	1.50E+12	1.50E+13	5%
Pea Creek	2.20E+12		1.26E+11	1.32E+12	1.60E+11	1.60E+12	27%
Peachtree Creek	3.22E+14		2.79E+12	1.43E+12	4.69E+11	4.69E+12	99%
Peavine Creek	8.52E+12		1.09E+12	5.32E+11	1.80E+11	1.80E+12	79%
Proctor Creek	2.55E+13	Q*200[a]	4.55E+11	2.84E+11	8.22E+10	8.22E+11	97%
Richland Creek	3.32E+13	3.54E+10	1.42E+12	3.08E+12	5.04E+11	5.04E+12	85%
Rocky Branch	1.44E+11		1.01E+10	1.02E+10	2.26E+09	2.26E+10	84%
Rottenwood Creek	3.02E+12		2.98E+11	1.74E+11	9.79E+10	9.79E+11	68%
Sandy Creek	4.21E+11		1.59E+10	1.09E+10	2.97E+09	2.97E+10	93%
Sewell Mill Creek	1.08E+12		4.50E+11	2.29E+11	7.55E+10	7.55E+11	30%
Sope Creek	3.87E+14		3.73E+13	2.09E+13	6.46E+12	6.46E+13	83%
Soquee River	1.46E+13	4.60E+10		8.60E+12	9.61E+11	9.61E+12	34%
South Fork Peachtree Creek	1.02E+14		8.86E+11	4.72E+11	1.51E+11	1.51E+12	99%

Stream Segment	Current Load (cnts/30 days)	TMDL Components					Percent Reduction
		WLA (cnts/30 days)	WLA_{SW} (cnts/30 days)	LA (cnts/30 days)	MOS (cnts/30 days)	TMDL (cnts/30 days)	
South Utoy Creek	2.21E+12		1.47E+11	9.62E+10	2.70E+10	2.70E+11	88%
Suwanee Creek	5.80E+13	1.76E+11	2.53E+12	5.05E+12	8.62E+11	8.62E+12	85%
Sweetwater Creek- Paulding/Cobb	1.09E+13		3.67E+12	8.35E+12	6.53E+11	6.53E+12	40%
Sweetwater Creek - Cobb/Douglas	1.59E+13		2.49E+11	5.63E+12	1.33E+12	1.33E+13	16%
Tanyard Branch	3.11E+13	Q*200[a]	1.49E+11	6.37E+10	2.36E+10	2.36E+11	99%
Tanyard Creek	6.32E+11			1.02E+11	1.14E+10	1.14E+11	82%
Testnatee Creek - Cleveland	5.78E+12	6.83E+10		3.23E+12	3.67E+11	3.67E+12	37%
Testnatee Creek - Town Creek to Chestatee River	5.78E+12			3.30E+12	3.67E+11	3.67E+12	37%
Tributary to Mud Creek	2.36E+11		7.58E+10	1.39E+11	2.39E+10	2.39E+11	0%
Utoy Creek	5.53E+12		3.61E+11	3.19E+11	7.56E+10	7.56E+11	86%
Ward Creek	5.79E+11		2.11E+11	1.17E+11	3.65E+10	3.65E+11	37%
Weracoba Creek	5.64E+11		3.98E+10	3.76E+10	8.60E+09	8.60E+10	85%
White Oak Creek	2.50E+12		8.43E+10	1.61E+12	1.89E+11	1.89E+12	25%
Willeo Creek	1.51E+12		6.98E+11	3.68E+11	1.18E+11	1.18E+12	22%
Woodall Creek	2.15E+13		8.12E+10	4.64E+10	1.42E+10	1.42E+11	99%

Note: The TMDL was developed for the “current” critical conditions. The average stream flow for the critical period was used to determine the TMDL and the corresponding monthly average discharge from each wastewater treatment facility was used to determine the WLA.

Management practices that may be used to help reduce and/or maintain the average annual sediment loads include:

- Compliance with NPDES permit limits and requirements
- Adoption of NRCS Conservation Practices
- Application of Best Management Practices (BMPs) appropriate to agricultural or urban land uses, whichever applies

The amount of fecal coliform delivered to a stream is difficult to determine. However, by requiring and monitoring the implementation of these management practices, their effects will improve stream water quality, and represent a beneficial measure of TMDL implementation.

1.0 INTRODUCTION

1.1 Background

The State of Georgia assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are placed into three categories, supporting, partially supporting, or not supporting their designated uses depending on water quality assessment results. These water bodies are found on Georgia's 305(b) list as required by that section of the CWA that addresses the assessment process, and are published in *Water Quality in Georgia* every two years.

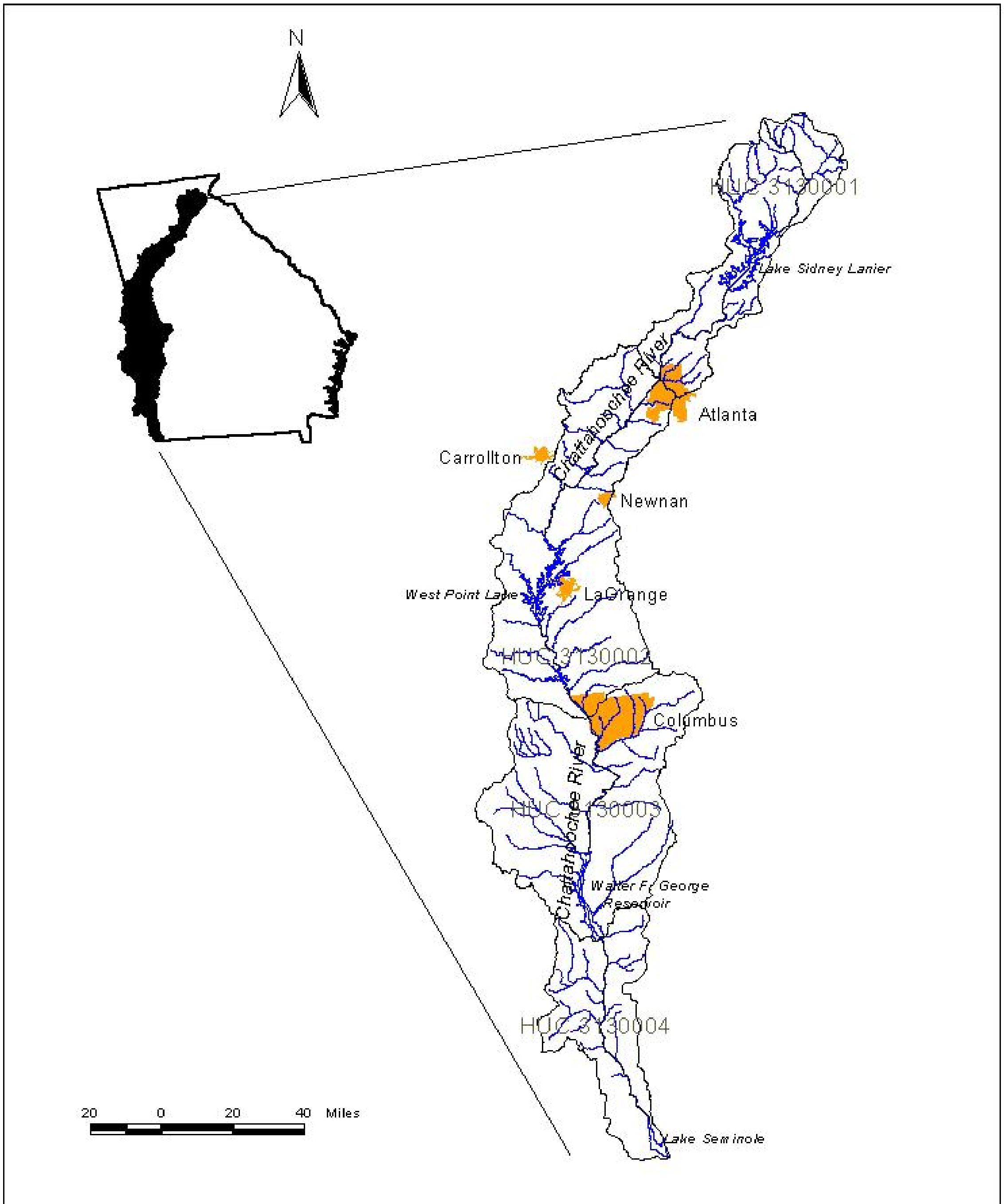
Some of the 305(b) partially and not supporting water bodies are also assigned to Georgia's 303(d) list, also named after that section of the CWA. Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and in-stream water quality conditions. This allows water quality-based controls to be developed to reduce pollution and to restore and maintain water quality.

EPA Region 4 approved Georgia's final 2002 303(d) list on April 30, 2002. The list identifies the waterbodies as either not supporting or partially supporting designated use classifications, due to exceedances of water quality standards for fecal coliform bacteria. Fecal coliform bacteria are used as an indicator of the potential presence of pathogens in a stream. Table 1 presents the streams of the Chattahoochee River Basin included on the 303(d) list for exceedances of the fecal coliform standard criteria. A total of 35 stream segments were listed as partially supporting the designated use, and 44 stream segments were listed as not supporting their designated use.

1.2 Watershed Description

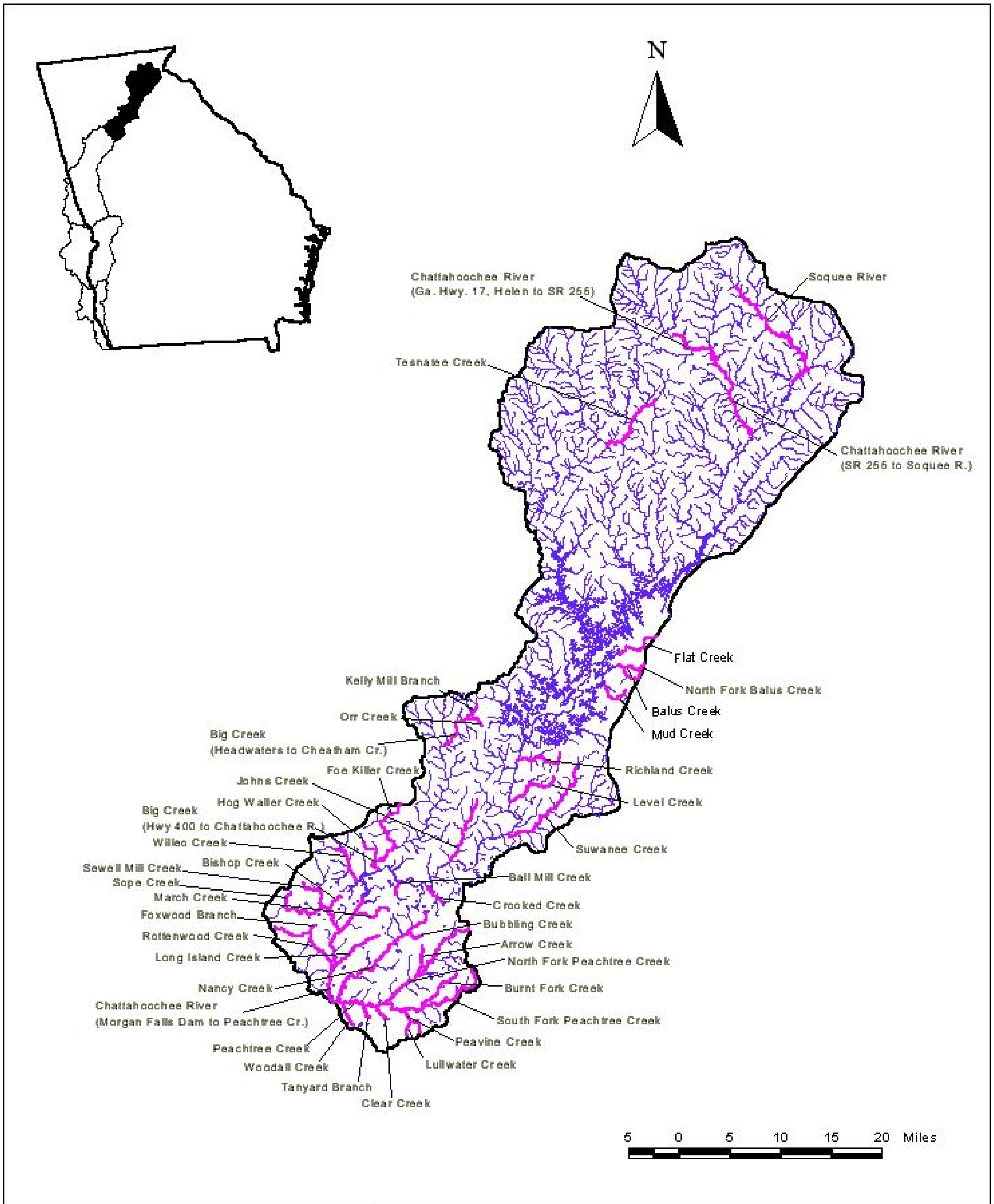
The Chattahoochee River originates in the southeast corner of Union County, in north Georgia, within the Blue Ridge Mountains (Figure 1). The river flows southwest to Lake Sidney Lanier (Lake Lanier), then through the Atlanta metropolitan area to West Point Lake on the Alabama border. At this point, the Chattahoochee forms the border between Georgia and Alabama. It continues flowing south through Walter F. George Reservoir and converges with the Flint River in Lake Seminole, at the Georgia-Florida border. The outflow from Lake Seminole forms the Apalachicola River in Florida, which ultimately discharges to the Gulf of Mexico. The Chattahoochee River Basin contains parts of the Blue Ridge, Piedmont, and Coastal Plain physiographic provinces that extend throughout the southeastern United States (EPD, 1997).

The USGS has divided the Chattahoochee basin into four sub-basins, or Hydrologic Unit Codes (HUCs). Figures 2 through 4 show the location of these sub-basins and the associated counties within each sub-basin.



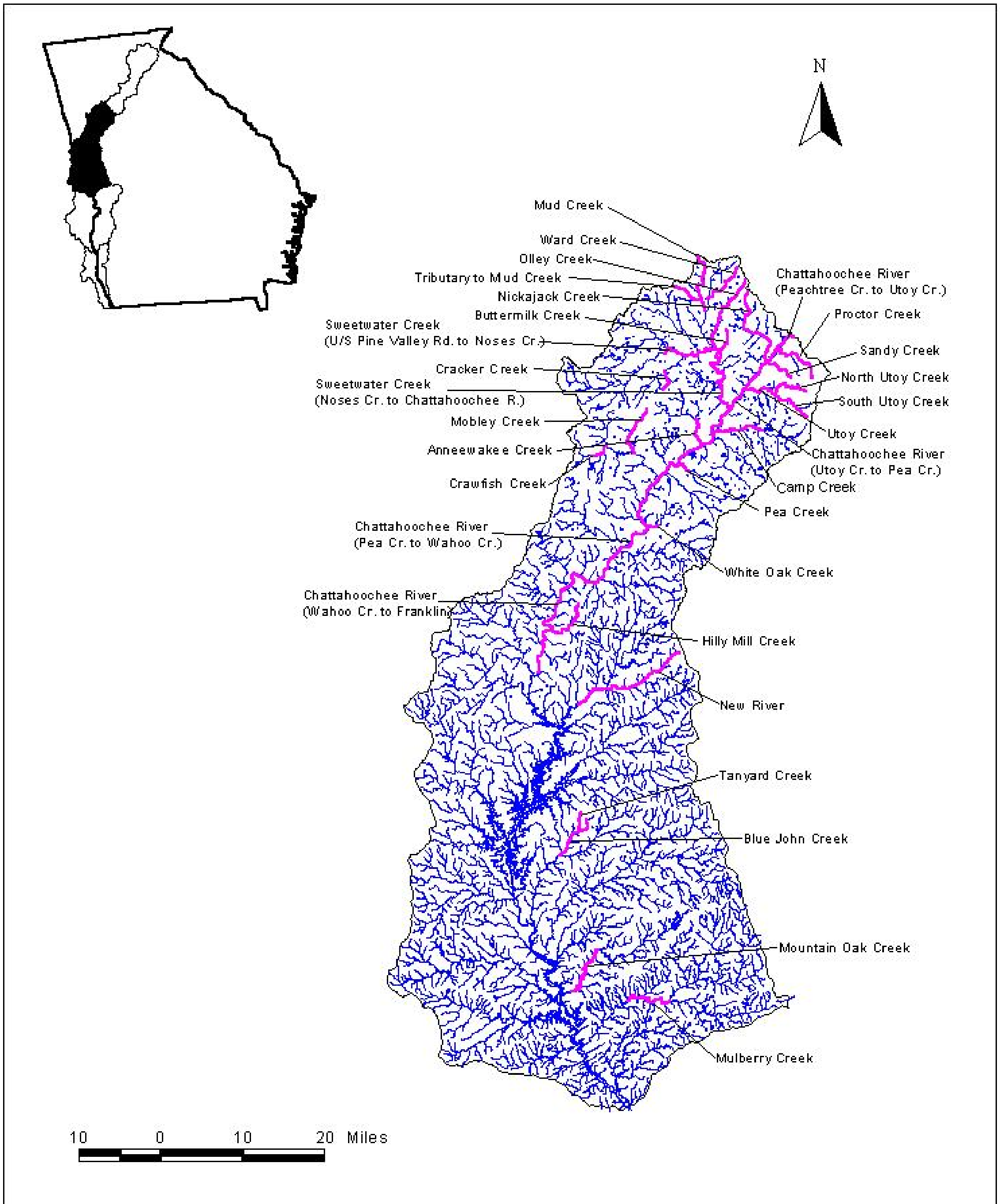
TMDL Evaluation - Fecal Coliform
Chattahoochee River Basin

Figure 1. Location of Chattahoochee River Basin

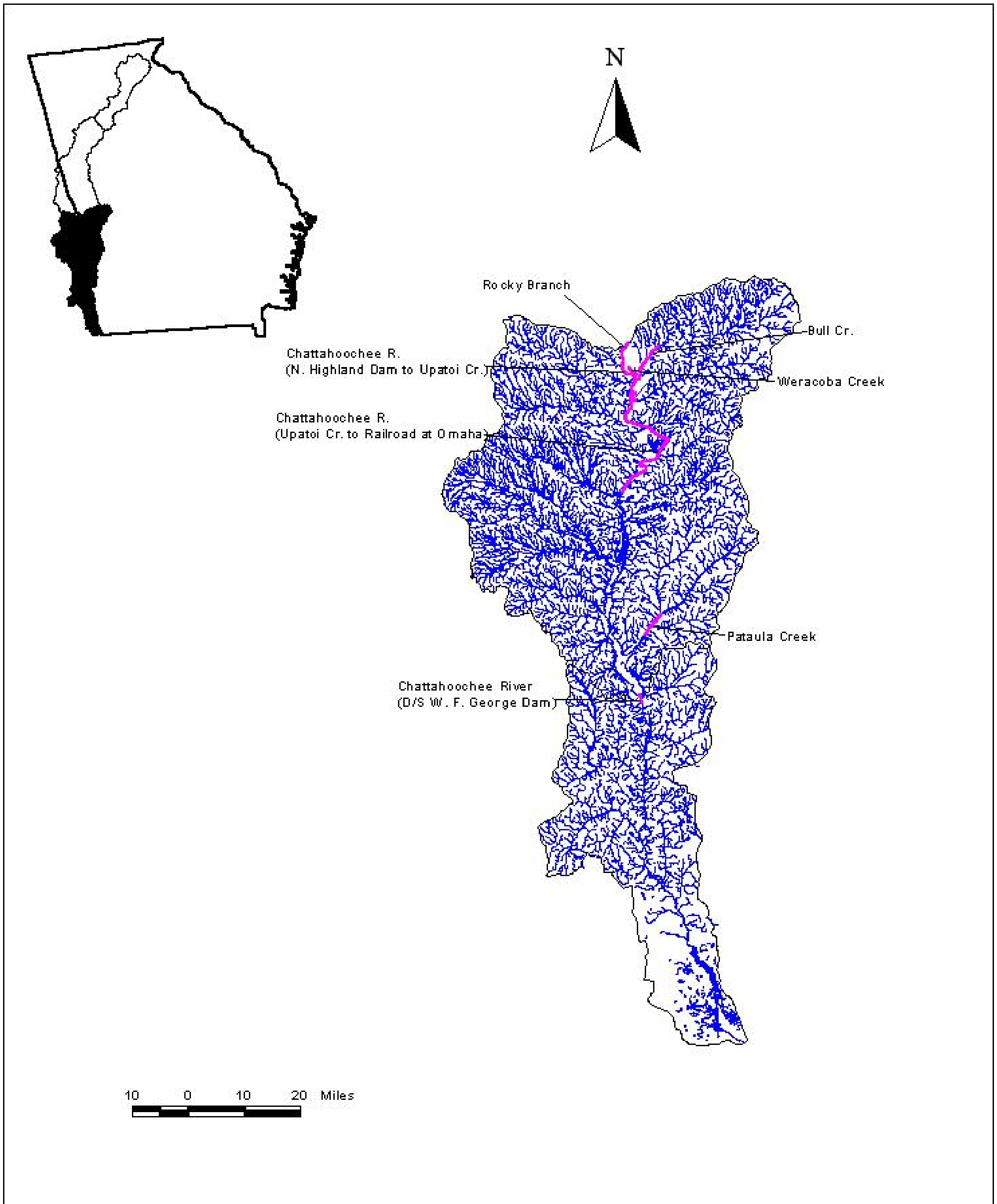


TMDL Evaluation - Fecal Coliform
Chattahoochee River Basin

Figure 2. HUC 03130001 303(d) Listed Streams



TMDL Evaluation - Fecal Coliform Chattahoochee River Basin	Figure 3. HUC 03130002 303(d) Listed Streams



TMDL Evaluation - Fecal Coliform
Chattahoochee River Basin

Figure 4. HUC 03130003 and 03130004
303(d) Listed Streams

Table 1. Waterbodies Listed for Fecal Coliform Bacteria in the Chattahoochee River Basin

Stream Segment	Location	Segment Length (miles)	Designated Use	Listing
Anneewakee Creek	House Creek to Lake Monroe, Douglas Co.	3	Fishing	PS
Arrow Creek	Atlanta, DeKalb Co.	3	Fishing	NS
Ball Mill Creek	Fulton/DeKalb Counties	3	Fishing	NS
Balus Creek	Gainesville, Hall Co.	3	Fishing	PS
Big Creek	Headwaters to Cheatham Creek, Forsyth Co.	3	Fishing	PS
Big Creek	Hwy 400 to Chattahoochee River, Fulton Co.	5	Fishing/ Drinking Water	NS
Bishop Creek	Cobb County	2	Fishing	NS
Blue John Creek	LaGrange, Troup Co.	8	Fishing	PS
Bubbling Creek	DeKalb County	2	Fishing	NS
Bull Creek	Columbus, Muscogee Co.	11	Fishing	NS
Burnt Fork Creek	DeKalb County	6	Fishing	NS
Buttermilk Creek	Cobb County	4	Fishing	NS
Camp Creek	Fulton County	4	Fishing	PS
Chattahoochee River	Ga. Hwy. 17, Helen to SR255. White/Habersham Co.	8	Recreation	PS
Chattahoochee River	Morgan Falls Dam to Peachtree Creek, Fulton/Cobb Co.	12	Recreation, Drinking Water	PS
Chattahoochee River	Peachtree Creek to Utoy Creek, Fulton/Cobb Co.	9	Fishing	NS
Chattahoochee River	Utoy Creek to Pea Creek, Fulton/Douglas Co.	14	Fishing	NS
Chattahoochee River	Pea Creek to Wahoo Creek Fulton/Douglas/Coweta/Carroll	21	Fishing	NS
Chattahoochee River	Wahoo Creek to Franklin Coweta/Carroll/Heard Co.	21	Fishing	PS
Chattahoochee River	N. Highland Dam to Upatoi Creek, Muscogee Co.	12	Fishing	PS
Chattahoochee River	Upatoi Creek to Railroad at Omaha, Chattahoochee/Stewart	31	Fishing	NS
Chattahoochee River	Downstream W. F. George Dam, Clay Co.	2	Fishing	PS
Clear Creek	Atlanta, Fulton Co.	3	Fishing	PS
Cracker Creek	Douglas County	3	Fishing	PS
Crawfish Creek	Douglas County	3	Fishing	PS
Crooked Creek	Tributary to Chattahoochee River, Gwinnett Co.	2	Fishing	NS
Flat Creek	Headwaters, Gainesville to Lake Lanier, Hall Co.	6	Fishing	NS
Foe Killer Creek	Fulton County	7	Fishing	NS
Foxwood Branch	Tributary to Rottenwood Creek, Cobb Co.	1	Fishing	PS
Hilly Mill Creek	Heard/Coweta Counties	6	Fishing	PS
Hog Waller Creek	Roswell, Fulton Co.	4	Fishing	PS
Johns Creek	Headwaters to Chattahoochee River, Fulton Co.	4	Fishing	NS
Kelly Mill Branch	Headwaters to Orr Creek, Forsyth Co.	2	Fishing	PS
Level Creek	Headwaters to Chattahoochee River, Gwinnett Co.	5	Fishing	NS
Long Cane Creek	Panther, Blue John & Long Cane Creeks, d/s LaGrange to Chattahoochee River, Troup Co.	14	Fishing	NS
Long Island Creek	Headwaters to Chattahoochee River, Fulton Co.	5	Fishing	NS
Lullwater Creek	DeKalb County	2	Fishing	NS
Marsh Creek	Fulton County	4	Fishing	NS
Mobley Creek	Douglas County	7	Fishing	NS
Mountain Oak Creek	Hamilton, Harris Co.	5	Fishing	PS

Stream Segment	Location	Segment Length (miles)	Designated Use	Listing
Mud Creek	Hall County	2	Fishing	PS
Mud Creek	Ga. Hwy. 120 to Noses Creek, Cobb Co.	5	Fishing	NS
Mulberry Creek	Ossahatchie Creek to Five Points Branch West near Mulberry Grove, Harris Co.	8	Fishing	PS
Nancy Creek	Headwaters to Peachtree Creek, Atlanta, DeKalb/Fulton Co.	16	Fishing	NS
New River	Heard/Coweta Counties	24	Fishing	PS
Nickajack Creek	Headwaters to Chattahoochee River, Cobb Co.	11	Fishing	NS
North Fork Balus Creek	Gainesville, Hall Co.	2	Fishing	PS
North Fork Peachtree Cr	Headwaters to Peachtree Creek, Gwinnett/DeKalb/Fulton	14	Fishing	NS
North Utoy Creek	Atlanta, Fulton Co.	6	Fishing	PS
Olley Creek	Cobb County	11	Fishing	NS
Orr Creek	U/S Castleberry Rd., Tyson Foods, to Big Creek, Forsyth	3	Fishing	NS
Pataula Creek	Hodchodkee Creek to W. F. George Lake, Quitman/Clay Co	6	Fishing	PS
Pea Creek	Fulton County	3	Fishing	PS
Peachtree Creek	I-85 to Chattahoochee River, Atlanta, Fulton Co.	7	Fishing	NS
Peavine Creek	DeKalb County	3	Fishing	NS
Proctor Creek	Headwaters to Chattahoochee River, Atlanta, Fulton Co.	9	Fishing	NS
Richland Creek	Headwaters to Chattahoochee River, Gwinnett Co.	5	Fishing	PS
Rocky Branch	Columbus, Muscogee Co.	2	Fishing	PS
Rottenwood Creek	Headwaters to Chattahoochee River, Cobb Co.	9	Fishing	NS
Sandy Creek	I-285 to Chattahoochee River, Fulton Co.	2	Fishing	NS
Sewell Mill Creek	Cobb County	4	Fishing	NS
Sope Creek	Headwaters to Chattahoochee River, Cobb Co.	11	Fishing	NS
Soquee River	Goshen Creek to SR 17, Clarkesville, Habersham Co.	29	Fishing	NS
South Fork Peachtree Cr	Headwaters to Peachtree Ck, DeKalb Co./Atlanta, Fulton Co.	15	Fishing	NS
South Utoy Creek	Headwaters to Fairburn Rd., Atlanta, Fulton Co.	5	Fishing	NS
Suwanee Creek	Mill Creek to Chattahoochee River, Gwinnett Co.	4	Fishing	NS
Sweetwater Creek	Noses to Chattahoochee River, Cobb/Douglas Co.	14	Fishing	PS
Sweetwater Creek	U/S Pine Valley Rd. To Noses Creek, Paulding/CobbCo.	10	Fishing	NS
Tanyard Branch	Atlanta, Fulton Co.	2	Fishing	PS
Tanyard Creek	LaGrange, Troup Co.	2	Fishing	PS
Tesnatee Creek	Cleveland, White Co.	5	Fishing	PS
Tesnatee Creek	Town Creek to Chestatee River, White/Lumpkin Co.	5	Fishing	NS
Tributary to Mud Cr	Cobb County	3	Fishing	PS
Utoy Creek	Atlanta, Fulton Co.	5	Fishing	NS
Ward Creek	Cobb County	6	Fishing	PS
Weracoba Creek	Columbus, Muscogee Co.	6	Fishing	NS
White Oak Creek	Fulton County	2	Fishing	NS
Willeo Creek	Cobb/Fulton Counties	5	Fishing	PS
Woodall Creek	Atlanta, Fulton Co.	3	Fishing	PS

Notes:
PS = Partially Supporting designated uses
NS = Not Supporting designated uses

The land use characteristics of the Chattahoochee River Basin watersheds were determined using data from Georgia's Multiple Resolution Land Coverage (MRLC). This coverage was produced from Landsat Thematic Mapper digital images developed in 1995. For the thirteen metro Atlanta counties, the Atlanta Regional Commission (ARC) Landuse Coverage was used, which was derived from digital images developed in 2000. Landuse classification is based on a modified Anderson level one and two system. Table 2 lists the land use distribution of the 79 watersheds on the 303(d) list. Regulated dams (Buford Dam, West Point Lake Dam, and W.F. George Dam) were considered as the upstream boundaries for the Chattahoochee River watersheds.

1.3 Water Quality Standard

The water use classification for the listed watersheds in the Chattahoochee River Basin is Drinking Water, Recreation, and Fishing. The criterion violated is listed as fecal coliform. The potential cause(s) listed include urban runoff, nonpoint sources, unknown sources, and combine sewer overflows. The use classification water quality standards for fecal coliform bacteria as stated in Georgia's Rules and Regulations for Water Quality Control Chapter 391-3-6-.03(6)(a), 391-3-6-.03(6)(b), and 391-3-6-.03(6)(c) is:

(a) Drinking Water Supplies: Those waters approved as a source for public drinking water systems permitted or to be permitted by the Environmental Protection Division. Waters classified for drinking water supplies will also support the fishing use and any other use requiring water of a lower quality.

(i) Bacteria: For the months of May through October, when water contact recreation activities are expected to occur, fecal coliform not to exceed a geometric mean of 200 per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200/100 ml (geometric mean) occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 per 100 ml in lakes and reservoirs and 500 per 100 ml in free flowing freshwater streams. For the months of November through April, fecal coliform not to exceed a geometric mean of 1,000 per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours and not to exceed a maximum of 4,000 per 100 ml for any sample. The State does not encourage swimming in surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of fecal coliform.

(b) Recreation: General recreational activities such as water skiing, boating, and swimming, or for any other use requiring water of a lower quality, such as recreational fishing. These criteria are not to be interpreted as encouraging water contact sports in proximity to sewage or industrial waste discharges regardless of treatment requirements:

(i) Bacteria: Fecal coliform not to exceed the following geometric means based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours:

(1) Coastal waters 100 per 100 ml
(2) All other recreational waters 200 per 100 ml
(3) Should water quality and sanitary studies show natural fecal coliform levels exceed 200/100 ml (geometric mean) occasionally in high quality recreational waters, then the allowable geometric mean fecal coliform level shall not exceed 300 per 100 ml in lakes and reservoirs and 500 per 100 ml in free flowing fresh water streams.

(c) Fishing: Propagation of Fish, Shellfish, Game and Other Aquatic Life; secondary contact recreation in and on the water; or for any other use requiring water of a lower quality:

(iii) Bacteria: For the months of May through October, when water contact recreation activities are expected to occur, fecal coliform not to exceed a geometric mean of 200 per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200/100 ml (geometric mean) occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 per 100 ml in lakes and reservoirs and 500 per 100 ml in free flowing freshwater streams. For the months of November through April, fecal coliform not to exceed a geometric mean of 1,000 per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours and not to exceed a maximum of 4,000 per 100 ml for any sample. The State does not encourage swimming in surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of fecal coliform. For waters designated as approved shellfish harvesting waters by the appropriate State agencies, the requirements will be consistent with those established by the State and Federal agencies responsible for the National Shellfish Sanitation Program. The requirements are found in the National Shellfish Sanitation Program Manual of Operation, Revised 1988, Interstate Shellfish Sanitation Conference, U. S. Department of Health and Human Services (PHS/FDA), and the Center for Food Safety and Applied Nutrition. Streams designated as generally supporting shellfish are listed in Paragraph 391-3-6-.03(14).

Table 2. Chattahoochee River Basin Landuse

Stream/Segment	Landuse Categories - Acres (Percent)														
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial, Industrial, Transportation	Bare Rock, Sand, Clay	Quarries, Strip Mines, Gravel Pits	Transitional	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total	Landuse Source
Anneewakee Creek	109	8479	329	1984	0	0	487	6140	889	0	513	209	0	19139	ARC
	(0.6)	(44.3)	(1.7)	(10.4)	(0.0)	(0.0)	(2.5)	(32.1)	(4.6)	(0.0)	(2.7)	(1.1)	(0.0)		
Arrow Creek	0	579.3	254.3	1030.6	0	0	49	21	0	0	21.6	0	0	1956	ARC
	(0.0)	(29.6)	(13.0)	(52.7)	(0.0)	(0.0)	(2.5)	(1.1)	(0.0)	(0.0)	(1.1)	(0.0)	(0.0)		
Ball Mill Creek	0	2157	39	135	0	0	0	103	0	0	105	0	0	2538	ARC
	(0.0)	(85.0)	(1.5)	(5.3)	(0.0)	(0.0)	(0.0)	(4.0)	(0.0)	(0.0)	(4.1)	(0.0)	(0.0)		
Balus Creek	0	0	437	319	0	0	0	2636	242	647	350	0	0	4631	MRLC
	(0.0)	(0.0)	(9.4)	(6.9)	(0.0)	(0.0)	(0.0)	(56.9)	(5.2)	(14.0)	(7.6)	(0.0)	(0.0)		
Big Creek - Headwaters	33	2722	15	1134	0	7	342	2793	1684	11	48	47	0	8836	ARC
	(0.4)	(30.8)	(0.2)	(12.8)	(0.0)	(0.1)	(3.9)	(31.6)	(19.1)	(0.1)	(0.5)	(0.5)	(0.0)		
Big Creek – Hwy 400	343	24785	1453	9579	0	7	2611	14299	10632	136	1189	1357	0	66391	ARC
	(0.5)	(37.3)	(2.2)	(14.4)	(0.0)	(0.0)	(3.9)	(21.5)	(16.0)	(0.2)	(1.8)	(2.0)	(0.0)		
Bishop Creek	0	957	0	234	0	0	0	0	16	0	88	0	0	1295	ARC
	(0.0)	(73.9)	(0.0)	(18.0)	(0.0)	(0.0)	(0.0)	(0.0)	(1.3)	(0.0)	(6.8)	(0.0)	(0.0)		
Blue John Creek	50	1667	282	943	0	13	65	8346	645	726	914	369	0	14021	MRLC
	(0.4)	(11.9)	(2.0)	(6.7)	(0.0)	(0.1)	(0.5)	(59.5)	(4.6)	(5.2)	(6.5)	(2.6)	(0.0)		
Bubbling Creek	0	319	0.3	759	0	0	14	15	0	0	6	0	0	1113	ARC
	(0.0)	(28.6)	(0.0)	(68.2)	(0.0)	(0.0)	(1.3)	(1.3)	(0.0)	(0.0)	(0.5)	(0.0)	(0.0)		
Bull Creek	460	0	13518	3773	0	153	213	28093	800	1460	1156	75	5	49706	MRLC
	(0.9)	(0.0)	(27.2)	(7.6)	(0.0)	(0.3)	(0.4)	(56.5)	(1.6)	(2.9)	(2.3)	(0.2)	(0.0)		
Burnt Fork Creek	0	1803	225	965	0	0	13	138	0	0	107.6	0	0	3251	ARC
	(0.0)	(55.5)	(6.9)	(29.7)	(0.0)	(0.0)	(0.4)	(4.2)	(0.0)	(0.0)	(3.3)	(0.0)	(0.0)		

Stream/Segment	Landuse Categories - Acres (Percent)														
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial, Industrial, Transportation	Bare Rock, Sand, Clay	Quarries, Strip Mines, Gravel Pits	Transitional	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total	Landuse Source
Buttermilk Creek	9 (0.2)	2420 (59.4)	28 (0.7)	786 (19.3)	0 (0.0)	0 (0.0)	82 (2.0)	536 (13.2)	173 (4.3)	0 (0.0)	0 (0.0)	40 (1.0)	0 (0.0)	4074	ARC
Camp Creek	253 (0.9)	7983 (27.5)	672 (2.3)	2408 (8.3)	0 (0.0)	70.1 (0.2)	718 (2.5)	14878 (51.3)	815 (2.8)	0 (0.0)	329.7 (1.1)	859 (3.0)	0 (0.0)	28987	ARC
Chattahoochee River Ga Hwy 17, Helen to SR 255	93 (0.1)	0 (0.0)	49 (0.1)	64 (0.1)	0 (0.0)	0 (0.0)	283 (0.4)	72431 (96.2)	377 (0.5)	1988 (2.6)	42 (0.1)	0 (0.0)	0 (0.0)	75327	MRLC
Chattahoochee River Morgan Falls Dam to Peachtree Creek	2923 (1.0)	133891 (46.0)	11936 (4.1)	43612 (15.0)	38 (0.0)	802 (0.3)	8439 (2.9)	61249 (21.0)	19262 (6.6)	255 (0.1)	6232 (2.1)	2625 (0.9)	0 (0.0)	291264	ARC
Chattahoochee River Peachtree Creek to Utoy Creek	3446 (0.9)	181531 (44.9)	23652 (5.9)	76781 (19.0)	38 (0.0)	931 (0.2)	9798 (2.4)	76676 (19.0)	19565 (4.8)	292 (0.1)	7737 (1.9)	3651 (0.9)	0 (0.0)	404098	ARC
Chattahoochee River Utoy Creek to Pea Creek	5713 (0.8)	279794 (40.9)	29287 (4.3)	96460 (14.1)	51 (0.0)	1241 (0.2)	14887 (2.2)	185056 (27.0)	47496 (6.9)	328 (0.0)	12105 (1.8)	11778 (1.7)	0 (0.0)	684196	ARC
Chattahoochee River Pea Creek to Wahoo Creek	7860 (0.9)	302808 (36.6)	29303 (3.5)	98909 (11.9)	51 (0.0)	1463 (0.2)	15484 (1.9)	275367 (33.2)	68932 (8.3)	371 (0.0)	12779 (1.5)	14961 (1.8)	0 (0.0)	828288	ARC
Chattahoochee River Wahoo Creek to Franklin	9163 (1.0)	315578 (34.9)	29492 (3.3)	101315 (11.2)	51 (0.0)	1478 (0.2)	15798 (1.7)	320664 (35.5)	79913 (8.8)	371 (0.0)	13348 (1.5)	17193 (1.9)	0 (0.0)	904364	ARC
Chattahoochee River N. Highland Dam to Upatoi Creek	13944 (1.7)	9 (0.0)	28345 (3.5)	12228 (1.5)	5 (0.0)	1115 (0.1)	19037 (2.4)	613805 (75.9)	29260 (3.6)	56371 (7.0)	5921 (0.7)	27772 (3.4)	930 (0.1)	808742	MRLC
Chattahoochee River Upatoi Creek to Railroad	20850 (1.3)	9 (0.0)	33614 (2.1)	17813 (1.1)	35 (0.0)	1898 (0.1)	62173 (3.9)	1215748 (77.2)	77312 (4.9)	71715 (4.6)	8973 (0.6)	62685 (4.0)	2390 (0.2)	1575215	MRLC
Chattahoochee River Downstream W. F. George Dam	103 (15.3)	35 (5.2)	1 (0.2)	11 (1.6)	0.9 (0.1)	0 (0.0)	40.5 (6.0)	480 (71.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	671	MRLC
Clear Creek	0 (0.0)	836 (18.0)	1332 (28.7)	2029 (43.6)	0 (0.0)	0 (0.0)	45 (1.0)	114 (2.5)	0 (0.0)	0 (0.0)	292.5 (6.3)	0 (0.0)	0 (0.0)	4648	ARC

Stream/Segment	Landuse Categories - Acres (Percent)														
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial, Industrial, Transportation	Bare Rock, Sand, Clay	Quarries, Strip Mines, Gravel Pits	Transitional	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total	Landuse Source
Cracker Creek	0 (0.0)	774 (37.3)	0 (0.0)	444 (21.4)	0 (0.0)	0 (0.0)	23 (1.1)	815 (39.3)	0 (0.0)	0 (0.0)	0 (0.0)	18 (0.9)	0 (0.0)	2074	ARC
Crawfish Creek	276 (1.9)	79 (0.5)	5 (0.0)	181 (1.3)	1 (0.0)	74 (0.5)	33 (0.2)	11022 (76.8)	797 (5.6)	1555 (10.8)	154 (1.1)	162 (1.1)	7 (0.0)	14344	MRLC
Crooked Creek	17 (0.3)	1471 (25.4)	873 (15.1)	2631 (45.5)	0 (0.0)	0 (0.0)	139 (2.4)	647 (11.2)	0 (0.0)	0 (0.0)	5 (0.1)	0 (0.0)	0 (0.0)	5783	ARC
Flat Creek	0 (0.0)	390 (10.4)	114 (3.0)	715 (19.1)	6 (0.2)	0 (0.0)	0 (0.0)	1860 (49.6)	127 (3.4)	166 (4.4)	371 (9.9)	2 (0.0)	0 (0.0)	3751	MRLC
Foe Killer Creek	19 (0.2)	4299 (54.4)	248 (3.1)	1747 (22.1)	0 (0.0)	0 (0.0)	186 (2.3)	730 (9.2)	434 (5.5)	0 (0.0)	205 (2.6)	36 (0.5)	0 (0.0)	7904	ARC
Foxwood Branch	0 (0.0)	787 (93.7)	0 (0.0)	39 (4.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	13 (1.6)	0 (0.0)	0 (0.0)	840	ARC
Hilly Mill Creek	25 (0.3)	1 (0.0)	0 (0.0)	6 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	6978 (85.6)	475 (5.8)	601 (7.4)	0 (0.0)	62 (0.8)	0 (0.0)	8148	MRLC
Hog Waller Creek	0 (0.0)	1538 (60.6)	104 (4.1)	543 (21.4)	0 (0.0)	0 (0.0)	53 (2.1)	182 (7.2)	2 (0.1)	0 (0.0)	116 (4.6)	0 (0.0)	0 (0.0)	2538	ARC
Johns Creek	50 (0.6)	5451 (65.0)	86 (1.0)	753 (9.0)	0 (0.0)	0 (0.0)	265 (3.2)	969 (11.6)	359 (4.3)	0 (0.0)	333 (4.0)	117 (1.4)	0 (0.0)	8383	ARC
Kelly Mill Branch	15 (0.6)	1204 (48.9)	0 (0.0)	330 (13.4)	0 (0.0)	0 (0.0)	0 (0.0)	702 (28.5)	195 (7.9)	0 (0.0)	14 (0.6)	0 (0.0)	0 (0.0)	2460	ARC
Level Creek	21 (0.4)	2736 (48.4)	42 (0.7)	222 (3.9)	0 (0.0)	0 (0.0)	70 (1.2)	2146 (38.0)	346 (6.1)	29 (0.5)	37 (0.7)	0 (0.0)	0 (0.0)	5649	ARC

Stream/Segment	Landuse Categories - Acres (Percent)														
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial, Industrial, Transportation	Bare Rock, Sand, Clay	Quarries, Strip Mines, Gravel Pits	Transitional	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total	Landuse Source
Long Cane Creek	368 (0.7)	1949 (3.6)	319 (0.6)	1398 (2.6)	0 (0.0)	154 (0.3)	378 (0.7)	37579 (70.1)	2527 (4.7)	4835 (9.0)	1090 (2.0)	2870 (5.4)	174 (0.3)	53642	MRLC
Long Island Creek	11 (0.2)	3987 (77.7)	302 (5.9)	627 (12.2)	0 (0.0)	0 (0.0)	8 (0.2)	176 (3.4)	0 (0.0)	0 (0.0)	22 (0.4)	0 (0.0)	0 (0.0)	5131	ARC
Lullwater Creek	0 (0.0)	575 (33.3)	564 (32.7)	188 (10.9)	0 (0.0)	0 (0.0)	0 (0.0)	126 (7.3)	0 (0.0)	0 (0.0)	273 (15.8)	0 (0.0)	0 (0.0)	1727	ARC
Marsh Creek	0 (0.0)	2273 (61.0)	466 (12.5)	609 (16.3)	0 (0.0)	0 (0.0)	51 (1.4)	312 (8.4)	0 (0.0)	0 (0.0)	17 (0.4)	0 (0.0)	0 (0.0)	3728	ARC
Mobley Creek	11 (0.1)	2522 (24.1)	0 (0.0)	415 (4.0)	0 (0.0)	207 (2.0)	48 (0.5)	4843 (46.2)	2285 (21.8)	0 (0.0)	76 (0.7)	77 (0.7)	0 (0.0)	10483	ARC
Mountain Oak Creek	527 (1.2)	0 (0.0)	5 (0.0)	143 (0.3)	1 (0.0)	0 (0.0)	1958 (4.5)	37403 (86.1)	678 (1.6)	1513 (3.5)	424 (1.0)	763 (1.8)	14 (0.0)	43429	MRLC
Mud Creek – Hall Co	3 (0.1)	0 (0.0)	17 (0.7)	105 (4.2)	0 (0.0)	0 (0.0)	0 (0.0)	1711 (68.1)	103 (4.1)	504 (20.0)	71 (2.8)	0 (0.0)	0 (0.0)	2514	MRLC
Mud Creek	74 (0.7)	5657 (53.9)	0 (0.0)	165 (1.6)	0 (0.0)	0 (0.0)	107 (1.0)	1867 (17.8)	2170 (20.7)	0 (0.0)	188 (1.8)	257 (2.5)	0 (0.0)	10486	ARC
Mulberry Creek	678 (0.5)	0 (0.0)	300 (0.2)	217 (0.2)	1 (0.0)	0 (0.0)	4682 (3.8)	103765 (83.3)	3794 (3.0)	8015 (6.4)	235 (0.2)	2804 (2.3)	27 (0.0)	124518	MRLC
Nancy Creek	68 (0.3)	13909 (57.9)	1868 (7.8)	6423 (26.7)	0 (0.0)	0 (0.0)	128 (0.5)	850 (3.5)	106 (0.4)	0 (0.0)	666 (2.8)	12 (0.0)	0 (0.0)	24030	ARC
New River	1066 (1.3)	8286 (10.3)	64 (0.1)	1375 (1.7)	0 (0.0)	36 (0.0)	126 (0.2)	52322 (64.8)	13589 (16.8)	0 (0.0)	59 (0.1)	3863 (4.8)	0 (0.0)	80786	ARC
Nickajack Creek	102 (0.4)	13425 (58.8)	892 (3.9)	2682 (11.8)	0 (0.0)	0 (0.0)	440 (1.9)	4505 (19.7)	262 (1.1)	0 (0.0)	178 (0.8)	334 (1.5)	0 (0.0)	22820	ARC
North Fork Balus Creek	0 (0.0)	40 (5.7)	5 (0.7)	32 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)	499 (70.6)	21 (3.0)	45 (6.4)	64 (9.1)	0 (0.0)	0 (0.0)	706	MRLC

Stream/Segment	Landuse Categories - Acres (Percent)														
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial, Industrial, Transportation	Bare Rock, Sand, Clay	Quarries, Strip Mines, Gravel Pits	Transitional	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total	Landuse Source
North Fork Peachtree Creek	55 (0.2)	13164 (52.6)	2863 (11.4)	7624 (30.5)	0 (0.0)	0 (0.0)	202 (0.8)	823 (3.3)	0 (0.0)	0 (0.0)	124 (0.5)	171 (0.7)	0 (0.0)	25026	ARC
North Utoy Creek	0 (0.0)	2341 (34.8)	1698 (25.2)	1070 (15.9)	0 (0.0)	6 (0.1)	18 (0.3)	940 (14.0)	0 (0.0)	0 (0.0)	656 (9.8)	0 (0.0)	0 (0.0)	6729	ARC
Olley Creek	9 (0.1)	4259 (47.0)	895 (9.9)	2002 (22.1)	0 (0.0)	0 (0.0)	157 (1.7)	961 (10.6)	356 (3.9)	0 (0.0)	324 (3.6)	90 (1.0)	0 (0.0)	9053	ARC
Orr Creek	29 (0.4)	2283 (33.9)	15 (0.2)	1090 (16.2)	0 (0.0)	7 (0.1)	191 (2.8)	1943 (28.8)	1153 (17.1)	10 (0.1)	14 (0.2)	0 (0.0)	0 (0.0)	6735	ARC
Pataula Creek	531 (0.2)	0 (0.0)	250 (0.1)	168 (0.1)	0 (0.0)	0 (0.0)	20876 (8.7)	179474 (74.8)	16147 (6.7)	5222 (2.2)	60 (0.0)	16965 (7.1)	250 (0.1)	239943	MRLC
North Fork Peachtree Creek	1 (0.3)	165 (32.3)	14 (2.7)	52 (10.1)	0 (0.0)	0 (0.0)	0 (0.0)	180 (35.2)	11 (2.2)	4 (0.9)	84 (16.5)	0 (0.0)	0 (0.0)	511	MRLC
Pea Creek	97 (1.1)	1019 (11.2)	0 (0.0)	12 (0.1)	0 (0.0)	0 (0.0)	9 (0.1)	6614 (72.5)	1246 (13.7)	0 (0.0)	0 (0.0)	127 (1.4)	0 (0.0)	9125	ARC
Peachtree Creek	142 (0.2)	27502 (46.1)	8131 (13.6)	19139 (32.1)	0 (0.0)	4 (0.0)	338 (0.6)	3062 (5.1)	0 (0.0)	37 (0.1)	1014 (1.7)	239 (0.4)	0 (0.0)	59608	ARC
Peavine Creek	0 (0.0)	1827 (48.0)	699 (18.4)	838 (22.0)	0 (0.0)	0 (0.0)	4 (0.1)	156 (4.1)	0 (0.0)	0 (0.0)	282 (7.4)	0 (0.0)	0 (0.0)	3807	ARC
Proctor Creek	0 (0.0)	3291 (31.3)	1784 (17.0)	3738 (35.5)	0 (0.0)	110 (1.0)	61 (0.6)	1267 (12.0)	0 (0.0)	0 (0.0)	268 (2.5)	0 (0.0)	0 (0.0)	10519	ARC
Richland Creek	6 (0.1)	2052 (28.6)	58 (0.8)	446 (6.2)	22 (0.3)	246 (3.4)	233 (3.2)	3787 (52.7)	144 (2.0)	12 (0.2)	177 (2.5)	0 (0.0)	0 (0.0)	7183	ARC
Rocky Branch	8 (0.7)	401 (39.0)	156 (15.2)	130 (12.6)	0 (0.0)	0 (0.0)	4 (0.3)	260 (25.3)	23 (2.3)	11 (1.1)	36 (3.5)	0 (0.0)	0 (0.0)	1029	MRLC
Rottenwood Creek	4 (0.0)	2615 (20.6)	1783 (14.0)	6628 (52.2)	0 (0.0)	0 (0.0)	125 (1.0)	1234 (9.7)	0 (0.0)	0 (0.0)	312 (2.5)	0 (0.0)	0 (0.0)	12701	ARC

Stream/Segment	Landuse Categories - Acres (Percent)														
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial, Industrial, Transportation	Bare Rock, Sand, Clay	Quarries, Strip Mines, Gravel Pits	Transitional	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total	Landuse Source
Sandy Creek	0	1517	147	806	0	0	0	387	0	0	70	70	0	2997	ARC
	(0.0)	(50.6)	(4.9)	(26.9)	(0.0)	(0.0)	(0.0)	(12.9)	(0.0)	(0.0)	(2.3)	(2.3)	(0.0)		
Sewell Mill Creek	33.1	8089.8	15	453.7	1.7	0	26.4	449.9	40	0	54.6	0	0	9164	ARC
	(0.4)	(88.3)	(0.2)	(5.0)	(0.0)	(0.0)	(0.3)	(4.9)	(0.4)	(0.0)	(0.6)	(0.0)	(0.0)		
Sope Creek	59	16097	588	3263	16	0	154	1612	233	0	493	0	0	22515	ARC
	(0.3)	(71.5)	(2.6)	(14.5)	(0.1)	(0.0)	(0.7)	(7.2)	(1.0)	(0.0)	(2.2)	(0.0)	(0.0)		
Soquee Creek	94	0	134	123	4	24	594	50548	1346	7176	155	16	4	60218	MRLC
	(0.2)	(0.0)	(0.2)	(0.2)	(0.0)	(0.0)	(1.0)	(83.9)	(2.2)	(11.9)	(0.3)	(0.0)	(0.0)		
South Fork Peachtree Creek	6.1	8991.8	2906.6	5262.9	0	0	53.5	1229.3	0	37.2	625.5	36.3	0	19149	ARC
	(0.0)	(47.0)	(15.2)	(27.5)	(0.0)	(0.0)	(0.3)	(6.4)	(0.0)	(0.2)	(3.3)	(0.2)	(0.0)		
South Utoy Creek	0.1	4140	640.6	1736.6	0	0	83.4	1096.5	0	0	278	0	0	7975	ARC
	(0.0)	(51.9)	(8.0)	(21.8)	(0.0)	(0.0)	(1.0)	(13.7)	(0.0)	(0.0)	(3.5)	(0.0)	(0.0)		
Suwanee Creek	91	8770	256	3811	0	0	1929	13305	2546	10	181	640	0	31539	ARC
	(0.3)	(27.8)	(0.8)	(12.1)	(0.0)	(0.0)	(6.1)	(42.2)	(8.1)	(0.0)	(0.6)	(2.0)	(0.0)		
Sweetwater Creek	1104	62144	2073	10321	13	232	2998	54517	21224	36	2061	6295	0	163018	ARC
	(0.7)	(38.1)	(1.3)	(6.3)	(0.0)	(0.1)	(1.8)	(33.4)	(13.0)	(0.0)	(1.3)	(3.9)	(0.0)		
Sweetwater Creek	603	30111	200	3534	13	0	2209	36837	16282	28	978	4645	0	95440	ARC
U/S Pine Valley Rd to Noses Ck	(0.6)	(31.5)	(0.2)	(3.7)	(0.0)	(0.0)	(2.3)	(38.6)	(17.1)	(0.0)	(1.0)	(4.9)	(0.0)		
Tanyard Branch	40	542	286	2011	0	0	19	0	0	0	94	0	0	2992	ARC
	(1.4)	(18.1)	(9.5)	(67.2)	(0.0)	(0.0)	(0.6)	(0.0)	(0.0)	(0.0)	(3.1)	(0.0)	(0.0)		
Tanyard Creek	2	459	108	200	0	0	0	306	41	44	100	0	0	1259	MRLC
	(0.1)	(36.5)	(8.6)	(15.8)	(0.0)	(0.0)	(0.0)	(24.3)	(3.3)	(3.5)	(7.9)	(0.0)	(0.0)		
Tesnatee Creek	107	0	166	224	0	0	197	15587	223	1313	71	0	0	17888	MRLC
Cleveland	(0.6)	(0.0)	(0.9)	(1.3)	(0.0)	(0.0)	(1.1)	(87.1)	(1.2)	(7.3)	(0.4)	(0.0)	(0.0)		
Tesnatee Creek	149	0	178	239	0	29	372	39977	666	4041	71	0	0	45722	MRLC
Town Creek to Chestatee River	(0.3)	(0.0)	(0.4)	(0.5)	(0.0)	(0.1)	(0.8)	(87.4)	(1.5)	(8.8)	(0.2)	(0.0)	(0.0)		

Stream/Segment	Landuse Categories - Acres (Percent)														
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial, Industrial, Transportation	Bare Rock, Sand, Clay	Quarries, Strip Mines, Gravel Pits	Transitional	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total	Landuse Source
Trib to Mud Creek	9	1523	0	35	0	0	42	541	1146	0	157	57	0	3510	ARC
	(0.2)	(43.4)	(0.0)	(1.0)	(0.0)	(0.0)	(1.2)	(15.4)	(32.6)	(0.0)	(4.5)	(1.6)	(0.0)		
Utoy Creek	86	9539	2519	3576	0	7	163	5357	0	0	1034	60	0	22341	ARC
	(0.4)	(42.7)	(11.3)	(16.0)	(0.0)	(0.0)	(0.7)	(24.0)	(0.0)	(0.0)	(4.6)	(0.3)	(0.0)		
Ward Creek	21	3164	232	336	0	0	64	228	36	0	1103	171	0	5356	ARC
	(0.4)	(59.1)	(4.3)	(6.3)	(0.0)	(0.0)	(1.2)	(4.3)	(0.7)	(0.0)	(20.6)	(3.2)	(0.0)		
Weracoba Creek	0	1582	407	703	0	0	1	990	20	23	187	5	0	3919	MRLC
	(0.0)	(40.4)	(10.4)	(17.9)	(0.0)	(0.0)	(0.0)	(25.3)	(0.5)	(0.6)	(4.8)	(0.1)	(0.0)		
White Oak Creek	69	693	0	0	0	0	0	7106	2336	0	0	531	0	10735	ARC
	(0.6)	(6.5)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(66.2)	(21.8)	(0.0)	(0.0)	(5.0)	(0.0)		
Willeo Creek	142	9179	56	433	0	0	153	623	69	0	8	2	0	10664	ARC
	(1.3)	(86.1)	(0.5)	(4.1)	(0.0)	(0.0)	(1.4)	(5.8)	(0.6)	(0.0)	(0.1)	(0.0)	(0.0)		
Woodall Creek	13	117	102	1258	0	4	11	164	0	0	130	0	0	1798	ARC
	(0.7)	(6.5)	(5.6)	(69.9)	(0.0)	(0.2)	(0.6)	(9.1)	(0.0)	(0.0)	(7.2)	(0.0)	(0.0)		

2.0 WATER QUALITY ASSESSMENT

Stream segments are placed on the 303(d) list as partially supporting or not supporting their water use classification based on water quality sampling data. A stream is placed on the partial support list if more than 10% of the samples exceed the fecal coliform criteria and on the not support list if more than 25% of the samples exceed the standard. Water quality samples collected within a 30-day period that have a geometric mean in excess of 200 counts per 100 milliliters during the period May through October, or in excess of 1000 counts per 100 milliliters during the period November through April are in violation of the bacteria water quality standard. In addition, a single sample in excess of 4000 counts per 100 milliliters during the period November through April can also provide a basis for adding a stream segment to the 303(d) listing.

Fecal coliform data were collected during calendar years 2000 and 2001. Sources of these data including the following:

- USGS basin water quality data, 2000 and 2001.
- EPD Trend Monitoring data, 2000 and 2001
- EPD special studies sampling data, 2000.
- City of Atlanta water quality data, 2000 and 2001
- Douglas County water quality data, 2000 and 2001
- Gwinnett County water quality data, 2000 and 2001

These sources had enough information to calculate a 30-day geometric mean and the data used for these TMDLs are presented in Appendix A.

For a number of listed stream segments, available data were not sufficient to calculate a 30-day geometric mean. Many of these stream segments had been placed on the 303(d) list as a result of data collected prior to 2000. These data were assembled from a variety of sources, which included:

- Atlanta Region Commission storm water sampling data
- Chattahoochee River Management Project, 1993 – 1996
- Cobb County Spills data, 1993; water quality sampling data, 1990 - 2002
- DeKalb County spills data, 1992 - 1993; water quality data, 1994 – 1995
- Columbus, GA. spills data, 1992 - 1993; water quality data, 1993 – 1994
- City of Gainesville water quality data, (1999-2001)
- Lake Sidney Lanier Clean Lakes Study
- NAWQUA water quality data
- Sanitary Survey sampling data, 1993

Summaries of these data are presented in Appendix B.

3.0 SOURCE ASSESSMENT

An important part of the TMDL analysis is the identification of potential source categories. Sources are broadly classified as either point or nonpoint sources. A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Nonpoint sources are diffuse, and generally, but not always, involve accumulation of fecal coliform bacteria on land surfaces that washoff as a result of storm events.

3.1 Point Source Assessment

Title IV of the Clean Water Act establishes the National Pollutant Discharge Elimination System (NPDES) permit program. Basically, there are two categories of NPDES permits: 1) municipal and industrial wastewater treatment facilities and 2) regulated storm water discharges.

3.1.1 Wastewater Treatment Facilities

In general, industrial and municipal wastewater treatment facilities have NPDES permits with effluent limits. These permit limits are either based on federal and state effluent guidelines (technology-based limits) or on water quality standards (water quality-based limits).

EPA has developed technology-based guidelines that establish a minimum standard of pollution control for municipal and industrial discharges without regard for the quality of the receiving waters. These are based on Best Practical Control Technology Currently Available (BPT), Best Conventional Control Technology (BCT), and Best Available Technology Economically Achievable (BAT). The level of control required by each facility depends on the type of discharge and the pollutant.

EPA and states have also developed numeric and narrative water quality standards. Typically, these standards are based on the results of aquatic toxicity tests and/or human health criteria and include a margin of safety. Water quality-based effluent limits are set to protect the receiving stream. These limits are based on water quality standards that have been established for a stream based on its intended use and the prescribed biological and chemical conditions that must be met to sustain that use.

Municipal and industrial wastewater treatment facilities discharges may contribute fecal coliform to receiving waters. There are 50 NPDES permitted discharges with effluent limits for fecal coliform bacteria identified in the Chattahoochee River Basin Watershed upstream from the listed segments. Table 3 provides the monthly average discharge flows and fecal coliform concentrations for the municipal and industrial treatment facilities, obtained from calendar year 2000 Discharge Monitoring Report (DMR) data. The permitted flow and fecal coliform concentrations for these facilities are also included in this table.

Combined sewer systems convey a mixture of raw sewage and storm water in the same conveyance structure to the wastewater treatment plant. These are considered a component of municipal wastewater treatment facilities. When the combined sewage exceeds the capacity of the wastewater treatment plant, the excess is diverted to a combined sewage overflow (CSO) discharge point. The CSOs are permitted to discharge only under high flow conditions with the WPCP facilities operating at full capacity.

Table 3. NPDES Facilities Discharging Fecal Coliform in the Chattahoochee River Basin

Facility Name	NPDES Permit No.	Receiving Stream	Actual 2000 Discharge: Average Flow (MGD)	Actual 2000 Discharge: Geo Mean (No./ 100 mL)	NPDES Permit Limits: Average Monthly Flow (MGD)	NPDES Permit Limits: Geo Mean (No./ 100 mL)	Number. of Violations July 1998-June 2001
Atlanta R M Clayton	GA0021482	Chattahoochee River	73.33	18.4	100.00	200	0
Atlanta Utoy Creek	GA0021458	Chattahoochee River	26.50	13.5	37.00	200	4
Baldwin WPCP	GA0033243	Little Mud Creek	0.13	36.7	0.30	200	0
Buford Southside	GA0023167	Suwanee Creek	0.87	30.9	2.00	200	2
Buford Westside WPCP	GA0023175	Richland Creek	0.15	51.5	0.25	200	1
Cagles Inc Harris	GA0001316	Fort Creek	0.32	4.6	NA	400 daily max	0
Callaway Gardens	GA0022527	Mountain Creek	0.15	34.2	0.50	200	0
City of Hamilton	GA0033618	Palmetto Creek	0.03	57.4	0.10	200	1
Clarkesville WPCP	GA0032514	Soquee River	0.23	89.1	0.75	200	3
Cleveland WPCP	GA0036820	Tesnatee Creek Trib	0.28	32.5	0.75	200	0
Cobb Co R L Sutton	GA0026140	Chattahoochee River	30.27	3.1	40.00	200	0
Cobb Co South	GA0026158	Chattahoochee River	20.44	34.8	42.0	200	2
Columbus South	GA0020516	Chattahoochee River	29.96	20.2	42.00	200	0
Columbus Water Works	GA0020532	Tiger Creek	Inactive - permit expired 7/1994		0.15	200	0
Cornelia WPCP	GA0021504	South Fork Little Mud Creek	2.4	59.8	3.00	200	0
Countryside MHP	GA0030201	Suwanee Creek	Countryside Village of Lake Lanier was connected to the city of Buford sewer system on March 6, 1998		0.13	200	0
Coweta Co Arnco WPCP	GA0000311	Wahoo Creek	0.07	3,740.0	0.10	200	0
Cumming WPCP	GA0046019	Big Creek	0.87	2.5	2.00	200	1
Dahlonega WPCP	GA0026077	Yahoola Creek Trib	0.87	5.0	1.44	200	0
Demorest WPCP	GA0032506	Hazel Creek Trib	0.19	42.0	0.40	200	0
Douglasville North	GA0030350	Gothards Creek to Sweetwater Ck	0.49	34.1	0.60	200	0
Douglasville Southside	GA0030341	Anneewakee Creek	2.32	36.8	3.25	200	0
Douglasville Sweetwater	GA0047201	Chattahoochee River	1.02	5.4	3.00	200	0
Flowery Branch WPCP	GA0031933	Lake Sidney Lanier	0.18	4.5	0.20	200	0
Fort Gaines	GA0026191	Chattahoochee River	0.08	27.7	0.30	200	0

Facility Name	NPDES Permit No.	Receiving Stream	Actual 2000 Discharge		NPDES Permit Limits		Number. of Violations July 1998-June 2001
			Average Flow (MGD)	Geo Mean (No./ 100 mL)	Average Monthly Flow (MGD)	Geo Mean (No./ 100 mL)	
Fulton Co Big Creek	GA0024333	Chattahoochee River	19.58	99.8	24.00	200	3
Fulton Co Camp Creek	GA0025381	Chattahoochee River	10.07	10.9	13.00	200	1
Fulton Co Johns Creek	GA0030686	Chattahoochee River	7.04	27.3	7.00	200	2
Fulton Co Little Bear	GA0047104	Little Bear Creek	0.03	1.8	0.10	200	0
Gainesville Flat Cr WPCP	GA0021156	Flat Creek	6.68	8.3	7.20	200	0
Gainesville Linwood	GA0020168	Lake Lanier	1.70	2.4	3.00	200	0
Gwinnett Co Crooked Cr/North	GA0026433	Chattahoochee River	14.13	6.3	36.00	25	1
Gwinnett Co North Advanced	GA0038130	Lake Lanier	Permit under appeal		40.00	200	0
Habersham BOE (Baldwin)	GA0033243	Licklog Creek	0.13	36.7	0.40	200	0
Habersham on Lanier	GA0030261	Lake Lanier	0.07	5.7	0.11	200	0
Heards County Water Authority	GA0021148	Chattahoochee River	0.09	5.3	0.16	200	0
LaGrange Long Cane	GA0036951	Chattahoochee River	5.49	7.6	12.50	200	0
Lake Lanier Islands	GA0049115	Lake Lanier	0.12	53.8	0.35	200	0
Lumpkin WPCP	GA0021032	Hodchodkee Creek Trib	0.15	No fecal limits	0.20	No fecal limits	0
Newnan Snake Creek	GA0021431	Snake Cr Trib to Wahoo	Diverted to Wahoo Ck in 10/1997		0.40	200	0
Newnan Wahoo WPCP	GA0031721	Unnamed Trib to Wahoo Creek	1.51	8.5	3.00	200	0
Palmetto WPCP	GA0025542	Little Bear Cr	0.44	30.7	0.60	200	4
Pine Mountain WPCP	GA0025691	Turkey Creek Trib	0.09	141.3	0.12	200	0
Tyson Foods Inc	GA0001074	Unnamed Trib/Orr's Cr	1.22	18.3	NA	400 daily max	0
Union City WPCP	GA0023094	Deep Creek Trib	Diverted to Fulton Cnty - Deep Creek WPCP in 1997		0.25	200	0
USA FT Benning Plant 1	GA0000973	Chattahoochee R	1.98	8.1	3.80	200	0
USA FT Benning Plant 2	GA0000973	Chattahoochee R	1.63	6.7	4.60	200	0
USAF Lockheed 006	GA0001198	Nickajack Creek	1.49	1.3	7.0	200	0
Villa Rica Sweetwater	GA0027171	Town Branch/Sweetwater Cr	0.15	1.6	0.52	200	0
West Point WPCP	GA0020052	Chattahoochee R	0.54	166.3	1.00	200	0

Source: EPA PCS Website, 2001

Four NPDES-permitted CSOs are located within the City of Atlanta and discharge to 303(d) listed stream segments. Two NPDES-permitted CSOs are located in Columbus, Georgia, and discharge directly into the Chattahoochee River. The permitted CSOs in the Chattahoochee River Basin are listed in Table 4.

The Atlanta CSOs are currently under a consent decree (EPA, 1999) to meet end-of-pipe limits for fecal coliform bacterial by 2007. These limits have yet to be established. The goal is for the CSOs to achieve instream water quality standards. Interim operational standards tied to stipulated penalties for the Atlanta CSOs, under the Consent Decree, are 2000 counts/100 mL between May through October and 4,000-counts/100 mL between November through April.

The wastewater of the Atlanta and Columbus CSOs are treated by chlorination. The Tanyard Creek CSO treatment facility is presently being upgraded to allow for enough contact time for adequate disinfection. The Columbus CSOs are only required to report fecal coliform concentrations for their discharges. Table 4 provides the percent of sampled events for 2000-2001 that exceeded the permit limits.

Table 4. Permitted Combined Sewer Overflows (CSOs) in the Chattahoochee River Basin

Municipality/County	Permit No.	Facility Name	Receiving Stream	Percent of Sampled Events that Exceeded Permitted Limit
Atlanta/Fulton Co.	GA0036871	Clear Creek	Clear Creek	14.3
Atlanta/Fulton Co.	GA0037125	Proctor Creek/Greens Ferry	Proctor Creek	14.3
Atlanta/Fulton Co.	GA0037117	Proctor Creek/North Ave	Proctor Creek	27.8
Atlanta/Fulton Co.	GA0037109	Tanyard Creek	Tanyard Branch	15.0
Columbus/Muscogee	GA0036838	Uptown Park – 19th Street	Chattahoochee River	No limit
Columbus/Muscogee	GA0036838	South Commons – State Docks	Chattahoochee River	No limit

Source: Permitting and Compliance Program, Environmental Protection Division, GA EPD, 2002

3.1.2 Regulated Storm Water Discharges

Some storm water runoff is covered under the NPDES Permit Program. It is considered a diffuse source of pollution. Unlike other NPDES permits that establish end-of-pipe limits, storm water NPDES permits establish controls. Currently, regulated storm water discharges that may include discharges with fecal coliform bacteria consist of those associated with industrial activities, including construction sites five acres or greater, and large and medium municipal separate storm sewer systems (MS4s) that serve populations of 100,000 or more.

Storm water discharges associated with industrial activities are currently covered under a General Storm Water Permit NPDES permit. This permit requires visual monitoring of storm water discharges, site inspections, implementation of Best Management Practices (BMPs), and record keeping.

Storm water discharges from MS4s are very diverse in pollutant loadings and frequency of discharge. At present, all cities and counties within Georgia that had a population of greater than 100,000 at the time of the 1990 Census, are permitted for storm water discharge. This includes 60 permittees, 45 of which are located in the greater Atlanta metro area.

Phase I MS4 permits require the prohibition of non-storm water discharges (i.e., illicit discharges) into the storm sewer systems and controls to reduce the discharge of pollutants to the maximum extent practicable, including the use of management practices, control techniques and systems, as well as design and engineering methods (Federal Register, 1990). A site-specific Storm Water Management Plan (SWMP) outlining appropriate controls is required by and referenced in the permit. There are twenty-eight Phase I MS4s in the Chattahoochee River Basin (Table 5).

Table 5. Phase I Permitted MS4s in the Chattahoochee River Basin

Name	Permit No.	Watershed
Alpharetta	GAS000102	Chattahoochee
Atlanta	GAS000100	Chattahoochee, Flint, Ocmulgee
Austell	GAS000103	Chattahoochee
Berkley Lake	GAS000138	Chattahoochee
Buford	GAS000104	Chattahoochee
Chamblee	GAS000105	Chattahoochee
Clarkston	GAS000106	Chattahoochee, Ocmulgee
Cobb County	GAS000108	Chattahoochee, Coosa
College Park	GAS000109	Chattahoochee, Flint
Columbus Consolidated	GAS000202	Chattahoochee
Decatur	GAS000110	Chattahoochee, Ocmulgee
DeKalb County	GAS000111	Chattahoochee, Ocmulgee
Doraville	GAS000113	Chattahoochee
Duluth	GAS000112	Chattahoochee, Ocmulgee
East Point	GAS000114	Chattahoochee, Flint, Ocmulgee
Fairburn	GAS000115	Chattahoochee, Flint
Forsyth County	GAS000300	Chattahoochee, Coosa
Fulton County	GAS000117	Chattahoochee, Ocmulgee, Coosa, Flint
Gwinnett County	GAS000118	Chattahoochee, Ocmulgee, Oconee
Marietta	GAS000125	Chattahoochee, Coosa
Norcross	GAS000127	Chattahoochee, Ocmulgee
Palmetto	GAS000128	Chattahoochee, Flint
Powder Springs	GAS000129	Chattahoochee
Roswell	GAS000131	Chattahoochee, Coosa
Smyrna	GAS000132	Chattahoochee
Sugar Hill	GAS000135	Chattahoochee
Suwanee	GAS000144	Chattahoochee, Ocmulgee
Union City	GAS000136	Chattahoochee, Flint

Source: Nonpoint Source Permitting Program, GA DNR, 2007

As of March 10, 2003, small MS4s serving urbanized areas are required to obtain a storm water permit under the Phase II storm water regulations. An urbanized area is defined as an area with a residential population of at least 50,000 people and an overall population density of at least 1,000 people per square mile. Thirty counties and 56 communities are permitted under the Phase II regulations in Georgia. There are twelve counties or communities located in the Chattahoochee River Basin that are covered by the Phase II General Storm Water Permit (Table 6).

Table 6. Phase II Permitted MS4s in the Chattahoochee River Basin

Name	Permit No.	Watershed
Cumming	GAG610000	Chattahoochee
Dallas	GAG610000	Chattahoochee, Coosa
Douglas County	GAG610000	Chattahoochee
Douglasville	GAG610000	Chattahoochee
Flowery Branch	GAG610000	Chattahoochee
Gainesville	GAG610000	Chattahoochee, Oconee
Hall County	GAG610000	Chattahoochee, Oconee
Hiram	GAG610000	Chattahoochee
Newnan	GAG610000	Chattahoochee, Flint
Oakwood	GAG610000	Chattahoochee, Oconee
Paulding County	GAG610000	Chattahoochee, Coosa, Tallapoosa
Sandy Springs	GAG610000	Chattahoochee

Source: Nonpoint Source Permitting Program, GA DNR, 2007

Those watersheds located within Phase I or Phase II MS4 city or county urbanized areas are listed in Table 7. The table provides the total area of each of these watersheds, and the percentage of the watersheds that is MS4 city or county urbanized area.

Table 7. Percentage of Watersheds Located in MS4 City or County Urbanized Areas

Name	Total Area (acres)	% in MS4 area
Big Creek - Hwy 400 to Chattahoochee River	30,720	46.3%
Chattahoochee River - Morgan Falls Dam to Peachtree Creek	232,384	79.8%
Chattahoochee River - Peachtree Creek to Utoy Creek	345,218	85.4%
Chattahoochee River - Utoy Creek to Pea Creek	564,516	82.5%
Chattahoochee River - Pea Creek to Wahoo Creek	620,196	74.9%
Chattahoochee River - N. Highland Dam to Upatoi Creek	54,400	6.7%
Johns Creek - Headwaters to Chattahoochee River	7,486	89.3%
Sweetwater Creek - Noses to Chattahoochee River	143,114	87.8%
Sweetwater Creek - U/S Pine Valley Rd to Noses Ck	14,656	15.4%

3.1.2 Confined Animal Feeding Operations

Confined livestock and confined animal feeding operations (CAFOs) are characterized by high animal densities. This results in large quantities of fecal material contained within a limited area. Processed agricultural manure from confined hog, dairy cattle and some poultry operations is generally collected in lagoons and applied to pastureland and cropland as a fertilizer during the growing season, at rates which often vary on a monthly basis.

In 1990, the State of Georgia began registering CAFOs. Many of the CAFOs have been issued land application permits for treatment of wastewaters generated from their operations. Table 8 presents the swine and non-swine (primarily dairies) CAFOs located in the Chattahoochee River Basin that are registered or have land application permits.

Table 8. Registered CAFOs in the Chattahoochee River Basin

Name	County	Type	Total No. of Animals
Bobby R. Gunter Dairy Farm	Lumpkin	Dairy	200
Elmer Truelove Dairy, Inc.	Hall	Dairy	150
Farmer's Dairy	Hall	Dairy	300
GilCrest Farms	Habersham	Swine	1900
McClure Hog Farm	Lumpkin	Swine	2000
R&R Farm #4	White	Swine	2200
Riverbottom Swine Unit	Stewart	Swine	1450

Source: Permitting and Compliance Program, Environmental Protection Division, GA EPD, 2002

3.2 Nonpoint Source Assessments

In general, nonpoint sources cannot be identified as entering a waterbody through a discrete conveyance at a single location. Typical nonpoint sources of fecal coliform bacteria include:

- Wildlife
- Agricultural Livestock
  - Animal grazing
  - Animal access to streams
  - Application of manure to crop and pasture land
- Urban Development
  - Leaking septic systems
  - Land Application Systems
  - Landfills

In urban areas, a large portion of storm water runoff may be collected to storm sewer systems and discharged through distinct outlet structures. For large urban areas, these storm sewer discharge points may be regulated as described in Section 3.1.2.

3.2.1 Wildlife

The importance of wildlife as a source of fecal coliform bacteria in streams varies considerably, depending on the animal species present in the subwatersheds. Based on information provided by the Wildlife Resources Division (WRD) of DNR, the animals that spend a large proportion of their time in or around aquatic habitats are considered to be the most important wildlife sources of fecal coliform. Waterfowl, most notably ducks and geese, are considered to potentially be the greatest contributors of fecal coliform. This is because they are typically found on the water surface, often in large numbers, and deposit their feces directly into the water. Other potentially important animals, regularly found around aquatic environments, include racoon, beaver, muskrat, and to a lesser extent, river otter and mink. Population estimates of these animal species in Georgia are currently not available.

White-tailed deer have a significant presence throughout the Chattahoochee River Basin. The 2000 deer census for counties in the Chattahoochee River Basin is presented in Table 9. Fecal coliform bacteria contributions from deer to water bodies are generally considered less significant than that of waterfowl, racoon, and beaver. This is because a greater portion of their time is spent in terrestrial habitats. However, feces deposited on the land surface can result in the introduction of fecal coliform to streams during runoff events. It should be noted that between storm events, considerable decomposition of the fecal matter might occur, resulting in a decrease in the associated fecal coliform numbers. This is especially true in warm, humid environments typical of the southeast. This also holds true for other terrestrial mammals such as squirrel and rabbit, and terrestrial birds (Personal communication, WRD, 2002).

3.2.2 Agricultural Livestock

Agricultural livestock are a potential source of fecal coliform to streams in the Chattahoochee River Basin. The animals grazing on pasture land deposit their feces onto land surfaces where it can be transported during storm events to nearby streams. Animal access to pasture land varies monthly, resulting in varying fecal coliform loading rates throughout the year. Beef cattle spend all of their time in pastures, while dairy cattle and hogs are confined periodically. Agricultural livestock also often have direct access to streams that pass through pastures, and as such can impact water quality in a more direct manner. (Personal communication, EPA, Georgia Agribusiness Council, NRCS, University of Georgia, et. al.).

Table 9. 2000 Deer Census Data by County in the Chattahoochee River Basin

County	Deer Density (number/sq mile)
Banks	40
Calhoun	35
Carroll	50
Chattahoochee	35
Cherokee	40
Clay	35
Cobb	35
Coweta	50
Dawson	40
DeKalb	35
Douglas	35
Early	35
Forsyth	40
Fulton	35
Gwinnett	35
Habersham	25
Hall	40
Harris	50
Heard	50
Lumpkin	25
Marion	35
Meriwether	50
Muscogee	50
Paulding	40
Quitman	35
Randolph	35
Seminole	35
Stewart	35
Talbot	50
Taylor	50
Towns	25
Troup	50
Turner	35
Union	25
White	25

Source: Wildlife Resource Division, GA DNR, 2000

Table 10, provides the estimated number of beef cattle per USGS 12-digit HUC. The number of dairy cattle, swine, sheep, goats and horses reported by county are presented in Table 11. These data were provided by the Natural Resources Conservation Service (NRCS) and are based on 2000 data.

Table 10. Estimated Beef Cattle Population in the Chattahoochee River Basin

HUC	Beef Cattle
31300010101	8
31300010102	316
31300010103	78
31300010104	753
31300010105	491
31300010106	1,036
31300010201	424
31300010202	1,044
31300010203	2,189
31300010204	1,269
31300010205	2,345
31300010206	928
31300010301	1,795
31300010302	3,085
31300010303	2,485
31300010304	2,367
31300010305	485

Source: NRCS, 2000

3.2.3 Urban Development

Fecal coliform from urban areas are attributable to multiple sources including: domestic animals, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, leaking septic systems, runoff from improper disposal of waste materials, and leachate from operating and closed landfills.

Urban runoff can contain high concentrations of fecal coliform from domestic animals and urban wildlife. Fecal coliform enter streams by direct washoff from the land surface, or the runoff may be diverted to a storm water collection system and discharged through a discrete outlet structure. For larger urban areas (population greater than 100,000), the storm water outlets are regulated under MS4 permits (see Section 3.1.2). For smaller urban areas, the storm water discharge outlets currently remain unregulated.

Table 11. Estimated Agricultural Livestock Populations in the Chattahoochee River Basin

County	Livestock						
	Dairy Cattle	Swine	Sheep	Horse	Goats	Chickens Layers	Chickens-Broilers Sold
Banks		1610	200	1325	3800	1429562	43554651
Calhoun		450	0	0	300	0	5096000
Carroll	408	-	100	300	500	313306	37169013
Chattahoochee		-	0	20	0	0	0
Cherokee	205	-	0	520	300	0	20758494
Clay	233	1250	0	75	500	0	0
Cobb		-	0	0	0	0	0
Coweta	383	-	0	600	100	429	0
Dawson		300	30	1200	300	238710	14376227
DeKalb	600	-	0	72	0	0	0
Douglas	200	-	0	525	0	0	0
Early		600	0	30	700	0	0
Forsyth		-	0	1500	0	716580	23076510
Fulton		-	0	0	200	0	0
Gwinnett	200	-	0	600	500	0	1967683
Habersham	75	1600	0	0	400	0	46662654
Hall	1460	200	40	900	1450	1373149	44321204
Harris		-	115	575	280	91	0
Heard	-	-	10	150	125	0	10082963
Lumpkin	283	175	20	180	50	0	14722844
Marion	-	300	0	350	4000	0	5858000
Meriwether	325	100	30	1000	1100	138	0
Muscogee		-	0	450	0	0	0
Paulding	100	-	0	2200	400	0	5120864
Quitman		-	0	30	300	0	0
Randolph	321	1400	0	150	250	0	0
Seminole	99	240	176	150	300	0	0
Stewart	-	1000	0	60	175	0	1009137
Talbot	362	-	0	134	75	0	0
Taylor		-	0	15	600	407665	6293097
Towns		450	30	515	200	0	0
Troup	608	-	0	350	0	0	0
Turner		749	25	80	650	0	0
Union	375	100	40	1000	300	0	0
White	448	3000	20	550	50	303818	18135126

Source: NRCS, 2000

In addition to urban animal sources of fecal coliform, there may be illicit sanitary sewer connections to the storm sewer system. As part of the MS4 permitting program, municipalities are required to conduct dry-weather monitoring to identify and then eliminate these illicit discharges. Fecal coliform may also enter streams from leaky sewer pipes or during storm events when the combine sewer overflows discharge.

3.2.3.1 Leaking Septic Systems

Some fecal coliform in the Chattahoochee River Basin may be attributed to failure of septic systems and illicit discharges of raw sewage. Table 12 presents the number of septic systems in each county of the Chattahoochee River Basin existing in 1990 based on U.S. 1990 Census Data, and the number existing in 2000 based on Georgia Department of Human Resources, Division of Public Health data. In addition, an estimate of the number of septic systems repaired during the ten-year period form 1990 to 2000 is given.

These data show that a substantial increase in the number of septic systems has occurred in several counties. This is generally a reflection of population increases outpacing the expansion of sewage collection systems during the decade. Hence, a large number of septic systems are installed to contain and treat the sanitary waste. It is estimated that there are approximately 2.37 people per household on septic systems (EPA, personal communication).

3.2.4.2 Land Application Systems

Many smaller communities use land application systems (LAS) for treatment of their sanitary wastewaters. These facilities are required through LAS permits to treat all their wastewater by land application and have zero discharge. However, runoff during storm events may carry surface residual containing fecal coliform bacteria to nearby streams. Some of these facilities may also exceed the ground percolation rate when applying the wastewater, resulting in surface runoff from the field. If not properly bermed, this runoff, which likely contains fecal coliform bacteria, may discharge to nearby surface waters. There are nineteen permitted LAS systems located in the Chattahoochee River Basin and they are listed in Table 13.

3.2.4.3 Landfills

Leachate from landfills may contain fecal coliform bacteria and may at some point discharge into surface waters. Sanitary (or municipal) landfills are the most likely type of landfills to serve as a source of fecal coliform bacteria. These receive household wastes, animal manure, offal, hatchery and poultry processing plant wastes, dead animals, and other types of wastes. Older sanitary landfills were not lined and have been closed. Those that remain active and have not been lined operate as construction/demolition landfills. Currently active sanitary landfills are lined and have leachate collection systems. All landfills, except inert landfills, are now required to install environmental monitoring systems for groundwater sampling and methane. There are 117 known landfills in the Chattahoochee River Basin (Table 14). Of these, eight are active landfills, and 109 are landfills that are inactive or closed. As shown in the Table 14, many of the older, inactive landfills were never permitted.

Table 12. Number of Septic Systems by County in the Chattahoochee River Basin

County	Total Septic Systems in 2000	Total Septic Systems in 1990	No. of Septic Systems Repaired 1990 to 2000
Banks	Not Available	Not Available	Not Available
Calhoun	1751	847	150
Carroll	25298	17067	1916
Chattahoochee	Not Available	Not Available	Not Available
Cherokee	Not Available	Not Available	Not Available
Clay	1227	827	20
Cobb	33209	25631	4247
Coweta	29232	12833	834
Dawson	8504	4056	337
DeKalb	24333	20432	1403
Douglas	22552	17258	2102
Early	3727	2454	242
Forsyth	39885	16083	953
Fulton	30312	21485	2647
Gwinnett	75333	56752	4486
Habersham	13508	7934	272
Hall	50661	25664	4596
Harris	9240	6360	100
Heard	4589	2878	106
Lumpkin	8477	4898	156
Marion	3429	6527	51
Meriwether	7052	4902	133
Muscogee	2834	1604	30
Paulding	31547	13085	277
Quitman	1616	1191	20
Randolph	1928	1178	20
Seminole	6399	2999	528
Stewart	1315	690	20
Talbot	1917	2742	30
Taylor	2726	1626	25
Towns	Not Available	Not Available	Not Available
Troup	15084	9103	1195
Turner	Not Available	Not Available	Not Available
Union	Not Available	Not Available	Not Available
White	10046	5031	216

Source: 1990 Census Data, Georgia Department of Human Resources, Division of Public Health, 2000

Table 13. Permitted Land Application Systems in the Chattahoochee River Basin

LAS Name	County	Permit No	Type
Alexander High School	Douglas	GAU030757	Municipal
Carroll County Water Authority	Carroll	GAU020071	Municipal
Chattahoochee County Municipal Waste Water Plant	Chattahoochee	GAU020224	Municipal
City of Whitesburg	Carroll	GAU020118	Municipal
Colonial Pipeline Co.	Cobb	GAU010543	Industrial
Days Inn Lagrange	Troup	GAU020276	Municipal
Dorsett Shoals Elementary School	Douglas	GAU030826	Municipal
Douglas Co. Water & Sewer Authority	Douglas	GAU020048	Municipal
Dutch Quality House	Hall	GAU010432	Industrial
Glidden Company	Hall	GAU010362	Industrial
Helen LAS	White	GAU020157	Municipal
Hogansville LAS	Troup	GAU020019	Municipal
International Processing	Douglas	GAU010489	Industrial
LJS Grease and Tallow	Carroll	GAU010591	Industrial
Paulding Co. Water System	Paulding	GAU020297	Municipal
Sugar Hill LAS **(closed)**	Gwinnett	GAU020003	Municipal
Unicoi State Park Lodge	White	GAU020066	Municipal
Windermere Urban Reuse	Forsyth	GAU020195	Private
Wrigley WM Jr. Company	Hall	GAU010595	Industrial

Source: Permitting and Compliance Program, Environmental Protection Division, GA EPD, 2000

Table 14. Landfills in the Chattahoochee River Basin

Name	County	Permit No.	Type	Status
McGukin - Cedar Heights Rd.	Carroll		Not Applicable	Inactive
Cusseta - Osteen St.	Chattahoochee		Not Applicable	Inactive
Ft. Benning - US 27/ 280, Old Cusseta Rd.	Chattahoochee	026-003D	Sanitary Landfill	Inactive
Ft. Benning - 1st Division Rd.	Chattahoochee	026-004D	Sanitary Landfill	Closed
Fort Gaines	Clay		Not Applicable	Inactive
SR 39 PH1	Clay	030-002D	Sanitary Landfill	Closed
SR 39 PH2	Clay	030-003D	Sanitary Landfill	Closed
Austell	Cobb		Not Applicable	Inactive
Austell Box Board	Cobb		Not Applicable	Inactive
Chambers - Oakdale Rd. I-285	Cobb	033-081D	Dry Trash Landfill	Closed
Chambers - Oakdale/ I-285	Cobb	033-093P	Recovered Materials Facility	Inactive
Cobb Co. Baler	Cobb	033-004P	Baler Facility	Inactive
Cobb Co. County Farm Rd.	Cobb	033-020D	Dry Trash Landfill	Inactive
Cobb Co. County Farm Rd.	Cobb	033-032D	Sanitary Landfill	Inactive
County Farm Rd. No. 2 PH 1-2-3	Cobb	033-037D	Dry Trash Landfill	Ceased Accepting Waste
County Farm Rd. PH2	Cobb	033-039D	Sanitary Landfill	Closed
Hoyt Samples Landfill	Cobb		Not Applicable	Inactive
Mid - South Supply - Bankhead Hwy	Cobb		Not Applicable	Inactive
North Cooper Lake Rd.	Cobb	033-030D	Dry Trash Landfill	Inactive
O.E. Matlock - Hwy 41	Cobb		Not Applicable	Inactive
Pacific Cabinet Co., Cousin St.	Cobb		Not Applicable	Inactive
Pebblebrook Baptist Church	Cobb		Not Applicable	Inactive
Sam Floyd - Powder Springs Rd.	Cobb		Not Applicable	Inactive
Six Flags - I-20	Cobb		Not Applicable	Inactive
Whitfield - Gordon Rd.	Cobb		Not Applicable	Inactive
Arnco - Sargent	Coweta		Not Applicable	Inactive
Coweta Co. Ishman Ballard Rd	Coweta	038-009D	Sanitary Landfill	Inactive
Coweta Co. Ishman Ballard Rd.	Coweta	038-015D	Construction and Demolition Waste Landfill	Active
Coweta Co. Ishman Ballard Rd. Ph 1A	Coweta	038-007D	Sanitary Landfill	Closed
Ga. Reclamation Center	Coweta	038-010P	Recovered Materials Facility	Inactive
Georgia Power, Plant Yates Gypsum	Coweta	038-014D	Industrial	Inactive
Grantville	Coweta		Not Applicable	Inactive
Palmetto	Coweta		Not Applicable	Inactive
Buford Highway	DeKalb	044-009D	Sanitary Landfill	Inactive
Chamblee-Keswick Dr.	DeKalb	044-031D	Dry Trash Landfill	Closed
Emory - Old Briarcliff Rd.	DeKalb	044-036D	Dry Trash Landfill	Inactive
Laurelwood	DeKalb		Not Applicable	Inactive
Blythe Ga. Hwy 92	Douglas		Not Applicable	Inactive
Cedar Mtn. - Worthan Rd. PH1	Douglas	048-009D	Sanitary Landfill	Active
Cedar Mtn. Rd.	Douglas	048-007D	Sanitary Landfill	Closed
Downs Rd.	Douglas		Not Applicable	Inactive
Giddens - Hwy. 92 Landfill	Douglas		Not Applicable	Inactive

Name	County	Permit No.	Type	Status
Lee H. Wallace - Basket Creek Rd.	Douglas		Not Applicable	Inactive
Cumming	Forsyth		Not Applicable	Inactive
Forsyth Co. - Kelly Mill Rd. Site # 2	Forsyth	058-001D	Sanitary Landfill	Inactive
Forsyth Co. - Kelly Mill Rd. Site # 2	Forsyth	058-003D	Sanitary Landfill	Inactive
Kelly Mill Rd. No. 2	Forsyth	058-004D	Sanitary Landfill	Closed
Miller/Trammel Trammel Rd.	Forsyth	058-007D	Dry Trash Landfill	Closed
Tomahawk Recycling	Forsyth	058-011P	Recovered Materials Facility	Inactive
Atlanta - Cascade Road SL	Fulton	060-046D	Sanitary Landfill	Closed
Atlanta - Gun Club Road	Fulton	060-026D	Sanitary Landfill	Closed
B.F.I. - Marietta Blvd.	Fulton		Not Applicable	Inactive
BFI - Watts Road	Fulton	060-051D	Sanitary Landfill	Closed
Chambers - Bolton Road	Fulton	060-083D	Municipal Solid Waste Landfill	Active
East Point Landfill	Fulton	060-017D	Not Applicable	Inactive
Field Road #1	Fulton		Not Applicable	Inactive
Fields Road No. 2 Atlanta Landfill	Fulton	060-033D	Dry Trash Landfill	Inactive
Fulton County - Merk Rd.	Fulton	060-011D	Sanitary Landfill	Closed
Fulton County - Morgan Falls	Fulton	060-007D	Sanitary Landfill	Closed
Grady Price - Hwy 29	Fulton		Not Applicable	Inactive
Grove Park	Fulton		Not Applicable	Inactive
James Ferell - Cascade Rd.	Fulton		Not Applicable	Inactive
Joe Jones	Fulton		Not Applicable	Inactive
MacDougald Construction Co.	Fulton	060-039D	Dry Trash Landfill	Inactive
Merk/Miles Road	Fulton	060-064D	Sanitary Landfill	Closed
Morris Road Dump	Fulton		Not Applicable	Inactive
Oxbo	Fulton		Not Applicable	Inactive
Price - Roosevelt Hwy	Fulton	060-075D	Dry Trash Landfill	Closed
Roy Pittman Prop. - Hwy 29	Fulton	060-028D	Dry Trash Landfill	Inactive
Safeguard Landfill Mgt C&D	Fulton	060-088D	Construction and Demolition Waste Landfill	Active
Skinner - Watts Rd.	Fulton		Not Applicable	Inactive
Southern States - Bolton Road	Fulton	060-010D	Sanitary Landfill	Closed
Strickland - Kimball Br. Rd.	Fulton		Not Applicable	Inactive
United Waste Westview PH2	Fulton	060-062D	Sanitary Landfill	Closed
Westview	Fulton	060-024D	Not Applicable	Inactive
Worley - Nesbitt Ferry Rd.	Fulton		Not Applicable	Inactive
B.J.	Gwinnett	067-014D	Not Applicable	Inactive
BFI - Richland Creek	Gwinnett	067-032D	Municipal Solid Waste Landfill	Active
Buford	Gwinnett	067-008D	Sanitary Landfill	Closed
Buford - Peachtree Ind. Blvd PH2	Gwinnett	067-030D	Sanitary Landfill	Closed
Buford - Tuggle Greer Rd.	Gwinnett	067-019D	Dry Trash Landfill	Closed
Norcross	Gwinnett		Not Applicable	Inactive
Sugar Hill - Appling Rd. PH1	Gwinnett	067-016D	Sanitary Landfill	Closed
Suwanee	Gwinnett		Not Applicable	Inactive
Walt McManus	Gwinnett		Not Applicable	Inactive

Name	County	Permit No.	Type	Status
Weathers - Nelson & Budd, Inc.	Gwinnett		Not Applicable	Inactive
WMI BJ Landfill Expansion	Gwinnett	067-025D	Sanitary Landfill	Closed
WMI BJ landfill PH3&4	Gwinnett	067-027D	Municipal Solid Waste Landfill	Closed
Clarkesville	Habersham		Not Applicable	Inactive
Cornelia	Habersham		Not Applicable	Inactive
Pea Ridge Road PH1	Habersham	068-016D	Sanitary Landfill	Closed
Pea Ridge Road PH2-3	Habersham	068-017D	Sanitary Landfill	Closed
City of West Point SR 103	Harris	072-003D	Sanitary Landfill	Closed
Hamilton Rd. E.	Harris	072-009D	Sanitary Landfill	Closed
Harris Co. - S2651	Harris	072-004D	Sanitary Landfill	Inactive
Franklin	Heard		Not Applicable	Inactive
Frolona Rd.	Heard	074-004D	Sanitary Landfill	Closed
Hwy. 100	Heard	074-001D	Sanitary Landfill	Inactive
CR 98 Durand SL	Meriwether	099-015D	Sanitary Landfill	Closed
Garden Services Inc.	Meriwether	099-010D	Dry Trash Landfill	Inactive
Phillips Rd.	Meriwether	099-004D	Sanitary Landfill	Inactive
Cols. Cons. Govt. Schatlulge Rd. East Side	Muscogee	106-008D	Not Applicable	Inactive
Columbus Sanitary Landfill	Muscogee	106-001D	Sanitary Landfill	Ceased Accepting Waste
Columbus Schatulga Rd W Fill PH2	Muscogee	106-011D	Sanitary Landfill	Ceased Accepting Waste
Columbus, Pine Grove	Muscogee	106-016D	Municipal Solid Waste Landfill	Active
Schatulga Road	Muscogee		Not Applicable	Inactive
Tyler Buena Vista Rd.	Muscogee	106-004D	Dry Trash Landfill	Ceased Accepting Waste
Coleman	Randolph		Not Applicable	Inactive
CR 145S PH2	Stewart	128-001D	Sanitary Landfill	Closed
Junction City	Talbot		Not Applicable	Inactive
Hogansville - Blue Creek Rd.	Troup	141-009D	Sanitary Landfill	Closed
LaGrange - Orchard Hill Rd.	Troup	141-005D	Sanitary Landfill	Closed
LaGrange I85/SR109	Troup	141-013D	Sanitary Landfill	Active
SR 109 Mountville PH1	Troup	141-008D	Sanitary Landfill	Closed
SR 109 Mountville PH2	Troup	141-023D	Construction and Demolition Waste Landfill	Active
Warner Rd. S.	Troup	141-012D	Sanitary Landfill	Closed
Duke's Creek	White	154-003D	Sanitary Landfill	Closed

Source: Land Protection Branch, GA DNR, 1999

4.0 ANALYTICAL APPROACH

The process of developing fecal coliform TMDLs for the Chattahoochee River Basin listed segments includes the determination of the following:

- The “current” critical fecal coliform load to the stream under “current” conditions;
- The TMDL for similar conditions under which the ”current” load was determined; and
- The percent reduction in the “current” critical fecal coliform load necessary to achieve the TMDL.

The calculation of the fecal coliform load at any point in a stream requires the fecal coliform concentration and stream flow. The availability of water quality and flow data varies considerably among the listed segments. A discussion of the available monitoring data was presented in Section 2.0. For the majority of listed segments, fecal coliform sampling data were sufficient to calculate at least one 30-day geometric mean to compare with the regulatory criteria (see Appendix A). Fecal coliform data for the remaining segments were limited (see Appendix B). Depending on the nature and availability of water quality data, different approaches were used to determine the “current” critical loads and TMDLs for the listed segments. These different approaches are outlined below.

4.1 Loading Curve Approach

For those segments in which sufficient water quality data were collected to calculate at least one 30-day geometric mean that was above the regulatory standard, the loading curve approach was used. The method involves comparing the “current” critical load to summer and winter seasonal TMDL curves.

As mentioned in Section 2.0, the USGS monitored many of the listed segments and collected stream flow information concurrently with water quality samples. Stream depths were measured and used to determine stream flows, based on rating curves developed by the USGS for each sampling location.

In cases where no stream flow measurements were available, flow on the day the fecal coliform samples were collected was estimated using data from a nearby gaged stream. The nearby stream had to have relatively similar watershed characteristics, including landuse, slope, and drainage area. The stream flows were estimated by multiplying the gaged flow by the ratio of the listed stream drainage area to the gaged stream drainage area. Table 15 listed those segments in which no flow data was available and the gaged station that was used to estimate the flow. If a gage stream was available within the same watershed, it was used.

The “current” critical loads were determined using fecal coliform data collected within a 30-day period to calculated the geometric means, and multiplying these values by the arithmetic mean of the flows measured at the time the water quality samples were collected. Georgia’s instream fecal coliform standards are based on a geometric mean of samples collected over a 30-day period, each sample is at least 24 hours apart. To reflect this in the load calculation, the fecal coliform loads are expressed as 30-day accumulation loads with units of counts per 30 days. This is described by the equation below:

$$L_{critical} = C_{geomean} * Q_{mean}$$

Table 15. Monitoring Stations with No Flow Data and USGS Gaging Stations used to Estimate the Flow

Stream Name	USGS Station Name	Station No.
Anneewakee Creek	Noses Creek at Powder Springs	02336968
Big Creek Headwaters	Big Creek near Alpharetta, GA	02335700
Big Creek Hwy 400	Big Creek near Alpharetta, GA	02335700
Chattahoochee River Morgan Falls Dam to Peachtree Ck	Chattahoochee at Atlanta, GA	02336000
Chattahoochee River Peachtree Ck to Utoy Ck	Chattahoochee at St Hwy 280	02336490
Chattahoochee River Utoy Ck to Pea Ck	Chattahoochee at Fairburn, GA	02337170
Chattahoochee River North Highland Dam to Upatoi	Chattahoochee at Columbus	02341500
Crawfish Creek	Snake Creek near Whitesburg, GA	02337500
Kelly Mill Branch	Big Creek near Alpharetta, GA	02335700
Mobley Creek	Snake Creek near Whitesburg, GA	02337500
Level Creek	Suwanee Creek near Suwanee, GA	02334885
North Fork Peachtree Creek	Peachtree Creek at Atlanta, GA	02336300
Orr Creek	Big Creek near Alpharetta, GA	02335700
Peachtree Creek	Peachtree Creek at Atlanta, GA	02336300
Richland Creek	Suwanee Creek near Suwanee, GA	02334885
Sope Creek	Sope Creek near Marietta, GA	02335870
Sweetwater Creek (Cobb/Douglas Co.)	Sweetwater Creek near Austell, GA	02337000

Where:
$L_{critical}$ = “current” critical fecal coliform load
$C_{geomean}$= fecal coliform concentration as a 30-day geometric mean
Q_{mean} = stream flow as arithmetic mean

The “current” critical load is dependent on the fecal coliform concentrations and stream flows measured during the sampling events. The number of events sampled is usually 16 events per year. Thus, it does not represent the full range of flow conditions or loading rates that can occur. Therefore, it must be kept in mind that the “current” critical loads used are only representative of the time periods sampled.

The maximum fecal load at which the instream fecal coliform criteria will be met can be determined using a variation of the equation above. By setting C equal to the seasonal instream fecal coliform standards, the load will equal the TMDL. However, the TMDL is dependent on stream flow. Figures in Appendix A graphically illustrates that the TMDL is a continuum for the range of flows (Q) that can occur in the stream over time. There are two TMDL lines. One line represents the summer TMDL for the period from May through October when the 30-day geometric mean standard is 200 counts/ 100 mL. The second line represents the winter TMDL for the period from November through April when the 30-day geometric mean standard is 1000 counts/ 100 mL. The equations for these two TMDL lines are given below.

$TMDL_{summer}$ = 200 counts (as a 30-day geometric mean)/100 mL * Q * Conversion Factor

$TMDL_{winter}$ = 1000 counts (as a 30-day geometric mean)/100 mL * Q * Conversion Factor

The graph shows the relationship between the “current” critical load ($L_{critical}$) and the TMDL. The TMDL for a given stream segment is the load for the mean flow corresponding to the “current” critical load. This is the point where the ”current” load most exceeds the TMDL curve. This critical TMDL can be represented by the following equation:

$$TMDL_{critical} = C_{standard} * Q_{mean} * \text{Conversion Factor}$$

Where:
$TMDL_{critical}$ = critical fecal coliform TMDL load
$C_{standard}$ = seasonal fecal coliform standard as 30-day geometric mean
summer - 200 counts/100 mL
winter - 1000 counts/ 100 mL
Q_{mean} = stream flow as arithmetic mean (same as used for $L_{critical}$)

A 30-day geometric mean load that plots above the respective seasonal TMDL curve, represents an exceedance of the instream fecal coliform standard. The difference between the “current” critical load and the TMDL curve represents the load reduction required for the stream segment to meet the appropriate instream fecal coliform standard. The load reduction can thus be expressed as follows:

$$\text{Load Reduction} = \frac{L_{critical} - TMDL_{critical}}{L_{critical}} * 100$$

4.2 Equivalent Site Approach

TMDLs must be developed for a number of listed segments for which sufficient data are not available to calculate the 30-day geometric mean fecal coliform concentrations. Although there may be sampling data for many of these streams, there are not enough data within a 30-day period to directly calculate geometric means. Therefore, an equivalent site approach is used to estimate the "current" and TMDL loads. This approach involves calculating loads for the stream segments that lack sufficient data based on a relationship to other, similar, equivalent site(s) that have data. This method provides estimates that can be refined in the future as additional data are collected.

Development of loads using the equivalent site approach addresses three key issues:

1. Site-specific monitoring data should be used, even if it is insufficient for direct estimation of geometric means. The site-specific and equivalent site monitoring data should be combined in a weighted approach that reflects the relative accuracy of information provided by each data source.

2. Equivalent site selection has a potential impact on the resulting load estimates. In the case where a TMDL has already been prepared for a downstream segment within the same watershed, the equivalent site selection is obvious. For other segments, multiple sites within the same general region may be available for use.

3. Different landuses result in different fecal coliform concentrations. An equivalent site with a perfect landuse match is unlikely to be available. Differences in landuses among watersheds should be addressed through use of a regionalization model that identifies the extent to which variability in fecal coliform concentrations can be explained by changes in landuse.

In translating data from an equivalent site to a listed segment, it is important to account for changes in fecal coliform runoff concentrations associated with different landuses, and for changes in flow associated with different drainage areas. The critical load at site *i* can be estimated in relations to the calculated critical loads at other sites using the following equation:

$$\text{Load}_{\text{critical}} = \frac{1}{n}\sum_{j=1}^{n}\left[A_{ij}\cdot C_j \cdot Q_{crit,j}\cdot\frac{DA_i}{DA_j}\right]$$

Where:
$L_{critical}$ = estimated critical fecal coliform load at site *i*
n = number of equivalent sites
A_{ij} = translation factor
C_j = fecal coliform concentration as 30-day geometric mean at site(s) *j*
$Q_{crit,j}$ = stream flow as arithmetic mean at site(s) *j*
DA_i = drainage area above site *i*
DA_j = drainage area above site *j*

The A_{ij} factor relates the geometric mean fecal coliform concentration at site *i* to that at site(s) *j.* It is expressed in log space, since a geometric mean is used. It is expected that this factor will vary with landuse, but may exhibit strong site-specific characteristics. For example, a given site might exhibit higher fecal coliform concentrations relative to an equivalent site than are expected from land use differences alone.

A method is needed that provides an appropriate weighing between limited site-specific data and a landuse based regression of equivalent sites. An empirical Bayes analysis is the mathematical technique ideally suited for this circumstance. This analysis combines two important concepts: maximum likelihood techniques for combining data sources, and hierarchical regionalization techniques. The data combination step assumes that both equivalent site data and site-specific data provide information the true local geometric mean. The two data sources are weighted in accordance with their degree of precision or accuracy. The regionalization step assumes that the true mean at any site is a result of random variability and a regional regression model on land use. Empirical Bayes techniques provide statistically optimal methods for computing both the data combination and regionalization steps from observed data.

In the empirical Bayes analysis, it is assumed that the long-term geometric mean fecal coliform concentration at a given site is a function of watershed landuse and site-specific factors that are represented by random noise. A sample realization of the geometric mean at site *i*, X_i, is assumed to be normally distributed about a true mean Θ_i, with standard error of the estimate given by σ_i. In statistical notation:

$$X_i \sim N(\Theta_i, \sigma_i^2)$$

The desired translation factor is then: $A_c = \Theta_I / \Theta_j$. Full technical details on the implementation of the empirical Bayes approach are provided in Appendix C. Table 16 list the equivalent sites used for the listed segments that did not have sufficient data to calculate a 30-day geometric mean.

The estimated TMDL for the stream segments with insufficient data can be calculated using the following equation:

$$TMDL = \frac{1}{n}\sum_{j=1}^{n}\left[C_{standard} \bullet Q_j \bullet \frac{DA_i}{DA_j}\right]$$

Where:
- TMDL = fecal coliform TMDL load at site *i*
- n = number of equivalent sites
- $C_{standard}$ = seasonal fecal coliform standard as 30-day geometric mean
  - summer - 200 counts/100 mL
  - winter - 1000 counts/ 100 mL
- $Q_{crit,j}$ = stream flow as arithmetic mean at site(s) *j* (cfs)
- DA_i = drainage area above site *i* (acres)
- DA_j = drainage area above site *j* (acres)

Table 16. List of Equivalent Sites

Site	Equivalent Sites
Arrow Creek	Crooked Creek Long Island Creek Peachtree Creek North Fork Peachtree Creek
Ball Mill Creek	Crooked Creek Willeo Creek
Balus Creek	Flat Creek
Bishop Creek	Willeo Creek Long Island Creek
Blue John Creek	Long Cane Creek
Bubbling Creek	Nancy Creek
Burnt Fork Creek	North Fork Peachtree Creek Crooked Creek Peachtree Creek
Buttermilk Creek	Willeo Creek Rottenwood Creek Long Island Creek Nickajack Creek
Chattahoochee River	Pataula Creek
Clear Creek	Peachtree Creek
Cracker Creek	Sweetwater Creek Mobley Creek Anneewakee Creek Crawfish Creek
Foe Killer Creek	Big Creek
Foxwood Branch	Rottenwood Creek
Hilly Mill Creek	Flat Creek New River
Hog Wallow Creek	Big Creek
Lullwater Creek	North Fork Peachtree Creek Crooked Creek Peachtree Creek
Marsh Creek	Crooked Creek Long Island Creek Willeo Creek
Mud Creek	Willeo Creek Rottenwood Creek Long Island Creek Nickajack Creek
Mud Creek (South Hall)	Flat Creek
North Fork Balus Creek	Flat Creek

Site	Equivalent Sites
North Utoy Creek	Utoy Creek
Olley Creek	Willeo Creek Rottenwood Creek Long Island Creek Nickajack Creek
Pea Creek	Camp Creek Crawfish Creek Mobley Creek Anneewakee Creek
Peavine Creek	North Fork Peachtree Creek Crooked Creek Peachtree Creek
Rocky Branch	Bull Creek Mulberry Creek Mountain Oak Creek
South Fork Peachtree Creek	Peachtree Creek
South Utoy Creek	Utoy Creek
Sewell Mill Creek	Willeo Creek Long Island Creek
Tanyard Branch	Peachtree Creek
Tanyard Creek	Long Cane Creek
Tributary to Mud Creek	Willeo Creek Rottenwood Creek Long Island Creek Nickajack Creek
Ward Creek	Willeo Creek Rottenwood Creek Long Island Creek Nickajack Creek
Weracoba Creek	Bull Creek Mulberry Creek Mountain Oak Creek
White Oak Creek	Camp Creek Crawfish Creek Mobley Creek Anneewakee Creek
Woodall Creek	Peachtree Creek

The DA_i / DA_j ratio, as mentioned in the previous section, adjusts the flow from site *j* to site *i*. In the case where flow data are available, the actual arithmetic mean flow associated with the estimated 30-day geometric mean fecal coliform concentration can be used.

As in the loading curve approach, the estimated percent load reduction needed at site *i* can be expressed as follows:

$$\text{Load Reduction} = \frac{L_{critical} - TMDL}{L_{critical}} * 100$$

5.0 TOTAL MAXIMUM DAILY LOADS

A Total Maximum Daily Load (TMDL) is the amount of a pollutant that can be assimilated by the receiving waterbody without exceeding the applicable water quality standard; in this case the seasonal fecal coliform standards. A TMDL is the sum of the individual waste load allocations (WLAs) and load allocations (LAs) for nonpoint sources and natural background (40 CFR 130.2) for a given waterbody. The TMDL must also include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the water quality response of the receiving water body. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measures. For fecal coliform bacteria, the TMDLs are expressed as counts per 30 days as a geometric mean.

A TMDL is expressed as follows:

$$TMDL = \Sigma WLAs + \Sigma LAs + MOS$$

The TMDL calculates the WLAs and LAs with margins of safety to meet the stream's water quality standards. The allocations are based on estimates that use the best available data and provide the basis to establish or modify existing controls so that water quality standards can be achieved. In developing a TMDL, it is important to consider if adequate data is available to identify the sources, fate, and transport of the pollutant to be controlled.

TMDLs may be developed using a phased approach. Under a phased approach, the TMDL includes: 1) WLAs that confirm existing limits and controls or lead to new limits, and 2) LAs that confirm existing controls or include implementing new controls (EPA TMDL Guidelines). A phased TMDL requires additional data be collected to determine if load reductions required by the TMDL lead to the attainment of water quality standards.

The TMDL Implementation Plan will establish a schedule or timetable for the installation and evaluation of point and nonpoint source control measures, data collection, assessment of water quality standard attainment, and if needed, additional modeling. Future monitoring of the listed segment water quality will then be used to evaluate this phase of the TMDL, and if necessary, reallocate the loads.

The fecal coliform loads calculated for each listed stream segment include the sum of the total loads from all point and nonpoint sources for the segment. The load contributions to the listed segment from unlisted upstream segments are represented in the background loads, unless the unlisted segment contained point sources that had permit violations for fecal coliform. In these cases, the upstream point sources are included in the wasteload allocations for the listed segment. In cases where two or more adjacent segments are listed, the fecal coliform loads to each segment are individually evaluated on a localized watershed basis. Point source loads originating in upstream segments are included in the background loads of the downstream segment. The following sections describe the various fecal coliform TMDL components.

5.1 Waste Load Allocations

The waste load allocation (WLA) is the portion of the receiving water's loading capacity that is allocated to existing or future point sources. Waste load allocations are provided to the point sources from municipal and industrial wastewater treatment systems and CSOs that have NPDES effluent limits.

There are 29 active NPDES permitted outfalls with fecal coliform permit limits in the Chattahoochee River Basin watershed that discharge into listed segments. The maximum allocated fecal coliform loads for these municipal and industrial wastewater treatment facilities are given in Table 17. The WLA loads were calculated based on the permitted or design flows and average monthly permitted fecal coliform concentrations or a fecal coliform concentration of 200 counts/ 100 mL as a 30-day geometric mean. If a facility expands its capacity and the permitted flow increases, the wasteload allocation for the facility will increase in proportion to the flow. These were expressed as 30-day geometric mean, presented as units of counts per 30 days. Tyson Foods Inc. requires a 50% reduction in its waste load allocation.

Table 17. WLA for Chattahoochee River Basin

Facility Name	Permit No.	Receiving Stream	Listed Watershed	WLA
Atlanta R M Clayton	GA0021482	Chattahoochee River	Chattahoochee River - Peachtree	2.28E+13
Atlanta Utoy Creek	GA0021458	Chattahoochee River	Chattahoochee River - Utoy	8.42E+12
Buford Southside	GA0023167	Suwanee Creek	Suwanee Creek	4.55E+11
Buford Westside WPCP	GA0023175	Richland Creek	Richland Creek	5.69E+10
Clarkesville WPCP	GA0032514	Soquee River	Soquee River	1.71E+11
Cleveland WPCP	GA0036820	Tesnatee Creek Trib	Tesnatee Creek	1.71E+11
Cobb County R L Sutton	GA0026140	Chattahoochee River	Chattahoochee River - Peachtree	9.10E+12
Cobb County South	GA0026158	Chattahoochee River	Chattahoochee River - Peachtree	9.10E+12
Columbus South	GA0020516	Chattahoochee River	Chattahoochee River - N. Highland Dam	9.56E+12
Columbus Water Works	GA0020532	Tiger Creek	Chattahoochee River - N. Highland Dam	Inactive
Countryside MHP	GA0030201	Suwanee Creek	Suwanee Creek	2.84E+10
Coweta Co Arnco WPCP	GA0000311	Wahoo Creek	Chattahoochee R – Wahoo to Franklin	2.28E+10
Cumming WPCP	GA0046019	Big Creek	Big Creek - Headwaters	4.55E+11
Douglasville Southside	GA0030341	Anneewakee Creek	Anneewakee Creek	7.39E+11
Douglasville Sweetwater	GA0047201	Chattahoochee River	Chattahoochee River - Utoy	6.83E+11
Fort Gaines	GA0026191	Chattahoochee River	Chattahoochee River - WF George	6.83E+10
Fulton County Big Creek	GA0024333	Chattahoochee River	Chattahoochee - Morgan Fall	5.46E+12
Fulton County Camp Creek	GA0025381	Chattahoochee River	Chattahoochee River - Utoy	2.96E+12
Gainesville Flat Cr WPCP	GA0021156	Flat Creek	Flat Creek	1.64E+12
Gwinnett Co Crooked Cr/North	GA0026433	Chattahoochee River	Chattahoochee - Morgan Fall	2.05+12
Palmetto WPCP	GA0025542	Little Bear Creek	Chattahoochee - Pea	1.37E+11
Tyson Foods Inc	GA0001074	Unnamed Trib/Orr's Ck	Orr Creek	3.41E+11
USA Ft Benning	GA0000973	Chattahoochee River	Chattahoochee River - Upatoi	1.05E+12
USAF Lockheed	GA0001198	Nickajack Creek	Nickajack Creek	1.59E+12
Atlanta Clear Creek CSO	GA0036871	Clear Creek	Clear Creek	Q*200
Atlanta Proctor Ck Greens Ferry CSO	GA0037125	Proctor Creek	Proctor Creek	Q*200
Atlanta Proctor Creek North Ave CSO	GA0037117	Proctor Creek	Proctor Creek	Q*200
Atlanta Tanyard Creek CSO	GA0037109	Tanyard Branch	Tanyard Branch	Q*200
Columbus Uptown Park CSO	GA0036838	Chattahoochee River	Chattahoochee River - N. Highland Dam	Q*200
Columbus South Commons	GA0036838	Chattahoochee River	Chattahoochee River - N. Highland Dam	Q*200

Of these NPDES facilities, four are CSOs in the City of Atlanta and two are CSOs in Columbus. They treat the overflow with chlorination prior to discharge. A specific load cannot be assigned to the CSOs, since flow volumes were dependent on the nature of individual storm events. However, the WLA for the CSOs can be calculated using the following equation:

$$WLA_{CSOs} = \Sigma \text{ (200 counts (as 30-day geometric mean)/100 mL } * Q_{CSOs}) * \text{Conversion Factor}$$

State and Federal Rules define storm water discharges covered by NPDES permits as point sources. However, storm water discharges are from diffuse sources and there are multiple storm water outfalls. Storm water sources (point and nonpoint) are different than traditional NPDES permitted sources in four respects: (1) they do not produce a continuous (pollutant loading) discharge; (2) their pollutant loading depends on the intensity, duration, and frequency of rainfall events, over which the permittee has no control; (3) the activities contributing to the pollutant loading may include various allowable activities of others, and control of these activities is not solely within the discretion of the permittee; and (4) they do not have wastewater treatment plants that control specific pollutants to meet numerical limits.

The intent of storm water NPDES permits is not to treat the water after collection, but to reduce the exposure of storm water to pollutants by implementing various controls. It would be infeasible and prohibitively expensive to try to control pollutant discharges from each storm water outfall. Therefore, storm water NPDES permits require the establishment of controls or BMPs to reduce pollutants entering the environment.

The waste load allocations from storm water discharges associated with MS4s (WLAsw) are estimated based on the percentage of urban landuse in each watershed covered by the MS4 storm water permit. At this time, the portion of each watershed that goes directly to the permitted storm sewer and that goes through non-permitted point sources or is sheet flow or agricultural runoff has not been clearly defined. Thus, it is assumed that approximately 70 percent of the storm water runoff from the regulated urban area is collected by the municipal separate storm sewer systems.

There are seven permitted CAFOs in the Chattahoochee River Basin. These facilities have no discharge. Therefore, they are not provided a WLA.

This TMDL will use an iterative approach. Future phases of the TMDL development will attempt to further define the sources of pollutants and the portion that enters the permitted storm sewer systems. As more information is collected and these TMDLs are implemented, it will become clearer, which BMPs are needed, and how the water quality standards can be achieved.

5.2 Load Allocations

The load allocation (LA) is the portion of the receiving water's loading capacity that is attributed to existing or future nonpoint sources or to natural background sources. Nonpoint sources are identified in 40 CFR 130.6 as follows:

- Residual waste
- Land disposal
- Agricultural and silvicultural
- Mines
- Construction
- Saltwater intrusion
- Urban storm water (non-permitted)

The LA is calculated as the remaining portion of the TMDL load available after allocating the WLA and the MOS and was determined by the following equation:

$$\Sigma \text{ LA} = \text{TMDL} - (\Sigma \text{ WLA} + \Sigma \text{ WLAsw} + \Sigma\text{MOS})$$

As described above, there are two types of load allocations: loads to the stream independent of precipitation including sources such as failing septic systems, leachate from landfills, animals in the stream, and leaking sewer system collection lines or background loads; and loads associated with fecal coliform accumulation on land surfaces that is washed off during storm events including runoff from saturated LAS fields. At this time, it is not possible to partition the various sources of load allocations. Table 16 presents the total load allocation expressed as counts per 30 days for the 303(d) listed streams located in the Chattahoochee River Basin for the “current” critical condition. In the future, with additional data, it may be possible to partition the load allocation by source.

Evaluation of the relationship between in-stream water quality and the potential sources of pollutant loading is an important component of TMDL development, and is the basis for later implementation of corrective measures and BMPs. For the ”current” TMDLs, the association between fecal coliform loads and the potential sources occurring within the subwatersheds of each segment was examined on a qualitative basis. The most probable sources were identified in Section 3.0.

5.3 Seasonal Variation

The Georgia fecal coliform criteria are seasonal. One set applies to the summer season, while a different set applies to the winter season. To account for seasonal variations, the critical loads for each listed segment were determined from sampling data obtained during both summer and winter seasons, when possible. However, in some cases, the available data was limited to a single season for the calculation of the critical load. The TMDL and percent reduction given in Table 16 for each listed segment was based on the season in which the critical load occurred. The TMDLs for each season, for any given flow, are presented as equations in Section 5.5.

Analyses of the available fecal coliform data and corresponding flows were performed to determine if the fecal coliform violations occurred during wet weather (high flow) or dry weather (low flow) conditions. The flow data from each sampling site were normalized by dividing the measured flow by the product of the average annual runoff (cfs/ sq mile), published in Open-File Report 82-577, and the appropriate drainage area (Carter, 1982). Plots of the normalized flows (Q/Qo) versus fecal coliform are shown in Appendix D. The plots do not show a consistent relationship between fecal coliform concentrations and flow. The summer and winter plots show that the fecal coliform violations occur during both high (wet weather) and low (dry weather) flow conditions.

5.4 Margin of Safety

The MOS is a required component of TMDL development. There are two basic methods for incorporating the MOS: 1) Implicitly incorporate the MOS using conservative assumptions to develop allocations; or 2) Explicitly specify a portion of the TMDL as the MOS and using the remainder for allocations. For this TMDL, an explicit MOS of 10 percent of the TMDL was used. The MOS values are presented in Table 18.

5.5 Total Fecal Coliform Loads

The fecal coliform TMDL for the listed stream segment is dependent on the time of year and the stream flow. The maximum seasonal fecal loads are given below.

$TMDL_{summer}$ = 200 counts (as a 30-day geometric mean)/100 mL * Q * Conversion Factor

$TMDL_{winter}$ = 1000 counts (as a 30-day geometric mean)/100 mL * Q * Conversion Factor

For purposes of determining necessary load reductions required to meet the instream water quality criteria, the "current" critical TMDL was determined. This load is the product of the applicable seasonal fecal coliform standard and the mean flow used to calculate the "current" critical load. It represents the sum of the allocated loads from point and nonpoint sources located within the immediate drainage area of the listed segment, the NPDES-permitted point discharges with recorded fecal coliform violations from the nearest upstream subwatersheds, and a margin of safety (MOS). The "current" critical loads and corresponding TMDLs, WLAs, LAs, MOSs, and percent load reductions for the Chattahoochee River Basin 303(d) listed streams are presented in Table 18.

The relationships of the "current" critical loads to the "current" critical TMDLs are shown graphically in Appendix A. The vertical distance between the two values represents the load reductions necessary to achieve the TMDLs. As a consequence of the localized nature of the load evaluations, the calculated fecal load reductions pertain to point and nonpoint sources occurring within the immediate drainage area of the listed segment. These "current" critical values represent a worst-case scenario for the limited set of data. Thus, the load reductions required are conservative estimates, and should be sufficient to prevent exceedances of the instream fecal coliform standard for a wide range of conditions.

Table 18. Fecal Loads and Required Fecal Load Reductions

Stream Segment	Current Load (cnts/30 days)	TMDL Components					Percent Reduction
		WLA (cnts/30 days)	WLA_{SW} (cnts/30 days)	LA (cnts/30 days)	MOS (cnts/30 days)	TMDL (cnts/30 days)	
Anneewakee Creek	3.95E+12	6.69E+11		2.38E+12	3.39E+11	3.39E+12	14%
Arrow Creek	6.87E+12		4.48E+11	1.99E+11	7.19E+10	7.19E+11	90%
Ball Mill Creek	2.49E+12		2.08E+11	1.01E+11	1.23E+11	1.23E+12	51%
Balus Creek	5.17E+12			1.70E+12	1.89E+11	1.89E+12	64%
Big Creek - Headwaters to Cheatham Creek	7.73E+12	2.12E+11		5.34E+12	1.39E+11	1.39E+12	82%
Big Creek - Hwy 400 to Chattahoochee River	1.01E+13		2.43E+11	1.00E+12	6.17E+11	6.17E+12	39%
Bishop Creek	2.04E+11		6.64E+10	2.97E+10	1.07E+10	1.07E+11	48%
Blue John Creek	2.34E+12			1.14E+12	1.27E+11	1.27E+12	46%
Bubbling Creek	2.87E+12		1.23E+11	5.49E+10	1.97E+10	1.97E+11	93%
Bull Creek	2.86E+12		1.65E+11	4.43E+11	6.75E+10	6.75E+11	76%
Burnt Fork Creek	1.02E+13		9.27E+11	4.56E+11	1.54E+11	1.54E+12	85%
Buttermilk Creek	5.67E+11		1.43E+11	1.07E+11	2.78E+10	2.78E+11	51%
Camp Creek	9.86E+14		4.41E+13	1.04E+14	1.64E+13	1.64E+14	83%
Chattahoochee River - Ga Hwy 17, Helen	2.97E+14			4.08E+13	4.54E+12	4.54E+13	85%
Chattahoochee River - Morgan Falls Dam to Peachtree Creek	3.16E+14	5.15E+12	5.68E+13	8.57E+13	1.64E+13	1.64E+14	48%
Chattahoochee River - Peachtree Creek to Utoy Creek	4.54E+14	2.73E+13	5.78E+13	7.07E+13	1.78E+13	1.78E+14	61%
Chattahoochee River - Utoy Creek to Pea Creek	2.02E+15	8.50E+12	1.07E+14	1.81E+14	3.29E+13	3.29E+14	84%
Chattahoochee River - Pea Creek to Wahoo Creek	2.28E+15	8.65E+10	9.33E+13	2.21E+14	3.50E+13	3.50E+14	85%
Chattahoochee River - Wahoo Creek to Franklin	1.26E+16	2.39E+18		3.59E+17	3.99E+16	3.99E+17	83%
Chattahoochee River - North Highland Dam to Upatoi Creek	5.11E+15	5.73E+12	1.60E+12	3.40E+14	3.86E+13	3.86E+14	92%
Chattahoochee River - Upatoi Creek to Railroad	1.26E+15	3.41E+11		4.40E+14	4.90E+13	4.90E+14	61%
Chattahoochee River - Downstream W.F. George Dam	3.14E+14	9.10E+09		2.70E+14	3.00E+13	3.00E+14	5%
Clear Creek	3.38E+13	Q*200[a]	2.25E+11	1.05E+11	3.66E+10	3.66E+11	99%
Cracker Creek	1.11E+12			3.41E+11	3.79E+10	3.79E+11	66%
Crawfish Creek	6.40E+12			3.78E+12	4.20E+11	4.20E+12	34%
Crooked Creek	3.62E+12		4.68E+11	2.85E+11	8.36E+10	8.36E+11	77%
Flat Creek	1.49E+13	1.57E+12		6.75E+11	2.49E+11	2.49E+12	83%
Foe Killer Creek	7.72E+11		3.93E+11	2.69E+11	7.35E+10	7.35E+11	5%
Foxwood Branch	9.75E+10		4.08E+10	1.75E+10	6.48E+09	6.48E+10	34%
Hilly Mill Creek	5.60E+12			2.46E+12	2.74E+11	2.74E+12	51%
Hog Waller Creek	2.69E+11		1.38E+11	7.45E+10	2.36E+10	2.36E+11	12%

Stream Segment	Current Load (cnts/30 days)	TMDL Components WLA (cnts/30 days)	TMDL Components WLA_{SW} (cnts/30 days)	TMDL Components LA (cnts/30 days)	TMDL Components MOS (cnts/30 days)	TMDL Components TMDL (cnts/30 days)	Percent Reduction
Johns Creek	3.26E+12		5.86E+11	5.46E+11	1.26E+11	1.26E+12	61%
Kelly Mill Branch	4.23+11			3.47E+11	4.12E+10	4.12E+11	3%
Level Creek	2.72E+13		1.36E+12	2.15E+12	3.90E+11	3.90E+12	86%
Long Cane Creek	6.40E+12			3.16E+12	4.84E+11	4.84E+12	24%
Long Island Creek	5.69E+11		1.67E+11	8.02E+10	2.75E+10	2.75E+11	52%
Lullwater Creek	3.45E+12		4.76E+11	2.58E+11	8.16E+10	8.16E+11	76%
Marsh Creek	9.64E+11		2.22E+11	1.24E+11	3.85E+10	3.85E+11	60%
Mobley Creek	4.38E+12			1.85E+12	2.05E+11	2.05E+12	53%
Mountain Oak Creek	1.76E+12			1.52E+12	1.68E+11	1.68E+12	5%
Mud Creek	8.47E+11			6.43E+11	7.14E+10	7.14E+11	16%
Mud Creek	3.23E+12		6.23E+11	8.85E+11	1.68E+11	1.68E+12	48%
Mulberry Creek	1.69E+12			1.37E+12	1.53E+11	1.53E+12	10%
Nancy Creek	2.70E+13		2.57E+12	1.26E+12	4.25E+11	4.25E+12	84%
New River	1.59E+12			4.26E+11	4.73E+10	4.73E+11	70%
Nickajack Creek	3.59E+12	4.10E+11	1.18E+11	9.93E+10	6.97E+10	6.97E+11	81%
North Fork Balus Creek	9.55E+11			4.23E+11	4.70E+10	4.70E+11	51%
North Fork Peachtree Creek	1.68E+14		9.32E+12	4.54E+12	1.54E+12	1.54E+13	91%
North Utoy Creek	1.60E+12		1.23E+11	8.15E+10	2.28E+10	2.28E+11	86%
Olley Creek	1.20E+12		3.28E+11	2.27E+11	6.17E+10	6.17E+11	49%
Orr Creek	5.02E+12	2.56E+11		1.41E+11	4.42E+10	4.42E+11	91%
Pataula Creek	1.58E+13			1.35E+13	1.50E+12	1.50E+13	5%
Pea Creek	2.20E+12		1.26E+11	1.32E+12	1.60E+11	1.60E+12	27%
Peachtree Creek	3.22E+14		2.79E+12	1.43E+12	4.69E+11	4.69E+12	99%
Peavine Creek	8.52E+12		1.09E+12	5.32E+11	1.80E+11	1.80E+12	79%
Proctor Creek	2.55E+13	Q*200[a]	4.55E+11	2.84E+11	8.22E+10	8.22E+11	97%
Richland Creek	3.32E+13	3.54E+10	1.42E+12	3.08E+12	5.04E+11	5.04E+12	85%
Rocky Branch	1.44E+11		1.01E+10	1.02E+10	2.26E+09	2.26E+10	84%
Rottenwood Creek	3.02E+12		2.98E+11	1.74E+11	9.79E+10	9.79E+11	68%
Sandy Creek	4.21E+11		1.59E+10	1.09E+10	2.97E+09	2.97E+10	93%
Sewell Mill Creek	1.08E+12		4.50E+11	2.29E+11	7.55E+10	7.55E+11	30%
Sope Creek	3.87E+14		3.73E+13	2.09E+13	6.46E+12	6.46E+13	83%
Soquee River	1.46E+13	4.60E+10		8.60E+12	9.61E+11	9.61E+12	34%
South Fork Peachtree Creek	1.02E+14		8.86E+11	4.72E+11	1.51E+11	1.51E+12	99%
South Utoy Creek	2.21E+12		1.47E+11	9.62E+10	2.70E+10	2.70E+11	88%

Stream Segment	Current Load (cnts/30 days)	TMDL Components					Percent Reduction
		WLA (cnts/30 days)	WLA_{SW} (cnts/30 days)	LA (cnts/30 days)	MOS (cnts/30 days)	TMDL (cnts/30 days)	
Suwanee Creek	5.80E+13	1.76E+11	2.53E+12	5.05E+12	8.62E+11	8.62E+12	85%
Sweetwater Creek- Paulding/Cobb	1.09E+13		3.67E+12	8.35E+12	6.53E+11	6.53E+12	40%
Sweetwater Creek - Cobb/Douglas	1.59E+13		2.49E+11	5.63E+12	1.33E+12	1.33E+13	16%
Tanyard Branch	3.11E+13	Q*200[a]	1.49E+11	6.37E+10	2.36E+10	2.36E+11	99%
Tanyard Creek	6.32E+11			1.02E+11	1.14E+10	1.14E+11	82%
Testnatee Creek - Cleveland	5.78E+12	6.83E+10		3.23E+12	3.67E+11	3.67E+12	37%
Testnatee Creek - Town Creek to Chestatee River	5.78E+12			3.30E+12	3.67E+11	3.67E+12	37%
Tributary to Mud Creek	2.36E+11		7.58E+10	1.39E+11	2.39E+10	2.39E+11	0%
Utoy Creek	5.53E+12		3.61E+11	3.19E+11	7.56E+10	7.56E+11	86%
Ward Creek	5.79E+11		2.11E+11	1.17E+11	3.65E+10	3.65E+11	37%
Weracoba Creek	5.64E+11		3.98E+10	3.76E+10	8.60E+09	8.60E+10	85%
White Oak Creek	2.50E+12		8.43E+10	1.61E+12	1.89E+11	1.89E+12	25%
Willeo Creek	1.51E+12		6.98E+11	3.68E+11	1.18E+11	1.18E+12	22%
Woodall Creek	2.15E+13		8.12E+10	4.64E+10	1.42E+10	1.42E+11	99%

Note: The TMDL was developed for the “current” critical conditions. The average stream flow for the critical period was used to determine the TMDL and the corresponding monthly average discharge from each wastewater treatment facility was used to determine the WLA.

6.0 RECOMMENDATIONS

The TMDL process consists of an evaluation of the 303(d) listed stream segments subwatersheds to identify, as best as possible, the sources of the fecal coliform loads causing the stream to exceed instream standard criteria. The TMDL analysis was performed using the best available data to specify WLAs and LAs that will meet fecal coliform water quality criteria so as to support the use classification specified for each listed segment.

This TMDL represents the first phase of a long-term process to reduce fecal coliform loading to meet water quality standards in the Chattahoochee River Basin. Implementation strategies will be reviewed and the TMDLs will be refined as necessary in the next phase (next five-year cycle). The phased approach will support progress toward water quality standards attainment in the future. In accordance with USEPA TMDL guidance, these TMDLs may be revised based on results of future monitoring and source characterization data efforts. The following recommendations target further source identification and involve the collection of data to support the "current" allocations and subsequent source reductions.

6.1 Monitoring

Water quality monitoring is conducted at a number of locations across the State each year. GAEPD has adopted a basin approach to water quality management that divides Georgia's major river basins into five groups. This approach provides for additional sampling work to be focused on one of the five basin groups each year and offers a five-year planning and assessment cycle. The Chattahoochee and Flint River Basins were the subjects of focused monitoring in 2000 and will again receive focused monitoring in 2005.

The TMDL Implementation Plan will outline an appropriate water quality sampling program for the listed streams in the Chattahoochee River Basin. The monitoring program will be developed to help identify the various fecal coliform sources. The sampling program will be used to verify the 303(d) stream segment listings. This will be especially valuable for those segments where no data, old data, or spill data resulted in the listing. In addition, scheduled quarterly geometric mean sampling will be performed to evaluate 303(d) listed waters and determine if there has been improvement in the water quality of the listed stream segments.

6.2 Fecal Coliform Management Practices

Based on the findings of the source assessment, NPDES point fecal coliform loads from wastewater treatment facilities do not significantly contribute to the impairment of the listed stream segments. This is because discharges from these facilities are required to treat to levels corresponding to instream water quality criteria. However, the 2000 - 2001 CSO DMR reports for the City of Atlanta revealed that, on several occasions, discharges these NPDES permitted facilities exceeded their fecal coliform permit limit. Fecal coliform loads from NPDES permitted MS4 areas may also be significant. But these sources cannot be easily segregated from other storm water runoff. Other sources of fecal coliform in urban areas include wastes that are attributable to domestic animals, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, leaking septic systems, runoff from improper disposal of waste materials, and leachate from operating and closed landfills. In agricultural areas, potential sources of fecal coliform may include CAFOs, animals grazing in pastures, dry manure storage facilities and lagoons, chicken litter storage areas, and direct access of livestock to streams. Wildlife and waterfowl can be an important source of fecal coliform bacteria.

Management practices are recommended to reduce fecal coliform source loads to the listed 303(d) stream segments, with the result of achieving the instream fecal coliform standard criteria. These recommended management practices include:

- Compliance with NPDES permit limits and requirements
- Adoption of NRCS Conservation Practices
- Application of Best Management Practices (BMPs) appropriate to agricultural or urban land uses, whichever applies.

6.2.1 Point Source Approaches

Point sources are defined as discharges of treated wastewater or storm water into rivers and streams at discrete locations. The NPDES permit program provides a basis for municipal, industrial and storm water permits, monitoring and compliance with limitations, and appropriate enforcement actions for violations.

In accordance with GAEPD rules and regulations, all discharges from point source facilities are required to be in compliance with the conditions of their NPDES permit at all times. In the future, all municipal and industrial wastewater treatment facilities with the potential for the occurrence of fecal coliform in their discharge will be given end-of-pipe limits equivalent to the water quality standard of 200 counts/100 ml or less.

The frequent exceedances of fecal coliform standards by the Atlanta CSOs should continue to be addressed. Operation of the CSO treatment facilities should be modified to reduce the frequency of noncompliant discharges. Compliance with the consent decree between the City of Atlanta and EPA should result in a significant reduction in the fecal coliform loads to the CSO receiving streams.

6.2.2 Nonpoint Source Approaches

The Georgia EPD is responsible for administering and enforcing laws to protect the waters of the State. EPD is the lead agency for implementing the State’s Nonpoint Source Management Program. Regulatory responsibilities that have a bearing on nonpoint source pollution include establishing water quality standards and use classifications, assessing and reporting water quality conditions, and regulating land-use activities, which may affect water quality. Georgia is working with local governments, agricultural, and forestry agencies such as the Natural Resources Conservation Service, the Georgia Soil and Water Conservation Commission, and the Georgia Forestry Commission to foster the implementation of Best Management Practices (BMPs) that address nonpoint source pollution. In addition, public education efforts are being targeted to individual stakeholders to provide information regarding the use of BMPs to protect water quality. The following sections describe, in more detail, recommendations to reduce nonpoint source loads of fecal coliform bacteria in Georgia’s surface waters.

6.2.2.1 Agricultural Sources

The Georgia Environmental Protection Division (EPD) should coordinate with other agencies that are responsible for agricultural activities in the state to address issues concerning fecal coliform loading from agricultural lands. It is recommended that information (e.g., livestock populations by subwatershed, animal access to streams, manure storage and application practices, etc.) be periodically reviewed so that watershed evaluations can be updated to reflect ”current” conditions. It is also recommended that BMPs be utilized to reduce the amount of fecal coliform bacteria transported to surface waters from agricultural sources to the maximum extent practicable.

The following three organizations have primary responsibility for working with farmers to promote soil and water conservation, and to protect water quality:

- The University of Georgia - Cooperative Extension Service
- Georgia Soil and Water Conservation Commission
- Natural Resources Conservation Service

The University of Georgia (UGA) has faculty, County Cooperative Extension Agents, and technical specialists who provide services in several key areas relating to agricultural impacts on water quality.

The Georgia EPD designated the GSWCC as the lead agency for agricultural Nonpoint Source Management in the State. The GSWCC develops nonpoint source management programs and conducts educational activities to promote conservation and protection of land and water devoted to agricultural uses.

The Natural Resources Conservation Service (NRCS) works with Federal, State, and local governments to provide financial and technical assistance to farmers. NRCS develops standards and specifications for BMPs that are to be used to improve, protect, or maintain our State's natural resources. In addition, every five years, the NRCS conducts the National Resources Inventory (NRI). The NRI is a statistically based sample of land use and natural resource conditions and trends that covers non-federal land in the United States.

NRCS is also providing technical assistance to the GSWCC and the Georgia Environmental Protection Division with the Georgia River Basin Planning Program. Planning activities associated with this program will describe conditions of the agricultural natural resource base once every five years. It is recommended that the GSWCC and the NRCS continue to encourage BMP implementation, education efforts, and river basin surveys with regard to River Basin Planning.

6.2.2.2 Urban Sources

Both point and nonpoint sources of fecal coliform bacteria can be significant in the Chattahoochee River Basin urban areas. Urban sources of fecal coliform can best be addressed using a strategy that involves public participation and intergovernmental coordination to reduce the discharge of pollutants to the maximum extent practicable. Management practices, control techniques, public education, and other appropriate methods and provisions may be employed. In addition to water quality monitoring programs, discussed in Section 6.1, the following activities and programs conducted by cities, counties, and state agencies are recommended:

- Uphold requirements that all new and replacement sanitary sewage systems be designed to minimize discharges from the system into storm sewer systems;

- Further develop and streamline mechanisms for reporting and correcting illicit connections, breaks, surcharges, and general sanitary sewer system problems;

- Sustained compliance with storm water NPDES permit requirements.

- Continue efforts to increase public awareness and education towards the impact of mans activities in urban settings on water quality, ranging from the consequences of industrial and municipal discharges down to activities of the individual in residential neighborhoods.

6.3 Reasonable Assurance

Permitted discharges will be regulated through the NPDES permitting process described in this report. An allocation to a point source discharger does not automatically result in a permit limit or a monitoring requirement. Through its NPDES permitting process, Georgia will determine whether the permitted dischargers to the listed watersheds have a reasonable potential of discharging fecal coliform levels equal to or greater than the allocated load. The results of this reasonable potential analysis will determine the specific type of requirements in an individual facility's NPDES permit. As part of its analysis, the EPD will use its EPA-approved 2001 NPDES Reasonable Potential Procedures to determine whether monitoring requirements or effluent limitations are necessary.

Georgia is working federal and state agencies such as the NRCS and the GSWCC, and with local governments to foster the implementation of best management practices to address nonpoint sources. In addition, public education efforts will be targeted to individual stakeholders to provide information regarding the use of best management practices to protect water quality.

6.4 Public Participation

A thirty-day public notice was provided for this TMDL. During this time the availability of the TMDL was public noticed, a copy of the TMDL was provided as requested, and the public was invited to provide comments on the TMDL.

7.0 INITIAL TMDL IMPLEMENTATION PLAN

EPD has coordinated with EPA to prepare this Initial TMDL Implementation Plan for this TMDL. EPD has also established a plan and schedule for development of a more comprehensive implementation plan after this TMDL is established. EPD and EPA have executed a Memorandum of Understanding that documents the schedule for developing the more comprehensive plans. This Initial TMDL Implementation Plan includes a list of BMPs and provides for an initial implementation demonstration project to address one of the major sources of pollutants identified in this TMDL, while State and/or local agencies work with local stakeholders to develop a revised TMDL implementation plan. It also includes a process whereby EPD and/or Regional Development Centers (RDCs), or other EPD contractors (hereinafter, "EPD Contractors"), will develop expanded plans (hereinafter, "Revised TMDL Implementation Plans"). These expanded plans can be found at http://www.gaepd.org/Files_PDF/techguide/wpb/TMDL/TMDL_Implementation_Plans/TMDL_TMDLPlan_List_2007.pdf.

This Initial TMDL Implementation Plan, written by EPD and for which EPD and/or the EPD Contractor are responsible, contains the following elements.

1. EPA has identified a number of management strategies for the control of nonpoint sources of pollutants, representing some best management practices. The "Management Measure Selector Table" shown below identifies these management strategies by source category and pollutant. Nonpoint sources are the primary cause of excessive pollutant loading in most cases. Any wasteload allocations for wastewater treatment plant facilities will be implemented in the form of water-quality based effluent limitations in NPDES permits. Any wasteload allocations for regulated storm water will be implemented in the form of best management practices in the NPDES permits. NPDES permit discharges are a secondary source of excessive pollutant loading, where they are a factor, in most cases.

2. EPD and the EPD Contractor will select and implement one or more BMP demonstration projects for each River Basin. The purpose of the demonstration projects will be to evaluate by River Basin and pollutant parameter the site-specific effectiveness of one or more of the BMPs chosen. EPD intends that the BMP demonstration project be completed before the Revised TMDL Implementation Plan is issued. The BMP demonstration project will address the major pollutant categories of concern for the respective River Basin as identified in the TMDLs. The demonstration project need not be of a large scale, and may consist of one or more measures from the Table or equivalent BMP measures proposed by the EPD Contractor and approved by EPD. Other such measures may include those found in EPA's "Best Management Practices Handbook," the "NRCS National Handbook of Conservation Practices," or any similar reference, or measures that the volunteers, etc., devise that EPD approves. If for any reason the EPD Contractor does not complete the BMP demonstration project, EPD will take responsibility for doing so.

3. As part of the Initial TMDL Implementation Plan the EPD brochure entitled "Watershed Wisdom -- Georgia's TMDL Program" will be distributed by EPD to the EPD Contractor for use with appropriate stakeholders for this TMDL. Also, a copy of the video of that same title will be provided to the EPD Contractor for its

use in making presentations to appropriate stakeholders on TMDL Implementation Plan development.

4. If for any reason the EPD Contractor does not complete one or more elements of a Revised TMDL Implementation Plan, EPD will be responsible for getting that (those) element(s) completed, either directly or through another contractor.

5. The deadline for development of a Revised TMDL Implementation Plan is the end of August 2004.

6. The EPD Contractor helping to develop the Revised TMDL Implementation Plan, in coordination with EPD, will work on the following tasks involved in converting the Initial TMDL Implementation Plan to a Revised TMDL Implementation Plan:

   A. Generally characterize the watershed;
   B. Identify stakeholders;
   C. Verify the present problem to the extent feasible and appropriate, (e.g., local monitoring);
   D. Identify probable sources of pollutant(s);
   E. For the purpose of assisting in the implementation of the load allocations of this TMDL, identify potential regulatory or voluntary actions to control pollutant(s) from the relevant nonpoint sources;
   F. Determine measurable milestones of progress;
   G. Develop monitoring plan, taking into account available resources, to measure effectiveness; and
   H. Complete and submit to EPD the Revised TMDL Implementation Plan.

7. The public will be provided an opportunity to participate in the development of the Revised TMDL Implementation Plan and to comment on it before it is finalized.

8. The Revised TMDL Implementation Plan will supersede this Initial TMDL Implementation Plan when the Revised TMDL Implementation Plan is approved by EPD.

Management Measure Selector Table

Land Use	Management Measures	Fecal Coliform	Dissolved Oxygen	pH	Sediment	Temperature	*Toxicity*	*Mercury*	Metals (copper, lead, zinc, cadmium)	PCBs, toxaphene
Agriculture	1. Sediment & Erosion Control	_	_		_	_				
	2. Confined Animal Facilities	_	_							
	3. Nutrient Management	_	_							
	4. Pesticide Management		_							
	5. Livestock Grazing	_	_		_	_				
	6. Irrigation		_		_	_				
Forestry	1. Preharvest Planning				_	_				
	2. Streamside Management Areas	_	_		_	_				
	3. Road Construction &Reconstruction		_		_	_				
	4. Road Management		_		_	_				
	5. Timber Harvesting		_		_	_				
	6. Site Preparation & Forest Regeneration		_		_	_				
	7. Fire Management	_	_	_	_	_				
	8. Revegetation of Disturbed Areas	_	_	_	_	_				
	9. Forest Chemical Management		_			_				
	10. Wetlands Forest Management	_	_	_		_		_		
Urban	1. New Development	_	_		_	_			_	

Land Use	Management Measures	Fecal Coliform	Dissolved Oxygen	pH	Sediment	Temperature	*Toxicity*	*Mercury*	Metals (copper, lead, zinc, cadmium)	PCBs, toxaphene
	2. Watershed Protection & Site Development	—	—		—	—		—	—	
	3. Construction Site Erosion and Sediment Control		—		—	—				
	4. Construction Site Chemical Control		—							
	5. Existing Developments	—	—		—	—			—	
	6. Residential and Commercial Pollution Prevention	—	—							
Onsite Wastewater	1. New Onsite Wastewater Disposal Systems	—	—							
	2. Operating Existing Onsite Wastewater Disposal Systems	—	—							
Roads, Highways and Bridges	1. Siting New Roads, Highways & Bridges	—	—		—	—			—	
	2. Construction Projects for Roads, Highways and Bridges		—		—	—				
	3. Construction Site Chemical Control for Roads, Highways and Bridges		—							
	4. Operation and Maintenance-Roads, Highways and Bridges	—	—			—			—	

REFERENCES

Carter, R.F., *Storage Requirements for Georgia Streams*, USGS, Water Resources Investigations, Open File Report 82-557, 1982.

Georgia EPD, 1997. *Chattahoochee River Basin Management Plan 1997,* State of Georgia, Department of Natural Resources, Environmental Protection Division, Water Protection Branch.

Georgia EPD, 2000. *Combined Databases Of Landfills In Georgia; Historic And Current Through 1999.* State of Georgia, Department of Natural Resources, Environmental Protection Division, Geologic Survey Branch.

Georgia EPD, 2000. *Final Georgia 2002 §303(d) / §305(b) List,* March 2002*,* State of Georgia, Department of Natural Resources, Environmental Protection Division, Water Protection Branch.

Georgia EPD, 2000. *State of Georgia Rules and Regulations for Water Quality Control, Chapter 391-3-6 Revised, July 2000,* State of Georgia, Department of Natural Resources, Environmental Protection Division, Water Protection Branch.

Georgia WRD, 2002. Personal Communications with a representative from the Wildlife Resources Division – Georgia Department of Natural Resources, Thomson, GA. February-May, 2002.

USDA, 2001. Personal Communications with Mr. Jimmy Bramblett, Water Resources Specialist, U.S. Department of Agriculture – NRCS, 355 East Hancock Ave., Athens, GA. January-May 2002.

Appendix A

30-day Geometric Mean Fecal coliform Monitoring Data

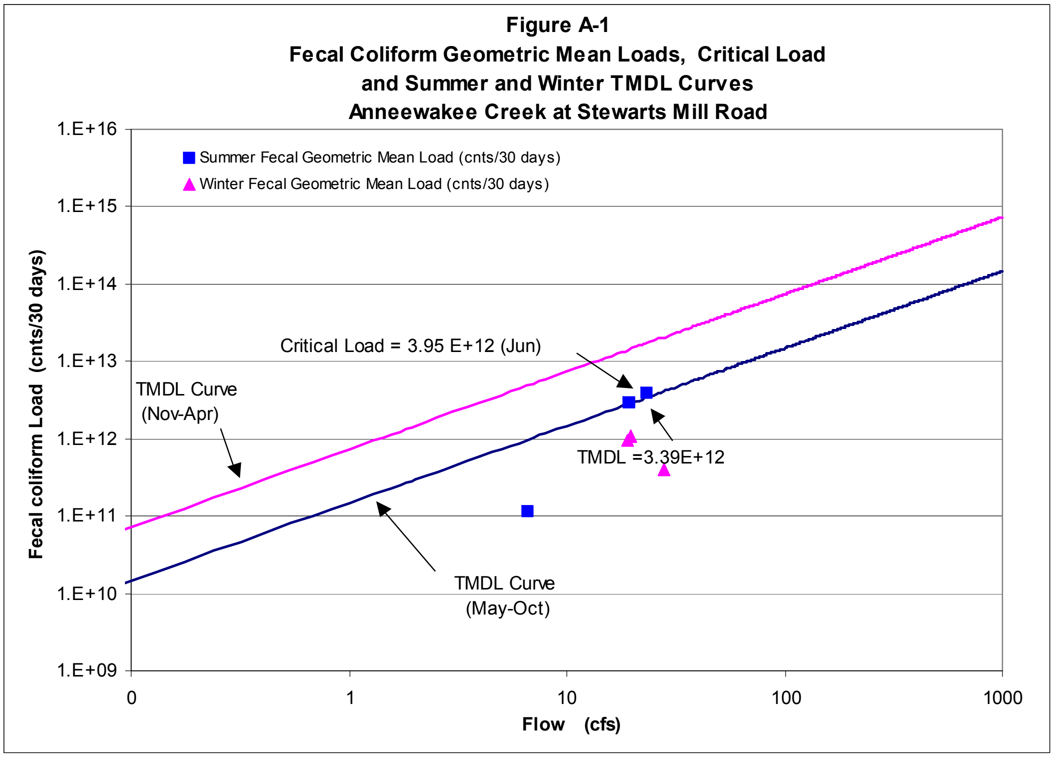


Figure A-1
Fecal Coliform Geometric Mean Loads, Critical Load
and Summer and Winter TMDL Curves
Anneewakee Creek at Stewarts Mill Road
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
Critical Load = 3.95 E+12 (Jun)
TMDL Curve
(Nov-Apr)
TMDL =3.39E+12
TMDL Curve
(May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
1.E+09
0
1
10
100
1000
Flow (cfs)

Table A-1. Data for Figure A-1, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
10/4/2000	20	8.71	5.40E+14			
10/12/2000	20	6.23	5.40E+14			
10/18/2000	20	6.03	5.40E+14			
10/25/2000	40	5.36	1.08E+15	23.78	6.58	1.15E+11
11/2/2000	30	5.02	8.11E+14			
11/7/2000	60	11.38	1.62E+15			
11/6/2000	50	5.02	1.35E+15			
11/20/2000	50	38.17	1.35E+15			
11/27/2000	575	38.17	1.55E+16	76.31	19.55	1.09E+12
12/7/2000	80	14.06	2.16E+15			
12/11/2000	40	12.72	1.08E+15			
12/20/2000	60	28.79	1.62E+15			
12/27/2000	120	20.09	3.25E+15	69.28	18.92	9.61E+11
4/10/2001	20	31.47	5.43E+14			
4/11/2001	20	29.46	5.43E+14			
4/17/2001	20	30.80	5.43E+14			
4/26/2001	20	19.42	5.43E+14	20.00	27.79	4.08E+11
5/1/2001	110	16.07	2.99E+15			
5/9/2001	70	13.39	1.90E+15			
5/14/2001	185	12.05	5.02E+15			
5/23/2001	510	15.40	1.39E+16			
5/30/2001	440	39.91	1.20E+16	199.96	19.37	2.84E+12
6/7/2001	550	48.21	1.49E+16			
6/14/2001	210	20.76	5.71E+15			
6/21/2001	110	11.38	2.99E+15			
6/26/2001	230	12.05	6.25E+15	233.34	23.10	3.95E+12

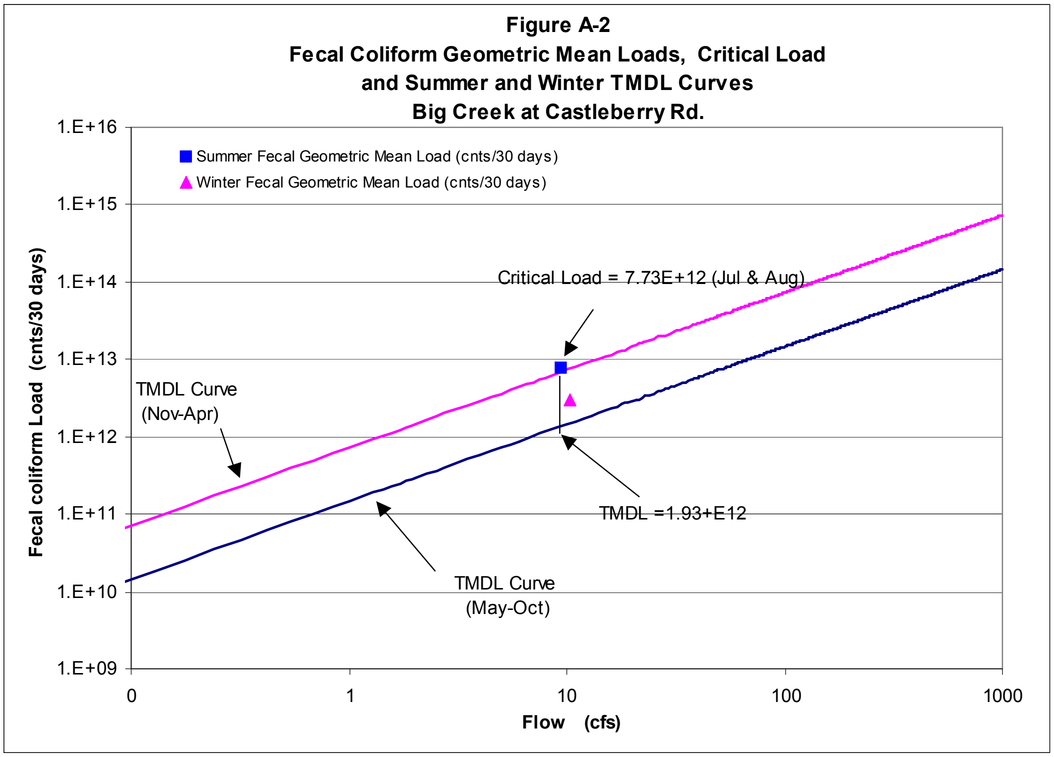


Table A-2. Data for Figure A-2, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
18-Jul-00	790	1.89	1.10E+12			
27-Jul-00	3300	1.89	4.58E+12			
31-Jul-00	330	28.92	7.00E+12			
7-Aug-00	1800	5.10	6.74E+12	1,116	9.45	7.73E+12
13-Nov-00	310	9.45	2.15E+12			
21-Nov-00	2300	12.10	2.04E+13			
28-Nov-00	460	11.53	3.89E+12			
5-Dec-00	80	8.32	4.88E+11	402	10.35	3.06E+12

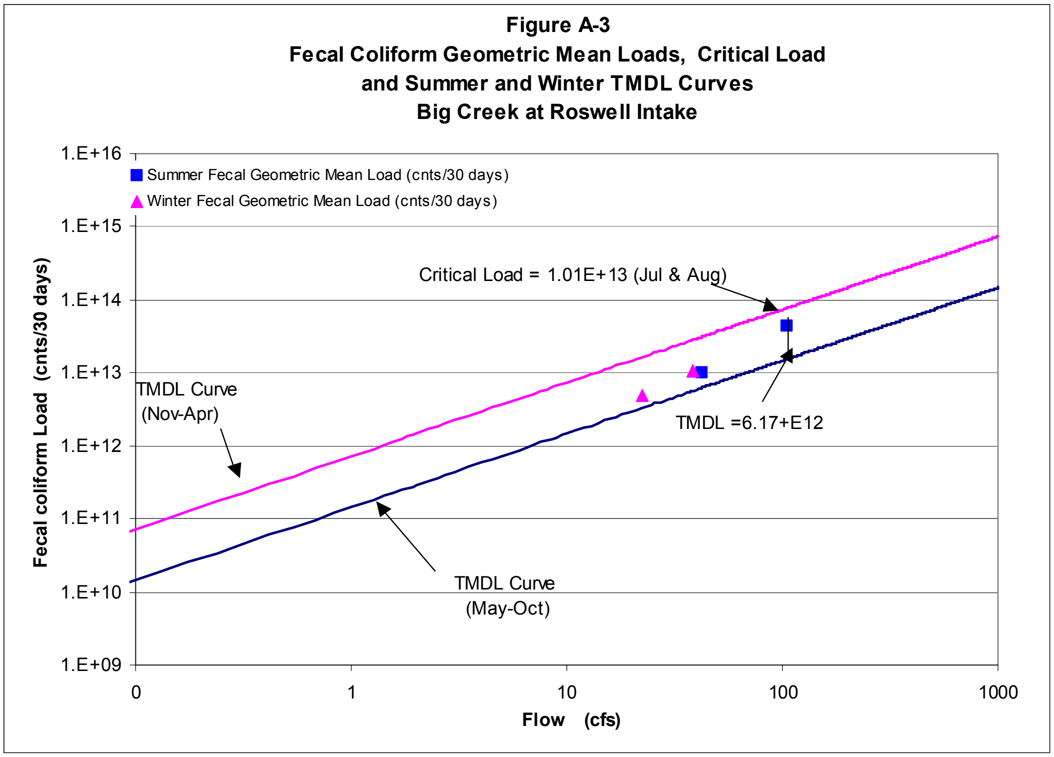


Table A-3. Data for Figure A-3, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
9-Mar-00	430	34.19	1.08E+13			
16-Mar-00	3300	234.96	5.69E+14			
23-Mar-00	330	92.05	2.23E+13			
30-Mar-00	230	59.62	1.01E+13	573	105.21	4.42E+13
11-May-00	490	25.42	9.14E+12			
18-May-00	220	19.29	3.11E+12			
25-May-00	140	28.05	2.88E+12			
1-Jun-00	490	16.66	5.99E+12	293	22.36	4.81E+12
27-Jul-00	130	8.77	8.36E+11			
3-Aug-00	460	129.75	4.38E+13			
10-Aug-00	330	17.53	4.24E+12			
17-Aug-00	580	12.27	5.22E+12	327	42.08	1.01E+13
8-Nov-00	1700	37.70	4.70E+13			
16-Nov-00	790	35.07	2.03E+13			
30-Nov-00	130	44.71	4.26E+12			
7-Dec-00	110	35.07	2.83E+12	372	38.14	1.04E+13

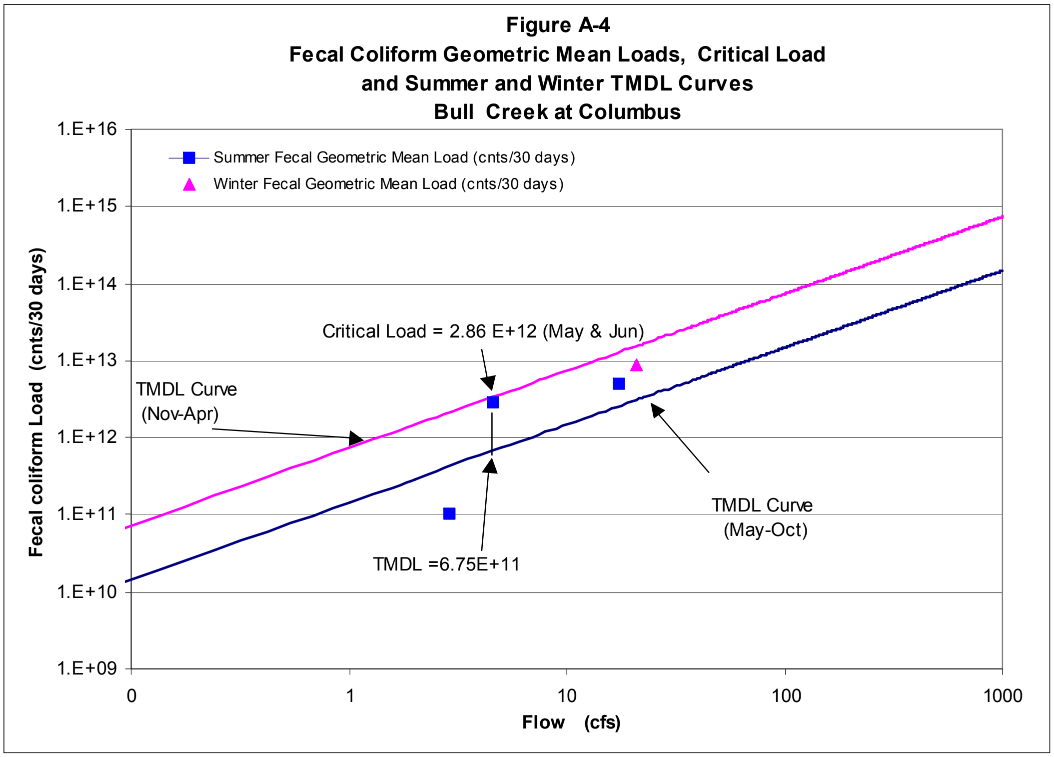


Table A-4. Data for Figure A-4, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
26-Jan-00	20	44.00	6.46E+11			
9-Feb-00	16000	14.00	1.64E+14			
16-Feb-00	700	13.00	6.68E+12			
23-Feb-00	490	13.00	4.67E+12	576	21.00	8.87E+12
31-May-00	310	2.80	6.37E+11			
7-Jun-00	140	2.80	2.88E+11			
20-Jun-00	1300	4.00	3.81E+12			
28-Jun-00	9200	8.80	5.94E+13	849	4.60	2.86E+12
30-Aug-00	2400	3.80	6.69E+12			
6-Sep-00	24000	57.00	1.00E+15			
20-Sep-00	20	3.00	4.40E+10			
27-Sep-00	20	6.00	8.80E+10	390	17.45	4.99E+12
27-Sep-00	20	6.00	8.80E+10			
4-Oct-00	20	2.20	3.23E+10			
18-Oct-00	260	2.00	3.81E+11			
25-Oct-00	50	1.30	4.77E+10	48	2.88	1.01E+11

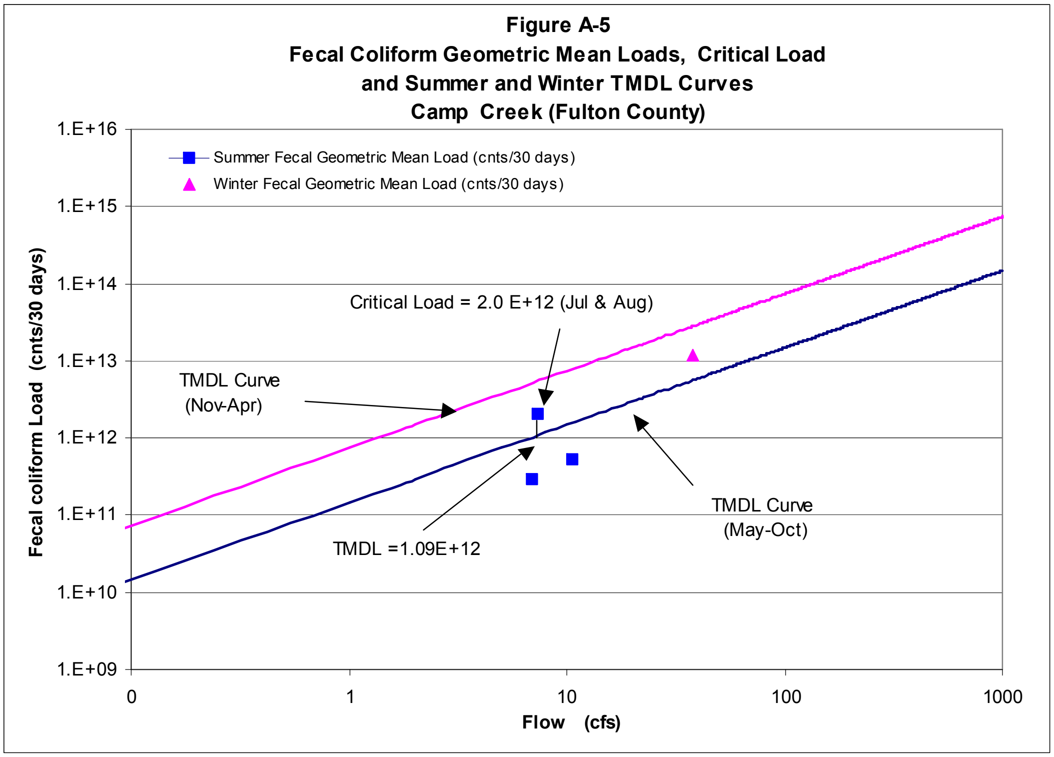


Table A-5. Data for Figure A-5, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
27-Jan-00	90	38.00	2.51E+12			
2-Feb-00	170	29.00	3.62E+12			
15-Feb-00	24000	56.00	9.86E+14			
24-Feb-00	90	29.00	1.91E+12	426	38.00	1.19E+13
4-May-00	220	17.00	2.74E+12			
10-May-00	40	10.00	2.93E+11			
15-May-00	50	8.10	2.97E+11			
1-Jun-00	50	7.60	2.79E+11	68	10.68	5.36E+11
12-Jul-00	1800	14.00	1.85E+13			
19-Jul-00	50	2.20	8.07E+10			
26-Jul-00	790	9.10	5.27E+12			
9-Aug-00	260	4.30	8.20E+11	369	7.40	2.00E+12
27-Sep-00	20	10.00	1.47E+11			
11-Oct-00	510	6.80	2.54E+12			
17-Oct-00	50	6.20	2.27E+11			
23-Oct-00	20	4.90	7.19E+10	57	6.98	2.89E+11

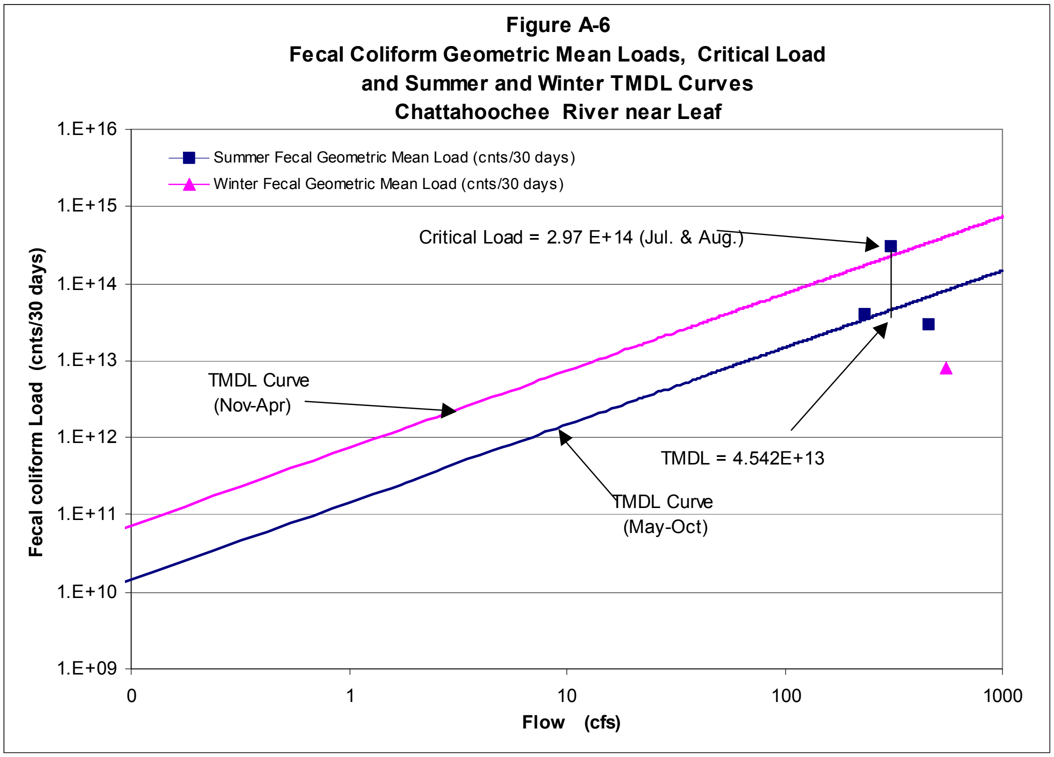


Table A-6. Data for Figure A-6, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
19-Jan-00	20	553.00	8.11E+12			
3-Feb-00	20	539.00	7.91E+12			
8-Feb-00	20	484.00	7.10E+12			
17-Feb-00	20	627.00	9.20E+12	20	550.75	8.08E+12
16-May-00	110	476.00	3.84E+13			
18-May-00	50	497.00	1.82E+13			
22-May-00	20	468.00	6.87E+12			
5-Jun-00	490	396.00	1.42E+14	86	459.25	2.89E+13
17-Jul-00	330	237.00	5.74E+13			
24-Jul-00	790	296.00	1.72E+14			
31-Jul-00	16000	429.00	5.03E+15			
8-Aug-00	700	275.00	1.41E+14	1,307	309.25	2.97E+14
11-Sep-00	330	210.00	5.08E+13			
18-Sep-00	50	166.00	6.09E+12			
25-Sep-00	490	371.00	1.33E+14			
4-Oct-00	330	195.00	4.72E+13	227	235.50	3.93E+13

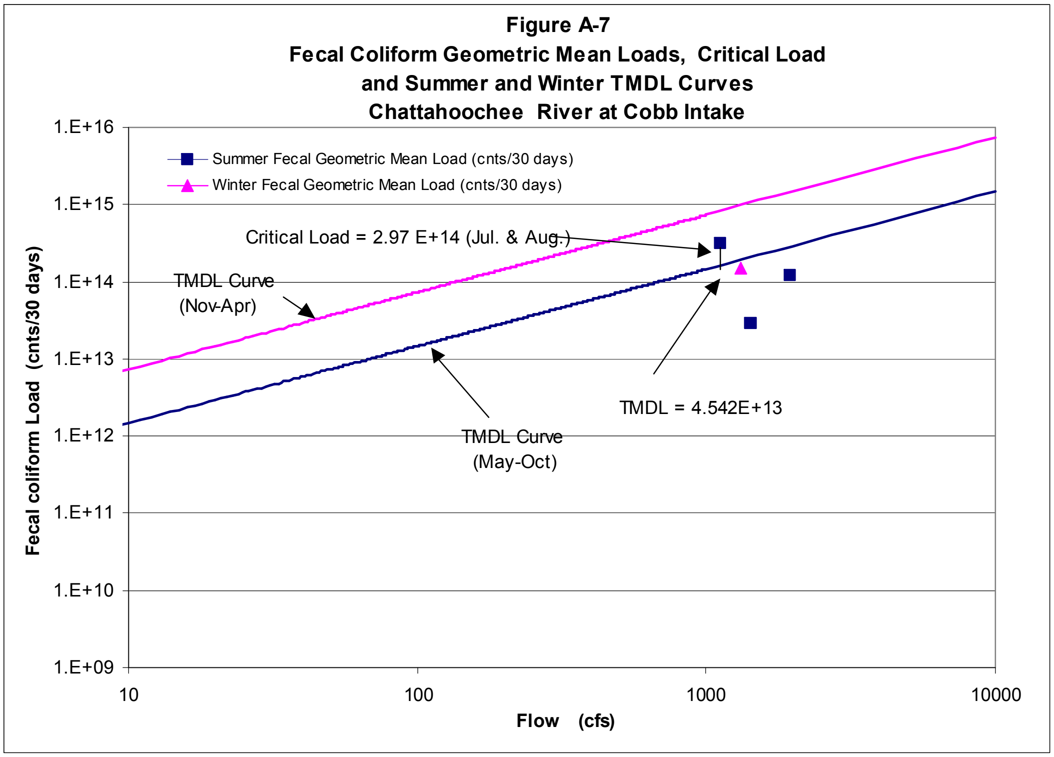


Table A-7. Data for Figure A-7, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
9-Mar-00	4900	1,070.00	3.85E+15			
16-Mar-00	20	1,940.00	2.85E+13			
23-Mar-00	330	1,200.00	2.90E+14			
30-Mar-00	20	1,020.00	1.50E+13	159	1,307.50	1.53E+14
11-May-00	790	881.00	5.11E+14			
18-May-00	1100	1,060.00	8.55E+14			
25-May-00	110	990.00	7.99E+13			
1-Jun-00	230	1,540.00	2.60E+14	385	1,117.75	3.16E+14
0-Jan-00	0	0.00	0.00E+00			
27-Jul-00	45	1,940.00	6.40E+13			
10-Aug-00	260	1,900.00	3.62E+14			
17-Aug-00	50	2,020.00	7.41E+13	84	1,953.33	1.20E+14
8-Nov-00	80	1,430.00	8.39E+13			
16-Nov-00	130	1,340.00	1.28E+14			
30-Nov-00	1	1,410.00	5.17E+11			
7-Dec-00	110	1,510.00	1.22E+14	28	1,422.50	2.87E+13

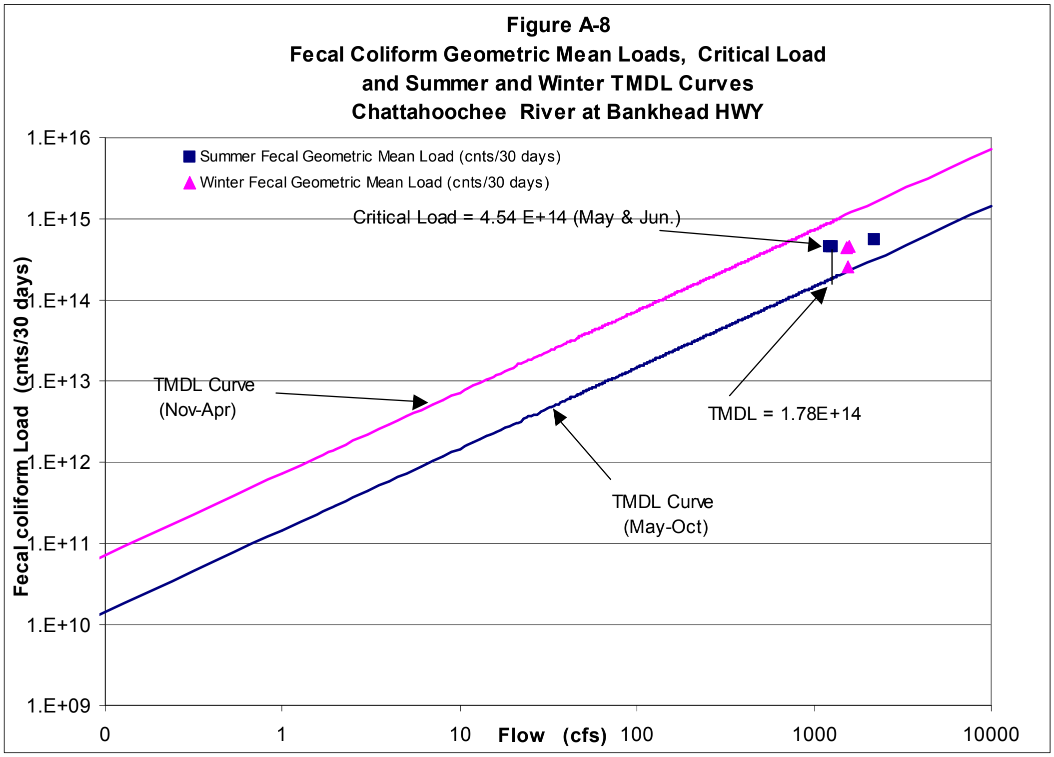


Figure A-8
Fecal Coliform Geometric Mean Loads, Critical Load
and Summer and Winter TMDL Curves
Chattahoochee River at Bankhead HWY
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
Critical Load = 4.54 E+14 (May & Jun.)
TMDL Curve (Nov-Apr)
TMDL = 1.78E+14
TMDL Curve (May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
1.E+09
Flow (cfs)
0
1
10
100
1000
10000

Table A-8. Data for Figure A-8, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
9-Mar-00	170	1,090.00	1.36E+14			
16-Mar-00	330	2,560.00	6.20E+14			
23-Mar-00	330	1,380.00	3.34E+14			
30-Mar-00	130	1,180.00	1.13E+14	221	1,552.50	2.52E+14
11-May-00	230	1,020.00	1.72E+14			
18-May-00	1300	1,140.00	1.09E+15			
25-May-00	460	1,090.00	3.68E+14			
1-Jun-00	490	1,610.00	5.79E+14	510	1,215.00	4.54E+14
27-Jul-00	4600	2,040.00	6.88E+15			
3-Aug-00	490	2,540.00	9.13E+14			
10-Aug-00	20	2,030.00	2.98E+13			
17-Aug-00	790	2,040.00	1.18E+15	356	2,162.50	5.65E+14
8-Nov-00	790	1,450.00	8.40E+14			
16-Nov-00	490	1,450.00	5.21E+14			
30-Nov-00	790	1,560.00	9.04E+14			
7-Dec-00	80	1,630.00	9.57E+13	395	1,522.50	4.42E+14
10-Jan-01	110	1,570.00	1.27E+14			
17-Jan-01	330	1,290.00	3.12E+14			
24-Jan-01	40	1,560.00	4.58E+13			
31-Jan-01	745	1,940.00	1.06E+15	181	1,590.00	2.12E+14
2-Apr-01	330	1,210.00	2.93E+14			
10-Apr-01	130	1,140.00	1.09E+14			
17-Apr-01	1700	1,170.00	1.46E+15			
24-Apr-01	90	1,260.00	8.32E+13	285	1,195.00	2.50E+14
	0	0.00	0.00E+00			
2-Jul-01	790	1,360.00	7.88E+14			
10-Jul-01	1100	1,190.00	9.60E+14			
17-Jul-01	130	1,250.00	1.19E+14	483	1,266.67	4.49E+14

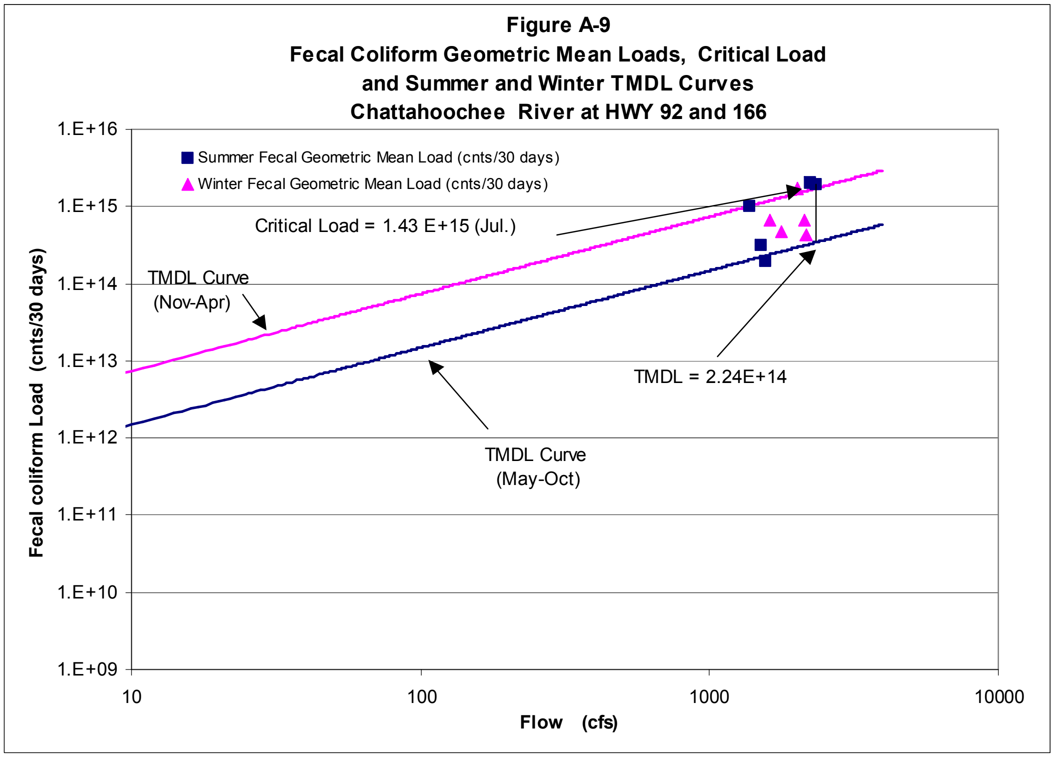


Figure A-9
Fecal Coliform Geometric Mean Loads, Critical Load
and Summer and Winter TMDL Curves
Chattahoochee River at HWY 92 and 166
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
Critical Load = 1.43 E+15 (Jul.)
TMDL Curve
(Nov-Apr)
TMDL = 2.24E+14
TMDL Curve
(May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
1.E+09
10
100
1000
10000
Flow (cfs)

Table A-9. Data for Figure A-9, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load from EDP Station 12140001.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
27-Jan-00	230	1,680.00	2.83E+14			
2-Feb-00	110	1,710.00	1.38E+14			
15-Feb-00	16000	1,590.00	1.87E+16			
24-Feb-00	230	1,520.00	2.56E+14	552	1,625.00	6.58E+14
4-May-00	5400	2,140.00	8.48E+15			
10-May-00	490	1,170.00	4.21E+14			
15-May-00	50	1,090.00	4.00E+13			
1-Jun-00	50	1,650.00	6.05E+13	285	1,512.50	3.16E+14
12-Jul-00	490	2,510.00	9.02E+14			
19-Jul-00	110	2,050.00	1.65E+14			
26-Jul-00	3500	2,720.00	6.98E+15			
9-Aug-00	9200	2,030.00	1.37E+16	1,148	2,327.50	1.96E+15
27-Sep-00	20	1,960.00	2.88E+13			
11-Oct-00	1100	1,630.00	1.32E+15			
17-Oct-00	80	1,440.00	8.45E+13			
23-Oct-00	490	1,250.00	4.49E+14	171	1,570.00	1.97E+14
9-Mar-00	790	1,510.00	8.75E+14			
16-Mar-00	1300	2,460.00	2.35E+15			
23-Mar-00	790	2,370.00	1.37E+15			
30-Mar-00	2300	1,670.00	2.82E+15	1,169	2,002.50	1.72E+15
11-May-00	24000	1,180.00	2.08E+16			
18-May-00	80	1,270.00	7.45E+13			
25-May-00	490	1,390.00	5.00E+14			
1-Jun-00	1100	1,650.00	1.33E+15	1,009	1,372.50	1.02E+15
27-Jul-00	2300	2,160.00	3.64E+15			
3-Aug-00	4100	2,800.00	8.42E+15			
10-Aug-00	490	2,070.00	7.44E+14			
17-Aug-00	490	1,950.00	7.01E+14	1,227	2,245.00	2.02E+15
8-Nov-00	940	1,680.00	1.16E+15			
16-Nov-00	110	1,650.00	1.33E+14			
30-Nov-00	330	1,890.00	4.58E+14			
7-Dec-00	460	1,870.00	6.31E+14	354	1,772.50	4.60E+14
10-Jan-01	170	1,970.00	2.46E+14			
17-Jan-01	330	1,570.00	3.80E+14			
24-Jan-01	790	2,060.00	1.19E+15			
31-Jan-01	700	2,910.00	1.49E+15	420	2,127.50	6.55E+14
2-Apr-01	105	2,170.00	1.67E+14			
10-Apr-01	130	1,790.00	1.71E+14			
17-Apr-01	2300	2,170.00	3.66E+15			
24-Apr-01	170	2,500.00	3.12E+14	270	2,157.50	4.28E+14
	0	0.00	0.00E+00			
2-Jul-01	1300	1,770.00	1.69E+15			
10-Jul-01	2300	1,430.00	2.41E+15			
17-Jul-01	700	1,380.00	7.09E+14	1,279	1,526.67	1.43E+15

Figure A-10
Fecal Coliform Geometric Mean Loads, Critical Load and Summer and Winter TMDL Curves
Chattahoochee River near Whitesburg

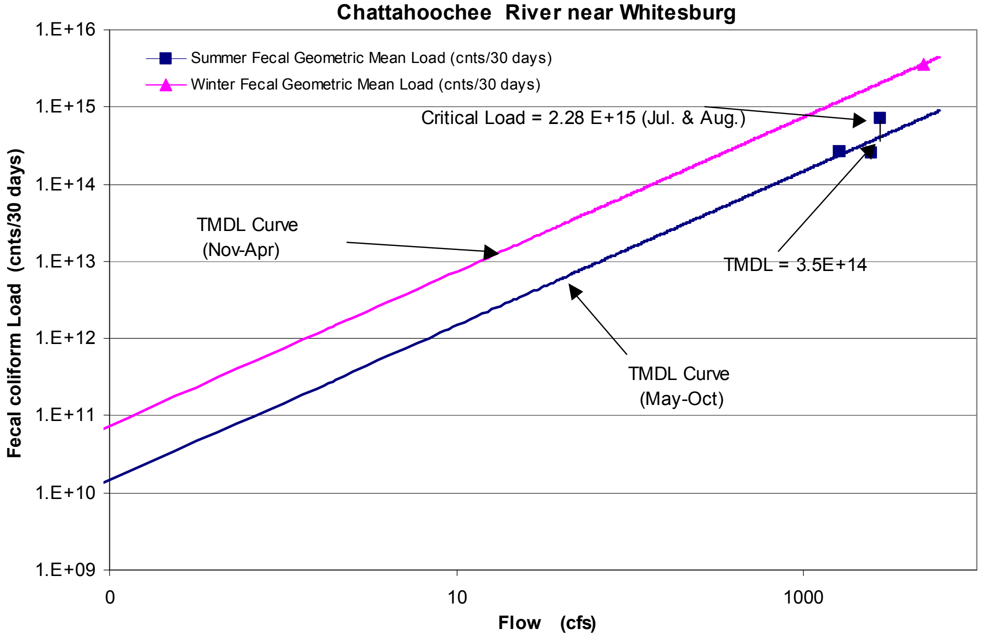


Table A-10. Data for Figure A-10, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
15-Mar-00	490	1,770.00	6.36E+14			
21-Mar-00	24000	8,610.00	1.52E+17			
29-Mar-00	70	2,010.00	1.03E+14			
5-Apr-00	1100	7,120.00	5.75E+15	975	4,877.50	3.49E+15
25-May-00	70	1,900.00	9.76E+13			
8-Jun-00	130	2,050.00	1.95E+14			
15-Jun-00	130	2,710.00	2.58E+14			
21-Jun-00	330	3,220.00	7.79E+14	141	2,470.00	2.55E+14
11-Jul-00	230	1,300.00	2.19E+14			
17-Jul-00	50	1,090.00	4.00E+13			
24-Jul-00	270	3,400.00	6.73E+14			
1-Aug-00	5400	5,150.00	2.04E+16	360	2,735.00	7.22E+14
28-Sep-00	790	1,770.00	1.03E+15			
5-Oct-00	50	1,480.00	5.43E+13			
11-Oct-00	260	1,300.00	2.48E+14			
18-Oct-00	230	1,880.00	3.17E+14	220	1,607.50	2.60E+14
15-Mar-00	50	1,800.00	6.60E+13			
21-Mar-00	7000	1,800.00	9.24E+15			
29-Mar-00	170	1,950.00	2.43E+14			
5-Apr-00	3500	6,900.00	1.77E+16	676	3,112.50	1.54E+15
25-May-00	80	1,650.00	9.68E+13			
8-Jun-00	80	1,790.00	1.05E+14			
15-Jun-00	130	2,500.00	2.38E+14			
21-Jun-00	490	1,300.00	4.67E+14	142	1,810.00	1.89E+14
11-Jul-00	1300	1,060.00	1.01E+15			
17-Jul-00	110	1,070.00	8.63E+13			
24-Jul-00	2200	2,600.00	4.20E+15			
1-Aug-00	9200	4,800.00	3.24E+16	1,304	2,382.50	2.28E+15
28-Sep-00	1300	1,740.00	1.66E+15			
5-Oct-00	230	1,740.00	2.94E+14			
11-Oct-00	790	1,540.00	8.92E+14			
18-Oct-00	230	1,590.00	2.68E+14	483	1,652.50	5.85E+14

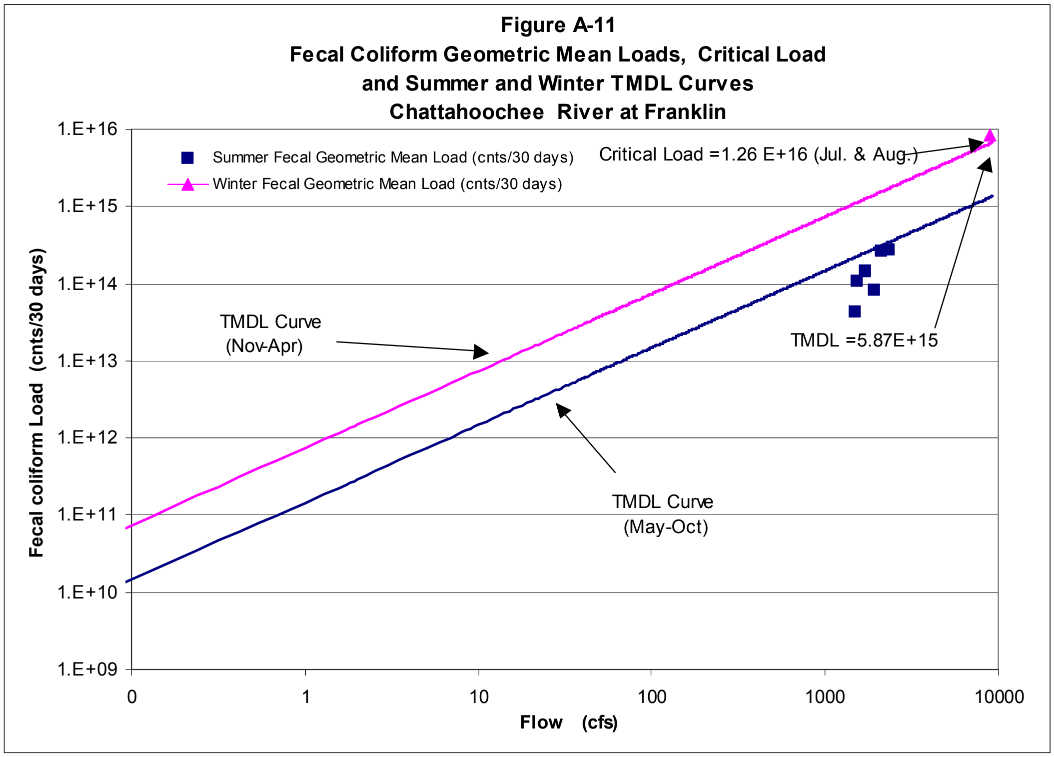


Figure A-11
Fecal Coliform Geometric Mean Loads, Critical Load
and Summer and Winter TMDL Curves
Chattahoochee River at Franklin
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
Critical Load =1.26 E+16 (Jul. & Aug.)
TMDL Curve
(Nov-Apr)
TMDL =5.87E+15
TMDL Curve
(May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
1.E+09
0
1
10
100
1000
10000
Flow (cfs)

Table A-11. Data for Figure A-11, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load (Sta.12170001).

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Mar-00	4900	12,650.00	4.55E+16			
22-Mar-00	7900	5,760.00	3.34E+16			
27-Mar-00	20	2,080.00	3.05E+13			
3-Apr-00	3500	15,000.00	3.85E+16	1,283	8,872.50	8.35E+15
30-May-00	20	1,650.00	2.42E+13			
12-Jun-00	50	1,250.00	4.58E+13			
19-Jun-00	50	1,370.00	5.02E+13			
27-Jun-00	50	1,710.00	6.27E+13	40	1,495.00	4.36E+13
31-Jul-00	81	2,570.00	1.53E+14			
10-Aug-00	230	2,490.00	4.20E+14			
14-Aug-00	230	1,180.00	1.99E+14			
28-Aug-00	170	3,010.00	3.75E+14	164	2,312.50	2.79E+14
20-Sep-00	20	1,190.00	1.75E+13			
26-Sep-00	170	3,560.00	4.44E+14			
16-Oct-00	70	1,200.00	6.16E+13			
18-Oct-00	50	1,750.00	6.42E+13	59	1,925.00	8.29E+13

(Sta. 12169801).

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Mar-00	7900	11,500.00	6.66E+16			
22-Mar-00	790	5,000.00	2.90E+15			
27-Mar-00	140	1,920.00	1.97E+14			
3-Apr-00	24000	13,600.00	2.39E+17	2,140	8,005	1.26E+16
30-May-00	80	1,500.00	8.80E+13			
12-Jun-00	80	1,180.00	6.92E+13			
19-Jun-00	80	1,300.00	7.63E+13			
27-Jun-00	170	2,100.00	2.62E+14	97	1,520	1.08E+14
31-Jul-00	270	2,340.00	4.63E+14			
10-Aug-00	230	2,210.00	3.73E+14			
14-Aug-00	170	1,070.00	1.33E+14			
28-Aug-00	80	2,740.00	1.61E+14	170	2,090	2.61E+14
20-Sep-00	20	1,080.00	1.58E+13			
26-Sep-00	460	3,090.00	1.04E+15			
16-Oct-00	80	1,110.00	6.51E+13			
18-Oct-00	230	1,590.00	2.68E+14	114	1,718	1.44E+14

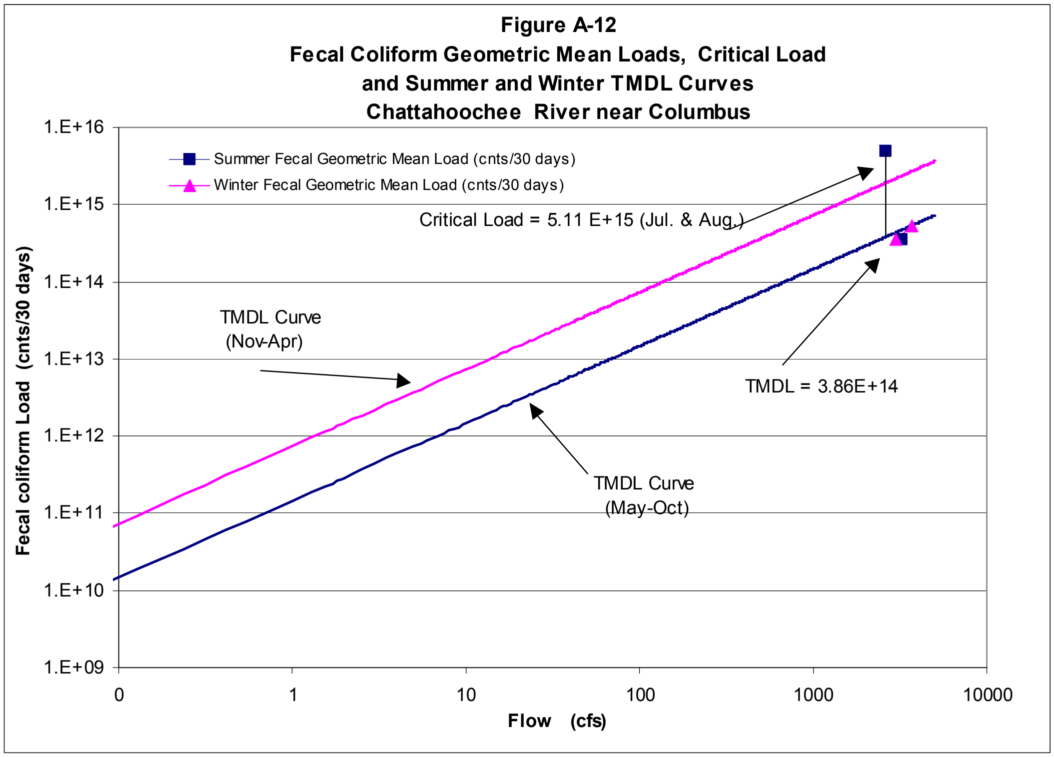


Table A-12. Data for Figure A-12, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
12-Jan-00	330	2,540.00	6.15E+14			
20-Jan-00	80	2,740.00	1.61E+14			
25-Jan-00	490	5,010.00	1.80E+15			
9-Feb-00	110	4,540.00	3.66E+14	194	3,707.50	5.28E+14
15-May-00	90	2,250.00	1.49E+14			
24-May-00	1100	2,560.00	2.07E+15			
30-May-00	50	4,430.00	1.62E+14			
14-Jun-00	110	3,570.00	2.88E+14	153	3,202.50	3.59E+14
17-Jul-00	80	2,140.00	1.26E+14			
25-Jul-00	700	2,040.00	1.05E+15			
2-Aug-00	54000	2,470.00	9.78E+16			
8-Aug-00	490	3,880.00	1.39E+15	2,646	2,632.50	5.11E+15
8-Nov-00	490	1,630.00	5.86E+14			
13-Nov-00	230	2,010.00	3.39E+14			
30-Nov-00	330	5,290.00	1.28E+15			
4-Dec-00	20	2,930.00	4.30E+13	165	2,965.00	3.59E+14

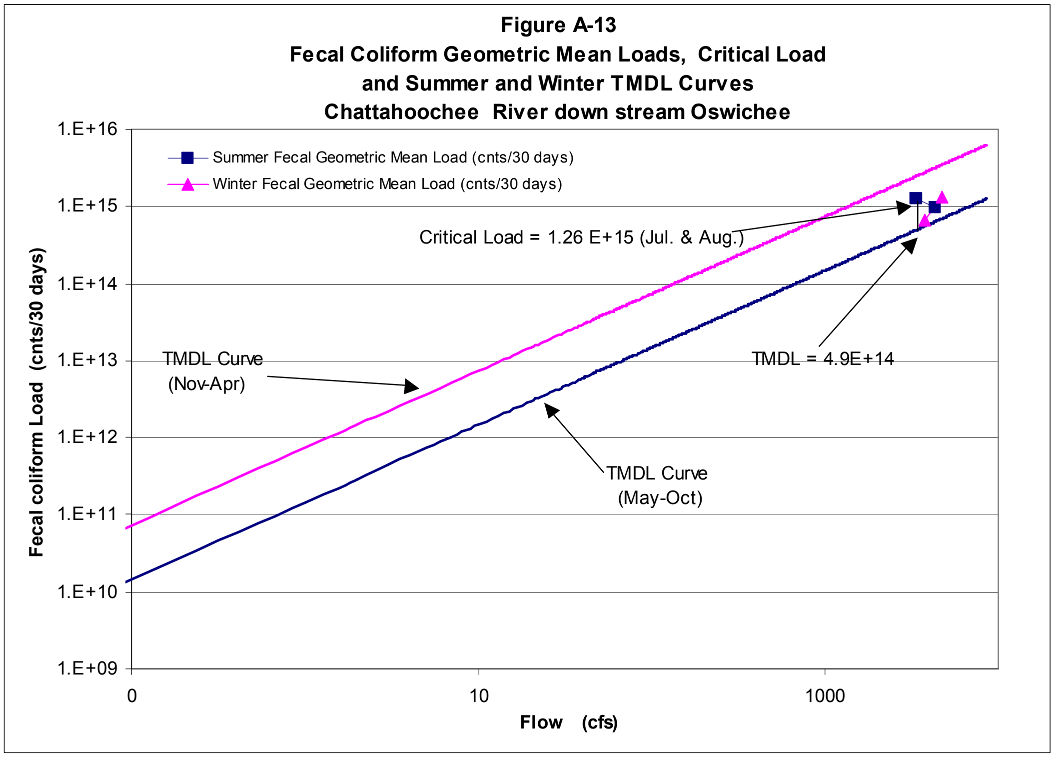


Table A-13. Data for Figure A-13, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
12-Jan-00	330	3,220.96	7.80E+14			
20-Jan-00	220	3,474.58	5.61E+14			
25-Jan-00	2300	6,353.15	1.07E+16			
9-Feb-00	130	5,757.15	5.49E+14	384	4,701.46	1.32E+15
0-Jan-00	0	0.00	0.00E+00			
15-May-00	330	2,853.21	6.91E+14			
30-May-00	490	5,617.66	2.02E+15			
14-Jun-00	170	4,527.10	5.65E+14	302	4,332.66	9.59E+14
17-Jul-00	170	2,713.72	3.38E+15			
25-Jul-00	1700	2,586.91	3.23E+15			
2-Aug-00	220	3,132.19	5.05E+14			
8-Aug-00	1100	4,920.21	3.97E+15	514	3,338.26	1.26E+15
0-Jan-00	0	0.00	0.00E+00			
8-Nov-00	790	2,066.99	5.00E+14			
13-Nov-00	330	2,548.87	9.35E+13			
30-Nov-00	50	6,708.22	2.46E+14	235	3,774.69	6.52E+14

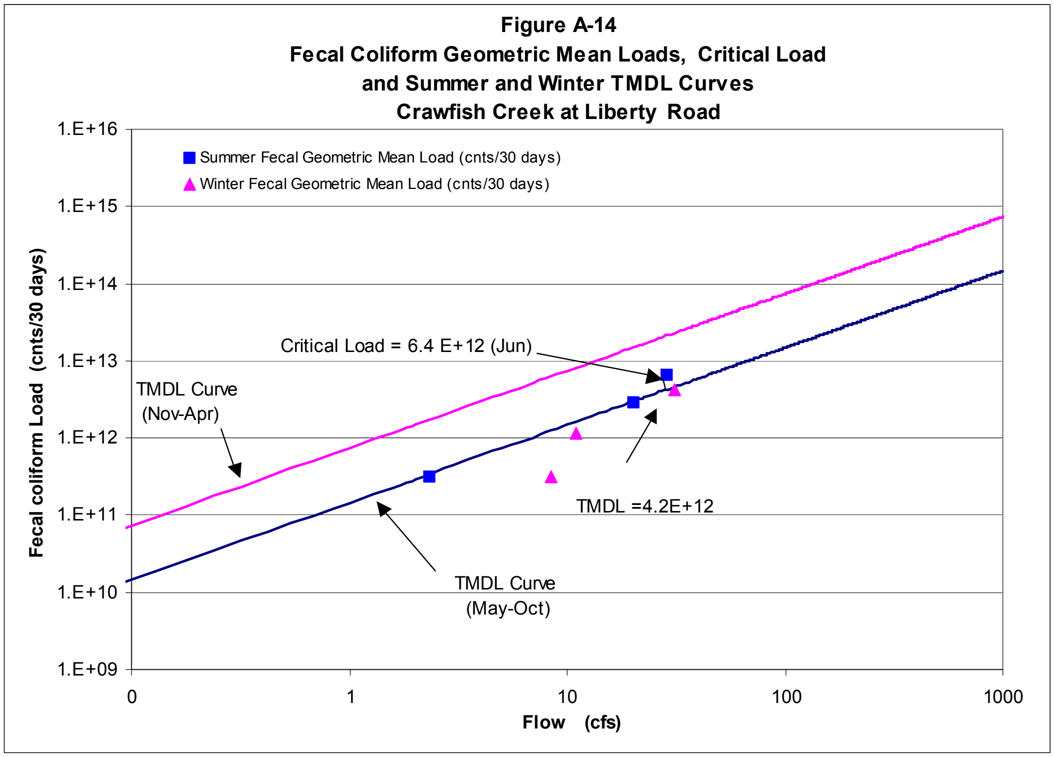


Figure A-14
Fecal Coliform Geometric Mean Loads, Critical Load
and Summer and Winter TMDL Curves
Crawfish Creek at Liberty Road
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
Critical Load = 6.4 E+12 (Jun)
TMDL Curve
(Nov-Apr)
TMDL =4.2E+12
TMDL Curve
(May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
1.E+09
0
1
10
100
1000
Flow (cfs)

Table A-14. Data for Figure A-14, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
4-Oct-00	1240	2.12	1.93E+12			
12-Oct-00	100	2.42	1.78E+11			
18-Oct-00	60	2.30	1.01E+11			
25-Oct-00	160	2.54	2.98E+11	186	2.35	3.20E+11
2-Nov-00	90	3.57	2.36E+11			
7-Nov-00	180	4.30	5.67E+11			
6-Nov-00	100	3.57	2.62E+11			
20-Nov-00	350	21.79	5.59E+12	141	11.00	1.14E+12
27-Nov-00	100	21.79	1.60E+12			
7-Dec-00	340	8.47	2.11E+12			
11-Dec-00	100	8.47	6.22E+11			
20-Dec-00	10	8.47	6.22E+10			
27-Dec-00	20	8.47	1.24E+11	51	8.47	3.17E+11
10-Apr-01	1900	33.89	4.72E+13			
11-Apr-01	80	32.08	1.88E+12			
17-Apr-01	80	33.89	1.99E+12			
26-Apr-01	90	24.82	1.64E+12	182	31.17	4.16E+12
1-May-01	140	21.79	2.24E+12			
9-May-01	190	18.76	2.62E+12			
14-May-01	160	16.34	1.92E+12			
23-May-01	330	26.03	6.30E+12			
30-May-01	190	17.55	2.45E+12	193	20.09	2.84E+12
7-Jun-01	200	31.47	4.62E+12			
14-Jun-01	240	36.32	6.39E+12			
21-Jun-01	160	19.97	2.34E+12			
26-Jun-01	1125	26.63	2.20E+13	305	28.60	6.40E+12

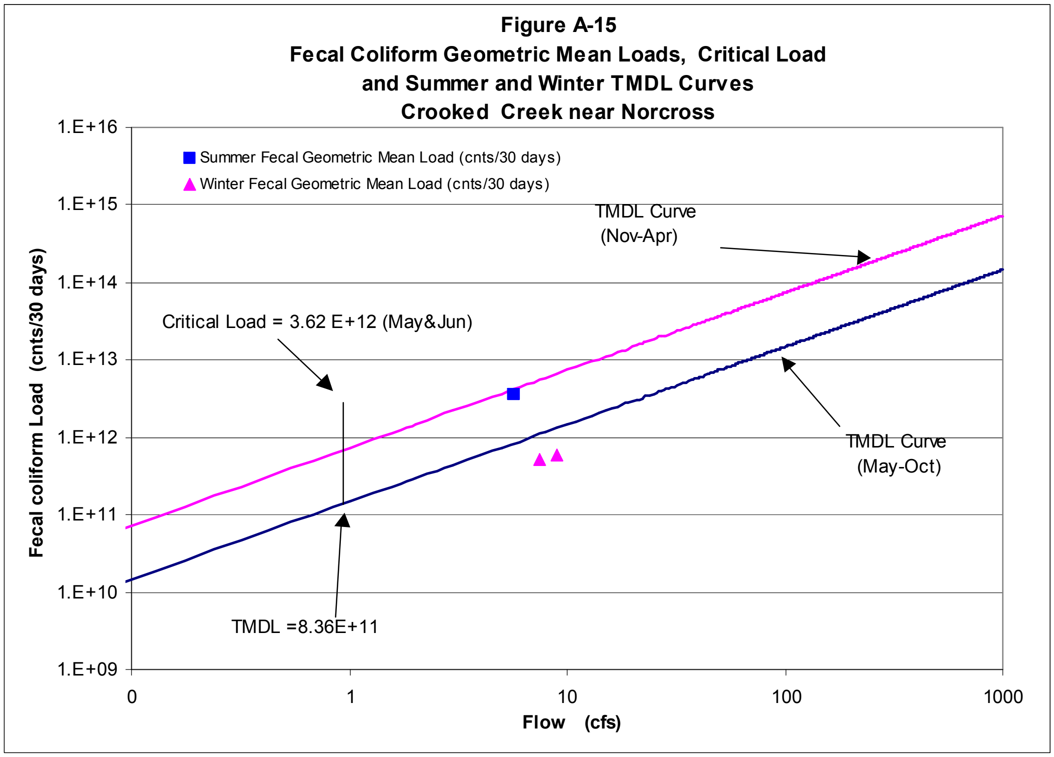


Figure A-15
Fecal Coliform Geometric Mean Loads, Critical Load
and Summer and Winter TMDL Curves
Crooked Creek near Norcross
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
TMDL Curve
(Nov-Apr)
Critical Load = 3.62 E+12 (May&Jun)
TMDL Curve
(May-Oct)
TMDL =8.36E+11
Fecal coliform Load (cnts/30 days)
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
1.E+09
0
1
10
100
1000
Flow (cfs)

Table A-15. Data for Figure A-15, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Jan-00	490	10.00	3.59E+12			
2-Feb-00	20	5.30	7.78E+10			
9-Feb-00	170	4.90	6.11E+11			
16-Feb-00	50	9.80	3.59E+11	96	7.50	5.26E+11
8-May-00	130	7.00	6.68E+11			
11-May-00	230	5.90	9.95E+11			
1-Jun-00	1100	4.70	3.79E+12			
6-Jun-00	17000	5.20	6.48E+13	865	5.70	3.62E+12
17-Jul-00	1100	3.00	2.42E+12			
24-Jul-00	1100	5.60	4.52E+12			
3-Aug-00	230	8.20	1.38E+12			
7-Aug-00	50	4.10	1.50E+11	343	5.23	1.32E+12
12-Sep-00	170	3.00	3.74E+11			
18-Sep-00	50	3.10	1.14E+11			
25-Sep-00	1700	17.00	2.12E+13			
3-Oct-00	220	3.10	5.00E+11	237	6.55	1.14E+12
5-Apr-01	860	18.00	1.14E+13			
12-Apr-01	300	7.00	1.54E+12			
19-Apr-01	1	6.00	4.40E+09			
26-Apr-01	232	5.00	8.51E+11	88	9.00	5.81E+11
5-Jul-01	88	29.00	1.87E+12			
12-Jul-01	920	4.00	2.70E+12			
19-Jul-01	1070	3.50	2.75E+12			
26-Jul-01	127	20.00	1.86E+12	324	14.13	3.36E+12
4-Oct-01	244	4.00	7.16E+11			
11-Oct-01	56	4.50	1.85E+11			
18-Oct-01	74	3.00	1.63E+11			
23-Oct-01	132	3.00	2.90E+11	107	3.63	2.86E+11

Figure A-16
Fecal Coliform Geometric Mean Loads, Critical Load and Summer and Winter TMDL Curves
Flat Creek at McEver Road

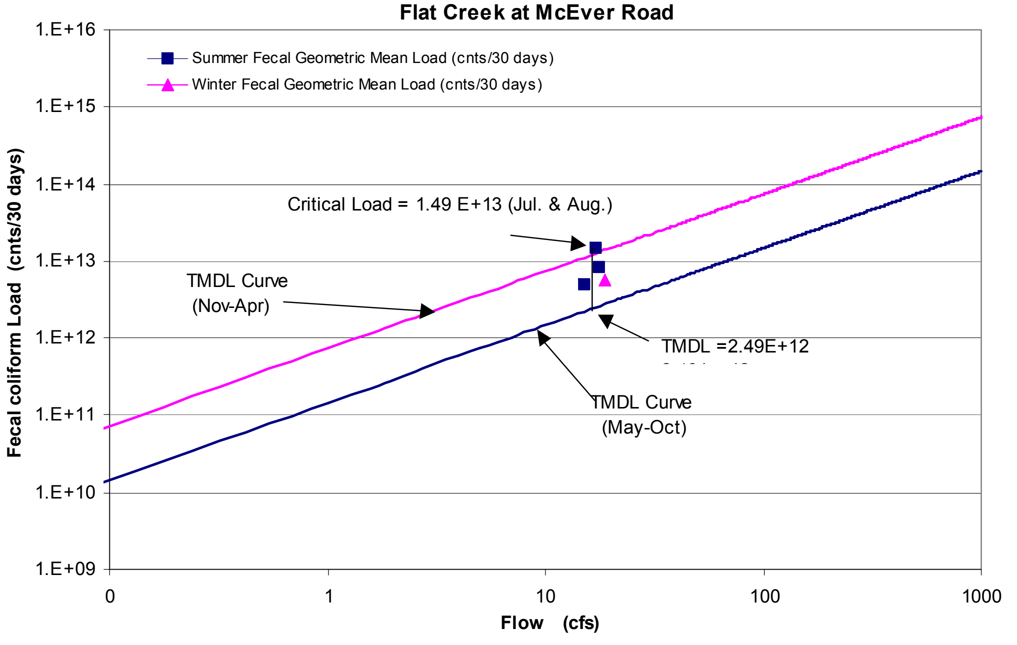


Table A-16. Data for Figure A-16, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Jan-00	700	24.00	1.23E+13			
2-Feb-00	80	19.00	1.11E+12			
9-Feb-00	490	15.00	5.39E+12			
16-Feb-00	1100	17.00	1.37E+13	417	18.75	5.73E+12
8-May-00	50	15.00	5.50E+11			
11-May-00	3500	16.00	4.11E+13			
1-Jun-00	210	15.00	2.31E+12			
6-Jun-00	1100	14.00	1.13E+13	448	15.00	4.93E+12
17-Jul-00	790	13.00	7.53E+12			
24-Jul-00	330	15.00	3.63E+12			
3-Aug-00	24000	22.00	3.87E+14			
7-Aug-00	330	18.00	4.36E+12	1,199	17.00	1.49E+13
12-Sep-00	1100	14.00	1.13E+13			
18-Sep-00	130	7.00	6.68E+11			
25-Sep-00	3500	32.00	8.22E+13			
3-Oct-00	330	17.00	4.12E+12	637	17.50	8.18E+12

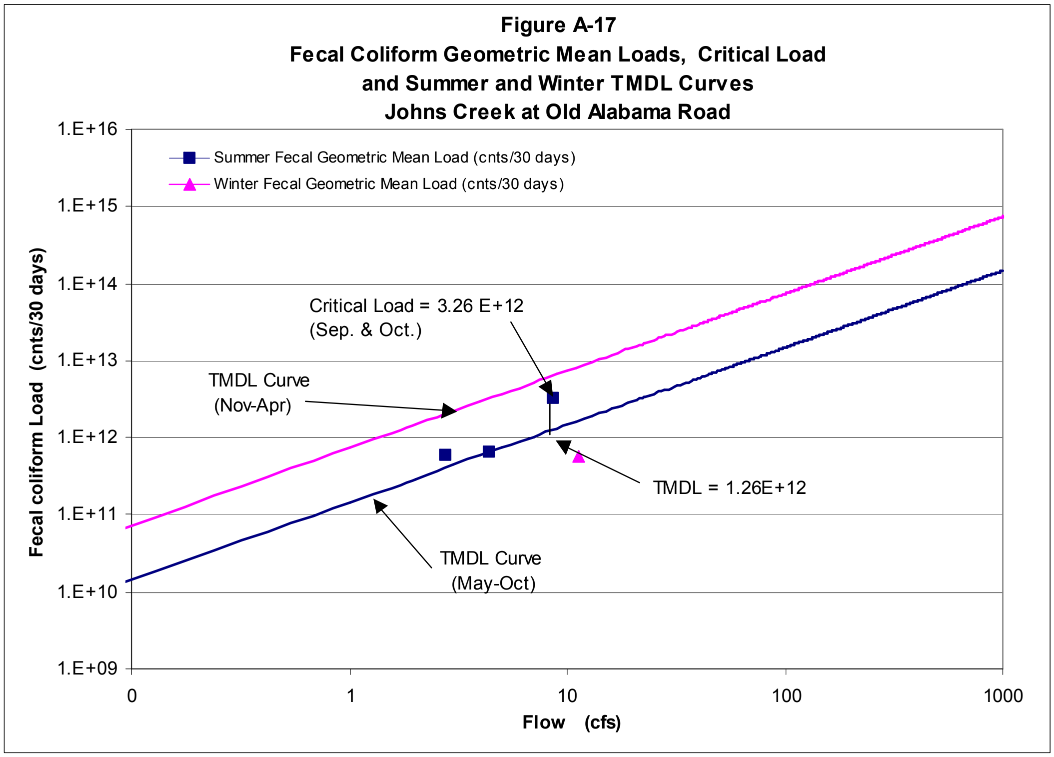


Table A-17. Data for Figure A-17, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
19-Jan-00	330	17.00	4.12E+12			
3-Feb-00	20	8.70	1.28E+11			
8-Feb-00	20	6.50	9.54E+10			
17-Feb-00	170	13.00	1.62E+12	69	11.30	5.70E+11
16-May-00	80	5.30	3.11E+11			
18-May-00	80	3.80	2.23E+11			
22-May-00	790	3.30	1.91E+12			
5-Jun-00	330	5.00	1.21E+12	202	4.35	6.45E+11
17-Jul-00	490	1.50	5.39E+11			
24-Jul-00	110	1.60	1.29E+11			
31-Jul-00	330	5.60	1.36E+12			
8-Aug-00	460	2.30	7.76E+11	301	2.75	6.07E+11
11-Sep-00	490	3.30	1.19E+12			
18-Sep-00	110	2.50	2.02E+11			
25-Sep-00	1700	24.00	2.99E+13			
4-Oct-00	790	4.50	2.61E+12	519	8.58	3.26E+12

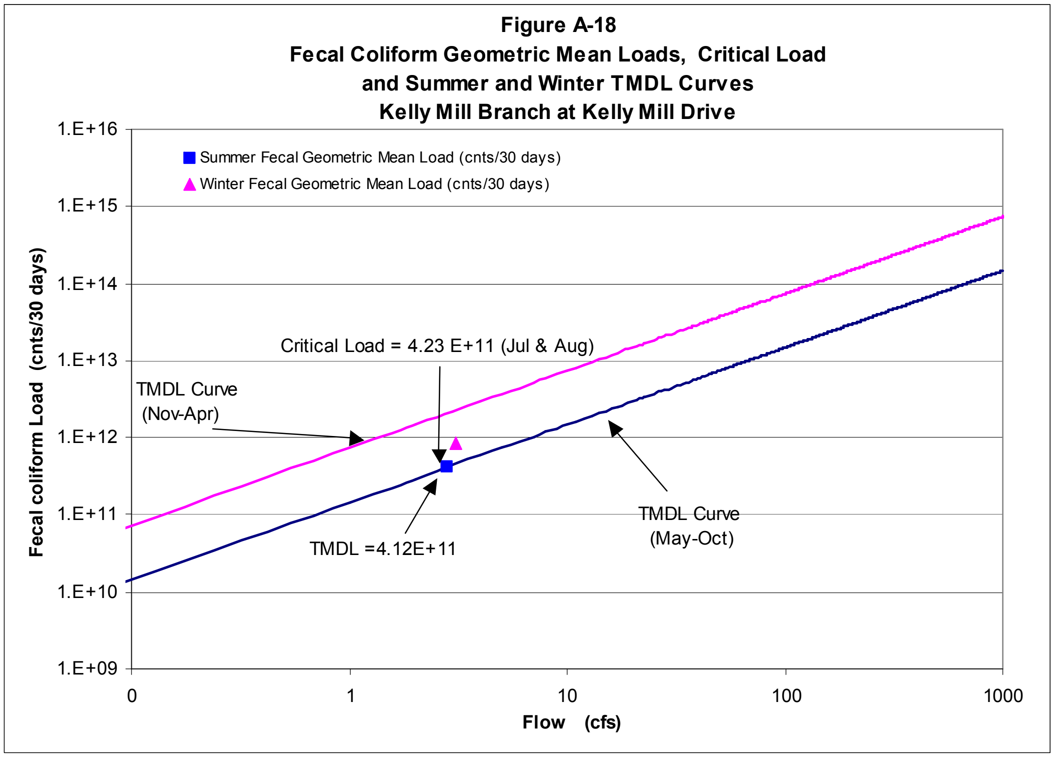


Table A-18. Data for Figure A-18, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
18-Jul-00	192	0.56	7.91E+10			
27-Jul-00	36	0.56	1.48E+10			
31-Jul-00	4600	8.59	2.90E+13			
7-Aug-00	56	1.52	6.23E+10	205	2.81	4.23E+11
13-Nov-00	528	2.81	1.09E+12			
21-Nov-00	188	3.59	4.96E+11			
28-Nov-00	460	3.43	1.16E+12			
5-Dec-00	448	2.47	8.12E+11	378	3.08	8.53E+11

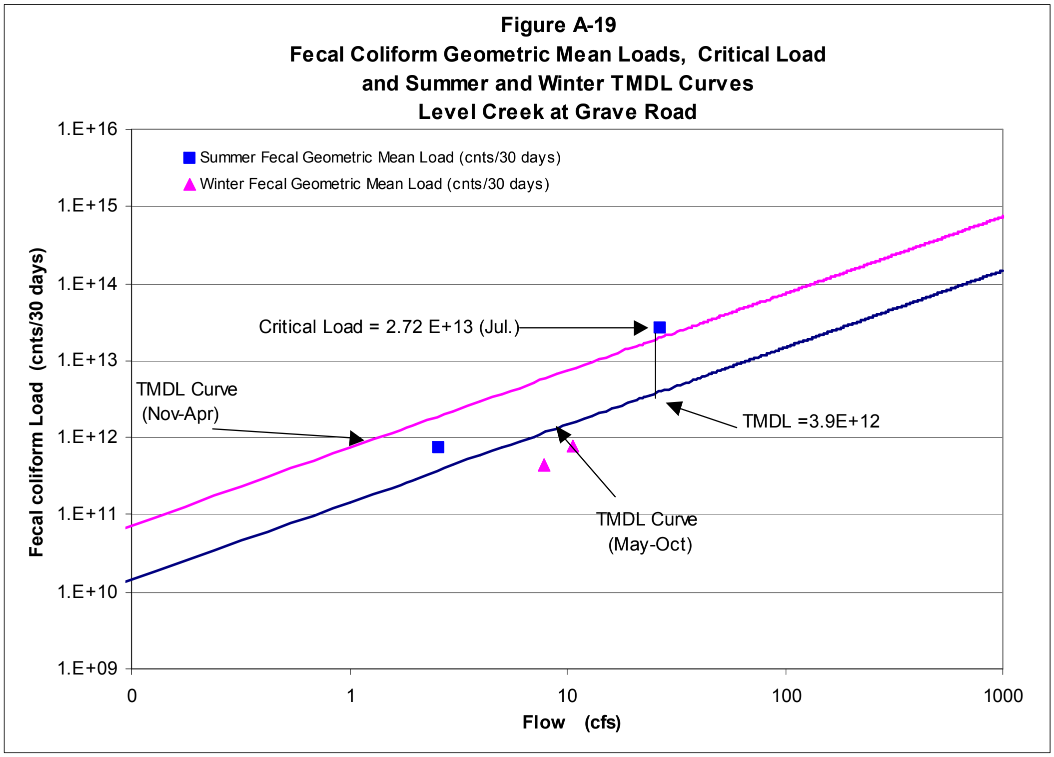


Table A-19. Data for Figure A-19, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
18-Jan-01	150	10.57	1.16E+12			
25-Jan-01	136	7.05	7.03E+11			
1-Feb-01	38	8.16	2.27E+11			
8-Feb-01	43	5.75	1.81E+11	76	7.88	4.39E+11
5-Apr-01	96	17.80	1.25E+12			
12-Apr-01	96	9.27	6.53E+11			
19-Apr-01	84	8.90	5.48E+11			
26-Apr-01	122	6.68	5.97E+11	99	10.66	7.71E+11
5-Jul-01	416	23.92	7.30E+12			
12-Jul-01	2440	4.26	7.63E+12			
19-Jul-01	610	2.97	1.33E+12			
26-Jul-01	6080	75.28	3.36E+14	1,393	26.61	2.72E+13
4-Oct-01	288	2.23	4.70E+11			
11-Oct-01	716	2.60	1.36E+12			
18-Oct-01	148	2.60	2.82E+11			
23-Oct-01	800	2.78	1.63E+12	395	2.55	7.39E+11

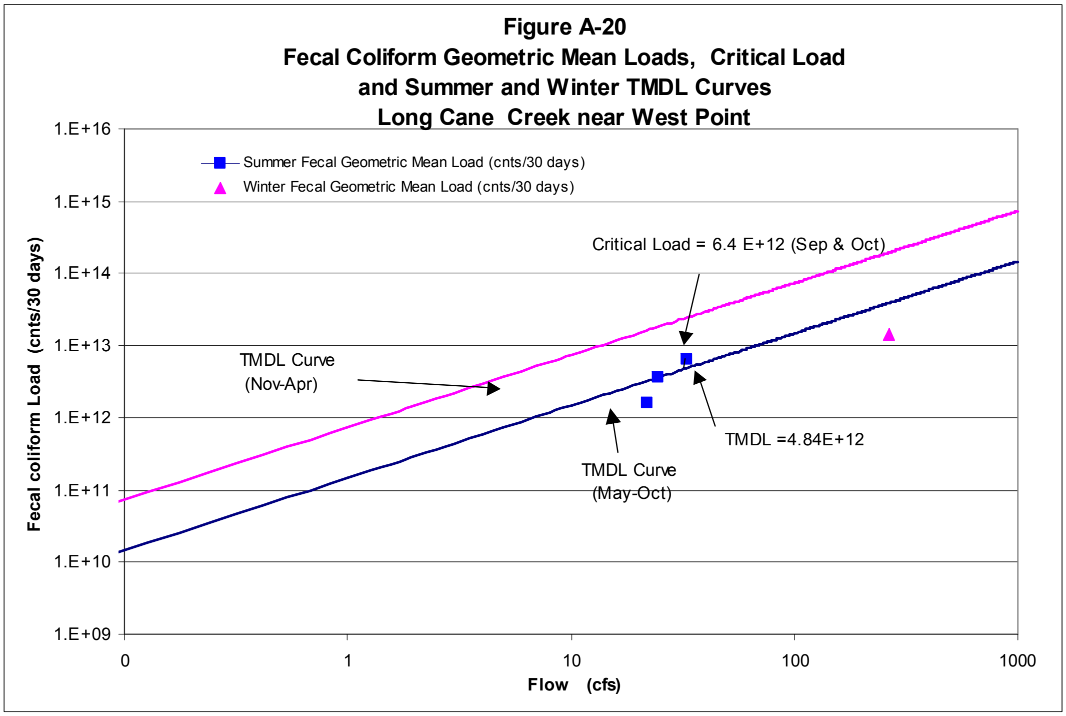


Table A-20. Data for Figure A-20, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
25-Jan-00	20	415.00	6.09E+12			
8-Feb-00	50	168.00	6.16E+12			
15-Feb-00	490	354.00	1.27E+14			
22-Feb-00	60	130.00	5.72E+12	74	266.75	1.44E+13
30-May-00	230	68.00	1.15E+13			
6-Jun-00	130	10.00	9.54E+11			
20-Jun-00	230	4.80	8.10E+11			
27-Jun-00	270	15.00	2.97E+12	208	24.45	3.72E+12
29-Aug-00	80	16.00	9.39E+11			
5-Sep-00	170	18.00	2.24E+12			
19-Sep-00	40	15.00	4.40E+11			
28-Sep-00	170	39.00	4.86E+12	98	22.00	1.58E+12
28-Sep-00	170	39.00	4.86E+12			
3-Oct-00	790	36.00	2.09E+13			
17-Oct-00	110	33.00	2.66E+12			
24-Oct-00	330	24.00	5.81E+12	264	33.00	6.40E+12

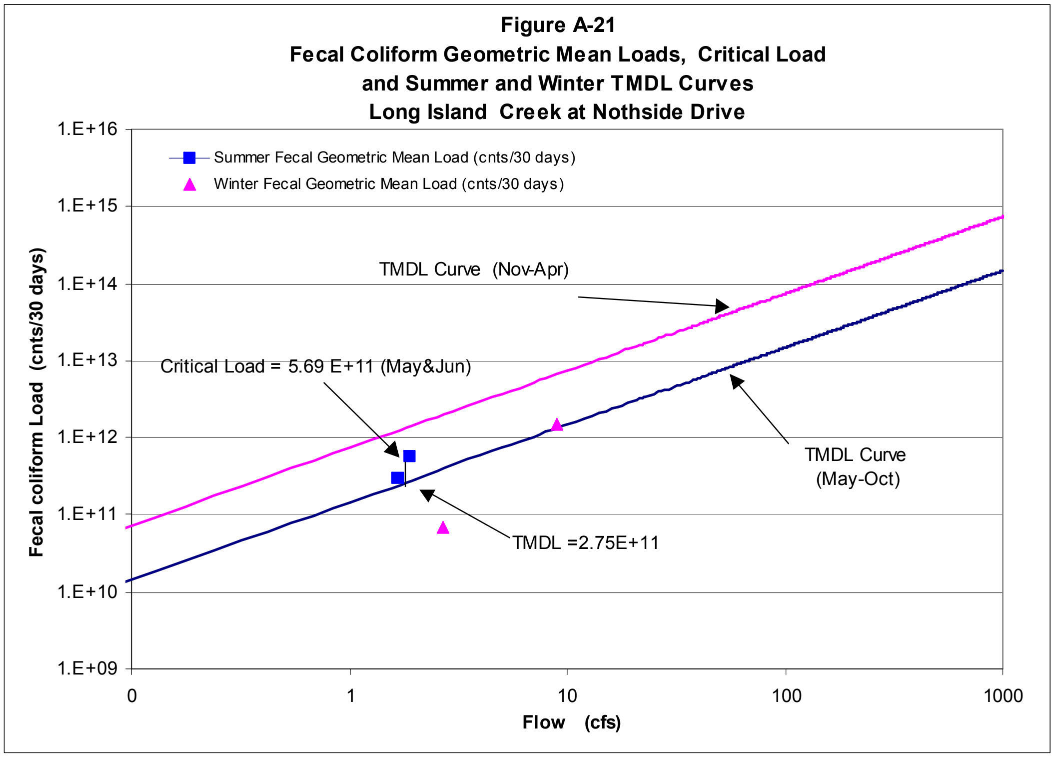


Table A-21. Data for Figure A-21, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
25-Jan-00	80	3.20	1.88E+11			
3-Feb-00	20	2.60	3.81E+10			
7-Feb-00	20	2.20	3.23E+10			
16-Feb-00	50	2.80	1.03E+11	36	2.70	7.04E+10
8-May-00	80	2.10	1.23E+11			
11-May-00	330	2.10	5.08E+11			
31-May-00	140	1.40	1.44E+11			
5-Jun-00	7900	1.90	1.10E+13	413	1.88	5.69E+11
5-Jul-00	700	0.36	1.85E+11			
12-Jul-00	81	1.70	1.01E+11			
19-Jul-00	130	1.70	1.62E+11			
2-Aug-00	460	2.90	9.79E+11	241	1.67	2.95E+11
6-Nov-00	700	2.60	1.34E+12			
16-Nov-00	790	4.40	2.55E+12			
30-Nov-00	280	1.70	3.49E+11			
4-Dec-00	2400	1.70	2.99E+12	781	2.60	1.49E+12

Figure A-22
Fecal Coliform Geometric Mean Loads, Critical Load and Summer and Winter TMDL Curves
Mobley Creek at Banks Mill Road

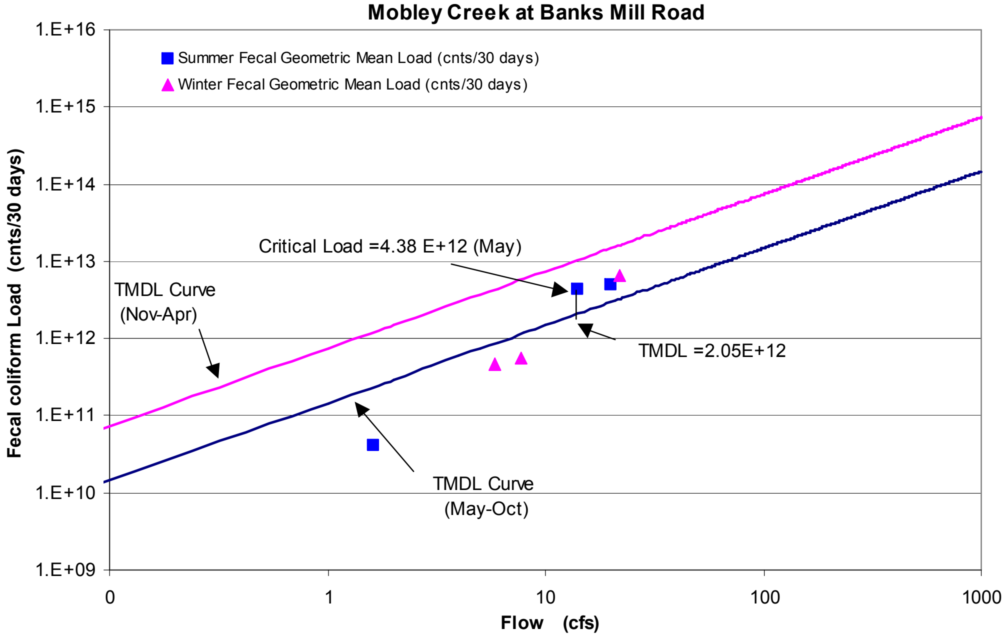


Table A-22. Data for Figure A-22, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
4-Oct-00	20	1.47	2.16E+10			
12-Oct-00	80	1.68	9.88E+10			
18-Oct-00	20	1.60	2.35E+10			
25-Oct-00	40	1.77	5.19E+10	34	1.63	4.03E+10
2-Nov-00	30	2.48	5.47E+10			
7-Nov-00	210	2.99	4.61E+11			
6-Nov-00	200	2.48	3.64E+11			
20-Nov-00	100	15.16	1.11E+12			
27-Nov-00	75	15.16	8.34E+11	99	7.65	5.55E+11
7-Dec-00	80	5.89	3.46E+11			
11-Dec-00	130	5.89	5.62E+11			
20-Dec-00	170	5.89	7.35E+11			
27-Dec-00	70	5.89	3.03E+11	105	5.89	4.56E+11
10-Apr-01	640	23.58	1.11E+13			
11-Apr-01	280	22.32	4.58E+12			
17-Apr-01	340	23.58	5.88E+12			
26-Apr-01	420	17.26	5.32E+12	400	21.68	6.36E+12
1-May-01	730	15.16	8.12E+12			
9-May-01	350	13.05	3.35E+12			
14-May-01	420	11.37	3.50E+12			
23-May-01	330	18.11	4.38E+12			
30-May-01	400	12.21	3.58E+12	427	13.98	4.38E+12
7-Jun-01	340	21.89	5.46E+12			
14-Jun-01	330	25.26	6.12E+12			
21-Jun-01	340	13.89	3.47E+12			
26-Jun-01	340	18.53	4.62E+12	337	19.89	4.91E+12

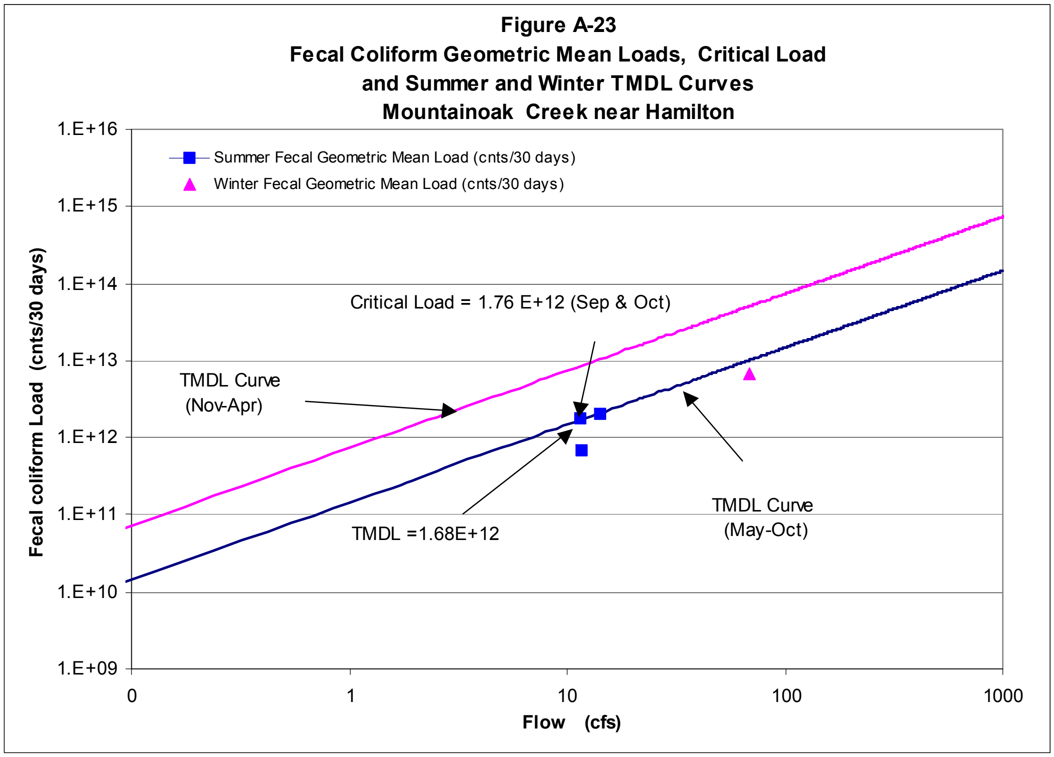


Table A-23. Data for Figure A-23, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
25-Jan-00	80	101.00	5.93E+12			
8-Feb-00	170	59.00	7.36E+12			
15-Feb-00	130	67.00	6.39E+12			
22-Feb-00	170	50.00	6.24E+12	132	69.25	6.69E+12
30-May-00	220	11.00	1.78E+12			
6-Jun-00	230	19.00	3.21E+12			
20-Jun-00	220	13.00	2.10E+12			
27-Jun-00	130	14.00	1.34E+12	195	14.25	2.04E+12
29-Aug-00	70	11.00	5.65E+11			
5-Sep-00	230	18.00	3.04E+12			
20-Sep-00	20	6.60	9.68E+10			
28-Sep-00	130	11.00	1.05E+12	80	11.65	6.87E+11
28-Sep-00	130	11.00	1.05E+12			
3-Oct-00	460	8.90	3.00E+12			
17-Oct-00	140	14.00	1.44E+12			
24-Oct-00	230	12.00	2.02E+12	209	11.48	1.76E+12

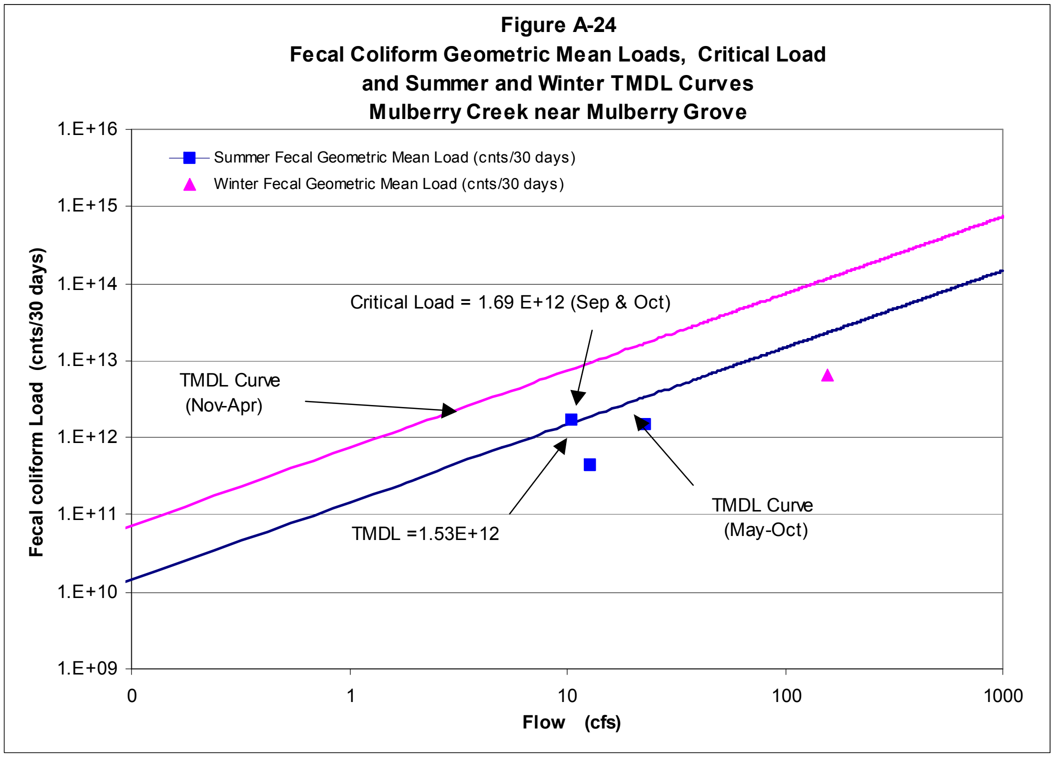


Table A-24. Data for Figure A-24, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
25-Jan-00	20	315.00	4.62E+12			
8-Feb-00	80	104.00	6.10E+12			
15-Feb-00	130	124.00	1.18E+13			
22-Feb-00	50	87.00	3.19E+12	57	157.50	6.56E+12
30-May-00	50	30.00	1.10E+12			
6-Jun-00	110	22.00	1.78E+12			
20-Jun-00	50	19.00	6.97E+11			
27-Jun-00	230	20.00	3.37E+12	89	22.75	1.49E+12
29-Aug-00	50	11.00	4.03E+11			
5-Sep-00	40	17.00	4.99E+11			
20-Sep-00	20	10.00	1.47E+11			
28-Sep-00	130	13.00	1.24E+12	48	12.75	4.47E+11
28-Sep-00	130	13.00	1.24E+12			
3-Oct-00	170	10.00	1.25E+12			
17-Oct-00	330	10.00	2.42E+12			
24-Oct-00	330	8.60	2.08E+12	221	10.40	1.69E+12

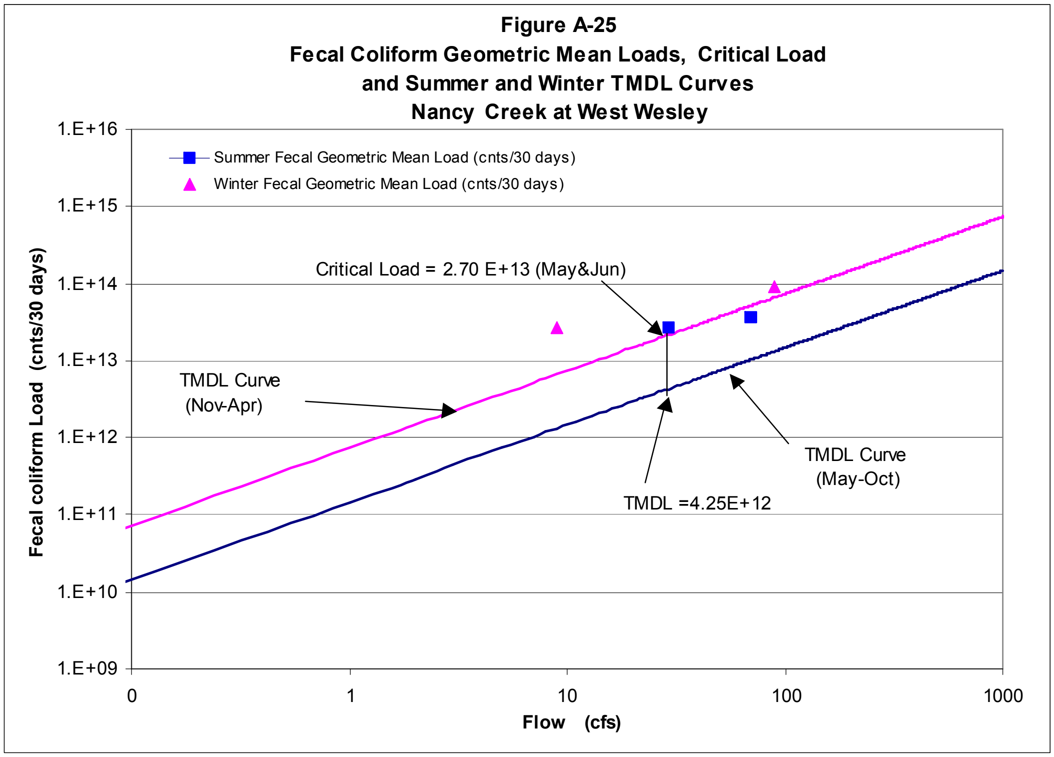


Table A-25. Data for Figure A-25, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Mar-00	7900	252.00	1.46E+15			
22-Mar-00	790	44.00	2.55E+13			
30-Mar-00	790	39.00	2.26E+13			
12-Apr-00	700	22.00	1.13E+13	1,363	89.25	8.92E+13
9-May-00	1300	20.00	1.91E+13			
17-May-00	490	19.00	6.83E+12			
22-May-00	24000	58.00	1.02E+15			
1-Jun-00	170	19.00	2.37E+12	1,270	29.00	2.70E+13
6-Jul-00	20	24.00	3.52E+11			
18-Jul-00	90	13.00	8.58E+11			
25-Jul-00	24000	117.00	2.06E+15			
1-Aug-00	5400	126.00	4.99E+14	695	70.00	3.57E+13
19-Sep-00	230	14.00	2.36E+12			
21-Sep-00	20	805.00	1.18E+13			
26-Sep-00	700	43.00	2.21E+13			
16-Oct-00	260	16.00	3.05E+12	170	219.50	2.74E+13

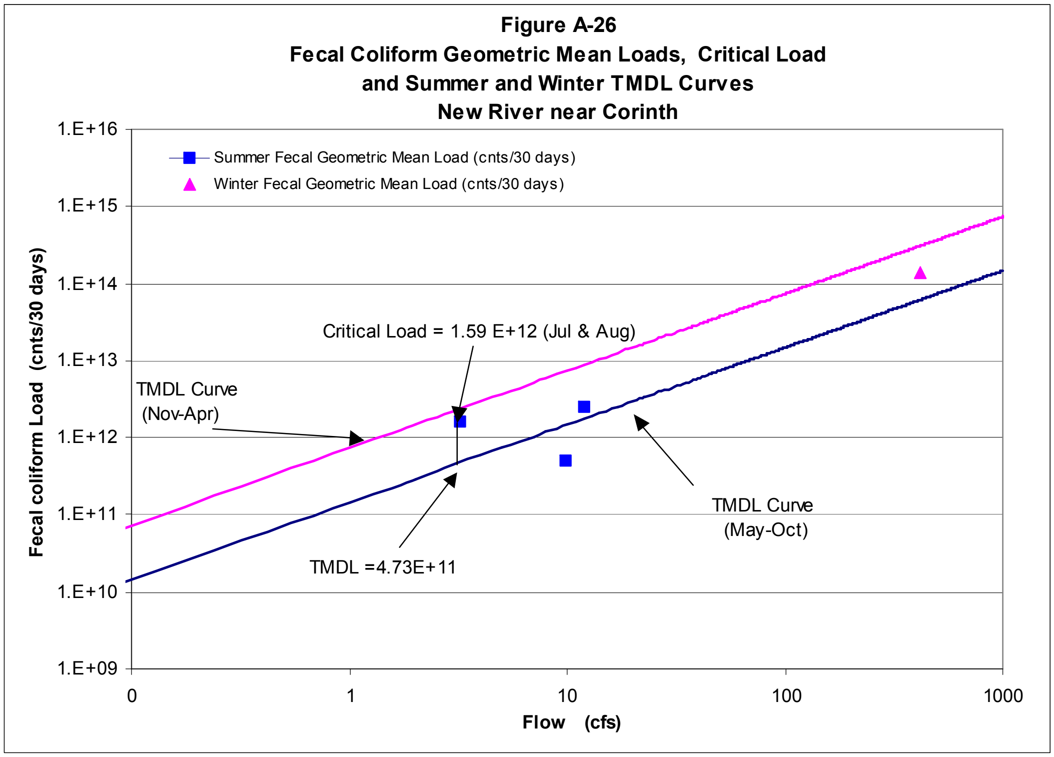


Table A-26. Data for Figure A-26, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
14-Mar-00	80	53.00	3.11E+12			
21-Mar-00	3300	807.00	1.95E+15			
28-Mar-00	220	120.00	1.94E+13			
4-Apr-00	790	689.00	3.99E+14	463	417.25	1.42E+14
30-May-00	50	19.00	6.97E+11			
12-Jun-00	330	9.20	2.23E+12			
19-Jun-00	170	10.00	1.25E+12			
26-Jun-00	2400	9.80	1.73E+13	286	12.00	2.52E+12
19-Jul-00	1300	1.20	1.14E+12			
2-Aug-00	5400	0.50	1.98E+12			
7-Aug-00	170	7.50	9.35E+11			
14-Aug-00	170	3.70	4.61E+11	671	3.23	1.59E+12
18-Sep-00	120	3.80	3.34E+11			
27-Sep-00	20	24.00	3.52E+11			
10-Oct-00	70	8.20	4.21E+11			
12-Oct-00	130	3.50	3.34E+11	68	9.88	4.95E+11

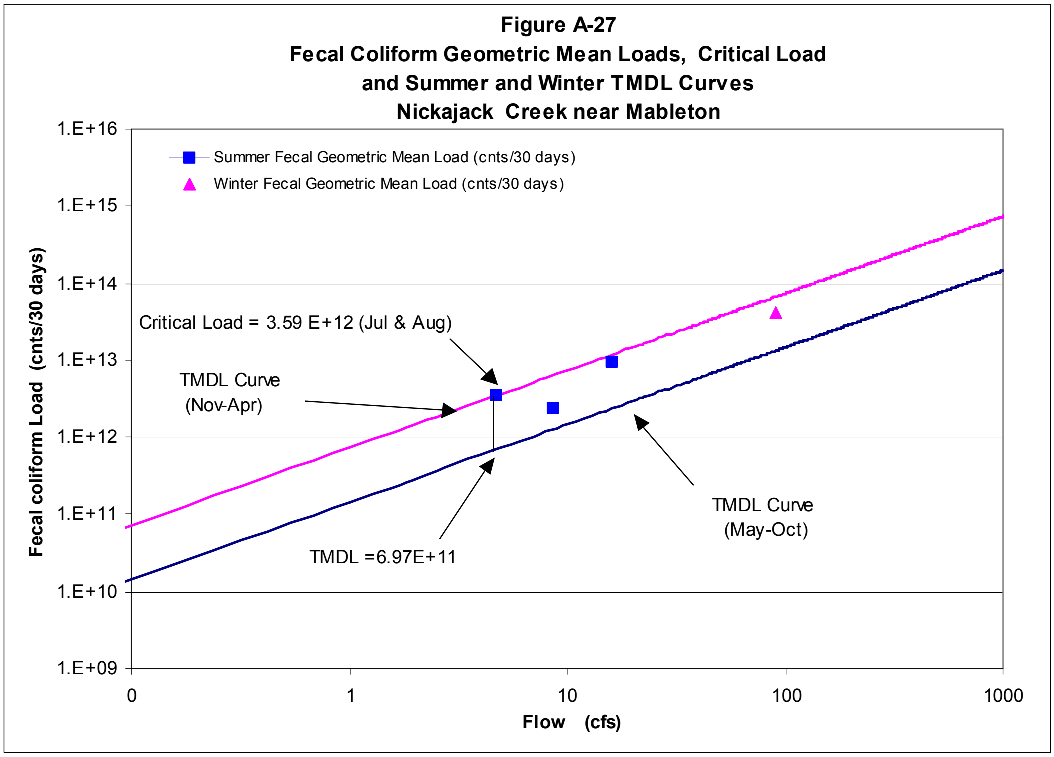


Table A-27. Data for Figure A-27, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Mar-00	4900	276.00	9.92E+14			
22-Mar-00	1100	35.00	2.82E+13			
30-Mar-00	130	28.00	2.67E+12			
12-Apr-00	230	22.00	3.71E+12	634	90.25	4.19E+13
9-May-00	1100	4.70	3.79E+12			
17-May-00	310	2.30	5.23E+11			
22-May-00	9200	53.00	3.58E+14			
1-Jun-00	130	4.20	4.01E+11	799	16.05	9.41E+12
6-Jul-00	310	2.00	4.55E+11			
18-Jul-00	460	2.00	6.75E+11			
25-Jul-00	24000	13.00	2.29E+14			
1-Aug-00	330	2.00	4.84E+11	1,031	4.75	3.59E+12
19-Sep-00	490	4.70	1.69E+12			
21-Sep-00	330	2.70	6.54E+11			
26-Sep-00	940	22.00	1.52E+13			
16-Oct-00	130	4.70	4.48E+11	375	8.53	2.34E+12

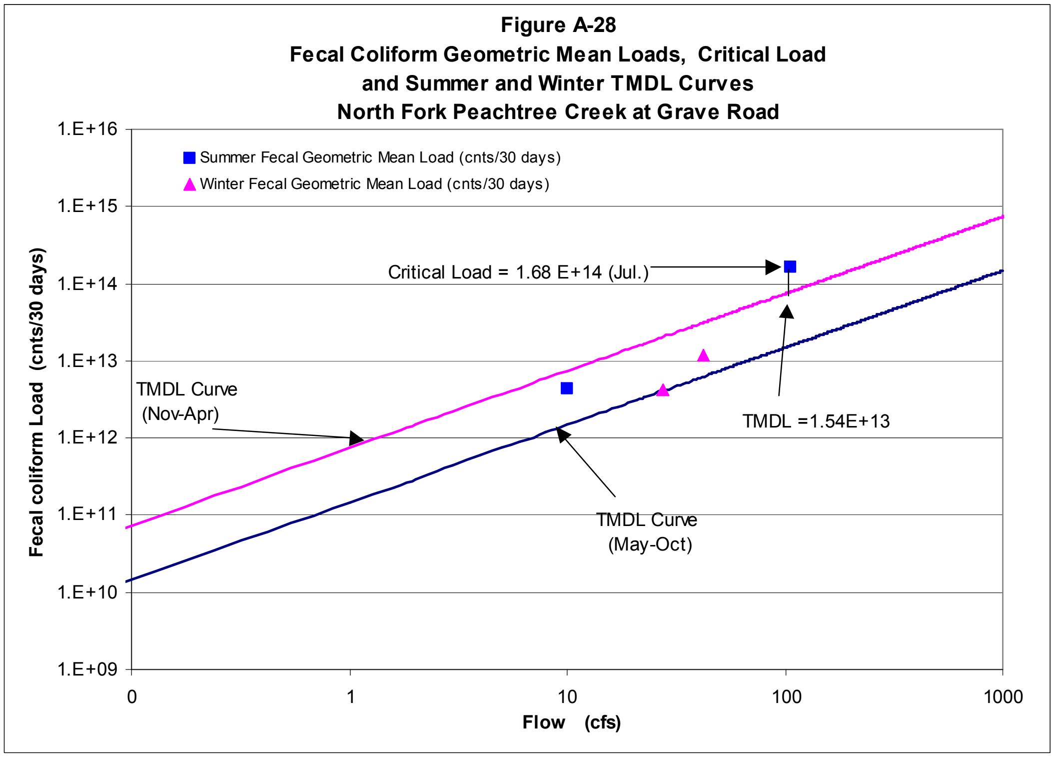


Table A-28. Data for Figure A-28, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
1-Jan-01	192	18.29	2.58E+12			
11-Jan-01	36	22.68	5.99E+11			
18-Jan-01	4600	41.69	1.41E+14			
25-Jan-01	56	27.80	1.14E+12	205	27.61	4.16E+12
5-Apr-01	528	70.22	2.72E+13			
12-Apr-01	188	36.57	5.04E+12			
19-Apr-01	460	35.11	1.18E+13			
26-Apr-01	448	26.33	8.65E+12	378	42.06	1.17E+13
5-Jul-01	432	94.36	2.99E+13			
12-Jul-01	3200	16.82	3.95E+13			
19-Jul-01	360	11.70	3.09E+12			
26-Jul-01	46000	296.98	1.00E+16	2,187	104.97	1.68E+14
4-Oct-01	840	8.78	5.41E+12			
11-Oct-01	968	10.24	7.27E+12			
18-Oct-01	272	10.24	2.04E+12			
23-Oct-01	560	10.97	4.51E+12	593	10.06	4.38E+12

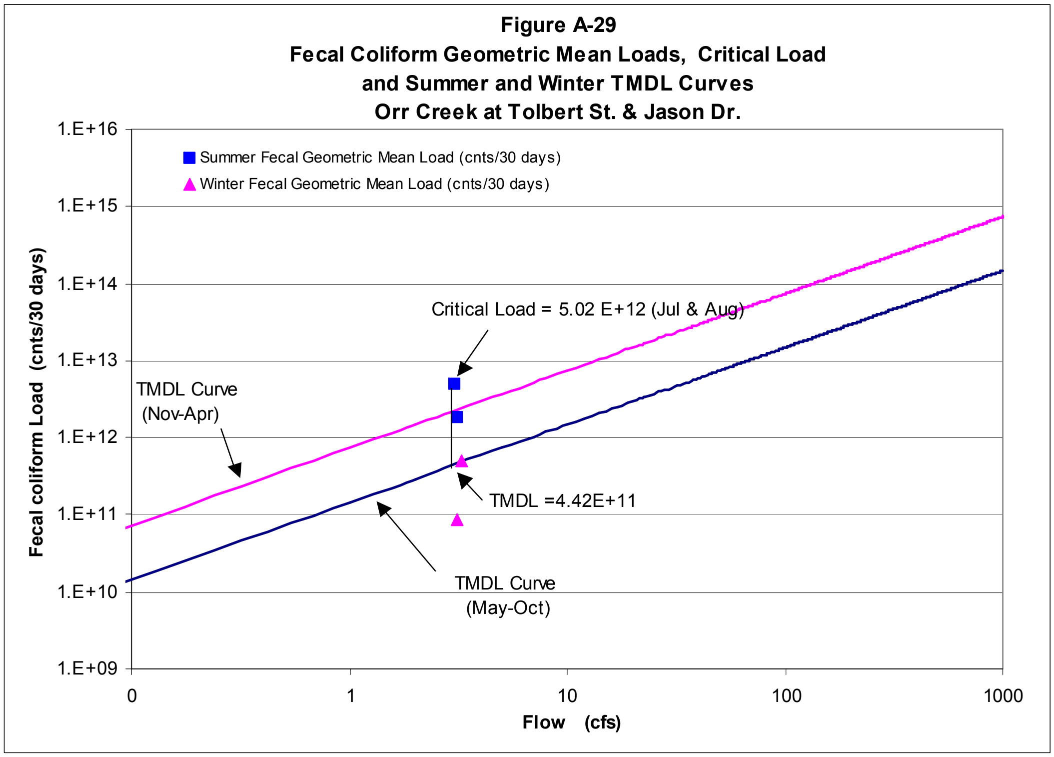


Table A-29. Data for Figure A-29, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
18-Jul-00	28000	1.96	4.03E+13			
27-Jul-00	1300	1.96	1.87E+12			
31-Jul-00	4300	5.71	1.80E+13			
7-Aug-00	170	2.41	3.00E+11	2,271	3.01	5.02E+12
13-Nov-00	50	3.01	1.10E+11			
21-Nov-00	20	3.38	4.95E+10			
28-Nov-00	90	3.30	2.18E+11			
5-Dec-00	20	2.85	4.19E+10	37	3.13	8.42E+10
18-Jul-00	1100	1.99	1.61E+12			
27-Jul-00	330	1.99	4.82E+11			
31-Jul-00	3300	6.10	1.48E+13			
7-Aug-00	330	2.48	6.00E+11	793	3.14	1.83E+12
13-Nov-00	2300	3.14	5.30E+12			
21-Nov-00	130	3.54	3.38E+11			
28-Nov-00	130	3.46	3.30E+11			
5-Dec-00	50	2.97	1.09E+11	210	3.28	5.05E+11

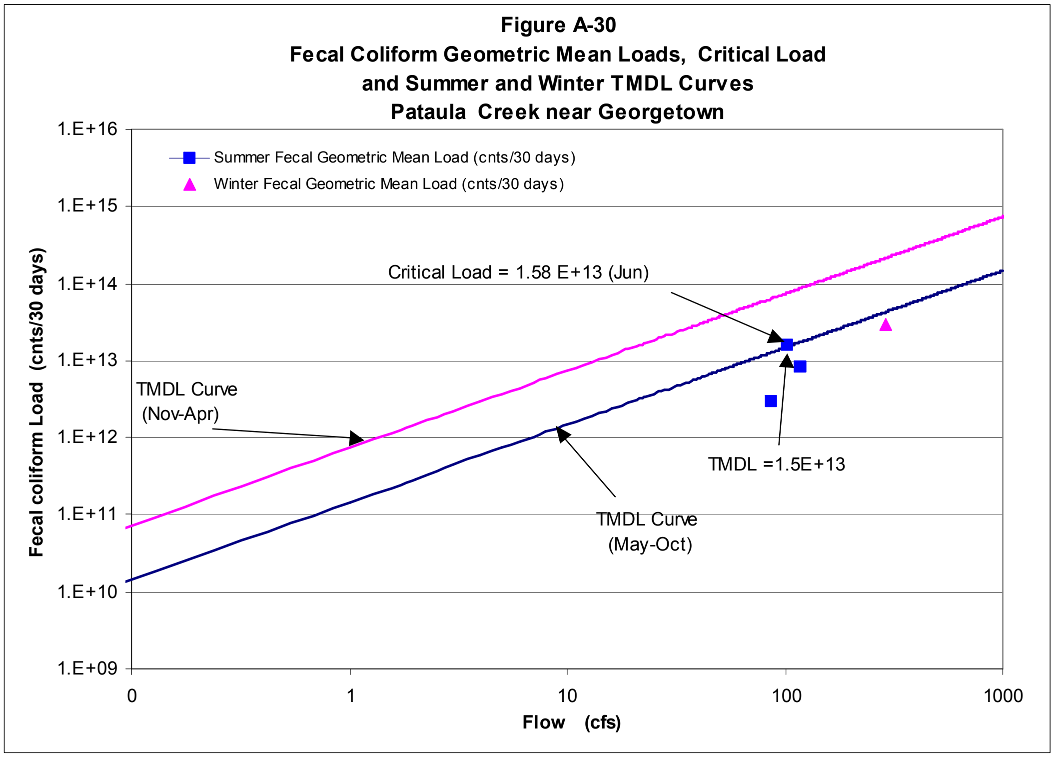


Table A-30. Data for Figure A-30, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
26-Jan-00	310	543.00	1.23E+14			
9-Dec-00	210	196.00	3.02E+13			
16-Feb-00	70	246.00	1.26E+13			
23-Feb-00	80	178.00	1.04E+13	138	290.75	2.95E+13
1-Jun-00	40	66.00	1.94E+12			
7-Jun-00	220	77.00	1.24E+13			
21-Jun-00	1300	115.00	1.10E+14			
28-Jun-00	170	152.00	1.90E+13	210	102.50	1.58E+13
30-Aug-00	130	70.00	6.68E+12			
6-Sep-00	1700	242.00	3.02E+14			
20-Sep-00	20	82.00	1.20E+12			
27-Sep-00	20	77.00	1.13E+12	97	117.75	8.38E+12
27-Sep-00	20	77.00	1.13E+12			
4-Oct-00	20	93.00	1.36E+12			
18-Oct-00	110	90.00	7.26E+12			
25-Oct-00	110	87.00	7.02E+12	47	86.75	2.98E+12

Figure A-31
Fecal Coliform Geometric Mean Loads, Critical Load and Summer and Winter TMDL Curves
Peachtree Creek at I-85

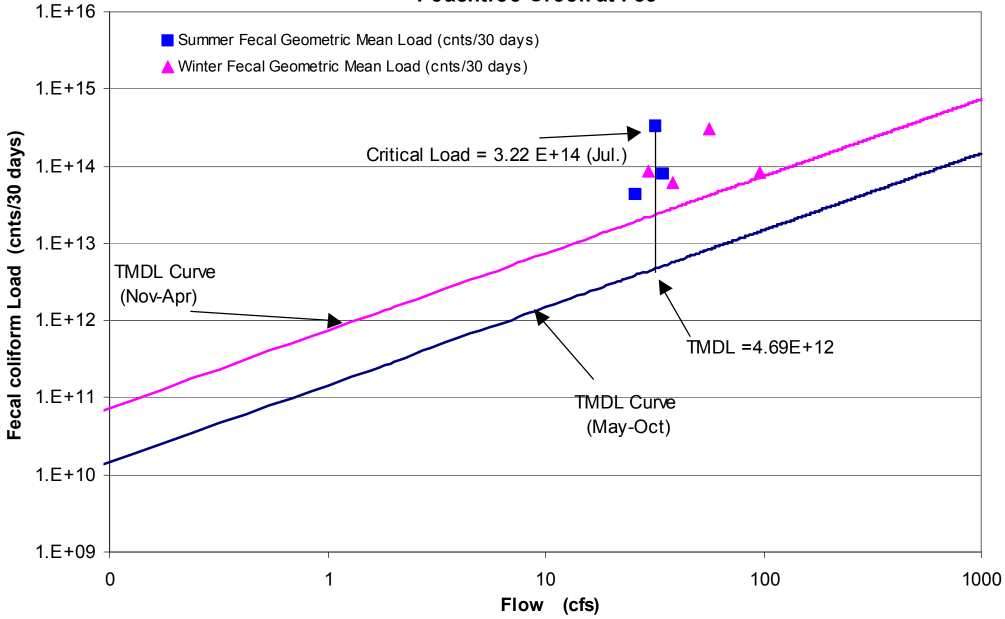


Table A-31. Data for Figure A-31, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
9-Mar-00	1700	34.00	4.24E+13			
16-Mar-00	1700	330.00	4.12E+14			
23-Mar-00	1100	63.00	5.08E+13			
30-Mar-00	7000	77.00	3.95E+14	2,172	38.25	6.09E+13
11-May-00	560	27.00	1.11E+13			
18-May-00	1300	22.00	2.10E+13			
25-May-00	3100	27.00	6.14E+13			
1-Jun-00	13000	18.00	1.72E+14	2,327	25.75	4.40E+13
27-Jul-00	7900	15.00	8.69E+13			
3-Aug-00	2300	58.00	9.79E+13			
10-Aug-00	2300	12.00	2.02E+13			
17-Aug-00	2300	8.40	1.42E+13	3,131	34.35	7.89E+13
8-Nov-00	1400	64.00	6.57E+13			
16-Nov-00	11000	34.00	2.74E+14			
30-Nov-00	4900	31.00	1.11E+14			
7-Dec-00	3300	24.00	5.81E+13	3,972	29.67	8.64E+13
10-Jan-01	4900	29.00	1.04E+14			
17-Jan-01	7900	27.00	1.56E+14			
24-Jan-01	54000	42.00	1.66E+15			
31-Jan-01	1300	127.00	1.21E+14	7,220	56.25	2.98E+14
2-Apr-01	940	56.00	3.86E+13			
10-Apr-01	790	55.00	3.19E+13			
17-Apr-01	4900	51.00	1.83E+14			
24-Apr-01	490	221.00	7.94E+13	1,156	95.75	8.12E+13
2-Jul-01	4900	30.00	1.08E+14			
10-Jul-01	2200	41.00	6.62E+13			
17-Jul-01	240000	25.00	4.40E+15	13,728	32.00	3.22E+14

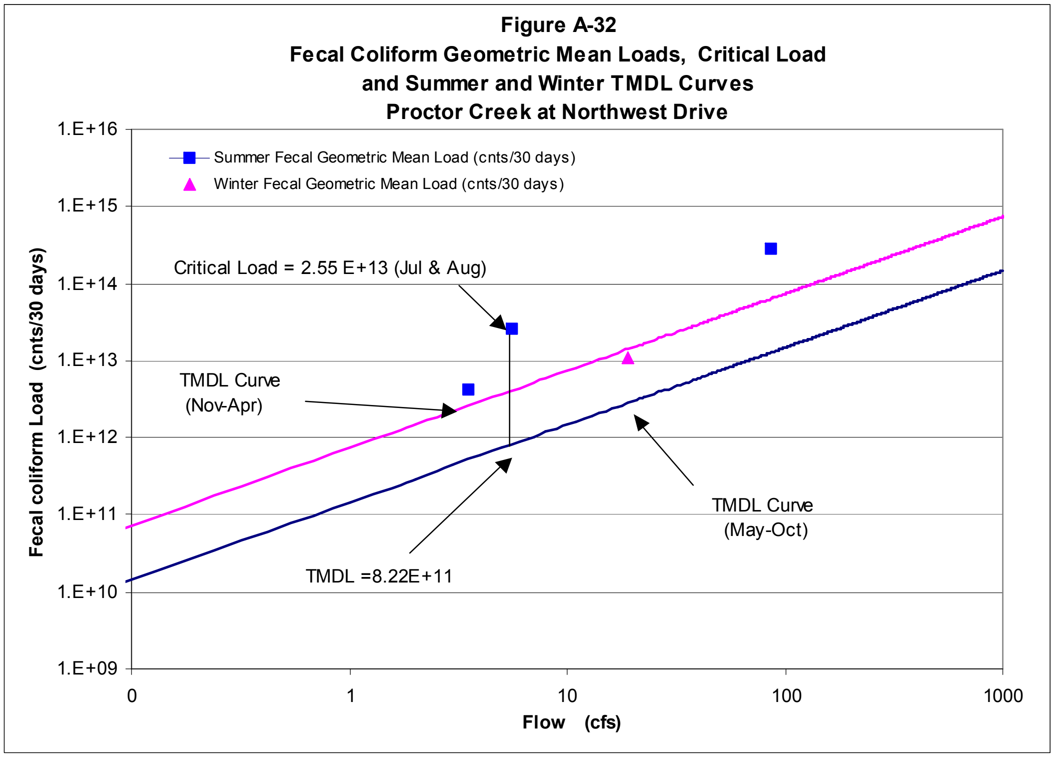


Table A-32. Data for Figure A-32, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Mar-00	790	44.00	2.55E+13			
22-Mar-00	1300	7.10	6.77E+12			
30-Mar-00	490	19.00	6.83E+12			
12-Apr-00	790	5.80	3.36E+12	794	18.98	1.11E+13
9-May-00	790	3.30	1.91E+12			
17-May-00	1300	2.80	2.67E+12			
22-May-00	700	7.80	4.01E+12			
1-Jun-00	9200	0.19	1.28E+12	1,604	3.52	4.14E+12
6-Jul-00	1100	2.10	1.69E+12			
18-Jul-00	16000	1.20	1.41E+13			
25-Jul-00	24000	12.00	2.11E+14			
1-Aug-00	3500	7.10	1.82E+13	6,201	5.60	2.55E+13
19-Sep-00	790	9.90	5.74E+12			
21-Sep-00	160000	321.00	3.77E+16			
26-Sep-00	9200	11.00	7.42E+13			
16-Oct-00	330	5.50	1.33E+12	4,426	86.85	2.82E+14

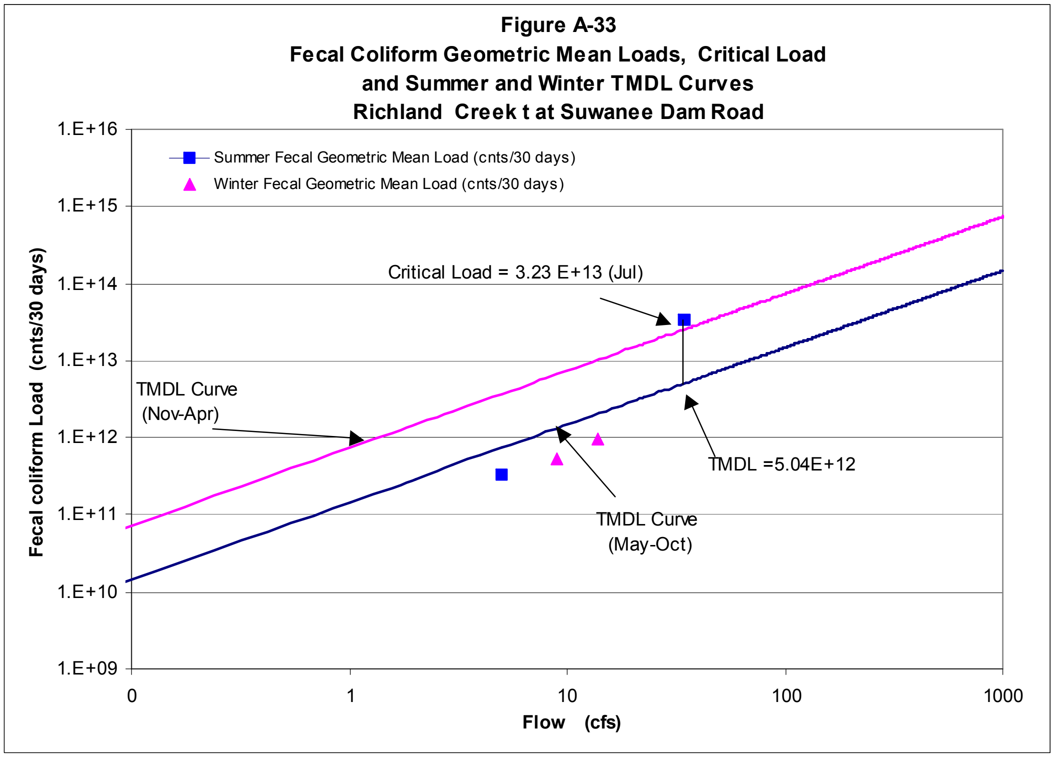


Table A-33. Data for Figure A-33, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
1-Jan-01	22	5.99	9.67E+10			
11-Jan-01	64	7.43	3.49E+11			
18-Jan-01	140	13.66	1.40E+12			
25-Jan-01	204	9.10	1.36E+12	80	9.04	5.28E+11
5-Apr-01	224	23.00	3.78E+12			
12-Apr-01	72	11.98	6.33E+11			
19-Apr-01	100	11.50	8.44E+11			
26-Apr-01	52	8.63	3.29E+11	96	13.78	9.67E+11
5-Jul-01	844	30.91	1.91E+13			
12-Jul-01	420	5.51	1.70E+12			
19-Jul-01	230	3.83	6.47E+11			
26-Jul-01	36800	97.27	2.63E+15	1,316	34.38	3.32E+13
4-Oct-01	256	2.88	5.40E+11			
11-Oct-01	156	3.35	3.84E+11			
18-Oct-01	80	3.35	1.97E+11			
23-Oct-01	100	3.59	2.64E+11	134	3.29	3.23E+11

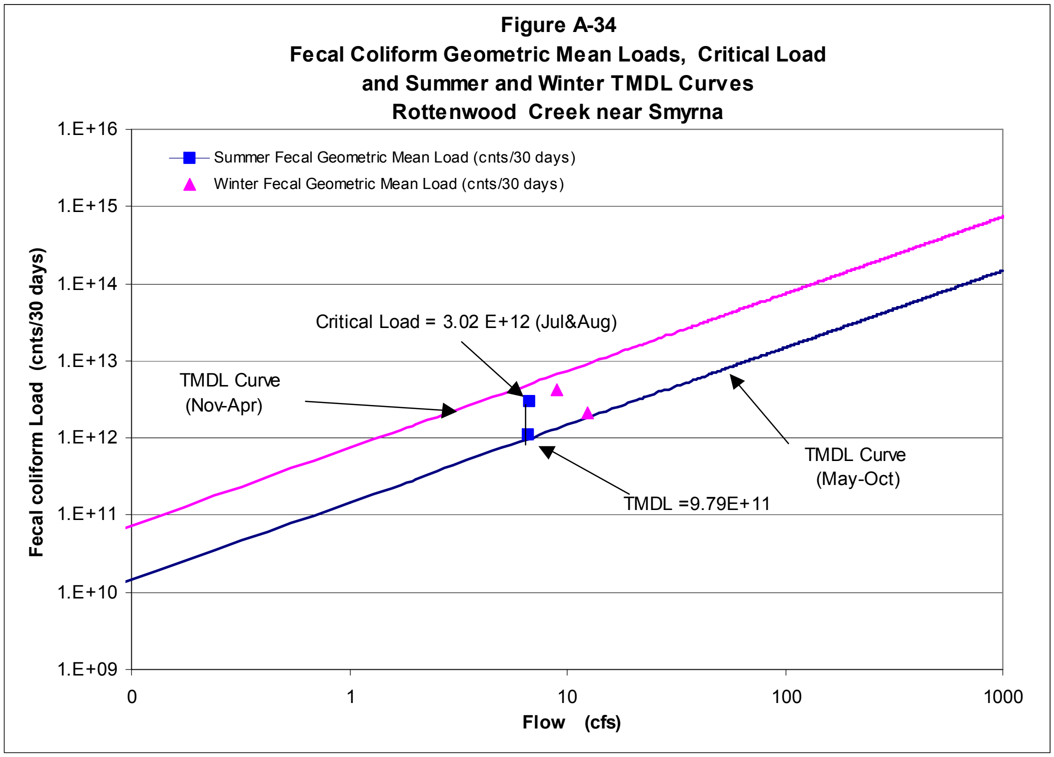


Table A-34. Data for Figure A-34, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
25-Jan-00	230	14.00	2.36E+12			
3-Feb-00	330	9.60	2.32E+12			
7-Feb-00	110	10.00	8.07E+11			
16-Feb-00	330	16.00	3.87E+12	229	12.40	2.08E+12
8-May-00	130	7.60	7.25E+11			
11-May-00	490	5.50	1.98E+12			
31-May-00	130	6.50	6.20E+11			
5-Jun-00	330	6.80	1.65E+12	229	6.60	1.11E+12
5-Jul-00	230	3.30	5.57E+11			
12-Jul-00	140	2.70	2.77E+11			
19-Jul-00	490	1.70	6.11E+11			
2-Aug-00	9200	19.00	1.28E+14	617	6.68	3.02E+12
6-Nov-00	3300	6.50	1.57E+13			
16-Nov-00	220	8.40	1.36E+12			
30-Nov-00	110	12.00	9.68E+11			
4-Dec-00	1700	11.00	1.37E+13	607	9.48	4.22E+12

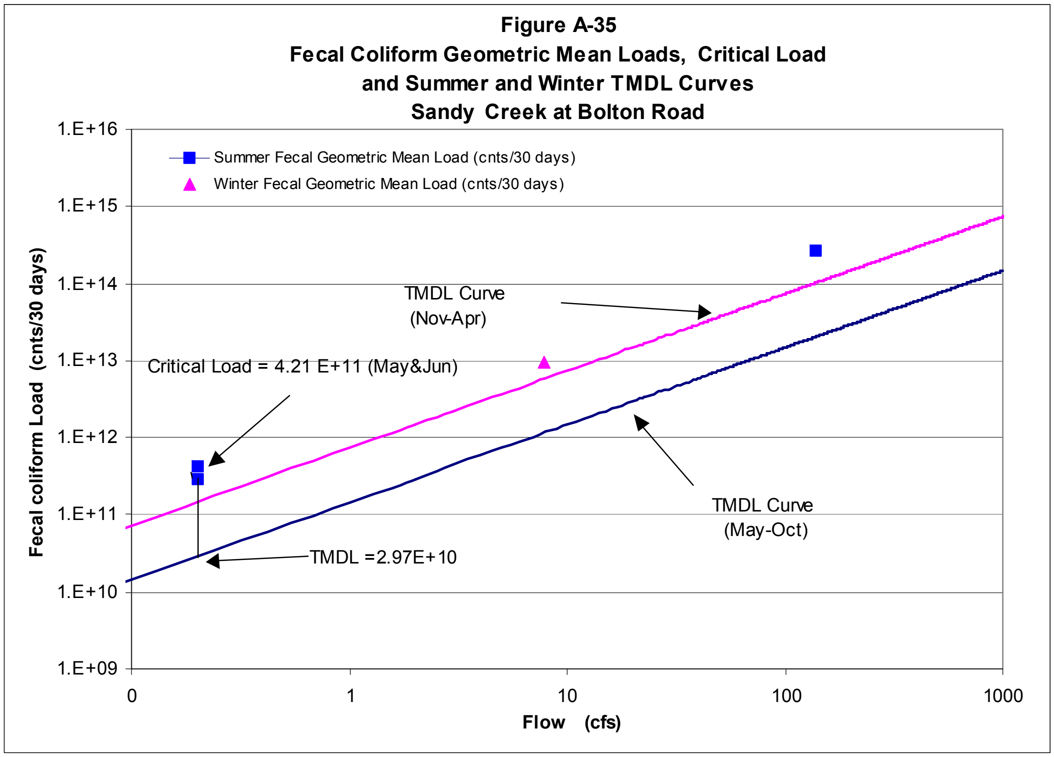


Table A-35. Data for Figure A-35, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Mar-00	1300	10.30	9.82E+12			
22-Mar-00	24000	0.71	1.25E+13			
30-Mar-00	1400	20.00	2.05E+13			
12-Apr-00	170	0.38	4.74E+10	1,651	7.85	9.50E+12
9-May-00	2800	0.28	5.75E+11			
17-May-00	5400	0.19	7.53E+11			
22-May-00	5400	0.34	1.35E+12			
1-Jun-00	790	0.00	5.79E+08	2,834	0.20	4.21E+11
6-Jul-00	790	0.13	7.53E+10			
18-Jul-00	330	0.05	1.21E+10			
25-Jul-00	16000	0.17	2.00E+12			
1-Aug-00	3500	0.46	1.18E+12	1,955	0.20	2.90E+11
19-Sep-00	170	3.40	4.24E+11			
21-Sep-00	160000	542.00	6.36E+16			
26-Sep-00	3500	8.50	2.18E+13			
16-Oct-00	460	4.30	1.45E+12	2,572	139.55	2.63E+14

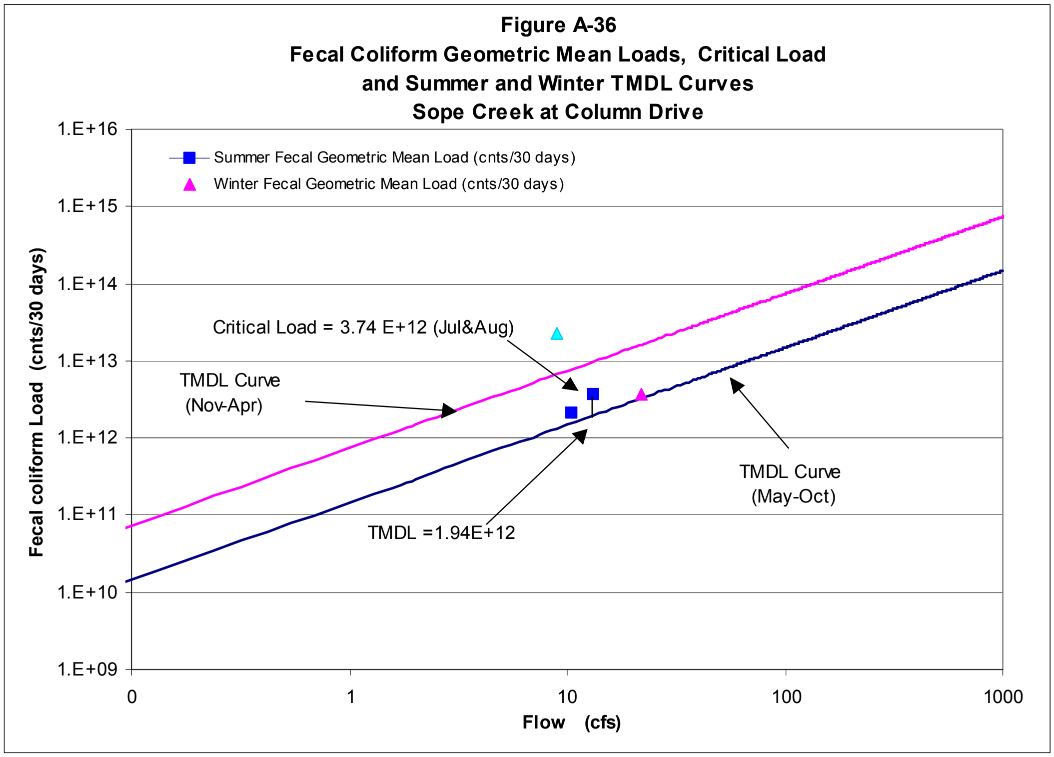


Table A-36. Data for Figure A-36, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
25-Jan-00	230	29.00	4.89E+12			
3-Feb-00	220	17.00	2.74E+12			
7-Feb-00	170	13.00	1.62E+12			
16-Feb-00	330	28.00	6.78E+12	231	21.75	3.68E+12
8-May-00	50	13.00	4.77E+11			
11-May-00	330	11.00	2.66E+12			
31-May-00	490	9.00	3.23E+12			
5-Jun-00	700	9.00	4.62E+12	274	10.50	2.11E+12
5-Jul-00	230	3.00	5.06E+11			
12-Jul-00	80	4.00	2.35E+11			
19-Jul-00	130	2.00	1.91E+11			
2-Aug-00	9200	44.00	2.97E+14	385	13.25	3.74E+12
6-Nov-00	3300	6.00	1.45E+13			
16-Nov-00	220	22.00	3.55E+12			
30-Nov-00	630	19.00	8.78E+12			
4-Dec-00	24000	22.00	3.87E+14	1,820	17.25	2.30E+13

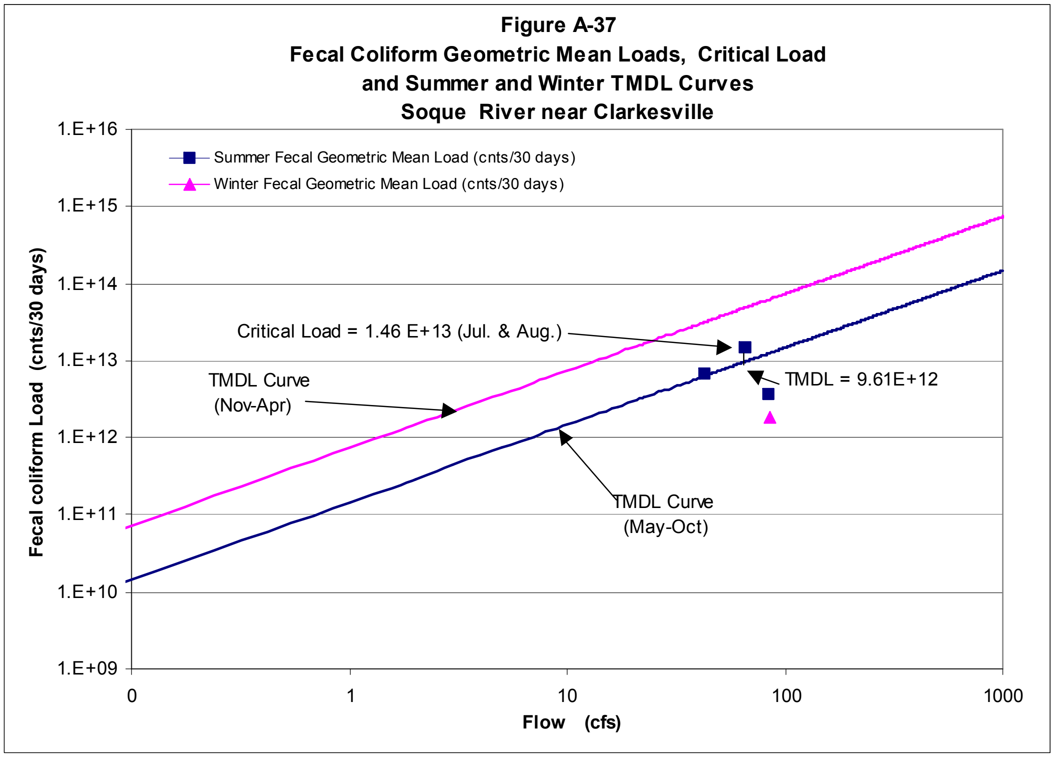


Table A-37. Data for Figure A-37, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
19-Jan-00	20	84.00	1.23E+12			
3-Feb-00	20	87.00	1.28E+12			
8-Feb-00	90	79.00	5.22E+12			
17-Feb-00	20	92.00	1.35E+12	29	85.50	1.83E+12
16-May-00	110	92.00	7.42E+12			
18-May-00	50	85.00	3.12E+12			
22-May-00	20	88.00	1.29E+12			
5-Jun-00	110	70.00	5.65E+12	59	83.75	3.62E+12
17-Jul-00	20	45.00	6.60E+11			
24-Jul-00	2200	69.00	1.11E+14			
31-Jul-00	420	92.00	2.83E+13			
8-Aug-00	460	56.00	1.89E+13	304	65.50	1.46E+13
11-Sep-00	80	42.00	2.46E+12			
18-Sep-00	110	32.00	2.58E+12			
25-Sep-00	1300	57.00	5.44E+13			
4-Oct-00	170	41.00	5.11E+12	210	43.00	6.62E+12

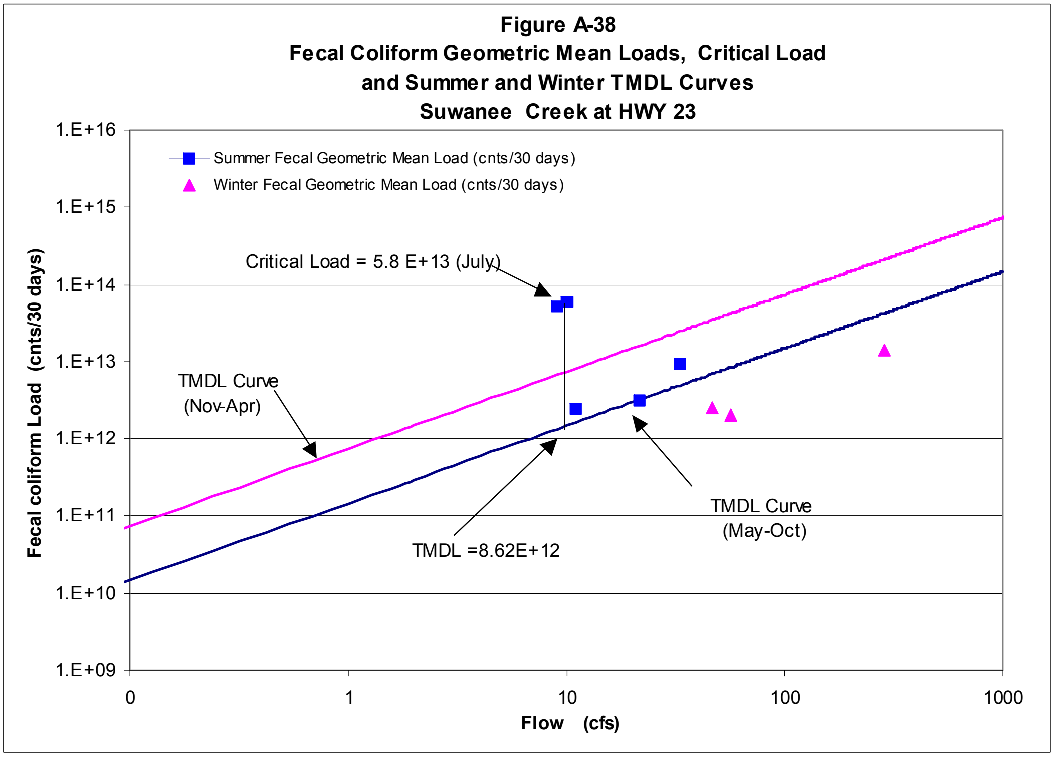


Figure A-38
Fecal Coliform Geometric Mean Loads, Critical Load
and Summer and Winter TMDL Curves
Suwanee Creek at HWY 23
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
Critical Load = 5.8 E+13 (July)
TMDL Curve
(Nov-Apr)
TMDL Curve
(May-Oct)
TMDL =8.62E+12
Fecal coliform Load (cnts/30 days)
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
1.E+09
0
1
10
100
1000
Flow (cfs)

Table A-38. Data for Figure A-38, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Jan-00	330	57.00	1.38E+13			
2-Feb-00	20	39.00	5.72E+11			
9-Feb-00	40	31.00	9.10E+11			
16-Feb-00	110	58.00	4.68E+12	73	46.25	2.49E+12
8-May-00	110	30.00	2.42E+12			
11-May-00	230	26.00	4.39E+12			
1-Jun-00	110	14.00	1.13E+12			
6-Jun-00	490	16.00	5.75E+12	192	21.50	3.03E+12
17-Jul-00	490	13.00	4.67E+12			
24-Jul-00	370	50.00	1.36E+13			
3-Aug-00	790	42.00	2.43E+13			
7-Aug-00	130	28.00	2.67E+12	369	33.25	9.01E+12
12-Sep-00	490	20.00	7.19E+12			
18-Sep-00	230	17.00	2.87E+12			
25-Sep-00	1800	102.00	1.35E+14			
3-Oct-00	9200	100.00	6.75E+14	1,169	59.75	5.12E+13
1-Jan-01	60	48.00	2.11E+12			
11-Jan-01	62	56.00	2.55E+12			
18-Jan-01	12	62.00	5.46E+11			
25-Jan-01	124	62.00	5.64E+12	49	57.00	2.03E+12
5-Apr-01	256	749.00	1.41E+14			
12-Apr-01	68	117.00	5.84E+12			
19-Apr-01	12	112.00	9.86E+11			
26-Apr-01	106	157.00	1.22E+13	69	283.75	1.43E+13
5-Jul-01	1600	118.00	1.38E+14			
12-Jul-01	290	38.00	8.08E+12			
19-Jul-01	220	18.00	2.90E+12			
26-Jul-01	32200	61.00	1.44E+15	1,346	58.75	5.80E+13
4-Oct-01	352	15.00	3.87E+12			
11-Oct-01	100	16.00	1.17E+12			
18-Oct-01	124	17.00	1.55E+12			
23-Oct-01	348	17.00	4.34E+12	197	16.25	2.35E+12

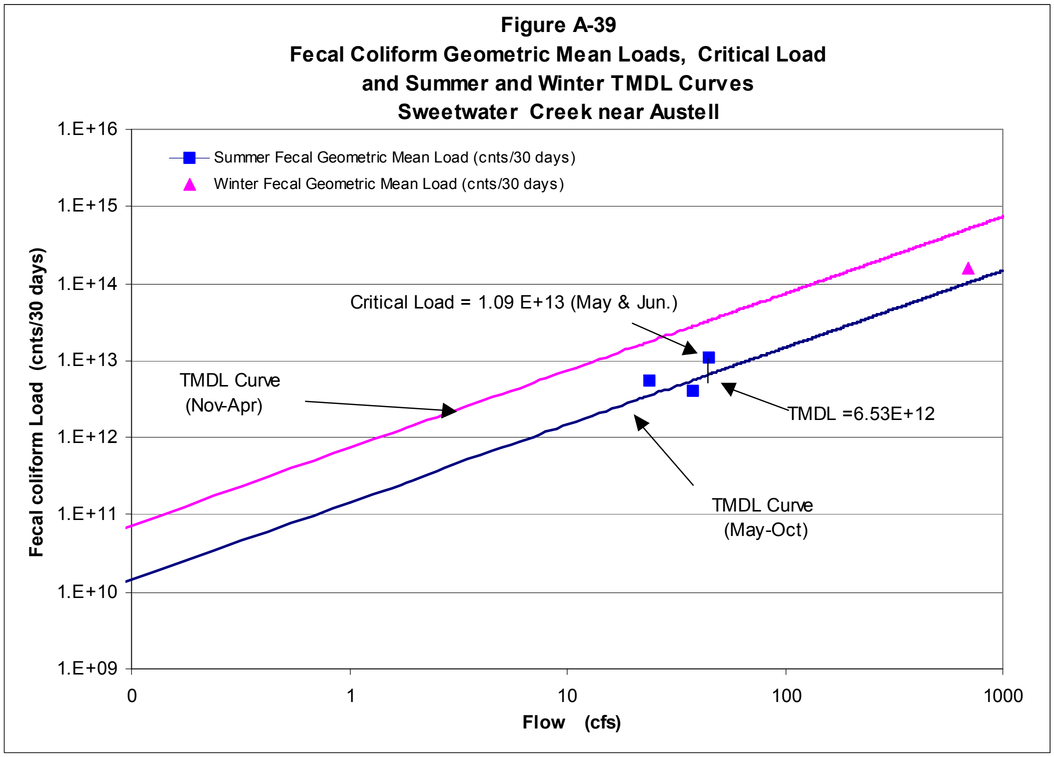


Table A-39. Data for Figure A-39, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Mar-00	3300	1,560.00	3.78E+15			
22-Mar-00	490	952.00	3.42E+14			
30-Mar-00	70	121.00	6.21E+12			
12-Apr-00	80	156.00	9.15E+12	308	697.25	1.58E+14
9-May-00	1300	57.00	5.44E+13			
17-May-00	170	35.00	4.36E+12			
22-May-00	330	54.00	1.31E+13			
1-Jun-00	170	32.00	3.99E+12	334	44.50	1.09E+13
6-Jul-00	70	8.40	4.31E+11			
18-Jul-00	230	2.00	3.37E+11			
25-Jul-00	1100	8.00	6.46E+12			
1-Aug-00	490	77.00	2.77E+13	305	23.85	5.34E+12
19-Sep-00	130	13.00	1.24E+12			
21-Sep-00	80	10.00	5.87E+11			
26-Sep-00	790	111.00	6.43E+13			
16-Oct-00	50	18.00	6.60E+11	142	38.00	3.97E+12

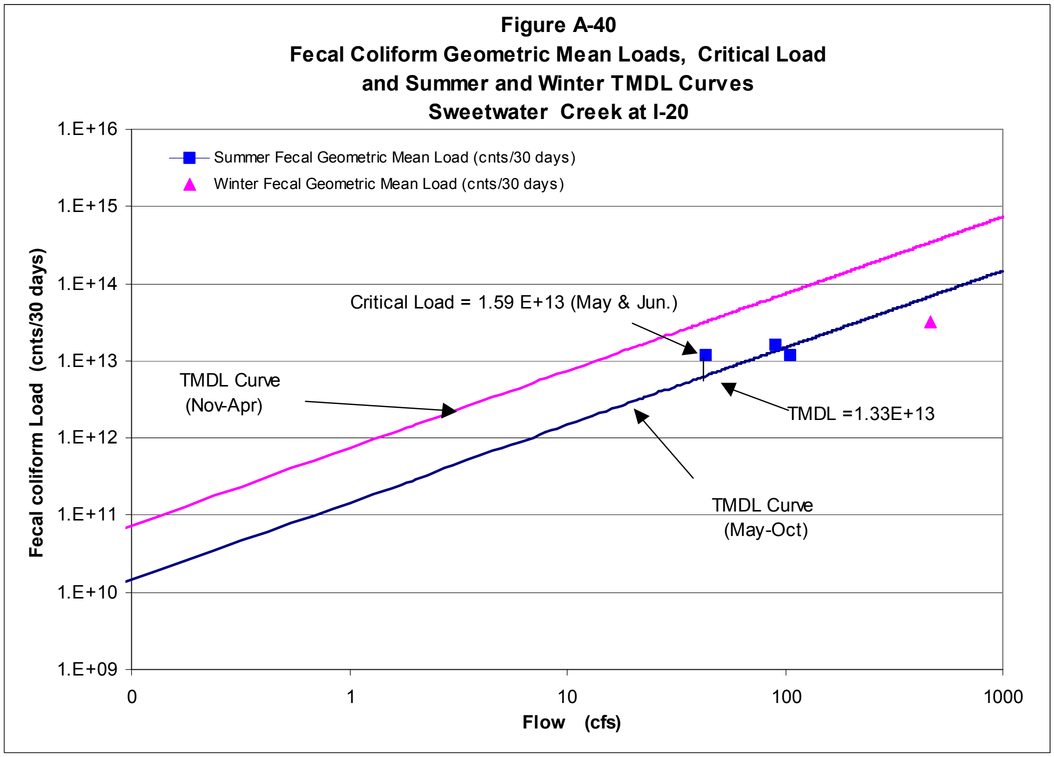


Figure A-40
Fecal Coliform Geometric Mean Loads, Critical Load
and Summer and Winter TMDL Curves
Sweetwater Creek at I-20
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
Critical Load = 1.59 E+13 (May & Jun.)
TMDL Curve
(Nov-Apr)
TMDL =1.33E+13
TMDL Curve
(May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
1.E+09
0
1
10
100
1000
Flow (cfs)

Table A-40. Data for Figure A-40, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
9-Mar-00	80	176.49	1.04E+13			
16-Mar-00	330	332.28	8.04E+13			
23-Mar-00	140	1,154.80	1.19E+14			
30-Mar-00	20	206.99	3.04E+12	93	467.64	3.18E+13
11-May-00	170	101.32	1.26E+13			
18-May-00	110	64.28	5.19E+12			
25-May-00	220	136.18	2.20E+13			
1-Jun-00	790	62.10	3.60E+13	239	90.97	1.59E+13
27-Jul-00	330	72.99	1.77E+13			
3-Aug-00	790	116.57	6.76E+13			
10-Aug-00	40	116.57	3.42E+12			
17-Aug-00	50	116.57	4.28E+12	151	105.67	1.17E+13
8-Nov-00	1245	43.58	3.98E+13			
16-Nov-00	220	43.58	7.03E+12			
30-Nov-00	490	43.58	1.57E+13			
7-Dec-00	130	43.58	4.16E+12	363	43.58	1.16E+13
10-Jan-01	1100	215.71	1.74E+14			
17-Jan-01	20	165.59	2.43E+12			
24-Jan-01	20	356.24	5.23E+12			
31-Jan-01	140	553.43	5.68E+13	89	322.74	2.10E+13
2-Apr-01	1100	380.21	3.07E+14			
10-Apr-01	80	348.62	2.05E+13			
17-Apr-01	1700	446.67	5.57E+14			
24-Apr-01	330	215.71	5.22E+13	471	347.80	1.20E+14

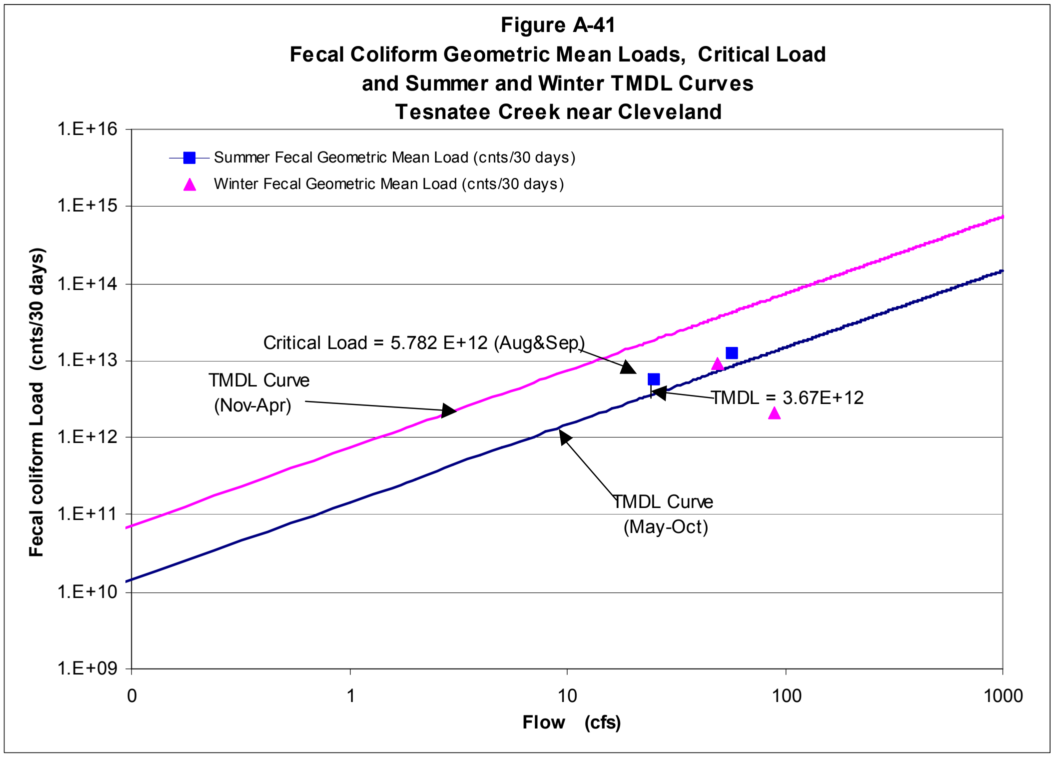


Table A-41. Data for Figure A-41, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
20-Jan-00	20	56.00	8.22E+11			
2-Feb-00	20	111.00	1.63E+12			
8-Feb-00	50	77.00	2.82E+12			
16-Feb-00	50	111.00	4.07E+12	32	88.75	2.06E+12
16-May-00	170	66.00	8.23E+12			
23-May-00	1100	72.00	5.81E+13			
8-Jun-00	80	49.00	2.88E+12			
13-Jun-00	490	42.00	1.51E+13	293	57.25	1.23E+13
15-Aug-00	360	21.00	5.55E+12			
23-Aug-00	170	26.00	3.24E+12			
30-Aug-00	490	26.00	9.35E+12			
12-Sep-00	330	27.00	6.54E+12	315	25.00	5.78E+12
6-Nov-00	330	31.00	7.50E+12			
13-Nov-00	490	49.00	1.76E+13			
28-Nov-00	110	62.00	5.00E+12			
29-Nov-00	230	54.00	9.11E+12	253	49.00	9.09E+12

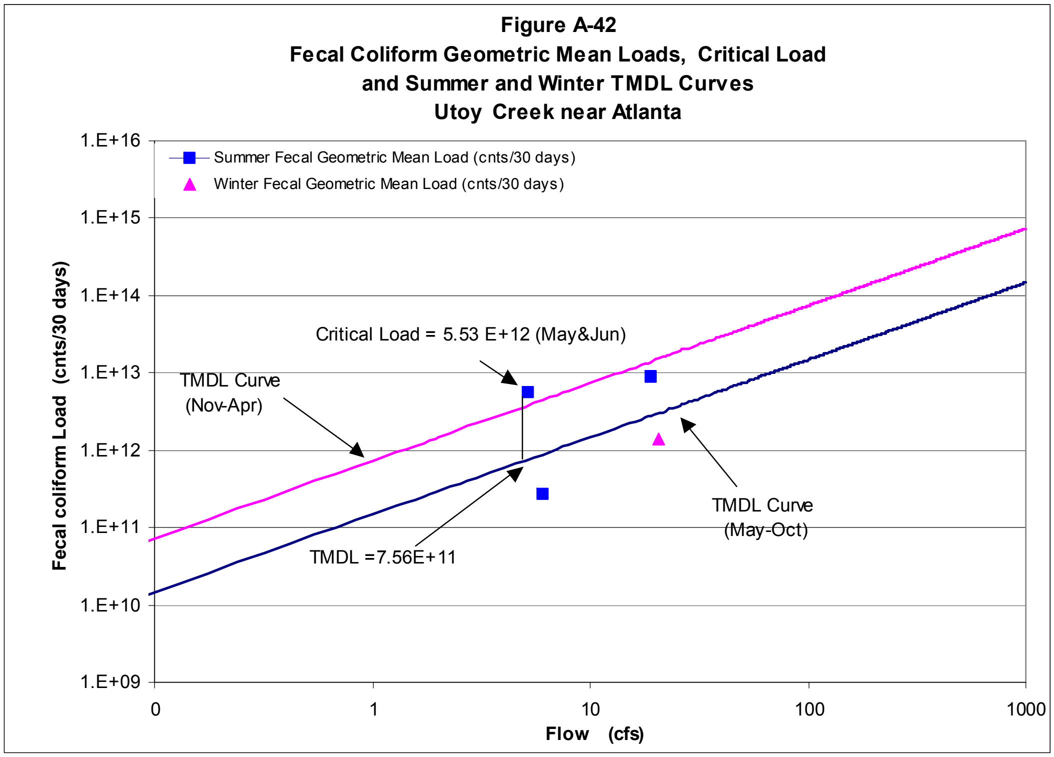


Table A-42. Data for Figure A-42, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
27-Jan-00	20	19.00	2.79E+11			
2-Feb-00	20	18.00	2.64E+11			
15-Feb-00	9200	27.00	1.82E+14			
24-Feb-00	20	18.00	2.64E+11	93	20.50	1.39E+12
4-May-00	2800	51.00	1.05E+14			
10-May-00	790	9.60	5.56E+12			
15-May-00	230	8.10	1.37E+12			
1-Jun-00	310	7.00	1.59E+12	630	18.93	8.75E+12
12-Jul-00	16000	8.40	9.86E+13			
19-Jul-00	330	2.40	5.81E+11			
26-Jul-00	1100	6.70	5.41E+12			
9-Aug-00	790	3.10	1.80E+12	1,464	5.15	5.53E+12
27-Sep-00	20	10.00	1.47E+11			
11-Oct-00	700	3.50	1.80E+12			
17-Oct-00	50	5.00	1.83E+11			
23-Oct-00	20	5.60	8.22E+10	61	6.03	2.70E+11

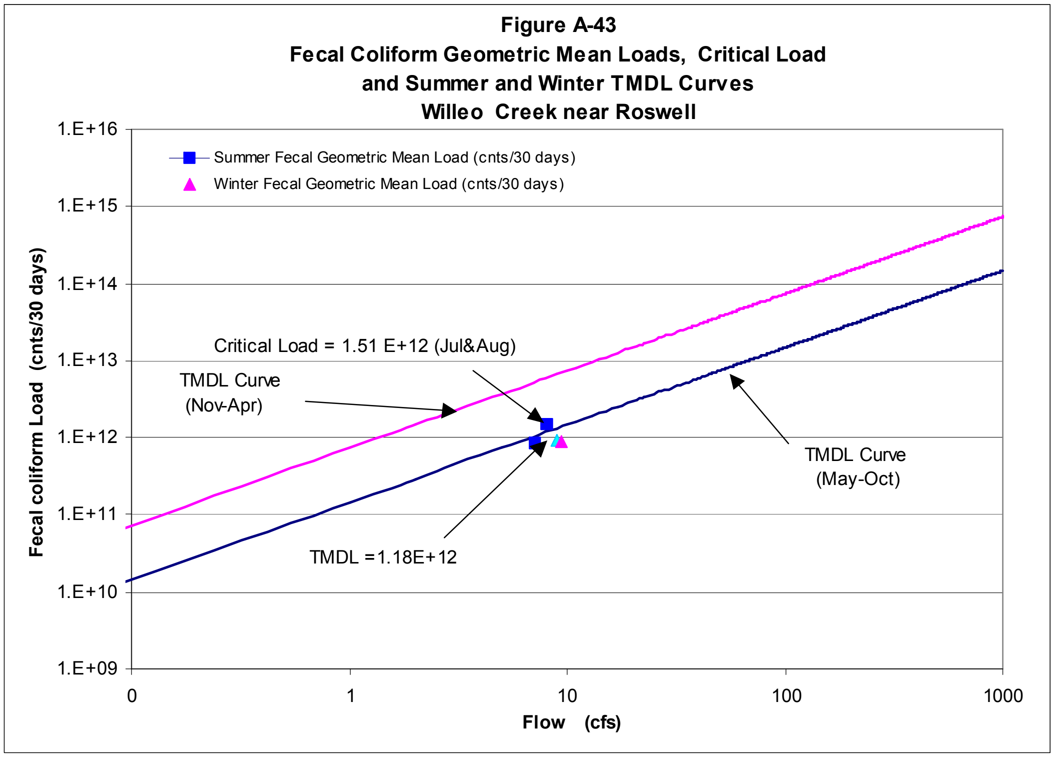


Table A-43. Data for Figure A-43, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Estimated Fecal Coliform Loading on Sample Day (cnts/30 days)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)
25-Jan-00	1100	12.00	9.68E+12			
3-Feb-00	50	8.10	2.97E+11			
7-Feb-00	130	7.50	7.15E+11			
16-Feb-00	40	10.00	2.93E+11	130	9.40	8.97E+11
8-May-00	80	7.70	4.52E+11			
11-May-00	230	7.30	1.23E+12			
31-May-00	220	7.00	1.13E+12			
6/5/2000	170	6.60	8.23E+11	162	7.15	8.49E+11
5-Jul-00	80	9.70	5.69E+11			
12-Jul-00	330	5.40	1.31E+12			
19-Jul-00	230	5.20	8.77E+11			
2-Aug-00	700	12.00	6.16E+12	255	8.08	1.51E+12
6-Nov-00	790	9.90	5.74E+12			
16-Nov-00	170	9.80	1.22E+12			
30-Nov-00	20	10.00	1.47E+11			
4-Dec-00	90	10.00	6.60E+11	125	9.93	9.08E+11

Appendix B

Summary of Limited Fecal Coliform Monitoring Data

Summary of Limited Fecal Coliform Monitoring Data

Impaired Segment	Number of Observations	Geometric Mean (counts/100 mL)	Data Source
Arrow Creek	21	1,096.48	DeKalb County (1994-1995)
Ball Mill Creek	23	512.86	DeKalb County (1994-1995), CRMP (1992-1996)
Balus Creek	59	186.21	Lake Sidney Lanier Study
Bishop Creek			
Blue John Creek			
Bubbling Creek	23	707.95	DeKalb County (1994-1995), ARC storm water data
Burnt Fork Creek	23	891.25	DeKalb County (1994-1995)
Buttermilk Creek	103	380.19	Cobb County (1990-2002)
Chattahoochee River	15	26.92	WRDB (1998-2000)
Clear Creek			
Cracker Creek			
Foe Killer Creek			
Foxwood Branch			
Hilly Mill Creek	35	144.54	CRMP (1992-1996)
Hog Wallow Creek			
Lullwater Creek	23	3,388.44	DeKalb County (1994-1995)
March Creek	38	5,623.41	CRMP (1992-1996)
Mud Creek	94	275.42	Cobb County (1990-2002)
North Fork Balus Creek	28	120.23	City of Gainesville (1999-2001)
North Utoy Creek			
Olley Creek	140	446.68	Cobb County (1990-2002)
Pea Creek	12	245.47	CRMP (1992-1996)
Peavine Creek	46	2,570.40	DeKalb County (1994-1995)
Rocky Branch			
South Fork Peachtree Creek	52	2,238.72	DeKalb County (1994-1995), ARC storm water data, NAWQA
South Utoy Creek			
Sewell Mill Creek	96	204.17	Sanitary survey (1993), Cobb County-90/02, NAWQA
Tanyard Branch			
Tanyard Creek			
Tributary to Mud Creek			
Ward Creek	90	549.54	Cobb County (1990-2001)
Weracoba Creek	60	676.08	City of Columbus (1993-1994)
White Oak Creek	55	338.84	CRMP (1992-1996)
Woodall Creek			

Appendix C

Technical Details for Calculating TMDLs for Limited-Data Sites

Conceptual Approach

The approach to estimating fecal coliform bacteria TMDLs for the waterbodies lacking geometric mean data relies on a relationship to other similar or “equivalent” waterbodies that do have data. This provides an estimated TMDL that can be refined in future as additional site-specific data are collected.

Development of the TMDLs via an “equivalent” site approach needed to address three important issues:

1. Any site-specific monitoring data for a waterbody should also be incorporated, even if it is not sufficient for direct estimation of geometric means.

2. Differences in land use will result in different fecal coliform bacteria concentrations, an equivalent waterbody that provides a perfect match in landuse to a subject site is unlikely to be available.

3. The selection of an equivalent waterbody is likely to have a strong impact on the resulting TMDL estimates for a subject waterbody

Consideration of these three issues led to a corresponding set of objectives for the approach:

1. Site-specific and equivalent site data should be combined in a weighted approach that reflects the relative accuracy of information provided by each data source.

2. Differences in land use among watersheds should be addressed through use of a regionalization model that identifies the extent to which changes in geometric mean fecal coliform concentrations can be explained by changes in land use.

3. The influence of equivalent waterbody selection should be minimized through the use of multiple equivalent waterbodies for each subject waterbody.

These three objectives may be met through use of an Empirical Bayes regionalization analysis. This method combines two important concepts: Bayesian maximum likelihood techniques for combining sources of data (local and regional), and hierarchical regionalization techniques. The data combination step assumes that both the regional or equivalent site information and the available site-specific data provide information on the true local geometric mean. The two sources of data should be combined or weighted in accordance with the degree of precision or accuracy in each source. The regionalization step assumes that the true mean at any site is a result of random variability and a regression model on land use. Empirical Bayes techniques provide statistically optimal methods for computing both the data combination and regionalization steps from observed data.

Technical Basis

In the TMDL Curve method, the needed reductions for a given waterbody, and thus the allocations, are determined by the ratio

$$\text{Reduction} = \frac{\text{TMDL Curve Point}}{\text{Critical Load}} \tag{1}$$

where the critical load is the estimated 30-day fecal coliform load most exceeding the TMDL curve, and the TMDL curve point is calculated as the geometric mean water quality standard for fecal coliform bacteria times the 30-day average flow corresponding to the critical load estimate. Both the numerator and denominator of this equation can be written in terms of a critical geometric mean, C_{crit} and a corresponding critical flow, $Q_{crit:}$

$$\text{TMDL Curve Point} = WQS \cdot Q_{crit} \tag{2}$$
$$\text{Critical Load} = C_{crit} \cdot Q_{crit}$$

For sites for which sufficient 30-day geometric means have not been collected, an estimate of C_{crit} is not available. For many waterbodies, some to many scattered observations are available, even though 30-day geometric means cannot be estimated. For other waterbodies, no site-specific data are available. In most cases, site-specific flow gaging is also not available. The approach estimates the TMDL for the sites without geometric mean data by adjusting the critical load, and thus the reduction estimate, from one or more equivalent sites that do have data.

In translating from an equivalent site to a subject site, it is important to account for changes in runoff concentrations associated with differences in land use, and for changes in flow associated with different basin size. The critical load at site *i* can be estimated in relation to calculated critical loads at *n* other sites through

$$\text{Critical Load}_{\text{i}} = \frac{1}{n}\sum_{j=1}^{n}\left[A_{ij} \cdot C_j \cdot Q_{crit,j} \cdot \frac{DA_i}{DA_j}\right] \tag{3}$$

in which A_{ij} is a factor (based on land use) that relates the geometric mean fecal coliform concentration at site *i* to that at site *j*, since a geometric mean is used), and *DA* represents the drainage area above the sample site.

The ratio DA_i/DA_j adjusts the flow from site j to site i. In the case where gage data are available, actual mean flows rather than drainage areas can be used for the ratio. Equation (3) thus translates both the critical geometric mean concentration and the associated critical flow to provide a new estimate of critical load at site *i*. Averaging over estimates obtained from *n* equivalent sites, the estimated reduction needed at site *i* is then, from (1):

$$\text{Reduction}_{\text{i}} = \sum_{\text{j=1}}^{\text{n}} \frac{\left[WQS \cdot Q_{crit,j} \cdot \frac{DA_i}{DA_j}\right]}{\left[A_{ij}\ G_j \cdot Q_{crit,j} \cdot \frac{DA_i}{DA_j}\right]} \tag{4}$$

The key task for completing this effort is determining the translation factor, A_{ij}, which relates the long term geometric mean at site *i* to that at site *j*. This factor can reasonably be assumed to vary with land use, but also to exhibit strong site-specific characteristics. For instance, a given site might tend to exhibit higher concentrations relative to an equivalent site than are expected from consideration of land use differences alone.

So, what is needed is a method that provides an appropriate weighting between limited site-specific data and a land-used based regression on equivalent sites. This situation is ideally suited for an empirical Bayes analysis (Berger, 1985; Morris, 1983). This is a technique for Bayesian updating that is based entirely in observed data (thus, “empirical”).

It is assumed that the long-term geometric mean fecal coliform concentration at a given site (expressed in log space) is a function of underlying properties of land use in the watershed plus site-specific factors that are represented by random noise. A sample realization of the (log-space) geometric mean at site *i*, x_i is assumed to be normally distributed about a true mean, 2_i, with standard error of the estimate given by Φ_i. In statistical notation:

$$x_i \sim \mathrm{N}\left(\theta_i, \sigma_i^2\right) \tag{5}$$

The desired translation factor for use in Equations (3) and (4) above is then

$$A_{ij} = e^{\theta_i} \big/ e^{\theta_j} \tag{6}$$

In a regional context, we assume that each of the true (but unknown) local site means arises from a regional regression on land characteristics, such that

$$\theta_i = \boldsymbol{y}_i^t \cdot \boldsymbol{\beta} + \varepsilon_i \tag{7}$$

where ***y*** is a vector of land use characteristics, the **ß** are regression coefficients, and γ_i is a normally-distributed error term, such that

$$\varepsilon_i \sim \mathrm{N}\left(0, \sigma_\pi^2\right) \tag{8}$$

Equations (7) and (8) constitute a standard linear regression model, written in vector notation. (Note that the vector **ß** includes an intercept value, in addition to coefficients on the regressors, and the first item in the vector ***y*** is a 1 corresponding to the intercept value.) The regionalization is accomplished by estimating **ß** and Φ_B from the data, i.e., across multiple sites. To simplify the mathematics, it is assumed that the Φ_i are known from the sample data, and uncertainty in the estimation of the Φ_i is ignored (Berger, 1985).

The desired maximum likelihood estimate of a geometric mean associated with a given site should range between the regression estimate, $\boldsymbol{y}_i^t$ **ß**, and the at-site observed geometric mean, x_i. If there are no monitoring data at a given site, the best estimator is simply the regression estimator. On the other hand, if there are sufficient data at a given site it is appropriate to use the observed geometric mean without regionalization. Weighting between these two end-members depends on the relative magnitudes of Φ_i and Φ_B, which express, respectively, the degree of uncertainty associated with the local and regional estimators. In a Bayesian sense, the best estimate is provided by the posterior distribution, incorporating the regional regression (as a prior) and the likelihood function of observed site data.

In a standard Bayes approach, the prior should be independent of the data used to form the likelihood function. Morris (1983) developed Empirical Bayes approximations to the posterior means and variances that take into account the errors introduced by estimating **ß** and Φ_B from the data. The maximum likelihood Empirical Bayes estimator of 2 is given by $:_i^{EB}$, with variance V_i^{EB}. These are estimated through the equations

$$\mathrm{E}(\theta_i) \;=\; \mu_i^{EB} = \; x_i - \hat{\mathrm{B}}_i \cdot \left(x_i - \boldsymbol{y}_i^t \hat{\boldsymbol{\beta}}\right) \tag{9}$$

and

$$V_i^{EB} = \sigma_i^2 \cdot \left[1 - \frac{\left(p - \hat{l}_i\right)}{p} \hat{\mathrm{B}}_{\mathrm{i}} \right] + \frac{2}{p - l - 2} \hat{\mathrm{B}}_{\mathrm{i}}^2 \left(\frac{\hat{\sigma}_p^2 + \hat{\sigma}_\pi^2}{\sigma_i^2 + \hat{\sigma}_\pi^2} \right) \left(x_i - \boldsymbol{y}_i^t \hat{\beta} \right)^2 \tag{10}$$

In these equations, the parameter B_i is a Bayes factor that weights between the regional and local estimates. The x_I and Φ_i are, as noted above, the observed mean and variance of the logarithms of fecal coliform concentration data at site *i*. When no observations are available at a site, Φ_I^2 is assumed to be equal to the mean variance across all sites with data.

The vector of regression parameters, **ß**, is estimated by the standard least squares regression equation, written in matrix notation as

$$\hat{\beta} = \left(\boldsymbol{y}^t \boldsymbol{V}^{-1} \boldsymbol{y} \right)^{-1} \left(\boldsymbol{y}^t \boldsymbol{V}^{-1} \boldsymbol{x} \right) \tag{11}$$

where ***y***, representing the observed land characteristics, is a (*p* x *l*) matrix of *l* regressors at *p* sites, ***x*** is the (*p* x 1) vector of observed means at the *p* sites, and ***V*** is a (*p* x *p*) diagonal matrix with diagonal elements $V_{ii} = \Phi_i^2 + \Phi_B^2$. The regional variance is in turn estimated as

$$\hat{\sigma}_\pi^2 = \frac{\sum_{i=1}^{p} \left\{ \left[\left(p / (p - l) \right) \left(x_i - \boldsymbol{y}_i^t \hat{\beta} \right)^2 - \sigma_i^2 \right] / \left[\sigma_i^2 + \hat{\sigma}_\pi^2 \right]^2 \right\}}{\sum_{i=1}^{p} \left(\sigma_i^2 + \hat{\sigma}_\pi^2 \right)^{-2}} \tag{12}$$

and the remaining factors are

$$\hat{\mathrm{B}}_{\mathrm{i}} = \frac{(p - l - 2)}{(p - l)} \cdot \frac{\sigma_i^2}{\sigma_i^2 + \hat{\sigma}_\pi^2} \tag{13}$$

$$\hat{l}_i = p \left[\boldsymbol{y} \left(\boldsymbol{y}^t \boldsymbol{V}^{-1} \boldsymbol{y} \right)^{-1} \boldsymbol{y}^t \right]_{ii} / \left(\sigma_i^2 + \hat{\sigma}_\pi^2 \right) \tag{14}$$

and

$$\hat{\sigma}_p^2 = \frac{\sum_{i=1}^{p} \sigma_i^2 / \left(\sigma_i^2 + \hat{\sigma}_\pi^2 \right)}{\sum_{i=1}^{p} 1 / \left(\sigma_i^2 + \hat{\sigma}_\pi^2 \right)} \tag{15}$$

These equations do not provide a closed form solution, as **ß** is involved in the equation for Φ_B, while is required in the equation for **ß**. The equations must thus be solved by iteration: Start with a guess for Φ_B and use it to calculate **ß**, then use the estimate of **ß** to recalculate Φ_B. Convergence is usually rapid, with the proviso that, if Φ_B converges to a negative number, it is replaced by zero. All the necessary calculations have been incorporated into a spreadsheet.

Development of Regionalization Format

The technical approach can be applied to any type of linear regional regression model. Some experimentation was needed to determine the appropriate independent variables for use in the regression equation. Results of Atlanta-area studies such as the Atlanta Regional Stormwater Characterization Study (Quasenbarth, 1993; CDM, 1996; CH2M HILL, 1999) suggested that the most relevant information for urban areas is likely to be percent of the watershed area in residential and commercial/industrial/office land uses.

Data to support the regionalization were obtained from the Georgia Water Resources Database (WRDB), including extensive data from the Chattahoochee River Modeling Project, and supplemented by local (county and municipal) data. Though some of the data sources extend back as far as 1968, the regionalization was restricted to data from the last ten years (1992-2002). Land use data were aggregated to the scale of 12-digit hydrologic unit codes with some further delineation based on reach segments. The smaller sub-watersheds were assigned 13 digit alphanumeric codes. These 12 or 13 digit watersheds will be referred to simply as watersheds in the following discussion.

For each watershed the mean and variance of the fecal coliform data were calculated in log space. The log-space means were then plotted against the fraction of the local watershed in agricultural, rural, urban, or single family residential land use. Single independent variable regressions on fractions in individual land uses had poor explanatory power and high standard errors; however, there was a positive correlation between coliform concentration and both single family residential and urban land uses. Correlation against agricultural land use was weakly negative. Multiple regressions provided better results, and the final exploratory model used fraction of land in single family residential and urban land uses. This model has an adjusted R^2 of 49 percent, as shown in Figure 1, with both coefficients statistically significant.

In sum, the exploratory regression indicates a statistically-significant relationship between the long-term geometric mean of observed fecal coliform data and land use. This model then provides the format for the empirical Bayes regional regression. As expected, the regional regression information provides some useful information, but is not in itself sufficient to provide an accurate estimate of observations. For this reason the weighting of regional and local data based on relative precision, as is done in the Bayes approach, is particularly important.

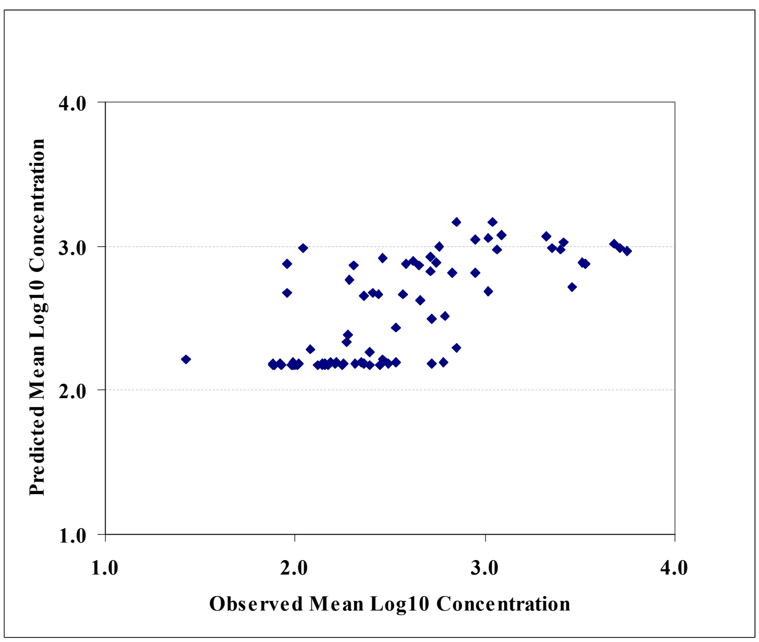


Figure 1. Predicted versus Observed Fecal Coliform Concentrations based on Land Use

Method Implementation

The methods described above were implemented in an Excel spreadsheet, using built-in matrix/array functions. The process consists of two general steps: Determination of the regionalization parameters and combination of site and regional data to estimate individual-site results.

The regionalization problem was broken into two sets. One set included the data from the Atlanta metropolitan area, the other set included sites outside the Atlanta metropolitan area. There are two reasons for taking this approach. First, there are likely to be systematic differences in the sources of bacterial pollution in this highly developed area. Second, the land use coverage in this area is obtained from the Atlanta Regional Commission (ARC) ESDIS coverage, which combines a variety of sources of high-accuracy information, including aerial photography interpretation, and is likely to differ in quality from the satellite imagery-derived MRLC data available for the remainder of the state.

Within the ARC area the regional regression used both fraction urban area and fraction single family residential area as independent variables. Outside the ARC area, the coefficient on single family residential area was not significantly different from zero. Therefore, the regionalization regression for sites in this area uses fraction urban area as a single independent variable. In both cases, only the local land use within the 12+-digit HUC corresponding to the listed segment was used in the regression, and not the entire upstream area land use, as concentrations are believed to be most strongly associated with local inputs. In three cases where the listed segment includes two or more 12+-digit HUCs, the land use distribution in the HUCs associated with the listed segment was combined for the purposes of the regression. The land use fractions associated with each site are shown in Table 1. Site fecal coliform data used

Table 1. Land Use Fractions used in Empirical Bayes Regionalization

Site	Location	HUC	Fraction Urban	Fraction Single Family Residential
Anneewakee Creek	House Creek to Lake Monroe (Douglas Co.)	031300020304A	0.0037	0.3004
Arrow Creek	Atlanta (Fulton Co.)	031300011201B	0.6500	0.3000
Aycocks Creek	Kaney Head Creek to Spring Creek (Miller Co.)	031300100405	0.0003	0.0000
Ball Mill Creek	Fulton/DeKalb Counties	031300010907B	0.0700	0.8500
Balus Creek	Gainesville (Hall Co.)	031300010803C	0.1026	0.0710
Beaver Creek	Spring Hill Creek to Flint River (Macon Co.)	031300060101	0.0100	0.0100
Bell Creek	Headwaters, d/s Thomaston, to Potato Creek (Upson Co.)	031300050908B	0.0800	0.1400
Big Creek	Hwy 400 to Chattahoochee River (Fulton Co.)	031300011004A	0.5600	0.2900
Big Slough	Near Pelham (Mitchell Co.)	031300080505	0.0000	0.0000
Bubbling Creek	DeKalb County	031300011203B	0.6600	0.2900
Buck Creek	Fox Branch to Flint River near Oglethorpe (Schley/Macon Co.)	031300060209	0.0002	0.0002
Bull Creek	Columbus (Muscogee Co.)	031300030104B	0.1800	0.3600
Burnt Fork Creek	DeKalb County	031300011202D	0.3600	0.5700
Buttermilk Creek	Cobb County	031300020208C	0.2000	0.5900
Camp Creek	Fulton County	031300020302	0.0800	0.2900
Camp Creek	Headwaters to Flint River (Clayton Co.)	031300050102	0.1100	0.5800
Centralhatchee Creek	Heard County	031300020407	0.0021	0.0031
Chattahoochee River	Ga. Hwy. 17, Helen to SR255 (White/Habersham Co.)	031300010102	0.0029	0.0012
Chattahoochee River	SR255 to Soquee River (White/Habersham Co.)	031300010106	0.0015	0.0017
Chattahoochee River	Morgan Falls Dam to Peachtree Creek (Fulton/Cobb Co.)	031300011101A	0.3100	0.4300
Chattahoochee River	Headwaters to Chattahoochee River (Cobb Co.)	031300011103A	0.3600	0.1100
Chattahoochee River	Utoy Creek to Pea Creek (Fulton/Douglas Co.)	031300020301	0.2300	0.5800
Chattahoochee River	Pea Creek to Wahoo Creek (Fulton Co.)	031300020307	0.5600	0.2000
Chattahoochee River	Pea Creek to Wahoo Creek (Fulton, Douglas, Coweta, Carroll Co.)	031300020312A	0.0029	0.0034
Chattahoochee River	Pea Creek to Wahoo Creek (Carroll Co.)	031300020401C	0.0300	0.0024
Chattahoochee River	Upatoi Creek to Railroad at Omaha (Chattahoochee/Stewart Co)	031300030606	0.0003	0.0000
Chattahoochee River	Downstream W. F. George, Dam (Clay Co.)	031300040101B	0.0100	0.0300
Cooleewahee Creek	Piney Woods Branch to Flint River near Newton (Dougherty/Baker Co.)	031300080304	0.0014	0.0003
Crawfish Creek	Douglas County	031300020308A	0.0000	0.0000
Crooked Creek	Tributary to Chattahoochee River (Gwinnett Co.)	031300010907C	0.6000	0.2600
Elkins Creek	Bull Creek to Flint River near Molena (Pike/Upson Co.)	031300050603	0.0009	0.0004
Fishpond Drain	U.S. Hwy. 84, Donalsonville to Wash Pond (Seminole Co.)	031300100802	0.0100	0.0100
Flat Creek	Headwaters Gainesville to Lake Lanier (Hall Co.)	031300010803B	0.2200	0.1000
Flat Shoal Creek	West Point (Troup/Harris Co.)	031300021007	0.0030	0.0012
Flint River	Hwy 138 to N. Hampton Road	031300050101A	0.1400	0.4300
Flint River	Road S1058/Woolsey Rd. to Horton Creek	031300050106B	0.0015	0.0034

Site	Location	HUC	Fraction Urban	Fraction Single Family Residential
Fowltown Creek	D/S Armena Rd. To Kinchafoonee Creek (Lee Co.)	031300070604	0.0012	0.0006
Gum Creek	Downstream Cordele to Lake Blackshear	031300060605B	0.0100	0.0100
Hannahatchee Creek	U.S. Hwy. 27 to Lake W.F. George (Stewart Co.)	031300030705	0.0005	0.0007
Hilly Mill Creek	Heard/Coweta Counties	031300020408C	0.0007	0.0002
Johns Creek	Headwaters to Chattahoochee River (Fulton Co.)	031300010906	0.1000	0.6600
Lanahassee Creek	W. Fork Lanahassee Creek to Kinchafoonee Creek (Webster Co.)	031300070203	0.0013	0.0002
Level Creek	Headwaters to Chattahoochee River (Gwinnett Co.)	031300010902B	0.0500	0.4900
Lime Creek	Little Lime Creek to Lake Blackshear (Sumter Co.)	031300060407	0.0000	0.0001
Long Cane Creek	Blue John Creek to Chattahoochee River	031300020912	0.0107	0.0110
Long Island Creek	Headwaters to Chattahoochee River (Fulton Co.)	031300011105B	0.1700	0.7900
Lullwater Creek	DeKalb County	031300011202C	0.1500	0.6700
Marsh Creek	Fulton County	031300011101B	0.2700	0.6100
Mobley Creek	Douglas County	031300020309B	0.0571	0.2857
Mossy Creek	Totherow Rd. near Clermont to Chattahoochee River (White/Hall Co.)	031300010302B	0.0100	0.0036
Mountain Oak Creek	Hamilton (Harris Co.)	031300021104B	0.0100	0.0001
Muckaloochee Creek	Little Muckaloochee Creek to Smithville Pond (Sumter Co.)	031300070903	0.0016	0.0016
Mud Creek	Ga. Hwy. 120 to Noses Creek (Cobb Co.)	031300020206C	0.0200	0.5900
Mulberry Creek	Ossahatchie Creek to Five Points Branch West near Mulberry Grove (Harris Co.)	031300021208B	0.0016	0.0001
Nancy Creek	Headwaters to Peachtree Creek, Atlanta (DeKalb/Fulton Co.)	031300011203A	0.2500	0.6500
New River	Corinth (Heard Co.)	031300020505B	0.0003	0.0001
Nickajack Creek	Headwaters to Chattahoochee River (Cobb Co.)	031300020102	0.1500	0.6100
North Fork Balus Creek	Gainesville (Hall Co.)	031300010803F	0.0500	0.0600
North Fork Peachtree Creek	Headwaters to Peachtree Creek, Gwinnett/DeKalb/Fulton Co.	031300011201C	0.3378	0.5405
Olley Creek	Cobb County	031300020207	0.2300	0.5400
Pataula Creek	Hodchodkee Creek to W.F. George Lake (Quitman/Clay Co.)	031300031508B	0.0002	0.0004
Patsiliga Creek	Beaver Cr. to Flint River, Butler (Taylor Co.)	031300051405	0.0100	0.0040
Pea Creek	Fulton County	031300020305	0.0013	0.1100
Peachtree Creek	I-85 to Chattahoochee River, Atlanta (Fulton Co.)	031300011204A	0.2700	0.6700
Peavine Creek	DeKalb County	031300011202B	0.2200	0.7500
Potato Creek	U.S. Hwy. 333 to Upson Co. Line (Lamar Co.)	031300050904B	0.0100	0.0040
Proctor Creek	Headwaters to Chattahoochee River, Atlanta (Fulton Co.)	031300020101C	0.4100	0.4300
Red Oak Creek	Little Red Oak Creek to Flint River near Imlac (Meriwether Co.)	031300050505	0.0016	0.0010
Rottenwood Creek	Headwaters to Chattahoochee River (Cobb Co.)	031300011104A	0.6700	0.1400

Site	Location	HUC	Fraction Urban	Fraction Single Family Residential
Sandy Creek	I-285 to Chattahoochee River (Fulton Co.)	031300020101B	0.1800	0.6300
Sewell Mill Creek	Cobb County	031300011103D	0.0511	0.8828
Soquee River	Goshen Creek to SR 17, Clarkesville (Habersham Co.)	031300010202	0.0004	0.0005
South Fork Peachtree Creek	Atlanta (Fulton Co.)	031300011202	0.3135	0.5196
Suwanee Creek	Mill Creek to Chattahoochee River (Gwinnett Co.)	031300010904	0.0600	0.0600
Sweetwater Creek	U/S Pine Valley Rd. to Noses Creek (Paulding/Cobb Co.)	031300020208	0.1625	0.4375
Swift Creek	Tobler Creek to Flint River (Upson Co.)	031300060608	0.0000	0.0000
Tesnatee Creek	Cleveland (White Co.)	031300010504	0.0100	0.0100
Turkey Creek	Pennahatchee Creek, NW Cordele to Flint River (Dooley Co.)	031300060507	0.0008	0.0010
Ulcohatchee Creek	Headwaters to Auchumpkee Creek (Crawford Co.)	031300051206	0.0011	0.0003
Utoy Creek	Atlanta (Fulton Co.)	031300020103A	0.1800	0.4200
Ward Creek	Cobb County	031300020205B	0.1300	0.7100
Weracoba Creek	Columbus (Muscogee Co.)	031300030104A	0.2800	0.4000
West Fork Little River	Headwaters to above Lake Lanier (White/Hall Co.)	031300010402A	0.0022	0.0024
White Oak Creek	Fulton County	031300020312B	0.0900	0.1900
Whitewater Creek	Headwaters to Little Whitewater Creek (Taylor Co.)	031300051503	0.0069	0.0001
Whitewater Creek	Big Whitewater Creek to Cedar Creek (Taylor/Macon Co.)	031300051507	0.0014	0.0012
Willeo Creek	Cobb/Fulton Counties	031300011102	0.0500	0.8600

in the regionalization consisted of the post-1992 data collected for the “limited data” TMDL sites, plus data provided by GA EPD for the TMDL Curve sites.

The empirical Bayes implementation yields the regionalization parameters shown in Table 2. These parameters are then used in Equation 9 to maximum likelihood estimates of 2 for each site. This in turn allows calculation of the translation factors through equation 6. The resulting TMDL estimates are provided in the main document.

Table 2. Regional Regression Parameter Estimates to Predict Long-Term Average Log base 10 Fecal Coliform Bacteria Concentration

Area	Intercept	Coefficient on fraction urban area	Coefficient on fraction single family residential
ARC	2.21	1.33	0.457
Outside ARC	2.13	2.73	NA

For both areas, the estimate of Φ_B is zero. This is a common occurrence in the method, and does not interfere with application. The implications are discussed by Berger (1985, p. 177) who states that the presence of a zero estimate of the regional or prior variance does not mean that there is no uncertainty in the estimate of the regional parameters. Rather, it implies a *lack* of information about Φ_B due to the fact that the likelihood function for Φ_B is quite flat.

The resulting empirical Bayes estimates of the site statistics are provided in Table 3.

Selection of Equivalent Site

Selection of equivalent sites proceeded with the following rules:

1. In the case where valid geometric mean data are available for a downstream segment within the same watershed, this site (or sites) was used as the equivalent site.

2. The total pool of equivalent sites available consisted of all the sites with completed TMDL estimates provided by GA EPD. Potential equivalent sites for segments within the Atlanta Metropolitan area were selected from other sites in the metro area; the pool for sites outside the metro area was other sites outside the metro area.

3. Where an equivalent site was not already present in a downstream segment, up to 5 equivalent sites were selected from within an approximately 10 mile radius, depending on availability. If the subject site is a headwater basin, preference was given to selection of equivalent sites that were also headwater basins, as these should have similar flow regimes.

4. If no equivalent sites were present within a 10 mile radius of the subject site, 1 or 2 equivalent sites were picked from the general pool of sites that had similar land use and drainage area size.

Selected equivalent sites for each limited-data site are identified in a table in the main report.

Translating Results to TMDLs

When a single equivalent site is used, estimation of the TMDL is straightforward. The procedure is the same as is used for the sites with valid geometric mean data, except that the estimates of critical load and associated flow are obtained from the equivalent site using the methods described in this appendix.

When multiple equivalent sites are used, the situation is somewhat more complicated, as each equivalent site may produce a different estimate of critical load and flow. The Bayes procedure described in this appendix is based, of necessity, on determining the relationship of long-term geometric means between sites. As a result, the primary output of this procedure is an estimate of the needed percent reduction, while the estimates of critical loads are less reliable because the regionalization reflects mean loads rather than critical loads. For this reason, the TMDL table entry for a limited-data site with multiple equivalent sites is filled in starting with the estimated percent reduction as the primary output and working

Table 3. Empirical Bayes Sufficient Statistics for Limited Data Sites (Expressed as Log base 10)

Site Name	HUC ID	µ EB (Equation 9)	V EB (Equation 10)
Atlanta Metro Area (ARC) Sites			
Ball Mill Creek	031300010907B	2.694	0.024
Hog Wallow Creek	031300011004B	2.830	0.358
Foe Killer Creek	031300011004C	2.795	0.350
Marsh Creek	031300011101B	2.898	0.062
Bishop Creek	031300011103B	2.792	0.349
Sewell Mill Creek	031300011103D	2.664	0.026
Foxwood Branch	031300011104C	2.704	0.329
Arrow Creek	031300011201B	3.211	0.018
South Fork Peachtree Creek	031300011202A, E	2.896	0.033
Peavine Creek	031300011202B	2.789	0.069
Lullwater Creek	031300011202C	2.738	0.061
Burnt Fork Creek	031300011202D	2.934	0.033
Bubbling Creek	031300011203B	3.206	0.028
Woodall Creek	031300011204B	3.245	0.462
Tanyard Branch	031300011204C	3.184	0.446
Clear Creek	031300011204D	3.029	0.406
North Utoy Creek	031300020103B	2.652	0.318
South Utoy Creek	031300020103C	2.719	0.333
Cracker Creek	031300020203C	2.670	0.322
Ward Creek	031300020205B	2.631	0.020
Trib to Mud Creek	031300020206B	2.425	0.270
Mud Creek	031300020206C	2.505	0.015
Olley Creek	031300020207	2.721	0.028
Buttermilk Creek	031300020208C	2.741	0.027
Pea Creek	031300020305	2.273	0.014
White Oak Creek	031300020312B	2.259	0.021
Turkey Creek	031300050302B	2.394	0.264
Non-ARC Sites			
Balus Creek	031300010803C, D, G	2.397	0.033
Mud Creek (S Hall)	031300010804B	2.244	0.178
North Fork Balus Creek	031300010803F	2.258	0.017
Hilly Mill Creek	031300020408C	2.132	0.020
Blue John Creek	031300020911A, F	2.305	0.187
Park Branch	031300020911D	2.472	0.213
Tanyard Creek	031300020911E	2.782	0.265
Rocky Branch	031300030101C	2.873	0.282
Weracoba Creek	031300030104A	2.885	0.038
Chattahoochee River	031300040101B	2.129	0.089
Big Slough	031300080505, 031300080506B	2.129	0.162

backward to fill in the other entries. The estimate of the TMDL is set at the average of the TMDL curve points determined in relationship to each of the equivalent sites. The estimate of "current" critical load is then set to a value such that "current" load times percent reduction equals the TMDL. When more than one equivalent site is used, this procedure results in an estimate of “current” critical load that may differ somewhat from the average of the critical load estimates obtained from the equivalent sites, but is within the range of the critical load estimates from the equivalent sites.

References

Berger, J.O. 1985. *Statistical Decision Theory and Bayesian Analysis* (2nd Edition). Springer-Verlag, New York.

CDM. 1996. Clear Creek Sewershed Evaluation. Report prepared for the U.S. Army Corps of Engineers, Mobile District.

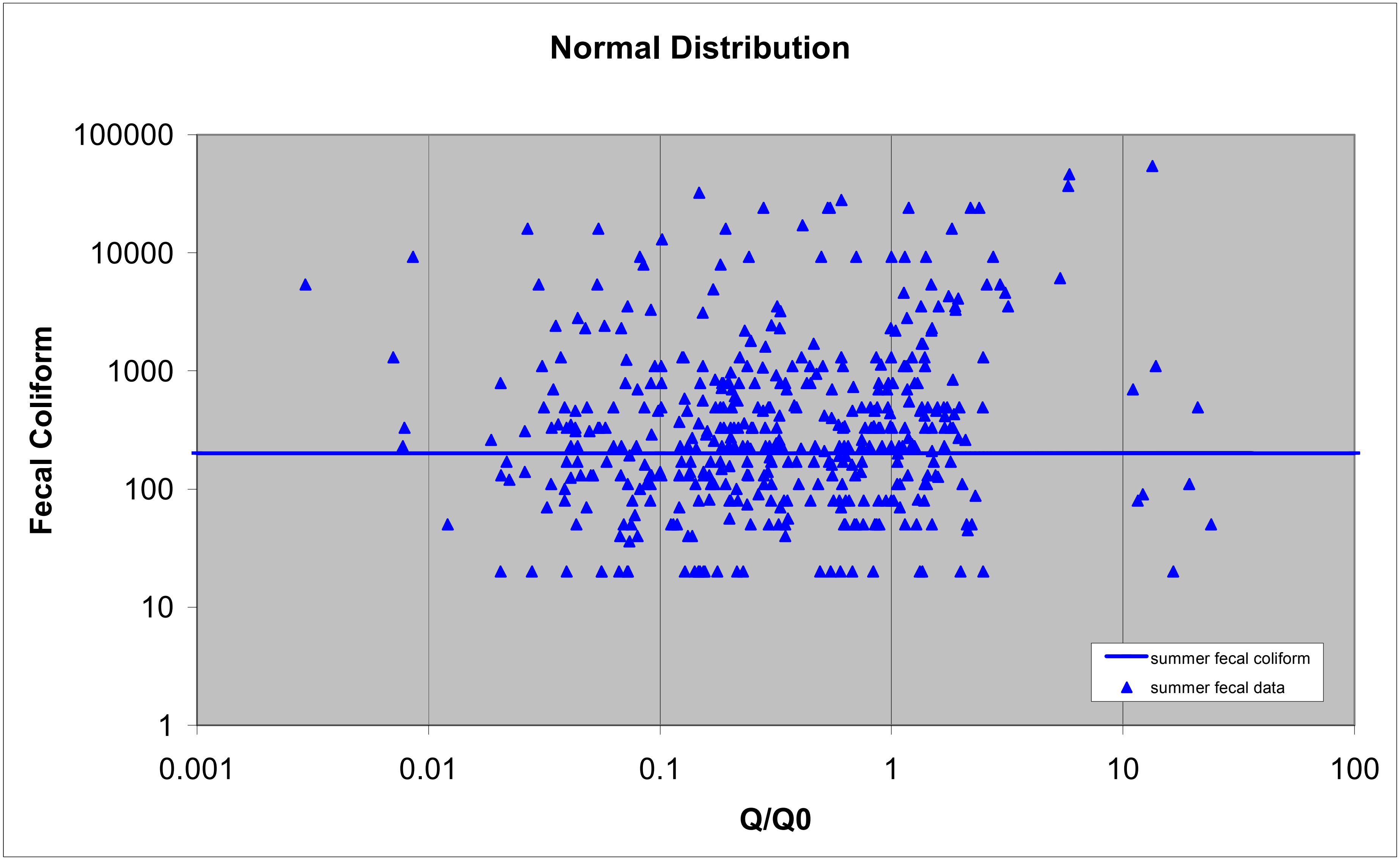
CH2M HILL. 1999. East Watershed Final Impact Assessment. Report prepared for Metro Atlanta Urban Watersheds Initiative.

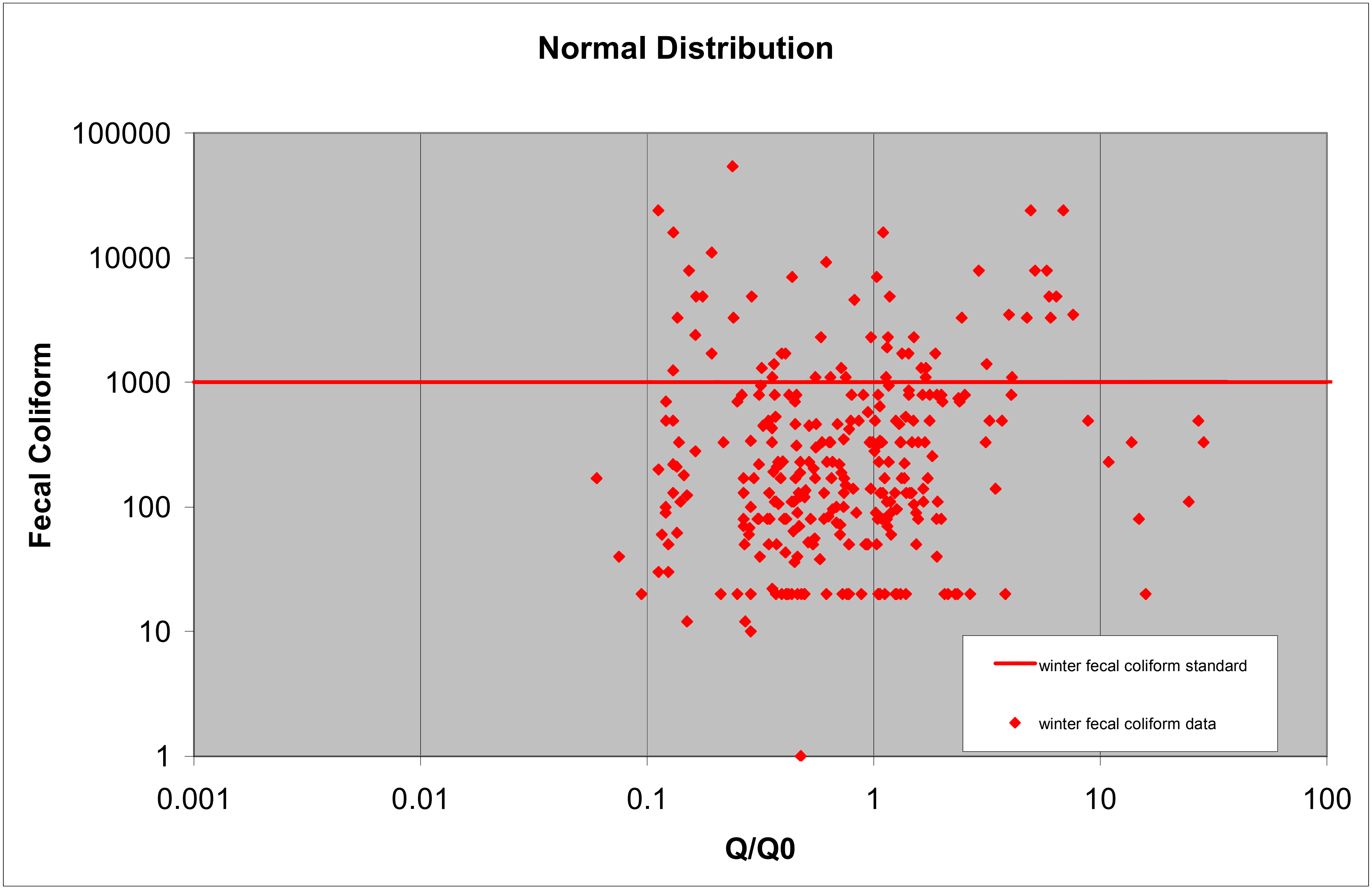
Morris, C. 1983. Parametric empirical Bayes inference: Theory and applications. *J. Amer. Statist. Assoc.*, 78: 47-65.

Quasenbarth, T. 1993. Selection of Water Quality Load Factors (Draft Working Paper). Report prepared by CDM for Atlanta Regional Stormwater Characterization Study.

Appendix D

Normalized Flows Versus Fecal Coliform Plots


Normal Distribution
100000
10000
1000
100
10
1
Fecal Coliform
0.001
0.01
0.1
1
10
100
Q/Q0
summer fecal coliform
summer fecal data


Normal Distribution
100000
10000
1000
100
10
1
Fecal Coliform
0.001
0.01
0.1
1
10
100
Q/Q0
winter fecal coliform standard
winter fecal coliform data

APPENDIX C: DEKALB COUNTY WATERSHED MONITORING DATA

Site: **Chattahoochee River:** **Nancy Creek at Chamblee Dunwoody Road**

State Standard			>6	>5	<32.2										<200 summer	
State Standard - Secondary			<8.5												<1000 winter	

DATE	Rainfall fro	TIME	pH	DO	Temp	Cond	Turb	Temp_Air	BOD5U	NTKN	NH3	NO2NO3	P-Total	P-Ortho	Fecal	Ecoli
;UNITS		TIME	SU	mg/L	Deg C	umho/cm	NTU	deg C	mg/L	ng/L as N	ng/L as N	mg/L as N	mg/L as P	mg/L as P	#/100 mL	#/100 mL
			M	M	M	M	M	M	G	G	G	G	G	G	G	G
			1	1	1	1	1	1	1	1	1	1	1	1	1	1
1/8/2003			6.9	12.4	5.6	101	12		<2		<0.1		0.03			
1/15/2003			7.2	9.5	4.6	96	8		<2		<0.10	0.9	0.02			
1/22/2003			6.6	6.8	8.2	103	10		2		<0.10		0.05			
1/29/2003			7.2	10.6	6.6	91	7		<2		<0.1		0.1			
4/2/2003			7.3	12.1	12.7	102	9		<2		0.12	1.3	0.02			
4/9/2003			7.1	9.7	12.4	109	10		2		0.1	1	0.04			
4/16/2003			7.3	6.5	15.3	109	11		<2		0.24		0.02			
4/23/2003			6.6	10.1	13.9	103	14		<2		0.11		0.1			
7/2/2003			7.2	7.3	20.4	85	51		2		<0.10		0.09			
7/9/2003			7.4	6.9	21.8	85	23		<2		<0.10	1.3	0.04			
7/16/2003			7.2	6.9	20	94	10		2		<0.10	1.2	0.03			
7/23/2003			6.6	7.3	21.9	40	159		3		<0.10	0.8	0.2			
10/1/2003			7.8	8	15.5	87	9		<2		<0.10	0.2	0.02			
10/8/2003			7.7	6.9	18.2	42	97		4		<0.10	0.7	0.19			
10/15/2003			7.4	7.1	15	82	8		2		<0.10	1.6	0.02			
10/22/2003			7.9	7.4	15.5	90	4		<2		<0.10	0.2	0.02			
1/7/2004			7.4	11.6	4.6	87	14		<2		0.34	1.7	0.14			
1/14/2004			7.1	10.7	6.8	85	6		<2		0.24		0.03			
1/21/2004			7	10.2	4.6	91	6		<2		0.42	0.9	0.04			
1/28/2004			7.5	8.9	2	117	16		2		0.3	1.3	0.14			
4/7/2004			7.4	7.8	12.5	94	5		<2		<0.10		0.02			
4/14/2004			7.3	9.3	9.8	99	26		2		<0.10	0.5	0.03			
4/21/2004			7.1	8.1	16.6	102	6		<2		<0.10	0.9	0.04			
4/28/2004			7.1	7.9	14.4	111	9		<2		<0.10	0.3	0.02			
7/7/2004			7.1	4.4	23.2	80	37		2		0.12	1.2	0.07			
7/14/2004			7.2	4.8	24.8	110	4		<2		<0.10	1.8	0.04			
7/21/2004			7.1	5.8	23.1	97	10		<2		0.16	1.3	0.07			
7/28/2004			7.1	5.9	23	90	10		<2		0.13	1.4	0.02			
10/13/2004			7.4	6.5	18.1	98	15		<2		<0.10	0.9	0.03			
10/20/2004			7.5	6.8	17.5	53	66		2		<0.10	0.9	0.09			
10/27/2004			7.2	7	16.9	109	8		<2		<0.10	0.9	0.02			
1/5/2005			7.5	8.7	11.7	101	7		<2		<0.10		0.02			

1/12/2005			7.2	10.6	12.6	94	5		<2		0.11	0.9	0.02			
1/19/2005			8.5	11.8	3.9	109	8		2		0.24	1.6	0.01			
1/26/2005			8.1	9.7	7.2	101	4		<2		<0.10	4.8	0.29			
4/6/2005			7.7	7	15	114	8		<2		<0.10		0.09			
4/20/2005			7.7	6.5	15.2	97	4		<2		0.15		<0.01			
4/27/2005			8.7	7.2	13.5	71	22		2		<0.10		0.05			
7/6/2005			7.3	5.8	23	73	20		2		<0.10		0.06			
7/13/2005			6.6	5.9	22.7	74	36		<2		<0.10		0.06			
7/27/2005			7.2	7.6	24.2	98	5		<2		<0.10		0.22			
10/5/2005			7.7	6.4	20	83	4		<2		<0.10		0.02			
10/12/2005			7.8	6.4	19.8	87	6		<2		<0.10		0.03			
10/19/2005			7.5	7.1	16.5	91	6		<2		<0.10		0.03			
1/4/2006	0.00		7.2	9.2	8.9	97	20		2		0.19		0.1		5100	
1/11/2006			7.2	7.4	12.1	95	5		<2		0.3		0.03			
1/18/2006	T		6.3	9.7	8.3	86	51		2		<0.10		0.04		2200	
1/25/2006	0.00		6.5	9.3	9	112	17		<2		<0.10		0.11		5200	
4/5/2006	0.00		7.6	9.1	13	95	4		<2		<0.10		0.24		320	
4/12/2006	0.00		7.2	9.3	13.9	95	5		2		<0.10		0.62		60	
4/19/2006	0.05		6.9	7.8	18	90	5		<2		0.1		0.02		1100	
4/26/2006	0.33		7	6.7	18.9	105	6		<2		<0.10		0.04		1400	
7/11/2006	0.00		7.2	7.2	22.8	96	5		<2		<0.10		0.04		1200	
7/18/2006			6.9	6.2	24.9	110	3		2		0.64		0.08			
7/25/2006	0.01		6.9	7	23.6	106	4		<2		0.16		0.02		5800	
10/4/2006	0.00		7.1	8.1	19	94	3		<2		<0.10		0.02		4400	
1/3/2007	0.00		7.4	6.8	7.4	65	7		2		<0.10		0.03		570	
1/10/2007	0.00		7.2	6.7	7.3	104	8		<2		<0.10		0.02		320	
1/17/2007	T		7.2	6.6	8.1	90	7		<2		<0.10		0.16		1800	
1/24/2007	0.00		7	6.9	6.6	94	8		<2		0.12		0.13		110	
1/31/2007	0.00		7.3	7.6	3.9	103	4		<2		<0.10		0.12		300	
4/4/2007	0.01		7.6	8.6	17.2	72	28		7		<0.10		0.11		400000	
4/11/2007	0.04		7.6	8.7	12.1	75	24		<2		0.1		0.03		720	
4/18/2007	0.00		7.3	8.7	13.1	122	2		<2		0.16		0.03		260	
4/25/2007	0.00		6.8	8.9	16.9	114	3		<2		0.1		0.27		190	
7/3/2007	0.00		7.2	6.9	23.1	58	6		<2		0.15		0.18		1600	
7/17/2007	0.71		7.2	6.8	22	83	8		<2		0.13		0.07		85000	
7/24/2007	0.00		7.2	8.9	20.9	152	12		<2		<0.10		0.08		4400	
10/3/2007	T		7.2	7.6	19.7	54	6		<2		0.15		0.02		160	
10/10/2007	0.01		7.1	7.2	21.8	68	26		4		<0.10		0.06		30000	
10/17/2007	0.00		7.2	8.8	18.2	92	4		<2		0.12		0.1		770	
10/24/2007	0.30	10:40	6.7	8.8	17.8	65.6	26		3		<0.10		0.57		6200	
1/2/2008	T	1000	7.4	12.7	4.8	63	10		<2		0.18		0.09		240000	
1/9/2008	0.40	1000	6.8	10.6	12.5	85	23		2		<0.10		0.16		4200	
1/16/2008	0.27	955	7	12.6	5.2	109	5		2		<0.10		0.01		3800	

1/23/2008	0.00	1000	7.4	13.2	5.2	104	12		2		0.13		0.03		2500	
4/2/2008	0.00	10:20	7	7.1	14.7	112	10		<2		0.1		0.03		2300	
4/9/2008	0.00	10:00	7.6	10.3	14.6	127	2		<2		<0.10		0.09		2200	
4/16/2008	0.00	10:00	7.1	8.3	10.9	123	10		<2		<0.10		0.03		280	
4/23/2008	0.00	9:45	7.5	6.6	16.5	120	6		<2		<0.10		0.03		840	
7/1/2008	0.00	9:52am	6.8	6.7	22.3	95	6		2		0.12		0.07		380	
7/8/2008	0.38	1005	7.1	6.3	24	87	18		6	<0.10	0.33		0.14		33000	
7/15/2008	0.00	930	6.9	7.1	23.6	81	13		<2		0.12		0.04		3000	
7/22/2008	0.28	10:33	7.3	6.7	25.1	103	4		<2		<0.10		0.2		580	
10/1/2008	0.00	1000	7.3	7.4	19.2	95	3		<2	<0.10	<0.10		0.03		90	
10/8/2008	2.04	10:30	7.3	7.8	18.4	119	11		7		<0.10		0.35		17000	
10/15/2008	0.00	1000	7.3	8.3	18.1	98	4		<2		<0.10		0.02		110	
10/22/2008	0.00	945	7.3	8.4	13.3	95	3		<2		0.2		0.09		800	
1/7/2009	0.66	9:30	6.2	9.8	13.4	54	64		2		<0.10		0.07		2800	
1/14/2009	0.00	10:00	6.5	12.4	5.4	119	7		<2	1.28	1.3		0.12		13000	
1/21/2009	0.00	9:45	6.2	lab error	1.7	146	4		<2		<0.10		0.02		100	
1/28/2009	0.20	9:45	7.2	11.7	9.8	111	6		<2		0.12		0.01		160	
4/1/2009	0.23	1025	5.2	9.6	13.6	99	20		5	<0.1	<0.10		0.05		5800	
4/8/2009	0.00	1000	7.7	11.8	8.4	139	6		<2		<0.10		<0.01		240	
4/22/2009	0.00	1010	7.8	9	13.1	122	7		2		<0.10	0.42	<0.01		480	
7/7/2009	0.54	10:25	7.2	5.4	23.4	86	8		<2	0.55	0.19	0.56	0.05		470	
7/14/2009	0.00	9:35	6.8	6.6	23	74	12		<2		0.17	0.83	0.06		20000	
7/21/2009	0.00	10:05	7	6.6	21.2	87	10		2		0.1		0.01		700	
7/28/2009	0.03	9:25	7.6	5.9	23.3	89	8		<2		<0.10		0.07		580	
10/7/2009	0.85	10:00	8.1	8.2	20.1	44	77		3		<0.10	0.36	0.13		22000	
10/14/2009	0.54	10:00	7.3	6.1	19	62	42		3		<0.10	0.27	0.1		6200	
10/21/2009	0.00	9:50	7.6	9.6	11.9	130	4		<2		0.22	0.57	0.03		4300	
1/6/2010	0.00	9:39	8.3	11.7	1.5	144	7		<2		<0.10	0.72	0.05		110	
1/13/2010	0.00	10:08	8	12	2.8	88	12		<2		0.13		0.02		80	
1/20/2010	T	9:30	7.5	10.5	8.6	98	13		<2		0.14	0.69	0.04		300	
1/27/2010	0.00	9:50	7.5	11.3	6.1	116	9		2		0.1	0.73	0.03		2800	
4/7/2010	0.00	9:52	7.5	9.1	17.9	125	6		2		<0.10	0.43	0.02		300	
4/14/2010	0.00	10:15	7.4	9.8	15.8	86	10		2		<0.10	0.52	0.04		850	
4/21/2010	0.01	10:20	7.5	9.5	14.8				4		0.14	0.73	0.02		270	
4/28/2010	0.00	10:15	7.5	8.4	13.7	109	32		<2		<0.10	0.52	0.12		400	
7/6/2010	0.00	10:20	7.5	5.7	22.8	114	9		2		<0.10		0.05		160	
7/13/2010	0.38	9:30	7.5	6.5	25.1	90	52		6		<0.10		0.12			
7/20/2010	0.03	9:30	7.3	6.5	25.1	108	5		<2		<0.10		0.06		660	
7/27/2010	0.01	9:30	7.3	6.8	25.5	54	37		3		<0.10		0.11		12000	
10/6/2010	0.00	10:10	7.3	11.5	13.8	98	7		<2		<0.10		0.08		360	
10/13/2010	0.00	10:00	9.4	9	17.4	111	4		2		<0.10		0.03		400	
10/27/2010	1.32	9:55	7.3	7	19.9	107	12		4		1.52		0.08		35000	
1/5/2011	0.24	10:15	7.1	15.1	6	95	7				<0.10		0.01		130	

1/26/2011	0.21	10:05	6.7	11.1	6.4	112	42		3		<0.20		0.1		1400	
4/6/2011	0.00	10:20	7.3	9	11.7	83	16		3		1.39		0.04		8000	
4/13/2011	0.00	10:00	7.2	9	15.4	93	11		2		0.2		0.06		6900	
4/20/2011	0.00	9:50	7.5	8.5	17	97	4		2		0.44		0.03		3300	
7/5/2011	0.01	10:45	7.3	8.7	23.5	58	36		4		<0.10		0.1		18000	
7/12/2011	0.08	1030	7.3	6	25	95	7		2		0.29		0.05		470	
7/19/2011	0.00	950	7.1	6.6	23.5	109	6		2		0.16		0.08		160	
7/26/2011	0.00	1015	7.8	5.7	24.7	55	28		2		<0.10		0.07		21000	
10/5/2011	0.00	10:55	7.3	7.2	16.5	138	15		3		0.52		0.14		550	
10/12/2011	0.02	955	7.1	8.5	17.1	65	12		2		<0.10		0.06		5200	
10/19/2011	0.59	1025	7.3	9	17.1	37	53		5		<0.10		0.15		22000	
10/26/2011	0.00	940	7.6	8.5	15.7	111	10		<2		<0.10		0.02		130	
1/4/2012	0.00	10:20	7.5	11.5	3.9	111	14		<2		0.1		0.01		120	
1/11/2012	0.23	10:20	7.7	10.1	13.3	49	27		2		<0.10		0.05		8100	
1/18/2012	0.12	10:10	7.8	10.4	10	63	32		3		0.13		0.09		2400	
1/25/2012	0.00	11:05	7.3	10.2	10.3	99	7		3		0.31		0.06		5000	
4/4/2012	0.61	10:05	7.4	7.5	19.8	60	29		10		0.19	0.5	0.11		43000	5600
4/11/2012	0.00	10:15	7.2	7.5	15.8	108	7		2		0.72	<0.20	0.08		750	160
4/18/2012	1.00	10:05	7.8	7.4	17.4	42	31		5		0.14	<0.20	0.13		31000	5400
4/25/2012	0.00	10:10	7.7	9.4	14.1	122	12		2		0.27	2.6	0.07		570	510
7/3/2012	0.08	10:05	7.4	6.5	24.7	127	4		3	6.99	0.13		0.05		80	
7/10/2012	0.25	9:45	7.6	7.7	23.9	90	9		3		0.26	0.46	0.07		890	
7/17/2012	T	9:55	7.9	7.8	24.8	115	5		<2		0.18		0.06		3300	
7/24/2012	0.00	9:50	8	7.8	25.3	61	10		<2		0.15	0.54	0.05		4000	
10/3/2012	0.00	10:25	lab error	6.2	19.5	79	16		12		0.25	0.52	0.33		60000	
10/10/2012	0.00	10:10	7.6	5.6	15.7	133	20		2		0.41		0.06		2600	
10/17/2012	0.00	10:40	7	8.1	17.8	126	4		<2		<0.10	0.46	0.03		390	
10/24/2012	0.01	9:50	7.6	8.5	15.1	131	3		<2		0.13		0.04		130	
1/2/2013	0.02	10:00	7.2	10.5	10	55	21		2	0.22	0.13		0.09		5400	
1/9/2013	0.00	10:25	7.2	9.2	9.9	160	8		8		2.78		0.31		29000	
1/16/2013	0.48	10:00	7.2	9.3	15.8	42	40		2		0.14		0.15		15000	
1/23/2013	0.00	10:10	7.2	9.7	8.9	152	8		6		<0.10		0.33		19000	
4/3/2013	0.14		7.8	10	13.2	111	5		2		0.27	0.54	0.18		4800	
4/10/2013	0.00		7.5	9.4	16.3	107	13		2		<0.10	0.27	0.04		140	
4/17/2013	0.00		7.7	8.8	18.3	117	13		2		0.25				330	
7/2/2013	0.02		7.1	8	22.4	64	10		3	1.9	<0.10	0.48	0.07		3000	
7/9/2013	T		7.6	7.9	22.7	112			2		0.19	0.65	0.03		6500	
7/16/2013	0.00		7.8	5.4	23.3	107	6		2		0.22		0.1		3100	
7/23/2013	T		7.3	7.8	22.8	99	4		2		0.2	0.47	0.05		22000	
10/2/2013	0.00		7.4	8.6	18.1	107	4		3		<0.10	0.83	0.04		430	
10/9/2013	0.00		7.3	8	17.5	103	7		5		0.78		0.12		60000	
10/16/2013	0.00		7.8	8.7	18.2	104	6		<2		<0.10		0.03		440	
10/23/2013	0.00		7.5	9.2	14.5	98	6		2		<0.10		0.02		210	

1/2/2014	0.16		7.8	10.4	8.9	115	5		<2	0.95	<0.10		0.01		140	
1/9/2014	0.01		7.7	12.2	2.9	126	8		<2		0.2		0.03		5800	
1/16/2014	0.00		7.8	11.2	6	121	5		<2		<0.10	1	0.02		360	
1/23/2014	0.00		7.9	11.7	4.2	92	4		<2		<0.10		<0.01		70	
4/2/2014	0.00		7.7	9.3	14.8	109	6		2		<0.10		0.09		310	
4/9/2014	0.00		7.1	9.7	12.8	105	12		2		<0.10	0.72	0.03		400	
4/16/2014	0.00		7.4	8.4	11.3	93	14		3		0.5	0.34	0.09		32000	
4/23/2014	0.01		7.8	9.1	15.6	120	5		<2		0.26	0.74	0.04		620	
7/1/2014	0.00		7.4	7.2	25.3	88	11		3	2.61	<0.10		0.13		11000	
7/8/2014	0.00		7.4	7.5	23.6	181	4		2		<0.10		0.03		300	
7/15/2014	T		7.1	7.5	23.7	71	18		4		<0.10		0.09		36800	
7/22/2014	T		7.4	8	22.1	75	12		2		0.14		0.06		40000	
10/1/2014	0.00		7.5	8.1	19.9	100	5		<2		0.24		0.05		60000	
10/8/2014	0.01		6.9	7.3	17.7	135	2		3		1.38		0.1		1800	
10/15/2014	0.00		7.1	7.4	17.7	68	20		2		<0.10	0.44	0.06		60000	
10/22/2014	0.00		7.2	6.9	14.6	112	8		2		0.14	0.34	0.13		31000	

average			7.3	8.4	15.5	96.4	14.4		3.0	2.1	0.3	0.9	0.1		13079.2	2917.5
max			9.4	15.1	25.5	181	159		12	6.99	2.78	4.8	0.62		400000	5600
min			5.2	4.4	1.5	37	2		2	0.22	0.1	0.2	0.01		60	160
median			7.3	8.1	15.8	97.5	8.0		2	1.28	0.18	0.72	0.05		1700	2955
															130	
															70	
															0.53846154	
NOTES														Meet stan	25	0.19230769
pH > 14 is impossible, noted as a lab error														exceeds su	35	0.26923077
DO >18 is impossible, noted as a lab error														exceeds w	70	0.53846154

acute criteria acute criteria acute criteria acute criteria = (e (0.8473[ln(hardness)] + 0.884))(0.978) µg/l
chronic criter chronic criter chronic criter chronic criteria = (e (0.8473[ln(hardness)] + 0.884))(0.986) µg/l

Solid TSS	CdTotal	CuTotal	PbTotal	ZnTotal	CdDissolve	CuDissolve	PbDissolve	ZnDissolve	Hardness	Alkalinity	Turb- Lab
mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L as CaCO3	ng/L as CaCO	NTU
G	G	G	G	G	G	G	G	G	G		M
1	1	1	1	1	1	1	1	1	1		1
									32	18	
									35	20	
									34	19	
									30	31	
									46	24	
									41	32	
									49	31	
									38	35	
									42	22	
									35	20	
									30	16	
									26	7	
									27	13	
									26	9	
									33	17	
									34	16	
									32	18	
									32	27	
									42	21	
									48	22	
									51	15	
									43	25	
									40	26	
									38	28	
										16	
									71	25	
										22	
										23	
										24	
										24	
										3.6	
										30	

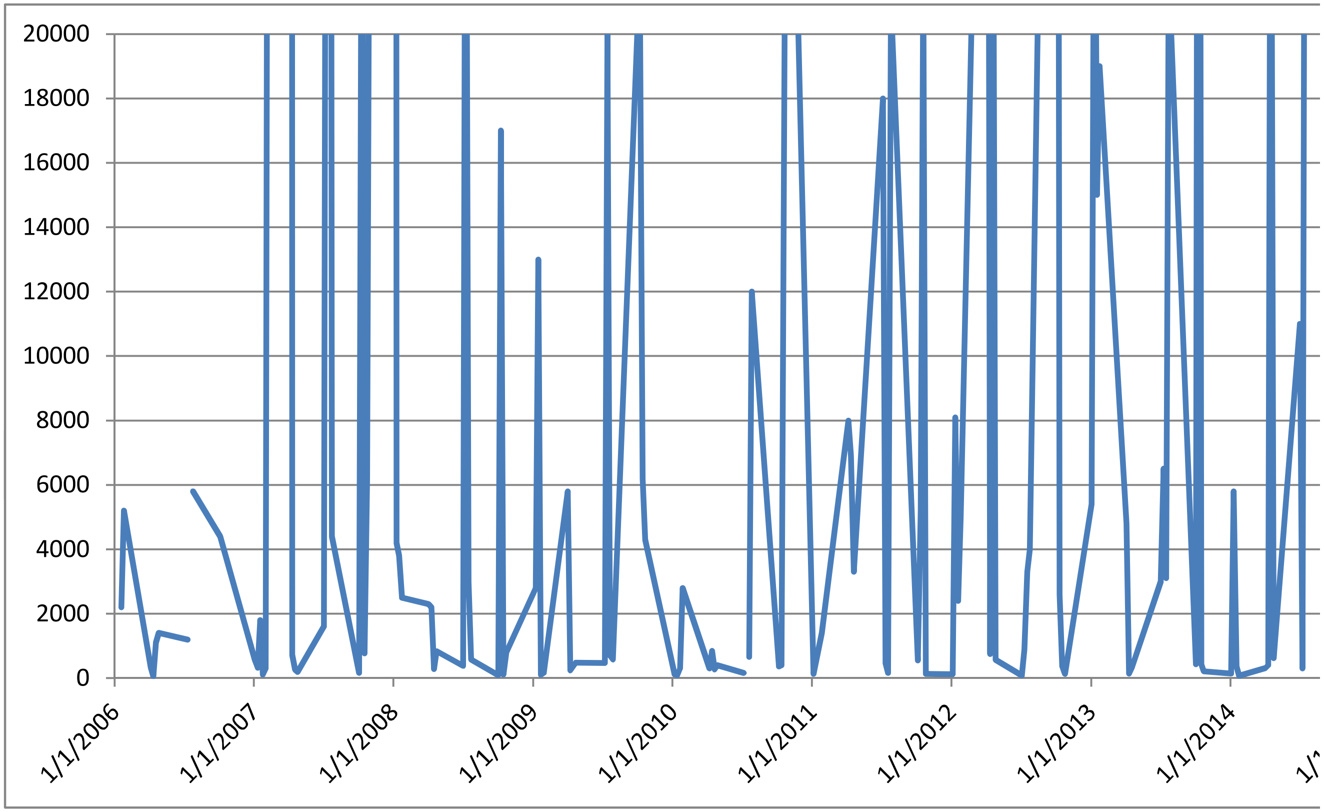
										28	
										31	
										27	
										39	
										30	
										21	
										18	
										21	
										23	
										21	
										24	
										16	
	0.1	4.26	2.36	19.4						20	
										21	
										20	
										25	
	0.12	16.2	4.37	117						34	
										26	
										23	
										21	
	0.08	1.52	4.52	10.8						34	
										26	
										22	
	2	2.02	0.89	4.1						21	
	0.13	7.66	4.57	38.1						26	
										21	
										20	
										24	
										22	
18	0.05	14.8	6.53	51.7					23	15	
										47	
										28	
										26	
										38	
										20	
	<1.0	2.29	4.43	39.8					23	65	
3	0.03	2.5	0.89	11.5					25	20	
										12	
										37	
										21	
	<1.0	2.58	3.72	26						67	
										82	
										149	

										24	
4	<1.0	2.2	3.98	20.5					36	24	
										34	
										41	
										32	
									23	11	
11	<1.0	5.34	3.26	49.3						14	
										19	
										37	
1	<1.0	6.51	3.27	20.2					22	30	
										22	
										36	
										42	
	1.16	26.6	23.8	91.5						10	
9										45	
										40	
										74	
15	<1.0	<1.0	3.69	42.5					29	16	
										44	
										30	
5	<1.0	52.8	16.2	109					36	24	
										20	
										25	
										25	
	<1.0	16.5	9.89	52.3						15	
										15	
										38	
	<1.00	1.65	1.76	22.8						33	
8									30	38	
										34	
										25	
3	<1.0	16.3	4.4	37.3					3.9	32	
										38	
										35	
										29	
19	<1.0	13	7.7	37.6					31	34	
										36	
										40	
										19	
5	<1.0	53	3.91	21					32	26	
										31	
										25	
	<1.0	42.8	5.4	32.7						29	

										18	
7	<1.0	65	9.67	37.4					32	28	
										26	
										36	
28	<1.0	58.5	22.3	35.8					18	13	
										31	
										37	
										10	
20	<1.0	25	13.7	37.6					35	38	
										15	
										7	
										33	
9	<1.0	26.3	<1.0	10.1					45	33	
										14	
										16	
										27	
7	<1.0	30.3	<1.0	13.1					25	20	
										41	
										11	
										39	
1	<1.0	5.87	1.91	15.3					40	33	
										26	
										29	
										27	
10	<1.0	2.05	1.06	14.4					30	24	
										41	
										34	
										40	
10	<1.0	32.3	1.98	11					25	14	
										49	
										13	
										51	
5	<1.0	34.7	2.57	20.7					50	33	
										38	
										47	
10	<1.0	3.66	16.1	28.3						26	
										39	
										41	
										33	
3	<1.0	1.45	7.05	9.18					30	41	
										37	
										47	
										43	

3	<1.0	37.4	10.8	21.9					42	37	
										41	
										32	
										37	
1	<1.0	43.6	16.8	64					35	36	
										30	
										31	
										39	
15	<1.0	7.86	8.62	30.3					30	27	
										31	
										24	
										21	
4	<1.0	7.48	5.05	56.9					34	33	
										47	
										30	
										45	

8.7	0.5	19.2	7.0	35.0
28	2	65	23.8	117
1	0.03	1.45	0.89	4.1
7.0	0.11	13	4.475	29.3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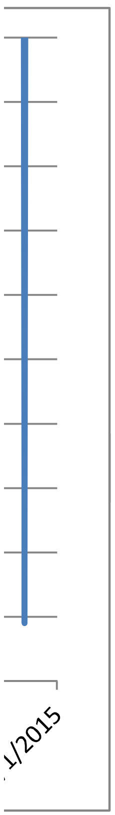
1/2015

Site: **Chattahoochee River:** **Nancy Creek at Johnson Ferry Road**

State Standard >6 >5 <32.2 <200 summer
State Standard - Secor <8.5 <1000 winter

DATE	TIME	pH	DO	Temp	Cond	Turb	Temp_Air	BOD5U	NTKN	NH3	NO2NO3	P-Total	P-Ortho	Fecal	Ecoli	Solid TSS
;UNITS	TIME	SU	mg/L	Deg C	umho/cm	NTU	deg C	mg/L	ng/L as N	ng/L as N	mg/L as N	mg/L as P	mg/L as P	#/100 mL	#/100 mL	mg/L
		M	M	M	M	M	M	G	G	G	G	G	G	G	G	G
		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1/8/2003		6.9	12.2	5.2	99	16		<2		<0.1		0.04				
1/15/2003		7.1	9	3.9	104	11		<2		<0.10	0.9	0.02				
1/22/2003		6.6	6.6	8.5	112	12		2		<0.10		0.04				
1/29/2003		7.2	10.3	6.7	102	11		<2		<0.10	1	0.01				
4/2/2003		7.2	11.5	12.8	106	10		<2		<0.10	1.1	0.04				
4/9/2003		7.1	9.1	12.8	106	8		<2		0.1	1	0.05				
4/16/2003		7.3	6.4	15.7	115	11		<2		0.19		0.03				
4/23/2003		6.6	9	14.1	104	13		<2		0.25		0.03				
7/2/2003		7.1	7	21	69	46		2		<0.10		0.1				
7/9/2003		7.1	6.7	23.2	92	20		<2		<0.10	1	0.06				
7/16/2003		7	6.8	22	92	15		2		<0.10	1.1	0.05				
7/23/2003		6.5	6.9	22.8	46	78		3		<0.10	1	0.12				
10/1/2003		7.4	8.7	15.5	89	6		<2		<0.10	0.2	0.02				
10/8/2003		7.4	6.4	18.6	48	101		4		<0.10	0.6	0.26				
10/15/2003		7.3	7.3	15.6	87	9		2		<0.10	1.1	0.03				
10/22/2003		7.6	7.9	15.3	110	3		<2		<0.10	0.5	0.02				
1/7/2004		7.4	11.8	3.9	91	11		<2		0.28	0.9	0.14				
1/14/2004		7.1	9.7	6.3	113	10		<2		0.68		0.14				
1/21/2004		6.9	11.1	3.6	95	4		<2		0.24	0.4	0.03				
1/28/2004		7.4	8.7	2.9	102	14		2		0.24	1.4	0.14				
4/7/2004		7.3	8.4	12.7	102	4		<2		<0.10		0.05				
4/14/2004		7.2	8.8	10.5	93	18		2		<0.10	2.6	0.04				
4/21/2004		7.2	7.1	17.1	99	5		<2		<0.10	0.9	0.04				
4/28/2004		7.2	7.3	14.6	114	6		<2		<0.10	0.3	0.02				
7/7/2004		7.1	3.8	23.7	75	19		2		<0.10	0.9	0.06				
7/14/2004		7	4.4	24.9	52	4		2		<0.10	1	0.03				
7/21/2004		7	5.4	23.3	101	5		<2		<0.10	0.9	0.06				
7/28/2004		7	5.5	23.8	95	7		<2		<0.10	1.2	0.02				
10/13/2004		6.9	3.4	18.9	126	7		3		0.59	0.8	0.17				
10/20/2004		7.3	6.1	18	89	37		3		0.12	1.1	0.08				
10/27/2004		7.1	6	17.4	111	7		<2		0.1	0.8	0.03				
1/5/2005		7.4	8.8	11.3	104	10		<2		<0.10		0.03				

1/12/2005		7.3	10.5	12.5	107	8		<2		0.18	1.5	0.02				
1/19/2005		9.1	11.8	3.4	108	16		2		0.14	1.8	0.01				
1/26/2005		7.7	10.4	6.4	105	5		2		<0.10	1.9	0.17				
4/6/2005		7.7	7.7	15	111	6		<2		<0.10		0.05				
4/20/2005		7.5	7.3	15.7	104	4		<2		<0.10		0.02				
4/27/2005		8.1	7.4	13.6	75	20		2		<0.10		0.04				
7/6/2005		7.1	5.3	24.2	86	12		2		<0.10		0.05				
7/13/2005		7	5	23.7	76	37		<2		<0.10		0.06				
7/27/2005		7	7	25.7	102	5		<2		<0.10		0.04				
10/5/2005		7.4	5.9	20.7	93	6		<2		<0.10		<0.01				
10/12/2005		7.5	6	20.5	93	13		<2		<0.10		0.04				
10/19/2005		7.2	7.2	16.3	102	3		<2		<0.10		0.03				
1/4/2006		7.1	9.1	8.8	94	18		<2		<0.10		0.09		2800		
1/11/2006		7.2	7.8	12.3	96	5		<2		0.17		0.02				
1/18/2006		6.3	8.2	8.3	85	48		<2		<0.10		0.04		2600		
1/25/2006		6.8	9.2	8.7	102	25		<2		<0.10		0.05		2800		
4/5/2006		7.1	8.8	13.1	106	4		<2		<0.10		0.12		200		
4/12/2006		6.9	9.1	14.6	106	4		2		<0.10		0.04		200		
4/19/2006		6.9	7.4	19.1	99	4		<2		<0.10		0.02		340		
4/26/2006		6.8	7.3	20.1	112	4		<2		<0.10		0.05		360		
7/11/2006		7	6.5	24.1	103	4		<2		<0.10		0.03		230		
7/18/2006		7	6.1	25.7	118	3		<2		<0.10		0.03		320		
7/25/2006		7.3	5.7	24.5	108	5		<2		<0.10		0.03		560		
10/4/2006		7	7.5	19.4	113	37		<2		<0.10		0.05		600		
1/3/2007		7	6.6	7.5	64	8		2		<0.10		0.04		350		
1/10/2007		7	6.8	6.7	105	16		<2		<0.10		0.16		400		
1/17/2007		7.1	6.4	7.9	93	9		<2		<0.10		0.1		2100		
1/24/2007		7	7.6	6.2	99	7		<2		<0.10		0.02		150		
1/31/2007		7.2	7.7	2.9	116	4		<2		<0.10		0.32		460		
4/4/2007		7.4	8	18	85	20		4		<0.10		0.11		38000		14
4/11/2007		7.4	6.9	12.6	88	28		<2		<0.10		0.03		2300		
4/18/2007		7	7.4	14.2	120	2		<2		0.22		0.03		290		
4/25/2007		6	6.4	18.1	109	5		<2		0.15		0.16		440		
7/3/2007		7	6.1	23.9	61	5		<2		0.18		0.02		2300		
7/17/2007		7.1	6.3	23.5	50	9		<2		<0.10		0.03		4400		
7/24/2007		6.9	8	21.9	73	15		<2		0.11		0.09		1300		
10/3/2007		6.9	6.9	20.5	93	8		<2		<0.10		0.03		490		3
10/10/2007		7	6.7	21.7	80	15		3		<0.10		0.05		6000		
10/17/2007		7.1	7.8	19	105	3		<2		<0.10		0.18		530		
10/24/2007	10:50	6.8	8.1	18.4	79.9	18		3		<0.10		0.71		25000		
1/2/2008	1025	7.6	12.3	3.4	60	8		<2		0.17		0.14		5200		
1/9/2008	1020	7.2	9.7	12.5	84	21		2		0.25		0.14		4300		
1/16/2008	1010	7.2	12.1	4.9	115	6		2		<0.10		0.03		330		

1/23/2008	1020	7.5	13	5.4	122	9		1		0.12		0.02		610		
4/2/2008	10:35	7.1	8	15	112	5		<2		<0.10		0.03		470		3
4/9/2008	10:25	7.2	9.9	14.7	121	5		<2		0.1		0.05		120		
4/16/2008	10:30	7.6	8.5	11	229	4		<2		0.54		0.04		590		
4/23/2008	10:00	7.5	6	17.2	126	3		<2		<0.10		0.04		370		
7/1/2008	10:06am	6.7	6.6	22.3	106	3		2		<0.10		0.03		450		
7/8/2008	1025	6.9	6.9	24.6	116	3		2	0.13	<0.10		0.18		1300		1
7/15/2008	945	6.8	6.2	23.5	84	6		<2		<0.10		<0.01		7000		
7/22/2008	11:20	6.9	5.5	25.6	89	6		3		<0.10		0.2		190000		
10/1/2008	1016	7.3	6.5	19	101	3		<2	<0.10	<0.10		0.04		154		9
10/8/2008	10:15	7.4	7.1	18.4	102	17		7		0.16		<0.01		31000		
10/15/2008	1015	7.5	7.2	17.6	103	2		<2		<0.10		0.02		650		
10/22/2008	1000	6.9	7.6	13.4	110	2		<2		0.39		0.02		360		
1/7/2009	9:50	6.2	9.9	13.4	51	67		2		<0.10		0.07		6200		
1/14/2009	10:30	6.6	13.4	4.5	120	9		<2	1.06	1		0.11		18000		10
1/21/2009	10:00	6.3	lab error	1.8	145	3		<2		0.1		0.02		340		
1/28/2009	10:00	7	11.4	9.8	110	6		<2		<0.10		0.02		100		
4/1/2009	1100	6.5	8.6	14.1	88	21		4	<0.1	<0.10		0.07		2900		24
4/8/2009	1015	7.6	10.3	8.5	138	5		<2		<0.10		0.01		210		
4/22/2009	1030	7.8	8.7	13.2	119	5		<2		<0.10	0.4	<0.01		160		
7/7/2009	10:45	7.1	5.1	24.5	93	9		<2	1.33	<0.10	0.64	0.04		820		5
7/14/2009	9:50	6.9	5.6	23.8	70	11		<2		<0.10	0.36	0.06		4300		
7/21/2009	10:20	6.8	6.9	21.4	88	8		<2		<0.10		<0.01		650		
7/28/2009	9:40	7.4	6	24.4	87	4		2		<0.10		0.04		4600		
10/7/2009	10:20	8	7.9	20.3	44	80		3		<0.10	0.54	0.13		6200		
10/14/2009	10:25	7.3	7.8	18.9	63	42		3		<0.10	0.28	0.1		40000		
10/21/2009	10:05	7.7	9.8	15	131	8		<2		0.23	0.66	0.02		3500		
1/6/2010	10:00	8.3	12.1	0.7	151	13		<2		<0.10	0.7	0.02		190		
1/13/2010	10:30	7.8	11.6	3.3	93	36		<2		<0.10		0.04		660		22
1/20/2010	9:50	7.4	10.3	7.9	109	10		<2		<0.10	0.73	0.02		140		
1/27/2010	10:05	7.7	11.1	6.1	110	13		<2		<0.10	0.72	0.03		590		
4/7/2010	10:08	7	7	18.2	117	4		<2		<0.10	0.51	0.07		110		2
4/14/2010	10:25	7.4	7.1	16.9	95	5		<2		<0.10	0.57	0.04		160		
4/21/2010	10:35	7.5	7.7	15.6				3		<0.10	0.66	0.02		320		
4/28/2010	10:30	7.4	9.6	14.4	111	8		<2		<0.10	0.57	0.02		230		
7/6/2010	10:50	7	6.7	23.8	120	5		<2		<0.10		0.05		320		2
7/13/2010	9:45	7.6	5.8	25.7	99	23		4		<0.10		0.07				
7/20/2010	9:45	7.3	5.4	25.7	107	4		2		<0.10		0.03		380		
7/27/2010	10:00	7.4	5.1	26.1	58	29		3		<0.10		0.07		7000		
10/6/2010	10:30	6.6	10.5	14	98	4		<2		<0.10		0.03		200		4
10/13/2010	10:20	7.5	8.4	17.9	104	7		<2		<0.10		0.02		40		
10/27/2010	10:10	7.2	4.8	20.6	87	182		4		<0.10		0.3		30000		
1/5/2011	10:30	7.3	13.3	5.8	98	15				<0.10		0.03		120		

1/26/2011	10:20	6.9	11.3	6	144	33		3		0.39		0.09		1400		
4/6/2011	10:35	7.4	7.8	12.7	77	16		2		<0.10		0.04		1700		13
4/13/2011	10:20	7.5	8	15.3	90	10		2		0.1		0.03		2800		
4/20/2011	10:05	7.4	7.8	17.6	121	5		2		0.17		0.03		310		
7/5/2011	11:10	7.2	8	25.5	66	18		4		<0.10		0.05		7000		14
7/12/2011	1040	7.7	5.1	25.2	97	5		<2		<0.10		0.03		180		
7/19/2011	1005	7.3	5.8	23.9	114	11		<2		<0.10		0.08		480		
7/26/2011	1025	7.7	6	24.1	55	30		2		<0.10		0.07		19000		
10/5/2011	11:15	7.3	7.7	16	126	10		2		<0.10		0.03		140		2
10/12/2011	1010	7.1	6.8	17.6	72	9		2		<0.10		0.05		2800		
10/19/2011	1045	7.5	7.5	17.4	45	41		4		<0.10		0.15		30000		
10/26/2011	1000	8	9	16,3	128	10		<2		<0.10		0.02		30		
1/4/2012	10:45	7.8	11	3.5	101	6		<2		<0.10		0.01		100		3
1/11/2012	10:35	7.8	8.3	13.7	61	16		2		<0.10		0.04		3700		
1/18/2012	10:30	7.1	9.8	8.6	76	11		2		0.1		0.04		2200		
1/25/2012	11:25	6.7	9.4	9.6	86	9		<2		0.14		0.04		340		
4/4/2012	10:30	7	4.8	20.2	97	20		5		0.27	0.5	0.2		29000	4500	6
4/11/2012	10:30	7.4	6.8	14.9	110	4		<2		0.25	0.52	0.04		460		
4/18/2012	10:20	8.2	7.1	18.2	57	32		5		0.12	<0.20	0.17		38000	5600	
4/25/2012	10:25	6.9	10.8	14.5	128	4		2		<0.10	0.65	0.03		310	360	
7/3/2012	10:20	7.5	7	25.8	128	3		<2	7.23	<0.10		0.02		680		2
7/10/2012	10:00	7.6	7.1	25.3	70	11		3		<0.10	0.47	0.05		8400		
7/17/2012	10:05	7.6	7.3	25.3	113	4		<2		<0.10		0.04		1300		
7/24/2012	10:05	7.5	7	25.1	70	6		<2		<0.10	0.53	0.04		3000		
10/3/2012	10:40	lab error	7	20.1	77	13		13		<0.10	0.6	0.54		60000		8
10/10/2012	10:30	7.3	6.3	16	126	7		<2		<0.10		0.03		420		
10/17/2012	10:20	7.7	8.3	16	120	6		<2		0.1	0.39	0.04		540		
10/24/2012	10:15	7.7	7.3	14.3	130	8		2		<0.10		0.06		380		
1/2/2013	10:20	7.5	10.3	9.2	50	24		<2	0.96	<0.10		0.12		3700		9
1/9/2013	10:40	7.4	9.3	10.1	137	4		3		1.62		0.11		360		
1/16/2013	10:15	7.7	9.4	15.4	44	32		2		<0.10		0.14		9000		
1/23/2013	10:25	7.9	10.2	7.2	129	4		3		0.76		0.07		540		
4/3/2013		7.9	9.6	13.9	107	7		2		<0.10	0.66	0.11		340		6
4/10/2013		7.4	8.9	16.3	108	4		2		<0.10	0.41	0.04		220		
4/17/2013		7.5	8.3	20.7	104	5		2		<0.10		0.03		350		
7/2/2013		7.4	7.1	23.4	64	10		3	1.52	<0.10	0.55	0.07		1000		1
7/9/2013		7.5	7.2	24.2	105			<2		0.1	0.65	0.03		400		
7/16/2013		7.5	7.3	23.8	107	4		<2		<0.10		0.08		630		
7/23/2015		7.5	7.4	23	92	5		<2		0.14	0.61	0.05		3400		
10/2/2013		7.5	8.4	20.3	111	2		2		<0.10	0.68	0.02		480		1
10/9/2013		7.3	8.2	17.6	89	9		<2		<0.10		0.04		6800		
10/16/2013		7.8	8.5	18.5	107	2		2		<0.10		0.02		610		
10/23/2013		7.3	8.7	14.3	100	3		<2		<0.10		0.02		370		

1/2/2014		8.1	10	10.4	110	6		<2	0.93	<0.10		0.01		280		2
1/9/2014		7.7	12.2	12.2	114	6		2		0.2		0.03		1800		
1/16/2014		8.2	11.1	11.2	114	7		<2		<0.10	0.81	0.02		350		
1/23/2014		8.2	12.1	11.7	95	5		<2		0.12		0.02		720		
4/2/2014		7.7	9.5	15	122	5		2		<0.10		0.08		190		23
4/9/2014		7.1	9.1	13.5	106	13		2		<0.10	0.68	0.03		900		
4/16/2014		7.3	9.7	11.6	89	10		2		<0.10	0.37	0.06		2600		
4/23/2014		7.9	8.6	16.8	117	4		<2		0.12	0.69	0.03		270		
7/1/2014		7.3	7.2	25.4	98	7		3	0.98	0.1		0.08		4800		2
7/8/2014		7.3	7.3	24.3	122	3		<2		<0.10		0.02		2500		
7/15/2014		7	6.8	24.3	88	10		2		<0.10		0.03		36586		
7/22/2014		7.2	7.6	22.4	72	12		<2		<0.10		0.04		3800		
10/1/2014		7	7.7	20.4	101	5		<2		<0.10		0.04		1300		2
10/8/2014		7.5	7.5	18.2	118	3		<2		0.26		0.04		190		
10/15/2014		7.2	8.3	17.9	66	18		2		0.1	0.52	0.06		15000		
10/22/2014		7.5	8.6	14.3	110	6		<2		<0.10	0.52	0.04		350		

average		7.3	8.0	16.0	98.5	13.4		2.7	1.8	0.3	0.8	0.1		5964.7	3486.7	7.1
max		9.1	13.4	26.1	229	182		13	7.23	1.62	2.6	0.71		190000	5600	24
min		6	3.4	0.7	44	2		1	0.13	0.1	0.2	0.01		30	360	1
median		7.3	7.7	16	102	8		2	1.02	0.17	0.66	0.04		600	4500	4

count	131	
Meet stan	17	0.12977099
exceeds su	45	0.34351145
exceeds w	54	0.41221374

NOTES

pH > 14 is impossible, noted as a lab error

DO >18 is impossible, noted as a lab error

acute criteria acute criteria acute criteria acute criteria = (e (0.8473[ln(hardness)] + 0.884))(0.978) µg/l
chronic criter chronic criter chronic criter chronic criteria = (e (0.8473[ln(hardness)] + 0.884))(0.986) µg/l

CdTotal	CuTotal	PbTotal	ZnTotal	CdDissolve	CuDissolve	PbDissolve	ZnDissolve	Hardness	Alkalinity	Turb- Lab
ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L as CaCO3	ng/L as CaCO	NTU
G	G	G	G	G	G	G	G	G		M
1	1	1	1	1	1	1	1	1		1
								36	22	
								37	28	
								36	19	
								33	34	
								38	28	
								42	29	
								48	30	
								37	31	
								37	18	
								41	15	
								35	17	
								30	8	
								30	16	
								22	8	
								35	20	
								34	20	
								35	16	
								45	30	
								27	20	
								51	23	
								56	23	
								46	22	
								56	28	
								50	30	
									15	
								69	26	
									23	
									23	
									38	
									22	
									3	
									31	

										30	
										30	
										30	
										28	
										41	
										23	
										22	
										19	
										26	
										28	
										26	
										22	
0.21	7	4.07	18.5							19	
										23	
										14	
										20	
0.12	18.2	5.35	83							9	
										21	
										24	
										23	
0.1	1.7	6.57	10.8							26	
										28	
										23	
<0.01	2.63	3.73	6.64							26	
0.06	5.84	4.56	29.4							24	
										26	
										24	
										21	
										25	
0.17	12.3	16.6	44.6						27	20	
										52	
										25	
										26	
										31	
										22	
<1.0	2.09	1.11	31.3						24	68	
0.06	2.55	0.91	10.6						33	30	
										23	
										33	
										28	
<1.0	2.9	4.68	35.8							64	
										85	
										149	

									26	
<1.0	2.62	5.27	27.9					35	18	
									32	
									75	
									39	
								32	41	
<1.0	2.05	8.7	14.2						29	
									25	
									26	
<1.0	6.66	4.32	28.3					31	36	
									31	
									44	
									43	
1.14	26	35.6	105						9	
									51	
									39	
									72	
<1.0	<1.0	6.19	42.1					26	<15	
									37	
									27	
<1.0	10.3	9.25	83.9					38	28	
									22	
									29	
									24	
<1.0	21.1	8.29	59.3						13	
									18	
									35	
<1.00	2.09	1.77	31.8						30	
								30	30	
									30	
									20	
<1.0	12.6	3.37	45.1					3.8	33	
									37	
									33	
									28	
<1.0	6.92	3.06	31.2					35	35	
									27	
									32	
									19	
<1.0	46.5	4.07	24.3					29	25	
									35	
									23	
<1.0	50.9	4.32	27.8						28	

									20	
<1.0	63.6	5.62	23					33	27	
									28	
									32	
1.1	54.6	22.6	33.9					24	21	
									30	
									37	
									13	
<1.0	15.3	3.7	21.4					38	35	
									20	
									12	
									36	
<1.0	26.3	<1.0	12.1					41	32	
									21	
									15	
									24	
<1.0	22.6	4.67	17.7					27	22	
									35	
									16	
									40	
<1.0	8.35	5.65	13.4					36	50	
									20	
									35	
									25	
<1.0	<1.0	<1.0	13.5					25	24	
									38	
									35	
									39	
<1.0	40	4.03	14.4					27	11	
									37	
									11	
									39	
<1.0	51.9	7.12	11.2					47	37	
									41	
									41	
<1.0	3.37	11.2	25.9						21	
									37	
									36	
									28	
<1.0	1.84	6.9	11.2					40	39	
									31	
									34	
									34	

<1.0	32.3	10.4	16.6						45	36	
										37	
										31	
										36	
<1.0	43	12.9	51.6						41	35	
										27	
										27	
										34	
<1.0	6.13	16.5	40.5						35	26	
										35	
										29	
										22	
<1.0	6.53	9.55	25.2						33	28	
										38	
										28	
										42	

0.4	18.2	7.7	31.2								
1.14	63.6	35.6	105								
0.06	1.7	0.91	6.64								
0.145	9.325	5.485	26.85								

Site: **Chattahoochee River:** **North Fork Peachtree Creek at Pleasantedale Road**

DATE	TIME	pH	DO	Temp	Cond	Turb	Temp_Air	BOD5U	NTKN	NH3	NO2NO3	P-Total	P-Ortho	Fecal	Ecoli	Solid TSS	CdTotal	CuTotal	PbTotal	ZnTotal	CdDissolve	CuDissolve	PbDissolve	ZnDissolve	Hardness	Alkalinity	Turb- Lab
;UNITS	TIME	SU	mg/L	Deg C	umho/cm	NTU	deg C	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L as P	mg/L as P	#/100 mL	#/100 mL	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L as CaCO3	mg/L as CaCO	NTU
		M	M	M	M	M	M	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G		M
		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
1/8/2003		6.5	11.5	5.2	119	11		<2		0.1		0.04													41	35	
1/15/2003		7	8.4	4.3	115	11		<2		0.12	1.1	0.02													45	38	
1/22/2003		6.3	5.8	9.7	113	17		2		0.15		0.06													36	23	
1/29/2003		7	9.5	6.8	123	11		<2		<0.10	1.6	0.02													43	35	
4/2/2003		6.9	10.3	13	109	11		<2		<0.10	6.4	0.03													47	38	
4/9/2003		7	8.5	12.6	110	8		2		0.22	0.8	0.04													43	36	
4/16/2003		6.9	5.1	16.3	117	6		<2		0.15		0.02													50	41	
4/23/2003		6.2	7.9	14.6	114	8		<2		0.11		0.02													42	43	
7/2/2003		6.9	6.9	20.6	37	27		<2		<0.10		0.04													32	22	
7/9/2003		7.2	6.1	23	120	21		<2		0.126	3.5	0.06													46	37	
7/16/2003		6.9	5.9	22.6	119	37		3		<0.10	1.1	0.07													42	38	
7/23/2003		6.2	7.3	22.3	33	93		3		<0.10	0.8	0.09													25	8	
10/1/2003		7.8	7.8	15.1	112	10		<2		0.15	0.3	0.04													43	35	
10/8/2003		7.3	6.6	18.2	41	81		4		<0.10	0.6	0.21													17	7	
10/15/2003		7.2	5.5	15.9	93	18		4		<0.10	1.1	0.05													35	29	
10/22/2003		7.4	6.4	15.9	118	8		<2		<0.10	0.2	0.03													41	36	
1/7/2004		7.2	10.8	4	108	9		<2		0.12	1.1	0.12													45	32	
1/14/2004		6.9	9.5	6.5	111	14		<2		0.35		0.04													55	43	
1/21/2004		6.8	11	4	112	10		<2		0.11	1	0.02													55	36	
1/28/2004		7.2	7.9	3.3	121	13		6		0.42	1.5	0.15													56	26	
4/7/2004		7.2	6.7	12.8	118	17		<2		0.1		0.07													54	35	
4/14/2004		7.1	7.6	10.4	89	75		2		<0.10	0.7	0.32													41	23	
4/21/2004		6.7	6.2	16.9	111	14		<2		0.11	1	0.09													58	30	
4/28/2004		7	6.6	13.7	112	8		<2		0.1	0.3	0.06													52	36	
7/7/2004		7	3.6	22.5	105	25		<2		0.11	0.7	0.05														33	
7/14/2004		6.9	3.9	24.1	71	5		<2		0.11	1.1	0.03													66	35	
7/21/2004		7.1	4.1	22.3	118	12		<2		0.4	0.9	0.06														36	
7/28/2004		6.6	4.5	23.2	145	35		<2		0.14	1.4	0.04														23	
10/13/2004		7.1	4.2	18.9	140	12		2		0.49	0.9	0.07														55	
10/20/2004		7	5.5	17.6	65	34		2		0.11	1.1	0.08														24	
10/27/2004		7	4.2	17.4	142	9		<2		0.54	0.8	0.07														46	
1/5/2005		7.2	7.1	11.8	127	8		<2		0.28		0.04														44	
1/12/2005		7.1	8.5	12.7	121	8		<3		0.54	1.6	0.04														42	
1/19/2005		7.6	10.6	3.3	125	8		2		0.48	2.2	0.02														37	
1/26/2005		7.4	8.6	7.6	124	8		2		0.22	1.8	0.28														41	
4/6/2005		7.5	7.5	14.3	165	6		<2		0.13		0.03														36	
4/20/2005		7.5	5.8	15.2	124	7		<2		0.31		0.03														43	
4/27/2005		8.4	6.6	12.9	85	11		2		0.2		0.06														25	
7/6/2005		6.9	4.7	23	82	18		<2		0.14		0.06														21	
7/13/2005		6.8	4.8	22.4	111	14		<2		0.43		0.08														31	
7/27/2005		6.6	5.3	24.5	128	7		<2		0.38		0.08														36	
10/5/2005		7.3	4.2	20	135	14		2		1.1		0.06														43	
10/12/2005		7.5	4.6	20.1	149	9		2		0.49		0.08														40	
10/19/2005		7.3	5.1	15.2	125	6		<2		0.38		0.07														31	
1/4/2006		7.1	8.1	8.5	129	10		2		0.24		0.06		350			0.37	5.42	3.18	37.6						28	
1/11/2006		6.9	5.6	12.2	128	9		2		0.48		0.04														41	
1/18/2006		6	8	8.3	82	57		2		0.15		0.05		3800												16	
1/25/2006		6.6	8.5	8.6	135	15		<2		0.14		0.17		380												35	
4/5/2006		7.4	6.3	12.4	133	7		<2		0.36		0.06		1300			0.09	16.7	4.5	82.1						36	
4/12/2006		6.8	5.4	14.8	133	8		2		0.48		0.18		700												41	
4/19/2006		6.5	4.2	19	141	5		<2		0.93		0.05		2500												45	
4/26/2006		6.6	4.8	19.2	146	8		<2		0.62		0.08		2200												40	
7/11/2006		6.9	3.3	22.5	125	27		<2		1.28		0.09		98000			0.04	1.81	4.02	14.7						36	
7/18/2006		6.8	7	23.2	101	5		<2		<0.10		0.04		540												26	
7/25/2006		6.8	6.9	22.9	98	6		<2		<0.10		0.05		540												32	
10/4/2006		6.9	5.7	18.7	133	17		<2		<0.10		0.02		420			<0.01	1.31	2.33	7.29						38	
1/3/2007		7.5	5.9	7.5	63	9		2		<0.10		0.03		190			0.11	4.7	5.72	42.1						27	
1/10/2007		7.1	6.2	6.5	134	10		<2		<0.10		0.06		240												33	
1/17/2007		7.2	5.7	7.7	114	11		<2		<0.10		0.14		390												32	
1/24/2007		7.2	6.6	6.4	103	8		<2		0.13		0.03		280												30	
1/31/2007		7.3	7.7	2.8	141	8		<2		0.15		0.13		120												32	
4/4/2007		7.4	6.6	17.6	93	38		6		<0.10		0.15		600000		18	0.09	14.6	4.84	58.3					31	23	
4/11/2007		7.7	8.6	11.5	82	32		<2		<0.10		0.03		1000												48	
4/18/2007		7.3	6.5	13.5	177	6		<2		0.32		0.03		160												36	
4/25/2007		7.3	6.7	16.5	144	6		<2		0.13		0.02		690												37	
7/3/2007		6.9	6	21.7	63	17		<2		0.16		0.04		5900												41	
7/17/2007		7	6.2	23.1	101	13		<2		<0.10		0.04		1500												31	
7/24/2007		6.9	7.7	20.8	302	20		<2		0.11		0.07		1800			<1.0	2.17	<1.0	37.8					37	39	
10/3/2007		7.1	8.8	19.8	65	17		<2		<0.10		0.06		530		17	0.06	2.14	1.19	13					38	46	
10/10/2007		7.2	4.3	20.6	146	21		3		<0.10		0.05		21000												33	

10/17/2007		7	5.2	18.3	122	12		<2		<0.10		0.05		850												37	
10/24/2007	10:20	6.7	7.3	17.7	60.1	17		2		<0.10		0.05		16000												19	
1/2/2008	945	7.4	12.1	3.7	114	6		2		0.13		1.23		290			<1.0	4.19	5.83	48.8						74	
1/9/2008	940	7	8.6	13.1	78	20		4		<0.10		0.06		2400												88	
1/16/2008	935	7.3	11.8	4.9	135	10		2		<0.10		0.01		130												150	
1/23/2008	940	7.9	11.9	6	54	15		2		0.12		0.02		660												19	
4/2/2008	9:50	6	9	14.2	124	10		<2		0.1		0.06		540		7	<1.0	2.97	4.97	24.6					42	25	
4/9/2008	9:50	7.1	9.5	13.9	130	8		<2	<0.10	<0.10		0.05		240												42	
4/16/2008	9:45	6.8	8.7	11.2	121	9		<2		0.12		0.03		290												44	
4/23/2008	9:30	7.6	6.8	16.4.	191	8		<2		0.16		0.03		290												41	
7/1/2008	9:34am	6.7	4.9	20.2	169	15		3		0.94		0.07		21000											44	47	
7/8/2008	935	6.9	4.1	22.7	141	11		4	<0.10	0.98		0.09		2600		7	<1.0	2.03	1.8	9.27						39	
7/15/2008	910	6.7	4.9	22.1	106	7		2		0.69		0.05		3500												30	
7/22/2008	9:44	6.9	4.7	23.6	183	11		2		0.81		0.18		190												46	
10/1/2008	920	7.1	7	18.4	366	5		<2	<0.10	<0.10		<0.01		2200		9	<1.0	7.07	6.85	33.6					136	42	
10/8/2008	10:05	7	7.2	18.4	203	17		3		<0.10		<0.01		5300												31	
10/15/2008	940	7.4	6.4	16.6	250	7		<2		<0.10		<0.01		530												39	
10/22/2008	930	7.3	7.4	13.3	120	11		<2		<0.10		0.03		4400												38	
1/7/2009	9:05	5.7	8.9	13.5	45	48		2		<0.10		0.02		5800			1.05	23.7	23.8	116						8	
1/14/2009	9:30	6.5	12.8	4.7	125	11		<2	<0.10	0.12		0.01		190		7										48	
1/21/2009	9:20	5.9	24.5	0.5	120	2		<2		<0.10		0.01		90												23	
1/28/2009	9:25	6.8	10.5	10.4	94	2		<2		<0.10		<0.01		180												69	
4/1/2009	1010	6.1	9.1	13.7	110	32		5	<0.1	0.13		0.04		4200		16	<1.0	<1.0	1.93	46.6					35	15	
4/8/2009	940	7.4	10.3	7.8	198	7		<2		0.16		0.04		140												44	
4/22/2009	955	7.6	8	12.6	141	8		<2		<0.10	0.29	<0.01		280												34	
7/7/2009	10:00	6.8	4.4	23	83	22		2	1.25	<0.10	0.42	0.04		2200		13	<1.0	10.4	19.6	104					34	33	
7/14/2009	9:15	6.7	5.3	22.7	68	22		<2		0.1	0.42	0.04		5500												13	
7/21/2009	9:45	6.8	6	19.6	96	19		<2		<0.10		<0.01		2200												32	
7/28/2009	9:05	7.3	5.5	22.9	98	10		2		<0.10		0.02		1400												28	
10/7/2009	9:35	7.9	8.3	18.8	85	48		2		<0.10	0.75	0.07		5500			<1.0	11.7	6.91	51.8						20	
10/14/2009	9:35	7.4	6.6	19.8	63	46		2		<0.10	0.27	<0.10		9000												16	
10/21/2009	9:30	7.1	8	13.7	138	10		<2		0.17	0.59	0.01		240												41	
1/6/2010	9:17	7.6	11.5	1.2	154	9		<2		<0.10	0.75	0.04		90			<1.00	1.57	1.58	33.3						40	
1/13/2010	9:39	6.3	12.3	2.2	98	5		<2		<0.10		0.03		120		10									41	37	
1/20/2010	9:10	7.5	10.1	8.3	110	20		<2		0.1	0.76	0.01		330												36	
1/27/2010	9:30	7.2	10.7	5.7	125	10		<2		0.11	0.71	0.1		420												25	
4/7/2010	9:27	7.2	7.1	17.3	119	10		<2		<0.10	0.51	0.08		200		3	<1.0	6.92	4.17	31.1					3.8	40	
4/14/2010	9:50	7.5	8.5	15.2	114	8		<2		<0.10	0.47	0.02		330												38	
4/21/2010	10:00	7.3	8.3	14.8				5		0.15	0.57	0.27		1200												35	
4/28/2010	9:45	7.5	10.5	13.1	119	12		<2		<0.10	0.48	0.02		580												37	
7/6/2010	9:50	7.1	4.9	21.4	130	7		2		0.5		0.07		6300		3	<1.0	9.65	5.63	49.3					40	47	
7/13/2010	9:15	7.3	5.2	23.6	93	21		3		0.22		0.1														25	
7/20/2010	9:20	7	4.8	23.9	112	8		2		<0.10		0.14		5900												41	
7/27/2010	9:10	7.1	6.1	24.3	52	37		3		<0.10		0.09		21000												16	
10/6/2010	9:40	7.1	9.3	12.8	127	6		2		1.2		0.07		4300		5	<1.0	45.9	2.39	21.8					37	37	
10/13/2010	9:45	7	6.9	17.3	126	7		2		1.3		0.09		1900												48	
10/27/2010	9:35	6.9	3.7	20.2	125	9		3		0.92		0.09		10000												42	
1/5/2011	10:00	6.9	13.5	5.9	117	16				0.32		0.05		420			<.10	50.6	2.42	30.7						38	
1/26/2011	9:45	6.3	11	6.7	141	41		3		<0.20		0.1		4500												21	
4/6/2011	9:55	7.1	8.6	10.8	93	9		2		0.15		0.06		2000		8	<1.0	50.6	6.31	8.35					39	37	
4/13/2011	9:20	7	6.6	14.3	108	8		2		0.34		0.04		2200												35	
4/20/2011	9:30	7.4	7.1	17	119	8		2		0.38		0.02		1200												42	
7/5/2011	10:20	6.8	7	22.6	84	12		4		0.31		0.06		7200		6	<1.0	54.3	21.2	35.3					27	25	
7/12/2011	1000	7.6	5.3	25.6	123	9		3		1.1		0.08		9000												43	
7/19/2011	925	7.6	6.6	23.7	124	8		3		1.03		0.1		33000												44	
7/26/2011	930	7.8	5.2	24.7	55	28		2		<0.10		0.07		18000												11	
10/5/2011	10:25	7	4.6	15.1	144	11		2		2.4		0.03		6900		7	<1.0	15.3	12.4	33.3					40	44	
10/12/2011	935	6.8	5.3	16.9	81	9		2		0.5		0.09		6900												21	
10/19/2011	1005	7.5	8.4	16.9	38	28		4		0.17		0.18		21000												7	
10/26/2011	930	7.6	8.9	16	109	7		<2		0.15		0.02		210												33	
1/4/2012	10:00	7.5	2.8	2.8	117	9		2		0.84		0.06		5600		5	<1.0	45.5	<1.0	14.9					42	40	
1/11/2012	10:00	8.2	8.9	13.6	46	106		4		0.15		0.19		1700												14	
1/18/2012	10:00	7.6	8.8	10.2	75	18		2		0.31		0.07		5700												17	
1/25/2012	10:50	7.5	9.2	9.2	97	11		<2		0.31		0.06		1900												26	
4/4/2012	9:40	7	5	18.9	85	26		6		0.39	0.54	0.13		27000		8	<1.0	38	6.41	28.4					28	24	
4/11/2012	9:50	7.1	5.2	14.3	119	6		2		1.02	0.24	0.06		3800												46	
4/18/2012	9:45	8.2	8.4	17.5	42	46		4		<0.10	<0.20	0.15		36000												13	
4/25/2012	9:50	6.3	8.1	14.1	157	14		3		1.25	1.56	0.28		27000												48	
7/3/2012	9:45	7.2	2.8	24	158	7		3	10.7	2.75		0.02		1800		4	<1.0	7.95	7.61	11.3					40	55	
7/10/2012	9:25	7.5	5.7	25.6	89	8		2		0.71	0.5	0.08		7600												27	
7/17/2012	9:35	7.5	5.1	23.3	146	6		<2		1.54		0.1		5400												41	
7/24/2012	9:30	7.6	6.3	22.6	98	7		<2		0.27	0.59	0.07		5600												40	
10/3/2012	10:00	24	5.7	19.8	81	12		<2		0.17	0.62	0.06		2800		7	<1.0	<1.0	<1.0	6.55					34	24	
10/10/2012	9:50	7.2	6.4	14.8	122	14		<2		<0.10		0.03		630												40	
10/17/2012	11:05	7.6	5.9	17.5	131	4		<2		<0.10	0.62	0.03		400												33	
10/24/2012	9:30	7.5	8.6	14	123	7		<2		<0.10		0.05		450												40	
1/2/2013	9:40	7.2	9.9	10	55	19		<2	0.8	<0.10		0.06		1500		11	<1.0	25	4.78	21					28	14	
1/9/2013	9:55	7	9.3	10.8	114	7		<2		0.17		0.01		60												36	
1/16/2013	9:35	7.4	8.9	16.2	46	19		2		<0.10		0.03		2600												10	
1/23/2013	9:40	7.8	10.7	7.6	120	7		<2		0.16		0.02		580												34	
4/3/2013		7.6	9.4	11.3	111	7		2		0.12	0.5	0.02		120		4	<1.0	50.3	9.03	18.3					51	33	

4/10/2013		7.1	7.7	16.4	110	6		<2		<0.10	0.34	0.09		160												52	
4/17/2013		6.9	7.1	17.9	118	6		<2		<0.10		0.03		270												50	
7/2/2013		7	6.7	21.7	103	6		<2	3.82	<0.10	0.52	0.02		4800		6	<1.0	1.24	3.48	14.6						39	
7/9/2013		7.6	6.9	22.9	108			<2		0.11	0.49	0.01		71												40	
7/16/2013		7.3	6.7	22.7	122	10		<2		<0.10		0.07		2000												40	
7/23/2013		6.9	6.6	22.7	98	10		<2		<0.10	0.45	0.04		4500												35	
10/2/2013		7.5	7.1	17.5	122	8		2		<0.10	0.58	0.01		390		2	<1.0	1.55	7.33	10.2					45	45	
10/9/2013		7.1	7.5	17.1	125	8		<2		<0.10		0.04		5500												34	
10/16/2013		7.5	7.7	17.7	117	7		<2		<0.10		<0.01		1900												44	
10/23/2013		7.4	8	14.6	109	6		<2		<0.10		<0.01		680												44	
1/2/2014		7.3	9.5	9	120	6		2	1.19	0.13		0.01		250		3	<1.0	46.5	11.9	22.5					49	37	
1/9/2014		7.6	11.2	3.7	122	5		<2		0.13		0.01		80												39	
1/16/2014		7.8	10.4	6.5	126	6		<2		0.13	1.22	0.02		70												41	
1/23/2014		7.8	11.2	3.4	104	7		<2		0.14		0.01		160												43	
4/2/2014		7.6	8.4	14.2	121	10		<2		<0.1		0.02		170		6	<1.0	50.1	4.64	33.2					43	50	
4/9/2014		7.1	8.8	12.6	127	16		2		<0.1	0.61	0.11		300												36	
4/16/2014		7.4	9.3	10.8	100	15		2		0.12	0.28	0.03		2100												36	
4/23/2014		7.9	8.2	15	119	10		2		0.12	0.74	0.06		340												41	
7/1/2014		7.1	2.2	24.2	177	16		10	3.71	4.21		0.6		60000		22	<1.0	5.3	19.8	65					42	57	
7/8/2014		7.2	3.1	25	202	16		12		4.57		0.71		60000												62	
7/15/2014		7.2	6.2	20.8	98	19		4		1.03		0.15		24,000												35	
7/22/2014		7.3	6.8	22.1	86	13		2		0.44		0.06		44000												29	
10/1/2014		7.1	5.4	18.9	147	8		3		0.94		0.11		4300		2	<1.0	4.92	2.48	21.4					45	46	
10/8/2014		6.9	5.2	18.2	129	5		2		0.98		0.1		2100												48	
10/15/2014		7	7.8	17.2	72	32		3		0.25	0.62	0.09		32000												25	
10/22/2014		7.1	6.8	14.3	132	9		2		1.01		0.13		5500												50	

count	131	
Meet stan	32	0.24427481
exceeds su	26	0.19847328
exceeds w	73	0.55725191
average	10,701.84	
max	########	
min	60.00	
median	1,800.00	

Site: **Chattahoochee River:** **North Fork Peachtree Creek at Plaster Road**

DATE	TIME	pH	DO	Temp	Cond	Turb	Temp_Air	BOD5U	NTKN	NH3	NO2NO3	P-Total	P-Ortho	Fecal	Ecoli	Solid TSS
;UNITS	TIME	SU	mg/L	Deg C	umho/cm	NTU	deg C	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L as P	mg/L as P	#/100 mL	#/100 mL	mg/L
		M	M	M	M	M	M	G	G	G	G	G	G	G	G	G
		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1/8/2003		6.9	11.1	6.3	246	17		<2		0.9		0.04				
1/15/2003		7	8.5	4.6	247	4		<2		0.95	2.3	0.02				
1/22/2003		6.5	5.6	9.8	137	12		5		0.35		0.07				
1/29/2003		7	9.3	7.7	232	3		<2		0.64	2.7	0.01				
2/6/2003		6.9	9.7	7.9												
2/13/2003		6.8	8.9	6.4												
2/20/2003		6.8	7.4	9												
2/27/2003		6	6.2	7.6												
3/6/2003		6.9	7.4	13.3												
3/13/2003		6.9	9	14.4												
3/20/2003		6.9	9.3	13.1												
3/27/2003		7.2	7.4	16.2												
4/2/2003		7.4	11.5	14.5	225	3		2		0.45	3.1	0.02				
4/9/2003		7	8.5	13	184	13		4		0.78	1.3	0.09				
4/16/2003		7.3	6.1	16.1	243	2		<2		0.92		0.02				
4/23/2003		6.7	8.7	14.1	220	4		<2		0.52		0.03				
5/8/2003		6.1	7.4	19.9												
5/15/2003		6.8	5.2	17.9												
5/22/2003		7.6	8.6	18.6												
5/29/2003		7.3	7.5	18.1												
6/5/2003		6.8	7	18.7												
6/12/2003		7.2	6.8	21.8												
6/19/2003		7.2	6.8	21.7												
6/26/2003		6.7	4.6	22.2												
7/2/2003		6.9	7	21.5	79	26		10		0.13		0.08				
7/9/2003		7	6.1	23.8	235	9		<2		0.33	3.1	0.02				
7/16/2003		7	6	23.8	243	9		4		0.52	2.3	0.04				
7/23/2003		6.5	6.8	22.8	58	71		3		<0.10	1.1	0.09				
8/7/2003		7	7.7	21.5												
8/14/2003		6.5	6.5	22.6												
8/21/2003		7	6.7	23.4												
8/28/2003		7.4	7.9	23.3												

9/4/2003		7.1	7	23.9												
9/11/2003		7	6.6	19.8												
9/18/2003		6.7	6.8	18.7												
9/25/2003		6.3	6.7	19.1												
10/1/2003		7.3	8.3	15.6	234	4		<2		0.59	1	0.02				
10/8/2003		6.3	6.8	18.7	46	30		3		<0.10	0.6	0.11				
10/15/2003		7.2	6.5	15.2	183	9		4		0.166	1.6	0.03				
10/22/2003		7.4	7	15.6	258	2		<2		0.29	0.2	0.02				
11/6/2003		6.8	5.1	20.3												
11/13/2003		6.7	5.6	12.9												
11/20/2003		6.8	4.4	14.7												
12/3/2003		7.1	4.6	8.5	242	3		<2.0		0.73	2.3	0.02				
12/10/2003		7	10	11.7												
12/17/2003		7.1	10.8	7.9												
1/7/2004		7.3	11.2	4	198	29		<2		0.91	2.2	0.14				
1/14/2004		7.1	9.6	7.5	222	6		<2		0.94		0.01				
1/21/2004		7	10.7	4.5	226	5		<2		0.89	1.5	0.02				
1/28/2004		7.5	8.3	3.6	225	8		2		0.75	2.8	0.13				
2/5/2004		7	7	6.9												
2/12/2004		6.9	8	6.5												
2/19/2004		7.2	10.3	6.3												
2/26/2004		7.3	10.2	5.1												
3/4/2004		7.3	7.6	15.1												
3/11/2004		7.3	8.9	9.6												
3/18/2004		7.5	8.8	13.2												
3/25/2004		7.6	8.9	13.6												
4/7/2004		7.3	8.2	13.4	236	5		<2		0.61		0.08				
4/14/2004		7.1	8.3	10.2	162	17		3		0.25	1.1	0.03				
4/21/2004		7.3	7.2	17.8	225	7		<2		0.36	2.3	0.04				
4/28/2004		7.1	7.7	14.6	234	10		<2		0.58	1.2	0.01				
5/6/2004		7.4	8.9	18.3												
5/13/2004		6.6	3.6	20.4												
5/20/2004		7.4	7.1	20.2												
5/27/2004		7.1	4.8	22.1												
6/3/2004		7.1	4.5	20.9												
6/10/2004		7.1	5..0	21.9												
6/17/2004		7	3.8	23.2												
6/24/2004		7	4	22.9												
7/7/2004		7.1	4.4	23.4	201	4		<2		0.12	2.1	0.02				
7/14/2004		7	5.5	23.8	103	3		<2		<0.10	3.4	0.02				
7/21/2004		7.2	6.6	22.7	233	3		<2		<0.10	2.4	0.14				
7/28/2004		6.8	5.2	24.1	122	54		<2		<0.10	1.5	0.08				
8/5/2004		7.1	4.1	23.6		5										

8/12/2004		6.8	6	22.5		197										
8/19/2004		6.7	5.1	21.4		4										
8/26/2004		6.3	7	22.3		329										
9/9/2004		6.8	9.5	21.3		4										
9/16/2004		7.5	6.7	21.5		89										
9/23/2004		7.4	6.8	19.2		6										
9/30/2004		7.1	6	18.5		5										
10/13/2004		7.3	5.5	18.9	252	4		<2		0.15	1.7	0.12				
10/20/2004		7.2	5.8	18.2	116	12		2		0.17	1.4	0.05				
10/27/2004		7.1	6	17.7	271	2		<2		0.17	2.3	0.01				
11/5/2004		7.2	8.1	15.9		14										
11/10/2004		7.1	7.6	12.3		4										
11/17/2004						2										
12/3/2004		7.2	7.9	9.1		4										
12/16/2004		7.4	12.7	6												
1/5/2005		7.3	7.9	12.9	255	4		<2		0.38		0.02				
1/12/2005		7.3	9.4	14.1	242	5		<4		0.64	2.8	0.01				
1/19/2005		8.9	10.9	4.5	233	3		<2		0.81	3.5	<1				
1/26/2005		7.6	8.9	8.5	239	3		<2		0.34	2.5	0.18				
2/3/2005		8.3	11.1	5.1		220										
2/11/2005		6.7	9.6	5.8		4										
2/17/2005		7.3	8.9	10.6		7										
2/24/2005		7.6	8.1	13.5		36										
3/3/2005		7.4	8.6	8.6		6										
3/10/2005		6.8	8.7	10		7										
3/17/2005		7.5	8.5	8.5		16										
3/24/2005		7.4	7.9	13.5		12										
4/6/2005		7.6	7.3	15.9	247	7		2		0.32		0.04				
4/20/2005		7.5	6.8	16.6	245	3		2		0.77		0.01				
4/27/2005		7.7	6.6	15	139	12		2		0.33		0.02				
5/12/2005		7.2	7	18.9		6										
5/19/2005		7	5.8	19.5		3										
5/26/2005		6.9	5	17.5		3										
6/9/2005		6.7	5.2	22.6		12										
6/16/2005		7.2	5.2	23.2		6										
6/23/2005		7	5.2	22.8		12										
6/30/2005		7.3	5.5	24.4		9										
7/6/2005		6.9	5	23.8	125	23		2		<0.10		0.07				
7/13/2005		7	5.3	23.5	178	16		<2		0.46		0.03				
7/27/2005		7.1	7.6	26	241	6		<2		0.16		0.05				
8/4/2005		6.9	6.6	23.7		8										
8/11/2005		7.1	6.8	23.8		24										
8/18/2005		7	7	23.5		11										

8/25/2005		6.7	6.5	23.6		10										
9/30/2005		7.4	5.2	20.5		3										
10/5/2005		7.2	5.7	21.8	244	2		<2		<0.10		0.02				
10/12/2005		7.5	5.4	21	227	2		<2		0.44		0.03				
10/19/2005		7.2	6.3	17.7	255	3		<2		<0.10		0.21				
12/2/2005		7	10	6.5		4										
1/4/2006		7	7.8	10.4	243	6		4		2.22		0.15		36000		
1/11/2006		7.1	6.6	13.2	269	7		5		4.25		0.28				
1/18/2006		6.8	9.2	8.7	163	41		2		0.58		0.04		600		
1/25/2006		7	8.7	9.6	241	5		2		0.73		0.08		310		
2/9/2006		7.1	8	8.1		11								91000		
2/16/2006		7.2	6.5	9.8		11								27000		
2/23/2006		7.3	10	11.5		49								28000		
3/9/2006		7.1	7.3	12.6		9								5400		
3/16/2006		7.3	10.5	12.1		10								240		
3/23/2006		7.7	9.3	10.3		5								300		
4/5/2006		7.1	8.1	13.8	237	3		<2		0.66		0.23		170		
4/12/2006		7	8.1	15.6	237	4		2		0.55		0.03		160		
4/19/2006		7.1	6.5	19.3	236	4		<2		0.38		0.02		170		
4/26/2006		7	7	20.4	267	2		<2		0.49		0.05		420		
5/11/2006		7.1	7.5	18.3		20								60000		
6/8/2006		7.3	7.9	21.1		4								440		
6/15/2006		7.1	7.6	23.3		3								240		
6/22/2006		7.1	7	25.2		2								2300		
6/29/2006		7.6	6	23.5		5								6400		
7/11/2006		7.3	6.4	24.4	264	9		<2		0.95		0.05		860		
7/18/2006		7	6.1	26.1	270	5		<2		0.66		0.05		lab error		
7/25/2006		7.2	5.8	25.1	270	6		<2		0.5		0.06		1900		
8/3/2006		6.7	4.1	25.7		13								60000		
8/10/2006		7.3	5.1	25.9		9								2800		
10/4/2006		7.1	7	19.5	263	3		<2		<0.10		0.02		540		
11/9/2006		7.1	7.4	12.8		6								6000		
11/16/2006		6.1	7.6	13.3		22								440000		
1/3/2007		7	6	8.8	212	3		2		0.27		0.11		4800		
1/10/2007		7	6.4	7.7	257	4		<2		<0.10		0.04		580		
1/17/2007		7	5.9	7.9	189	4		<2		0.29		0.13		6000		
1/24/2007		6.8	6.3	7.1	233	3		<2		0.76		0.11		4200		
1/31/2007		7	6.9	4.1	267	2		<2		0.95		0.17		420		
2/15/2007		7	9.9	6		5								280		
2/22/2007		6.7	6.9	12.9		14								2500		
4/4/2007		5.5	7.6	17.7	98	35		6		0.13		0.1		460000		20
4/11/2007		7.3	7.9	12.4	93	39		<2		0.74		0.03		590		
4/18/2007		7.1	7.6	14.3	257	2		<2		0.21		0.03		350		

4/25/2007		7.6	8.9	16.7	222	2		<2		0.24		0.04		160		
6/14/2007		6.9	6.4	22		3								6500		
6/21/2007		7	6	22.4		6								32000		
6/28/2007		7.2	6.7	25.3		3								2200		
7/3/2007		6.9	7.2	22.1	116	5		<2		<0.10		0.18		7900		
7/17/2007		7.2	5.6	25.6	111	5		<2		<0.10		0.04		2400		
7/24/2007		7.1	8.7	21.9	246	8		<2		0.14		0.13		6100		
8/16/2007		7	4.1	25.5		3								1800		
10/3/2007		7.2	6.9	20.3	131	9		<2		<0.10		0.05		2100		7
10/10/2007		7.1	6.3	22	122	12		4		<0.10		0.07		140000		
10/17/2007		7.1	6.9	18.7	248	3		<2		<0.10		0.02		5900		
10/24/2007	11:10	6.7	7.5	17.8	83.3	15		3		<0.10		0.4		24000		
11/2/2007	9:30	6.7	9.4	13.8		3								3000		
11/8/2007	10:20	7.4	10	8.3		3								260		
11/29/2007	9:25	6.4	10.3	8.5		11								750		
1/2/2008	1040	7.2	12.3	4.2	246	21		<2		0.54		0.08		350		
1/9/2008	1040	7	8.6	14.2	116	45		6		<0.10		0.34		4900		
1/16/2008	1035	7	11.3	5.7	238	6		2		0.72		0.03		120000		
1/23/2008	1045	7.2	11.3	7.3	140	34		3		0.25		0.07		4500		
2/14/2008	9:49	7.3	12.4	4.9		8								2100		
2/21/2008	9:25	7	10.4	9.2		9								610		
2/28/2008	9:34	7	11.8	5.2		23								550		
4/2/2008	11:05	7	6.8	16.1	256	5		2		0.49		0.61		350		2
4/9/2008	10:50	7.1	9.2	15.5	248	10		<2	0.97	0.58		0.03		280		
4/23/2008	10:20	7.3	6.4	17.7	244	2		<2		0.44		<0.01		550		
5/8/2008	950	6.3	6.7	19.2		6								570		
5/15/2008	9:45	6.9	6.8	17.8		4								2300		
5/21/2008	9:40	9.7	5.7	18		11								2500		
6/5/2008	10:10am	7.3	6.4	24.1		7								2300		
6/12/2008	10:20am	6.7	5.9	23.6		34								400000		
6/19/2008	10:05am	7.1	7	20.5		6								1200		
6/26/2008	10:07am	7	7.2	22.5		4								540		
7/1/2008	10:28am	7	5.5	21.2	209	3		2		<0.10		0.03		2400		
7/8/2008	1045	7	6.3	25.1	232	4		2	1.56	<0.10		0.04		1400		3
7/15/2008	1000	6.9	6.1	22.9	177	13		<2		0.12		0.02		4100		
7/22/2008	11:38	7.2	7.1	26	246	3		<2		<0.10		0.1		330		
8/7/2008	9:40	7.2	5.2	25.3		4								2800		
8/21/2008	10:55	6.9	6.3	23.2		9								1400		
10/1/2008	1041	7.4	6.8	18.9	247	3		2	10.3	<0.10		0.03		210		8
10/8/2008	11:10	7.3	6.6	19.3	144	23		13		0.29		0.07		41000		
10/15/2008	1045	7.4	7	18.2	245	6		<2		<0.10		0.14		500		
10/22/2008	1030	7.1	7.5	13.4	232	4		<2		0.3		0.01		340		
11/13/2008	1011	6.7	7.9	11.2		17								210		

11/20/2008	920	7.4	9.8	7.7		9								2300		
1/7/2009	10:10	6.2	9.2	13.8	73	54		3		<0.10		0.05		6000		
1/14/2009	10:40	6.6	12.6	4.7	122	6		<2	<0.10	0.22		0.02		520		7
1/21/2009	10:30	6.5	17.1	0.5	181	4		<2		<0.10		0.08		580		
1/28/2009	10:15	7.2	10.2	10.6	154	5		<2		0.38		0.03		460		
2/12/2009	10:30	6.9	7.4	11.9		5								6800		
2/19/2009	9:45	6.6	9.5	11		68								2000		
4/1/2009	1135	6.1	8.9	14.5	126	41		6	<0.1	0.2		0.05		22000		20
4/8/2009	1030	7.6	10.4	8.9	289	3		<2		0.89		<0.01		560		
4/22/2009	1045	7.8	8.6	13.8	259	5		2		0.63	1.35	<0.01		120		
5/14/2009	11:20	7.4	7.7	19.3		5								2800		
5/21/2009	9:40	6.7	9.1	17.7		13								2000		
5/28/2009	10:05	6.8	6	21.4		40								2300		
6/5/2009	9:50	7.2	6.7	21.1		40								Lab error		
6/12/2009	9:45	7.3	6.4	22.7		7								3000		
6/19/2009	9:30	7.2	6.1	23.8		12								300		
6/26/2009	9:15	7.2	5.4	23.7		8								360		
7/7/2009	11:10	7.7	5.9	25.1	133	8		2	0.42	<0.10	0.74	0.03		5000		4
7/14/2009	10:05	6.9	6	23.4	138	13		2		0.18	1.02	0.03		6730		
7/21/2009	10:45	7.1	7.6	21.2	191	13		<2		<0.10		<0.01		610		
7/28/2009	10:00	7.5	6.4	23.6	210	5		2		<0.10		0.02		4200		
8/6/2009	10:15	7.4	6.5	23.8		4								500		
8/13/2009	9:30	7.1	6.6	23.3		9								700		
10/7/2009	10:35	7.7	7.5	21.2	50	78		2		<0.10	0.26	0.12		31000		
10/14/2009	10L:45	7.3	8.4	18.8	95	28		3		<0.10	0.3	0.25		52000		
10/21/2009	10:25	7.4	9.7	12.5	160	8		<2		0.3	1.68	0.04		3200		
11/5/2009	9:50	6.6	8.4	12		2								260		
1/6/2010	10:29	7.5	10.8	2.6	294	10		<2		0.68	1.5	0.28		280		
1/13/2010	10:52	8.3	11.3	4	99	3		<2		0.76		0.02		50		2
1/20/2010	10:10	7.5	9.7	9.5	208	5		<2		0.62	1.42	<0.01		120		
1/27/2010	10:20	7.5	10.6	6.7	225	6		<2		0.58	1.54	0.01		450		
4/7/2010	10:43	7.4	7.6	18	221	6		2		0.3	1.56	<0.10		200		2
4/14/2010	10:50	7.4	8.7	16.9	207	3		<2		0.4	1.29	0.02		480		
4/21/2010	10:55	7.2	8	16.6				8		0.55	1.08	0.03		5700		
4/28/2010	10:55	7.5	8.6	14.9	228	10		<2		0.43	1.29	0.02		410		
7/6/2010	11:20	7.6	6.7	24.5	227	8		2		<0.10		0.06		760		4
7/13/2010	10:00	7.1	4.9	25.2	105	13		4		<0.10		0.06				
7/20/2010	10:00	7.4	5.4	25.5	185	3		<2		<0.10		0.05		2300		
7/27/2010	10:20	7.4	5.6	25.4	143	8		<2		<0.10		0.04		1900		
10/6/2010	11:15	7.4	12.2	14.2	215	3		,2		0.21		0.03		490		2
10/13/2010	10:55	7.3	11	18.6	208	3		2		0.18		0.02		520		
10/27/2010	11:00	7.1	5.7	20.7	169	3		<2		0.14		0.01		3200		
1/5/2011	11:20	7.3	13.5	7	200	5				0.49		0.01		510		

1/26/2011	11:05	7.2	10.7	6.2	121	34		3		1.03		0.07		2000		
4/6/2011	11:25	7.4	9.1	12.8	174	6		2		0.28		0.02		410		1
4/13/2011					189	3		2		0.43		0.07		480		
4/20/2011	10:25	7.4	8.3	17.6	189	2		2		0.42		<0.01		280		
4/27/2011	9:25	6.8	6.6	19.3	241	3		<2		0.37		<0.01		5400		
7/5/2011	11:30	7	8.9	25.3	87	14		3		<0.10		0.04		52000		6
7/12/2011	1115	7.9	5.2	25.9	196	3		<2		<0.10		0.01		290		
7/19/2011	1020	7.3	6.3	23.8	215	5		<2		<0.10		0.03		770		
7/26/2011	1040	8	4.6	25.9	61	44		3		<0.10		0.12		29000		
10/5/2011	11:40	7.4	7.4	17.3	263	9		<2		<0.10		0.02		100		1
10/12/2011	1030	7.2	6.7	17.6	123	5		<2		0.1		0.02		3200		
10/19/2011	1055	7.7	8.4	15.9	38	28		4		<0.10		0.07		28000		
10/26/2011	1030	7.8	8.3	14.2	124	9		<2		<0.10		0.02		290		
1/4/2012	11:05	7.7	11.7	4.8	196	3		<2		0.71		0.03		470		2
1/11/2012	10:55	7.9	9.2	14.2	54	46		3		<0.10		0.07		7700		
1/18/2012	10:55	7.5	9.5	10.2	95	17		2		<0.10		0.04		2100		
1/25/2012	11:45	7.3	9.7	10.6	181	4		<2		0.32		0.01		2100		
4/4/2012	10:45	7.2	6.1	20.5	101	17		6		0.17	<0.20	0.05		96000		7
4/11/2012	11:05	7.3	8.3	15.1	192	2		2		0.2	1.54	0.02		590		
4/18/2012	10:40	7.6	7.4	18	58	29		4		0.12	<0.20	0.09		46000		
4/25/2012	10:45	7.3	10.6	14.8	238	6		<2		0.31	1.54	0.03		360		
7/3/2012	10:45	7.6	8	25.1	248	3		<2	10.1	<0.10		0.01		600		2
7/10/2012	10:20	7.6	7.5	24.5	212	3		2		0.19	1.48	0.03		5800		
7/17/2012	10:25	7.7	7.9	24.8	245	5		<2		<0.10		0.02		3500		
7/24/2012	10:20	7.8	7.4	24.6	171	5		<2		<0.10	1.52	0.02		5200		
10/3/2012	11:05	43	6.5	22	144	10		<2		0.16	1.14	0.05		6200		10
10/10/2012	10:55	7.5	6.1	15.8	229	13		<2		0.17		0.05		720		
10/17/2012	10:00	7.8	7.9	14.3	216	2		<2		0.17	1.33	0.02		820		
10/24/2012	10:35	7.5	8.5	14.6	220	2		<2		<0.10		0.02		420		
1/2/2013	10:45	7.3	10	10.3	102	18		8	0.7	0.1		1.24		1200		8
1/9/2013	11:00	7.4	9.2	11.4	211	3		<2		0.65		0.03		70		
1/16/2013	10:35	7.8	9.2	15.8	62	23		<2		<0.10		0.04		5400		
1/23/2013	10:45	7.6	10.8	7.5	216	8		<2		0.49		0.03		140		
4/3/2013		7.9	10.2	13.2	211			<2		0.48	1.52	0.04		150		3
4/10/2013		7.5	9.7	17.7	204			2		0.25	1.38	0.04		80		
4/17/2013		7.3	8.6	19.6	216			<2		0.47		0.02		90		
4/24/2013		7.2	8.5	16.2	207			<2		0.43		0.02		430		
7/2/2013		7	6.7	23.5	120	4		3	3.48	<0.10	0.68	0.07		5000		7
7/9/2013		7.5	7.5	23.7	211			<2		0.28	1.39	0.01		470		
7/16/2013		7.5	7.9	23.5	220	4		<2		<0.10		0.02		1300		
7/23/2013		7.2	7.1	23.1	168	6		<2		0.2	0.92	0.02		18000		
10/2/2013		7.4	9.1	20.2	202	14		2		0.11	1.64	0.02		490		5
10/9/2013		7.4	8.2	17.9	196	4		<2		0.19		<0.01		6600		

10/16/2013		7.7	8.8	18.5	222	4		<2		0.11		<0.01		220		
10/23/2013		7.4	8.8	14.9	204	2		<2		0.18		<0.01		290		
1/2/2014		7.7	9.5	10.3	224	13		<2	0.86	0.62		0.01		190		9
1/9/2014		7.5	11.5	4.3	228	2		<2		0.86		0.01		40		
1/16/2014		7.9	10.7	5.9	213	3		<2		0.65	2.74	<0.01		70		
1/23/2014		7.9	11.5	3.7	189	7		<2		0.77		<0.01		160		
4/2/2014		7.6	9.1	15.5	221	3		<2		<0.10		0.08		120		3
4/9/2014		7.1	8.9	14.2	217	6		<2		0.32	1.47	0.02		620		
4/16/2014		7.3	9.6	11.7	177	7		2		0.51	0.95	0.03		3800		
4/23/2014		7.6	8.5	17	214	3		2		0.32	1.24	0.04		2100		
7/1/2014		7.4	6.9	25.6	122	10		2	0.44	<0.10		0.06		19000		2
7/8/2014		7.5	7.9	25.6	215	5		<2		<0.10		0.01		450		
7/15/2014		7	7.2	24.4	137	6		2		<0.10		0.03		60000		
7/22/2014		7.1	7.5	22	147	5		<2		0.14		0.02		4500		
10/1/2014		7.3	8.3	20.1	189	3		<2		0.12		0.01		1300		2
10/8/2014		7.9	8.3	19.1	200	2		<2		0.13		<0.01		350		
10/15/2014		7	8.1	18.3	117	20		2		0.14	1.01	0.06		14000		
10/22/2014		7.6	8.7	14.9	204	4		<2		0.21		0.01		440		

count	180	
Meet stan	40	0.22222222
exceeds su	48	0.26666667
exceeds w	92	0.51111111
average	9,317.40	
max	#########	
min	40.00	
median	750.00	

CdTotal	CuTotal	PbTotal	ZnTotal	CdDissolve	CuDissolve	PbDissolve	ZnDissolve	Hardness	Alkalinity	Turb- Lab
ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L as CaCO3	ng/L as CaCO	NTU
G	G	G	G	G	G	G	G	G		M
1	1	1	1	1	1	1	1	1		1
								83	78	
								80	78	
								46	27	
								78	40	
								83	76	
								64	55	
								82	77	
								73	77	
								64	22	
								82	70	
								82	78	
								28	14	

								77	70	
								21	10	
								69	54	
								77	70	
								77	76	
								72	68	
								84	70	
								82	68	
								87	57	
								69	69	
								75	60	
								86	65	
								79	73	
									54	
								68	75	
									80	
									32	

									88	
									44	
									82	
									36	
									78	
									71	
									76	
									59	
									82	
									44	
									35	
									55	
									77	

									81	
									76	
									62	
0.12	3.7	2.96	26.3						74	
									92	
									44	
									72	
0.02	15.5	3.45	93						76	
									66	
									78	
									70	
0.05	1.73	6.97	19.5						85	
									84	
									92	
<0.01	1.4	4.06	11,7						78	
0.08	4.46	4.23	34.3						64	
									33	
									31	
									65	
									73	
								19		
0.1	12.1	6.35	49.6					34	25	
									56	
									77	

									74	
									21	
									71	
<1.0	1.97	1.07	29.6					62	57	
0.06	5.35	4.87	45.5					71	80	
									36	
									72	
									30	
<1.0	3.24	5.16	28.6						90	
									81	
									173	
									15	
<1.0	7.99	4.23	30.1					84	71	
									80	
									79	
								69	71	
<1.0	3.2	7.33	30						67	
									54	
									82	
<1.0	8.28	3.79	37.6					69	81	
									26	
									82	
									87	

1.38	24.4	27.6	109						28	
									47	
									40	
									79	
<1.0	<1.0	5.7	40.7					47	22	
									77	
									66	
<1.0	9.97	14.4	70.5					54	49	
									25	
									64	
									76	
<1.0	15.1	12.5	70.7						13	
									18	
									50	
<1.00	2.46	4.06	41.1						70	
								76	72	
									70	
									35	
<1.0	7.16	4.09	37.2					7.8	60	
									40	
									58	
									71	
<1.0	11.3	4.97	57					70	65	
									28	
									50	
									57	
<1.0	38.7	2.02	21.5					69	67	
									64	
									46	
<1.0	44.8	5.98	36.6						63	

									25	
<1.0	58.1	2.7	<1.0					70	62	
									55	
									68	
									65	
1	55.2	23.5	34.2					30	25	
									64	
									74	
									9	
<1.0	21.6	16.4	28.2					65	71	
									32	
									15	
									37	
<1.0	27.9	<1.0	15.1					74	60	
									21	
									21	
									52	
<1.0	27.2	5.19	22					35	27	
									64	
									21	
									61	
<1.0	5.29	11	10.5					72	72	
									69	
									60	
									59	
<1.0	<1.0	<1.0	6.11					55	43	
									70	
									61	
									58	
<1.0	27.7	2.47	20.4					42	29	
									58	
									20	
									76	
<1.0	53.8	<1.0	9.73					90	70	
									77	
									73	
									71	
<1.0	3.29	10.7	27.1						45	
									76	
									73	
									60	
<1.0	1.74	5.52	5.73					75	64	
									68	

										70	
										73	
<1.0	40.6	14.6	34.7						88	62	
										65	
										71	
										77	
<1.0	36.6	14.3	62.4						75	42	
										64	
										55	
										66	
<1.0	5.84	15.3	27.1						46	35	
										61	
										37	
										52	
<1.0	5.64	4.64	27						67	54	
										70	
										34	
										67	

Site: **Chattahoochee River:** **North Fork Peachtree Creek at U.S. Hwy 23**

DATE	TIME	pH	DO	Temp	Cond	Turb	Temp_Air	BOD5U	NTKN	NH3	NO2NO3	P-Total	P-Ortho	Fecal	Ecoli	Solid TSS
;UNITS	TIME	SU	mg/L	Deg C	umho/cm	NTU	deg C	mg/L	ng/L as N	ng/L as N	mg/L as N	mg/L as P	mg/L as P	#/100 mL	#/100 mL	mg/L
		M	M	M	M	M	M	G	G	G	G	G	G	G	G	G
		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1/8/2003		7.2	12.2	4.9	139	10		<2		0.1		0.05				
1/15/2003		7.3	9.1	3.6	136	6		<2		0.15	2.3	0.14				
1/22/2003		6.8	6.5	8.8	128	10		2		0.2		0.05				
1/29/2003		7.4	10.5	6.1	148	5		<2		<0.10	2	0.01				
2/6/2003		7.2	10.3	7.3												
2/13/2003		7.2	10.1	5.9												
2/20/2003		7.1	8.1	7.8												
2/27/2003		6.5	6.3	8												
3/6/2003		7.1	6.9	13.1												
3/13/2003		7.4	9.6	14.7												
3/20/2003		6.9	8.3	13.3												
3/27/2003		7.5	7.5	16.1												
4/2/2003		7.4	11.8	13.6	130	3		<2		<0.10	2.3	0.02				
4/9/2003		7.2	8.5	13.2	118	6		2		0.13	1.1	0.03				
4/16/2003		7.4	5.9	16.7	141	5		<2		0.1		0.02				
4/23/2003		6.9	8.9	14.8	129	5		<2		<0.10		0.03				
5/8/2003		5.4	6.9	19.8												
5/15/2003		6.7	5	17.5												
5/22/2003		7.5	8.4	18.5												
5/29/2003		7.6	7.5	18.4												
6/5/2003		7.1	7.3	19.8												
6/12/2003		7.4	7	22.5												
6/19/2003		7.4	5.4	21.8												
6/26/2003		7	5	22.4												
7/2/2003		7	7	21.3	67	40		2		<0.10		0.08				
7/9/2003		7.1	6.3	24	134	8		<2		<0.10	2.3	0.03				
7/16/2003		7.2	6.2	23.8	138	5		2		<0.10	2.6	0.03				
7/23/2003		6.6	6.5	22.8	57	71		5		<0.10	1	0.14				
8/7/2003		7.1	8.1	22.3												
8/14/2003		6.4	6.7	23.4												
8/21/2003		7.1	6.7	24.2												
8/28/2003		7.2	6.4	24.2												

9/4/2003		7.2	6.9	24.7												
9/11/2003		7.3	6.5	20.5												
9/18/2003		6.6	6.6	19.4												
9/25/2003		6.6	6.8	19.7												
10/1/2003		7.2	8.5	15.9	136	9		2		0.28	0.4	0.07				
10/8/2003		6	6.1	18.4	38	108		4		<0.10	0.8	0.36				
10/15/2003		7.4	7.1	16	124	8		<2		<0.10	1	0.03				
10/22/2003		7.4	7.6	16	142	7		<2		<0.10	1	0.02				
11/6/2003		7	5.7	20.1												
11/13/2003		7.2	5.5	13.6												
11/20/2003		7.1	4.7	13.6												
12/3/2003		7.3	4.6	7.4	132	5		<2.0		0.1		0.01				
12/10/2003		7	10.1	10.5												
12/17/2003		7.1	11	7.9												
1/7/2004		7	11.4	4	105	8		<2		0.13	1	0.13				
1/14/2004		7.2	10.6	6.1	128	5		<2		0.12		0.02				
1/21/2004		7.3	11.9	7.3	127	5		<2		<0.10	1.2	0.02				
1/28/2004		7.4	9.2	2.7	116	8		<2		0.11	2.7	0.14				
2/5/2004		7.3	8.2	5.7												
2/12/2004		6.8	7.8	6.5												
2/19/2004		7.5	10.9	5.6												
2/26/2004		7.3	10.7	5.6												
3/4/2004		7.5	8.4	14.9												
3/11/2004		7.3	9.9	8.6												
3/18/2004		7.7	9.2	12.7												
3/25/2004		7.6	9.4	12.2												
4/7/2004		7.4	8.4	13.5	147	5		<2		<0.10		0.03				
4/14/2004		7.3	5.6	11	92	18		2		<0.10	0.6	0.04				
4/21/2004		7.6	7.1	18.1	136	5		<2		<0.10	1.2	0.06				
4/28/2004		7.3	7.6	14.9	132	5		<2		<0.10	0.9	0.01				
5/6/2004		7.4	8.3	17.4												
5/13/2004		7	5	20.7												
5/20/2004		7.1	5.2	20.8												
5/27/2004		7.2	4.7	23.2												
6/3/2004		7.3	4.6	20,9												
6/10/2004		7.1	4.1	22.5												
6/17/2004		7.1	4	23.9												
6/24/2004		6.9	4	23.4												
7/7/2004		7.2	4.1	23.7	122	6		<2		<0.10	0.7	0.04				
7/14/2004		7	4.6	24.9	78	11		<2		<0.10	1.4	0.03				
7/21/2004		7.1	5.6	23.3	128	9		<2		0.12	1.1	0.14				
7/28/2004		7.1	5.5	24.3	75	37		<2		0.13	1.2	0.06				
8/5/2004		7.1	5.2	24.9		7										

8/12/2004		6.9	4.5	22.8		234										
8/19/2004		7	5.8	22.4		8										
8/26/2004		6.5	8.7	22.9		19										
9/9/2004		6.9	9.3	21.6		12										
9/16/2004		7.6	6.5	21.5		15										
9/23/2004		7.4	7.5	19		14										
9/30/2004		7.2	6.3	18.8		10										
10/13/2004		7.4	6.1	19.1	156	4		<2		<0.10	1	0.03				
10/20/2004		7.1	6.3	18.1	60	27		2		<0.10	1.2	0.05				
10/27/2004		7.4	6.4	17.7	157	5		<2		<0.10	1	0.02				
11/5/2004		7.3	8	16.3		29										
11/10/2004		6.9	8.5	11.3		6										
11/17/2004						5										
12/3/2004		7.2	8.9	8		6										
12/16/2004		7.5	14.3	4.2												
1/5/2005		7.5	9.3	11.5	142	5		<2		<0.10		0.02				
1/12/2005		7.5	11.1	12.6	137	4		<2		0.24	1.9	0.02				
1/19/2005		N/A	12.4	3.4	124	8		2		0.19	2.8	<1				
1/26/2005		7.8	10.5	6.4	145	5		<2		0.14	1.4	0.23				
2/3/2005		7.1	11.2	4.6		56										
2/11/2005		7.6	10.6	5.5		7										
2/17/2005		7.6	9.3	10.2		4										
2/24/2005		7.3	8.1	14		74										
3/3/2005		7	9.6	8.6		7										
3/10/2005		6.7	9.6	8.9		8										
3/17/2005		6.9	9.1	9.1		20										
3/24/2005		7.7	8.4	12.8		14										
4/6/2005		7.7	7.8	15.5	137	8		<2		<0.10		0.09				
4/20/2005		7.7	7.3	16	141	5		<2		<0.10		0.02				
4/27/2005		7.8	7	14	86	16		3		<0.10		0.06				
5/12/2005		7.6	6.1	18.7		4										
5/19/2005		7.1	6.2	19.1		5										
5/26/2005		7.1	6.1	17		5										
6/9/2005		7.4	5.6	22.6		15										
6/16/2005		7.3	5.1	22.9		4										
6/23/2005		6.9	5.2	21.9		5										
6/30/2005		7.6	5.6	24		18										
7/6/2005		6.9	4.8	24.2	69	30		2		<0.10		0.1				
7/13/2005		7.1	5.3	23.5	93	38		<2		<0.10		0.07				
7/27/2005		6.9	6.7	25.9	143	5		<2		<0.10		0.21				
8/4/2005		7	6.7	23.8		6										
8/11/2005		7.1	6.8	23.7		34										
8/18/2005		6.8	7	24.1		17										

8/25/2005		6.8	6.7	24.3		10										
9/9/2005		6.8	6.3	21		6										
9/16/2005		7.4	5.5	22.7		7										
9/23/2005		8	5.2	22.8		5										
9/30/2005		7.3	5.2	20.8		4										
10/5/2005		7.5	5.4	20.9	145	7		<2		<0.10		<0.01				
10/12/2005		7.6	5.9	20.7	124	4		<2		<0.10		0.03				
10/19/2005		7.7	6.6	16.7	149	5		<2		<0.10		0.02				
12/2/2005		6.7	9.8	6.4		8										
1/4/2006		7.3	9.1	9.1	110	13		<2		<0.10		0.06		9200		
1/11/2006		7.5	7.6	12.1	138	14		2		0.27		0.03				
1/18/2006		6.7	7.4	8.6	80	63		2		<0.10		0.05		2700		
1/25/2006		7.2	9.4	8.9	114	16		<2		<0.10		0.11		560		
2/9/2006		7.2	10.8	6.6		9								13000		
2/16/2006		7.4	10.4	9.2		4								150		
2/23/2006		7.4	9.7	11.4		81								4000		
3/9/2006		7.4	10.3	11.5		7								620		
3/16/2006		7.4	10.2	11.8		6								180		
3/23/2006		7.7	9.8	10		9								640		
4/5/2006		7.3	8.6	13.7	135	4		<2		<0.10		0.07		220		
4/12/2006		7.2	8.5	15	135	4		3		0.12		0.05		3000		
4/19/2006		7.2	6.9	19.7	157	4		<2		<0.10		0.02		1500		
4/26/2006		6.9	6	20.1	152	5		<2		<0.10		0.05		300		
5/11/2006		7.1	7.1	18.1		16								12000		
6/8/2006		7.4	6.6	21.2		5								2000		
6/15/2006		7.2	4.8	22.4		5								600		
6/22/2006		6.9	5	24.5		4								1100		
6/29/2006		7.5	6.6	22.6		6								5200		
7/11/2006		7.6	6.5	23.8	141	5		<2		<0.10		0.03		420		
7/18/2006		7.1	5	25.3	135	5		<2		<0.10		0.03		2700		
7/25/2006		7.1	5.8	24.6	129	6		<2		<0.10		0.06		660		
8/3/2006		6.9	5.4	26.2		7								3100		
8/10/2006		7.2	5.8	26.3		5								520		
9/7/2006		6.8	6.2	22.1		8								680		
10/4/2006		7.2	6.8	19.5	190	4		<2		<0.10		0.02		3200		
11/9/2006		7.6	8.6	11.7		6								9000		
11/16/2006		6.5	7.5	13.2		35								20000		
1/3/2007		7.3	6.7	7.8	95	6		2		0.14		0.05		5900		
1/10/2007		7.4	6.7	6.8	127	8		<2		<0.10		0.05		5800		
1/17/2007		7.2	6.4	8	119	6		<2		<0.10		0.09		4400		
1/24/2007		7.1	7	6.2	113	6		<2		<0.10		0.02		1800		
1/31/2007		7.4	7.5	2.8	152	4		<2		0.13		0.27		300		
2/15/2007		7.4	10.6	5		12								5300		

2/22/2007		6.8	8.4	11		14								4800		
4/4/2007		6.5	7	18.5	92	69		5		<0.10		0.41		360000		20
4/11/2007		7.1	7.6	12.5	79	50		<2		0.77		0.08		3900		
4/18/2007		7.2	7.6	14.7	135	5		<2		0.17		0.05		2900		
4/25/2007		7.6	9.3	18.1	148	3		<2		<0.10		0.04		600		
6/14/2007		7.1	6.2	22.2		3								440		
6/21/2007		7.1	5.6	22.6		2								3900		
6/28/2007		6.8	5.6	24.2		2								1800		
7/3/2007		7.2	5.9	22.7	77	9		<2		0.11		0.3		6900		
7/17/2007		7.3	5.9	24.4	66	13		<2		0.21		0.04		420		
7/24/2007		7.4	7.5	22.6	273	14		<2		0.13		0.09		1800		
8/16/2007		7.1	4.1	25.8		3								480		
10/3/2007		7.1	5.5	21	142	6		<2		<0.10		0.02		3400		2
10/10/2007		7.2	6.6	20.6	122	9		2		<0.10		0.08		33000		
10/17/2007		7.4	7.6	19.1	145	10		2		<0.10		0.03		1000		
10/24/2007	11:20	6.7	7.8	18.4	78.2	40		4		<0.10		1.04		20000		
11/2/2007	9:50	7.1	8.4	14.2		6								1400		
11/8/2007	10:00	7.4	9.7	8.2		5								1800		
11/29/2007	9:45	6.9	10.8	8.5		5								880		
1/2/2008	1100	7.1	13	3.6	87	8		<2		<0.10		0.22		3100		
1/9/2008	1055	7	10.1	12.1	146	20		2		<0.10		1.84		2700		
1/16/2008	1045	7	12.3	5.7	138	6		2		0.13		0.02		1300		
1/23/2008	1100	7.1	13	5.4	90	12		1		0.16		0.02		1900		
2/14/2008	10:01	7.2	12.2	4.9		9								2300		
2/21/2008	9:40	7.1	11.2	8.7		11								570		
2/28/2008	9:45	7	11.6	5.1		14								650		
4/2/2008	11:20	7.3	7.6	15.6	141	8		<2		<0.10		0.11		5100		6
4/9/2008	11:10	7.1	10	15.3	146	4		<2		<0.10		0.05		380		
4/16/2008	11:20	7.2	8.8	11.8	229	4		<2	0.78	0.6		0.02		640		
4/23/2008	10:35	7.4	6.3	17.5	161	4		<2		<0.10		<0.01		220		
5/8/2008	1000	6.7	6.6	20.1		8								470		
5/15/2008	10:00	6.7	7.2	18.1		8								730		
5/21/2008	9:55	7.4	6.3	18.4		8								2100		
6/5/2008	10:25am	7.2	5.5	24.2		5								27000		
6/12/2008	10:35am	6.5	5.7	23.4		86								620000		
6/19/2008	10:15am	7.1	6.3	21		5								1200		
6/26/2008	10:16am	6.2	5.3	22.9		3								31000		
7/1/2008	10:40am	7.1	6.4	21.5	172	3		<2		<0.10		0.03		1000		
7/8/2008	1105	7	5.7	24.9	177	3		<2	<0.10	0.12		<0.01		1800		1
7/15/2008	1015	7	6.4	23.4	91	10		<2		<0.10		0.01		4100		
7/22/2008	11:49	7.3	6	25.7	153	7		<2		<0.10		0.09		49000		
8/7/2008	9:55	7.2	5	24.9		3								1500		
8/21/2008	10:40	6.4	4.2	22.2		53								1900		

10/1/2008	1100	7.4	5.6	18.9	182	3		<2	0.45	<0.10		0.05		41000		3
10/8/2008	11:25	7.1	6.2	19.9	149	54		12		0.22		0.81		28000		
10/15/2008	1100	7.5	7.3	17.9	139	3		<2		<0.10		<0.01		740		
10/22/2008	1040	7.2	7.4	13.7	133	3		<2		<0.10		0.02		250		
11/13/2008	958	6.8	8.4	11.2		4								1800		
11/20/2008	935	7.3	10.1	6.7		4								1400		
1/7/2009	10:30	6.4	8.9	13.8	46	95		3		<0.10		0.09		12000		
1/14/2009	10:50	6.7	12.4	4.8	124	5		<2	<0.10	0.22		0.02		540		3
1/21/2009	10:45	6.4	17.4	0.3	194	6		<2		<0.10		0.02		560		
1/28/2009	10:30	6.9	10.1	10.5	152	6		2		0.39		0.09		5200		
2/12/2009	10:40	7.4	8.9	11.7		6								310		
2/19/2009	10:15	6.7	9.7	10.8		80								3800		
4/1/2009	1155	6.1	9.3	13.9	136	27		4	<0.1	0.11		0.07		12000		33
4/8/2009	1045	8	10	8.7	176	6		2		0.37		<0.01		7270		
4/22/2009	1100	7.5	8.7	13.6	150	4		<2		<0.10	0.51	<0.01		3400		
5/14/2009	11:05	7.2	7.6	18.6		9								560		
5/21/2009	9:55	7	8.1	18.2		9								2400		
5/28/2009	9:55	7	6	21.3		43								5000		
6/5/2009	10:05	7.1	6.3	21.9		43								Lab error		
6/12/2009	10:00	7.2	6	23.1		8								3500		
6/19/2009	9:40	7.2	5.8	24.6		9								410		
6/26/2009	9:30	7.1	5	24.6		4								240		
7/7/2009	11:30	7	5.9	24.1	134	9		<2	0.37	<0.10	0.56	0.03		420		5
7/14/2009	10:15	7	6.1	23.8	74	12		<2		<0.10	0.33	0.04		11000		
7/21/2009	11:00	6.7	6.5	21.1	109	18		<2		<0.10		<0.01		1800		
7/28/2009	10:15	7.4	5.2	23.9	146	6		2		<0.10		0.02		15000		
8/6/2009	10:30	7.3	7	24.4		4								700		
8/13/2009	9:45	6.9	4.8	23.7		13								540		
10/7/2009	10:50	7.6	7.6	21.2	50	78		2		<0.10	0.35	0.17		29000		
10/14/2009	11:00	6.9	7.9	19.2	90	29		3		<0.10	0.3	<0.10		20000		
10/21/2009	10:35	7.3	9.1	14.1	161	13		<2		0.32	0.84	0.01		4300		
11/5/2009	10:05	7.1	8.8	11.6		5								580		
1/6/2010	10:42	7.7	12.4	0.5	185	12		<2		0.12	0.96	0.06		270		
1/13/2010	11:10	7.8	12.1	2	202	7		<2		0.16		0.02		190		10
1/20/2010	10:25	7.8	10.5	7.9	125	8		<2		0.11	0.92	<0.01		260		
1/27/2010	10:35	7.8	10.9	6.2	129	4		<2		0.12	0.93	0.05		5200		
4/7/2010	10:58	7.4	9	18.4	146	5		<2		<0.10	0.73	0.02		320		1
4/14/2010	11:10	7.5	8.4	16.5	116	5		2		0.18	0.66	0.03		740		
4/21/2010	11:10	7.5	9	15.5				3		<0.10	0.74	0.02		240		
4/28/2010	11:05	7.5	10.8	14	148	9		<2		0.27	0.75	0.03		2800		
7/6/2010	11:40	7.2	5.9	23.3	155	5		<2		<0.10		0.04		640		2
7/13/2010	10:15	7.3	5.1	24.9	101	46		3		<0.10		0.09				
7/20/2010	10:10	7.5	5.2	25	102	9		<2		<0.10		0.11		2000		

7/27/2010	10:30	7.4	6	26	51	79		3		<0.10		0.08		15000		
10/6/2010	11:30	7.4	12.4	13.8	129	5		<2		<0.10		0.06		1500		1
10/13/2010	11:10	7.2	10.7	18.1	133	3		<2		<0.10		0.08		350		
10/27/2010	11:05	7.6	5.8	20.7	106	7		<2		<0.10		0.03		2200		
1/5/2011	11:25	7.5	15.1	6.2	122	7				0.2		0.03		2000		
1/26/2011	11:20	7.2	10.8	6.4	175	79		3		<0.20		0.28		3700		
4/6/2011	11:45	7.4	9.7	13.1	87	10		2		<0.10		0.04		3400		6
4/13/2011	11:15	7.6	8.1	15.7	107	4		2		<0.10		0.06		2200		
4/20/2011	10:35	7.5	8.3	17.8	135	4		2		<0.10		<0.01		430		
7/5/2011	11:50	7.2	9.4	24.7	79	16		3		<0.10		0.06		13000		15
7/12/2011	1155	7	5.9	25.1	122	12		2		<0.10		0.2		1100		
7/19/2011	1035	7.7	5.9	23.7	132	4		<2		<0.10		0.03		1200		
7/26/2011	1110	7.9	5.9	25.7	60	45		3		<0.10		0.11		25000		
10/5/2011	12:00	7.3	9.3	17.5	170	10		2		0.27		0.03		2200		4
10/12/2011	1045	7.2	7.4	17.3	76	9		<2		<0.10		0.03		4600		
10/19/2011	1110	7.4	7.2	18	45	78		5		<0.10		0.42		16000		
10/26/2011	1100	7.8	8.5	15	134	9		<2		0.12		0.02		1700		
1/4/2012	11:20	7.7	13.1	3.1	132	8		<2		0.27		0.02		1000		3
1/11/2012	11:10	7.6	9.2	13.5	58	25		2		<0.10		0.06		3600		
1/18/2012	11:10	7.6	9.8	9.9	84	29		2		<0.10		0.08		3900		
1/25/2012	12:00	7.4	10.7	9.5	100	8		<2		<0.10		0.02		1100		
4/4/2012	11:05	7	6.4	20.6	87	20		6		<0.10	0.55	0.08		35000		15
4/11/2012	11:15	7.3	6.7	15	131	7		<2		<0.10	0.54	0.03		430		
4/18/2012	10:50	7.6	6.7	17.8	41	69		5		0.16	<0.20	0.49		35000		
4/25/2012	11:00	7.9	9.6	14.7	174	8		<2		0.12	1.29	0.04		340		
7/3/2012	11:00	7.5	6.7	26.3	157	3		<2	6.32	<0.10		0.02		640		2
7/10/2012	10:35	7.5	4.9	24.9	61	20		4		<0.10	0.68	0.08		80000		
7/17/2012	10:40	7.6	6.6	25.5	131	5		<2		<0.10		0.04		1900		
7/24/2012	10:35	7.5	6.5	24.9	85	4		<2		<0.10	0.52	0.02		7000		
10/3/2012	11:20	20	7	21.4	74	16		<2		<0.10	0.74	0.06		2600		9
10/10/2012	11:10	7.5	6.2	16.4	144	128		<2		<0.10		0.14		280		
10/17/2012	9:40	7.8	7.6	15.7	191	2		<2		0.1	1.23	0.02		550		
10/24/2012	10:55	7.6	7.9	15	163	5		<2		<0.10		0.03		470		
1/2/2013	11:00	7.7	10.4	9.7	52	29		2	1.08	<0.10		0.5		3800		19
1/9/2013	11:20	7.9	10	10.3	129	4		<2		0.18		<0.01		270		
1/16/2013	10:50	7.5	9.2	15.4	59	21		<2		<0.10		0.09		2800		
1/23/2013	11:00	7.8	10.9	7.3	137	9		<2		<0.10		0.02		600		
4/3/2013		7.9	10.2	12.8	122	5		<2		<0.10	0.74	0.01		570		2
4/10/2013		7.7	9	18.8	122	4		2		<0.10	0.49	0.04		1500		
4/17/2013		7.6	8.4	19.6	120	6		<2		<0.10		0.03		200		
7/2/2013		7	6.7	23.4	92	15		2	11.4	<0.10	0.58	0.08		12900		11
7/9/2013		7.6	7.4	23.6	121			<2		<0.10	0.72	0.02		520		
7/16/2013		7.5	7.2	23.8	114	7		<2		<0.10		0.05		3700		

7/23/2013		7.6	7.2	23.9	92	12		<2		<0.10	0.51	0.04		4800		
10/2/2013		7.5	8.7	19.1	147	4		<2		<0.10	2.58	0.01		580		3
10/9/2013		7.5	7.8	17.6	113	6		<2		0.42		0.04		26000		
10/16/2013		7.6	7.5	18.5	149	4		<2		0.43		0.05		550		
10/23/2013		7.5	8.3	14.7	136	4		<2		0.15		0.02		400		
1/2/2014		7.8	10	8.9	138	7		<2	0.47	0.19		0.02		2000		5
1/9/2014		7.8	12.2	2.6	143	18		<2		0.24		0.02		410		
1/16/2014		8	11	5.5	126	8		<2		0.14	2.43	0.02		640		
1/23/2014		8.1	12.1	2.5	120	8		2		0.17		0.01		160		
4/2/2014		7.7	9.4	15.3	141	4		<2		<0.10		0.03		160		2
4/9/2014		7.5	9.1	14.1	114	15		2		<0.10	0.91	0.04		2900		
4/16/2014		7.5	9.5	12.4	98	12		2		<0.10	0.37	0.03		2500		
4/23/2014		7.8	8.7	16.8	140	4		<2		0.14	0.79	0.04		200		
7/1/2014		7.5	6.6	24.6	114	7		2	0.78	0.2		0.1		3900		3
7/8/2014		7.6	6.7	25.1	158	5		<2		<0.10		0.01		1000		
7/15/2014		7.2	6.6	23.9	80	18		2		<0.10		0.05		17000		
7/22/2014		7.3	7.5	22.5	76	11		<2		<0.10		0.04		3600		
10/1/2014		7.4	7.9	19.6	136	6		<2		<0.10		0.03		580		6
10/8/2014		7.9	7.7	19.7	133	4		<2		<0.10		0.03		410		
10/15/2014		7.3	8.3	18.4	64	40		2		<0.10	0.69	0.09		16000		
10/22/2014		7.6	8.6	15	126	7		<2		<0.10		0.01		340		

count	181	
Meet stan(	26	0.14364641
exceeds su	46	0.25414365
exceeds w	109	0.60220994
average	10,704.92	
max	#########	
min	150.00	
median	1,800.00	

CdTotal	CuTotal	PbTotal	ZnTotal	CdDissolve	CuDissolve	PbDissolve	ZnDissolve	Hardness	Alkalinity	Turb- Lab
ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L as CaCO3	ng/L as CaCO	NTU
G	G	G	G	G	G	G	G	G		M
1	1	1	1	1	1	1	1	1		1
								49	36	
								48	40	
								44	35	
								48	35	
								50	40	
								47	41	
								58	40	
								49	43	
								33	18	
								56	33	
								48	40	
								25	11	

								47	42	
								19	7	
								47	42	
								50	42	
								48	53	
								44	28	
								53	37	
								46	35	
								55	28	
								62	48	
								49	32	
								65	45	
								57	43	
									35	
								67	37	
									37	
									15	

									48	
									22	
									46	
									40	
									44	
									46	
									46	
									39	
									43	
									35	
									16	
									34	
									44	

									45	
									42	
									40	
0.48	5.49	13.5	23.4						26	
									45	
									18	
									28	
0.08	17.1	4.37	76.9						42	
									41	
									42	
									42	
0.02	1.61	5.14	12.8						42	
									39	
									40	
<0.01	1.21	2.45	7.19						42	
0.54	6.37	4.83	29.2						25	
									34	
									37	
									30	
									41	

								21		
0.07	13.7	5.39	37.9					30	22	
									67	
									45	
									49	
									45	
									30	
<1.0	1.7	1.83	34.3					37	68	
0.06	2.67	1.31	25.4					44	50	
									37	
									50	
									26	
<1.0	3.4	8.54	25.7						69	
									104	
									154	
									31	
<1.0	2.71	5.45	20					44	26	
									38	
									78	
									52	
								47	64	
<1.0	1.22	4.82	30.2						50	
									23	
									51	

<1.0	7.14	4.91	27.3					52	61	
									29	
									52	
									52	
<1.0	24.5	20.9	68.2						11	
									46	
									42	
									81	
<1.0	<1.0	<1.0	23					37	20	
									48	
									31	
<1.0	6.62	13.2	66.4					58	53	
									23	
									40	
									45	
<1.0	14.2	10.1	5						15	
									21	
									44	
<1.00	3.75	3.31	27.6						42	
								47	42	
									37	
									30	
<1.0	7.21	10.8	43.3					5.2	38	
									41	
									50	
									45	
<1.0	15.2	5.26	34.2					47	46	
									25	
									35	

									15	
<1.0	51.3	2.4	24.7					39	40	
									44	
									30	
<1.0	35.3	2.74	17.9						36	
									26	
<1.0	48.1	3.9	<1.0					36	29	
									28	
									41	
<1.0	43	21	11					24	22	
									41	
									46	
									12	
<1.0	15.2	9.07	18.8					53	50	
									18	
									11	
									37	
<1.0	31.2	<1.0	9.13					47	40	
									25	
									14	
									25	
<1.0	31	10	19.8					29	23	
									43	
									12	
									45	
<1.0	5.6	10.5	10.6					45	50	
									15	
									39	
									34	
<1.0	3.16	<1.0	4.93					28	20	
									35	
									51	
									51	
<1.0	28.5	4.9	16.2					38	9	
									39	
									23	
									37	
<1.0	35.4	7.04	15.3					47	40	
									42	
									44	
<1.0	3.41	13	29						29	
									50	
									44	

									32	
<1.0	1.58	6.52	5.14					49	49	
									37	
									47	
									43	
<1.0	44.6	14	27.2					52	41	
									51	
									35	
									46	
<1.0	49.8	33.2	104					52	63	
									31	
									29	
									45	
<1.0	5.62	8.25	20.2					47	35	
									50	
									27	
									31	
<1.0	5.78	10.6	62.1					47	47	
									46	
									20	
									44	

Site: Chattahoochee River: Bubbling Creek at Hartsmill Road

State Standard		>6	>5	<32.2										<200 summer		
State Standard - Secor		<8.5												<1000 winter		

DATE	TIME	pH	DO	Temp	Cond	Turb	Temp_Air	BOD5U	NTKN	NH3	NO2NO3	P-Total	P-Ortho	Fecal	Ecoli	Solid TSS
;UNITS	TIME	SU	mg/L	Deg C	umho/cm	NTU	deg C	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L as P	mg/L as P	#/100 mL	#/100 mL	mg/L
		M	M	M	M	M	M	G	G	G	G	G	G	G	G	G
		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3/5/2003		7.1	6.1	11.6	154	3		2		<0.10	1.4	0.03				
3/12/2003		7.2	8.4	11	144	2		2		<0.10	1.9	0				
3/19/2003		6.8	5.2	14.7	59	43		2		0.161		0.12				
3/26/2003		7.3	5.4	14.5	150	2		2		<0.10	1.3	0.01				
6/4/2003		7.3	6.9	19.1	117	6		<2		<0.10	1	0.04				
6/11/2003		7.4	7	20.1	139	5		<2		<0.10	1.3	0.04				
6/18/2003		6	7.3	22.1	32	204		2		<0.10	1.2	0.63				
6/25/2003		7	7.7	19.7	130	3		<2		<0.10		0.02				
9/3/2003		7.3	6.9	22.3	119	2		<2		<0.10	1.6	0.02				
9/10/2003		7.4	7.3	19.5	115	2		<2		<0.10	1.4	0.03				
9/17/2003		6.8	5.5	18.8	104	2		<2		<0.10	2.5	0.04				
9/24/2003		7.1	6.6	17.9	131	5		<2		<0.10	3.1	0.03				
12/5/2003		6.9	2.7	7.3	84	8		<2		<0.10	0.7	0.02				
12/12/2003		7.2	13.4	5.3	118	9		2		<0.10		0.04				
12/19/2003		6.9	10.3	5.8	116	12		2		<0.10		0.05				
12/26/2003		6.8	6.5	4												
3/3/2004		7.7	8.8	14.1	148	3		<2		<0.10	4.6	0.02				
3/10/2004		7.7	9.6	9.2	164	2		<2.0		<0.10	2.4	0.15				
3/17/2004		7.6	8.8	11.9	98	4		<2		<0.10	1.7	0.01				
3/24/2004		7.8	8.5	9.9	131	2		<2		<0.10	1.5	0.01				
6/2/2004		7.4	5.1	18.7	96	4		<2		<0.10	1.6	0.06				
6/9/2004		7.2	4.3	20.1	127	3		<2		<0.10	2	0.03				5
6/16/2004		7.1	4.4	22	119	26		<2		<0.10	1	0.05				
6/23/2004		7	4.7	21.9	113	37		<2		<0.10	2.7	0.05				
9/8/2004		6.7	10.5	21.8	90	16		<2		<0.10		0.05				5
9/15/2004		7.5	8.4	19.7	124	2		<2		<0.10	0.4	0.01				
9/29/2004		7	6.8	18.8	127	12		<2		<0.10	5.9	0.03				
12/1/2004		7.6	8.6	11.6	72	34		2		<0.10	0.8	0.05				
12/8/2004		8.5	9.1	12.1	106	13		<2		<0.10	1.1	0.03				
12/15/2004		7.4	13.3	5.2	153	3		<2		<0.10	1.9	0.01				
12/22/2004		7.6	13	6.6	146	1		<2		<0.10	1.1	0.02				
3/2/2005		7.3	10.7	6.4	117	4		<2		<0.10		0.02				

3/9/2005		7	10.1	8.3	123	13		<2		<0.10		0.02				
3/16/2005		6.9	9.5	9.5	57	40		<2		<0.10		0.1				
3/23/2005		7.3	8.9	12.2	78	39		2		<0.10		0.07				
6/8/2005		6.8	5.8	20.7	112	16		2		<0.10		0.06				
6/15/2005		7.3	5.1	21.5	140	29		<2		<0.10		0.05				
6/22/2005		6.3	7	19.3	103	12		2		<0.10		0.12				
6/29/2005		7	5.7	21.2	127	6		<2		<0.10		0.03				
9/7/2005		7.6	5.5	19.4	132	2		<2		<0.10		0.03				
9/14/2005		8.1	5.3	19.6	135	2		<2		<0.10		0.01				
9/21/2005		7.3	5	20.5	145	5		<2		<0.10		0.04				
9/28/2005		8.1	4.6	21.1	107	2		<2		<0.10		0.02				
12/7/2005		7.4	10.8	6	124	7		<2		<0.10		0.16				
12/14/2005		7.7	8.8	6.5	125	7		<2		<0.10		0.05				
12/21/2005		7.4	10.9	4.2	127	2				0.1		0.11				
12/28/2005		7.2	8.3	8.3	136	4		<2		0.1		0.05				
3/7/2006		7.4	10.1	10.6	127	4		<2		<0.10		0.06		550		
3/14/2006		7.2	8.8	15	86	39		2		<0.10		0.08		2800		
3/21/2006		7.1	9.7	10	110	24		<2		<0.10		0.05		740		
3/28/2006		6.8	9.6	10.6	151	8		<2		<0.10		0.02		90		
6/7/2006		7.2	6.5	17.8	135	4		<2		<0.10		0.14		340		
6/14/2006		7.3	6.7	19.9	141	4		<2		<0.10		0.02		32000		
6/21/2006		7.1	5.9	21.7	158	3		<2		<0.10		0.02		7000		
6/28/2006		7.3	7.6	22.1	129	11		<2		<0.10		0.02		12000		
9/13/2006		6.5	8.7	20	38	1072		3		<0.10		0.07		300000		
9/20/2006		7	6.1	18	90	8		<2		<0.10		0.02		6200		
3/6/2007		7.1	8.5	9.9	149	3		<2		<0.10		0.05		230		1
3/13/2007		7.4	9.1	11.8	152	3		<2		<0.10		0.49		120		
3/20/2007		7.4	10.1	12.7	145	2		<2		<0.10		0.02		90		
3/27/2007		7.4	7.5	17.4	146	2		<2		<0.10		0.04		50		
6/6/2007		6.8	4.3	20	103	31		7		<0.10		0.33		60000		
6/13/2007		6.6	6.4	19.8	92	13		6		<0.10		0.2		60000		
6/20/2007		7.1	6	21.8	67	17		3		0.12		0.1		48000		
6/27/2007		7.2	6.5	22.3	101	4		<2		<0.10		0.06		60000		
9/5/2007		7.1	7.2	21.6	122	3		2		<0.10		0.05		2100		4
9/12/2007		7	7.9	22.7	118	14		2		<0.10		0.07				
9/19/2007		7.3	9.5	17.7	151	2		<2		<0.10		0.04		490		
9/26/2007		6.7	7.3	20.7	147	4		<2		0.17		0.02		lab error		
12/5/2007	1104	7.1	6.6	6.6	98	2		2		<0.10		0.01		1300		
12/12/2007	1100	6.8	9.1	12.9	141	1		2		<0.10		0.06		160		
12/19/2007														500		
3/4/2008	11:00	6.8	11.9	15.2	51	93		4		0.13		0.43		2200		95
3/11/2008	11:00	6.9	11.2	9.4	162	1		<2		< 0.10		0.9		100		
3/18/2008	10:45	7.1	10.2	12	148	1		<2		<0.10		0.03		140		

3/25/2008	10:45	6.8	11.6	7.7	190	6		<2		<0.10		0.02		280		
6/4/2008	11:15am	7.3	6.2	21.4	149	9		<2		<0.10		0.02		780		2
6/11/2008	11:00am	7.3	6.2	22.2	146	2		<2	<0.10	<0.10		0.01		1200		
6/18/2008	11:41am	7.4	7.1	19.8	138	3		<2		<0.10		<0.01		2000		
6/25/2008	10:45am	7.2	7.2	20	105	2		<2		<0.10		0.08		2900		
9/3/2008	1115	7.4	6.6	21.4	133	4		<2	0.24	<0.10		0.28		490		4
9/10/2008	1112	6.8	6.7	22.3	83	13		2		<0.10		0.17		21000		
9/17/2008	1116	7.5	6.1	19.6	121	2		<2		<0.10		0.14		560		
9/24/2008	1052	7.3	6	17.7	133	2		2		<0.10		0.03		460		
12/3/2008	1035	6.8	16.6	4.4	100	2		<2		<0.10		0.04		310		
12/10/2008	1035	5.9	9.8	14.4	56	192		8	0.59	<0.10		0.85		22000		
12/17/2008	1025	7	8.9	13	144	2		2		<0.10		<0.01		60		
3/3/2009	11:05	6.5	12.5	5.1	124	26		<2	<0.10	<0.10		0.01		460		
3/10/2009	10:50	7.1	10.1	14.3	159	2		<2		<0.10		0.02		50		
3/17/2009	10:45	6.9	12	11.1	118	13		2		<0.10		0.12		3300		
3/24/2009	10:45	6.9	11.2	12	171	2		<2		0.1		0.01		120		
6/3/2009	10:35	7.3	6.9	20.1	143	2		<2		<0.10	1.1	<0.01		240		1
6/10/2009	10:20	7.4	7.1	20.4	149	2		<2	<0.10	<0.10	1.02	<0.10		390		
6/17/2009	10:20	7.5	6.3	21.7	171	2		<2		<0.10	0.92	<0.01		420		
6/24/2009	10:22	7.2	6.2	22.1	106	3		2		<0.10	0.76	0.02		580		
9/2/2009	10:15	7.3	7.7	19.4	117	2		<2	<0.10	0.1	1.06	<0.01		480		<1
9/9/2009	11:00	7.3	7.2	20	118	2		<2		<0.10	0.88	0.1		2900		5
9/16/2009	11:00	6.6	8.3	21.6	39	40		3		<0.10		0.11		37000		
9/23/2009	10:55	6.8	6	20.6	125	11				<0.10	0.74	0.04		4800		
12/2/2009	10:26	7.4	8.7	10.1	21	91		4		<0.10	0.29	0.29		4600		
12/9/2009	11:51	7.8	8.9	11.8	69	48		2		<0.10		<0.10		5300		
3/2/2010	10:30	8.3	6.6	6.5	53	40		3		0.18	0.64	0.04		530		27
3/8/2010	10:55	7.7	10.4	10.8	139	32		<2		<0.10	0.9	0.03		40		
3/16/2010	11:10	7.6	10.2	10.6	141	9		<2		<0.10	0.91	0.03		30		
6/2/2010	10:55	7.5	7.4	20.4	139	4		<2		<0.10		0.02		220		5
6/9/2010	11:55	7.5	7.9	20.5	133	2		<2		<0.10		0.07		460		
6/16/2010	10:15	7	5.2	18.3	105	11		2		<0.10		0.06		15000		
6/23/2010	11:05	7.4	7.1	22.3	98	11		<2		<0.10		<0.01		220		
9/1/2010	11:04	7.4	7.8	21	101	2		<2		<0.10		0.13		250		10
9/8/2010	11:30	7.5	7.3	20.6	123	1		<2		<0.10		<0.10		190		
9/15/2010	11:10	7.5	6.4	19.5	105	2		<2		<0.10		<0.01		700		
9/22/2010	11:08	7.4	6.3	21.6	105	3		<2		<0.10		0.1		60		
12/1/2010	11:00	7.7	11.2	9.5	61	22		2		<0.10		0.05		3200		
12/8/2010	10:45	7.5	14	3.3	130	1		<2		<0.10		0.01		20		
12/15/2010	10:00	7.5	13.6	1.2	115	1		<2		<0.10		0.02		130		
12/22/2010	10:10	7.4	10.5	9.4	174	8		<2		<0.10		0.01		120		
3/1/2011	11:25	7.8	7.8	12.9	86	16		<2		<0.10		0.03		750		5
3/8/2011	11:30	7.8	12	10.4	137	2		<2		<0.10		<0.01		100		

3/15/2011	10:55	7.5	14.9	10.9	42	77		3		0.13		0.11		22000		
3/22/2011	11:45	7.5	10.3	15.5	133	2		<2		<0.10		<0.01		50		
6/1/2011	1150	7.1	6.4	22.1	124	5.2		<2		<0.10		0.02		140		<1
6/8/2011	12:15	7.1	6.4	21.9	102	5		<2		<0.10		0.01		190		4
6/15/2011	1115	7.1	9.5	20.6	113	2		<2		<0.10		0.02		320		
6/22/2011	1055	7.2	9.4	22.3	119	2		<2		<0.10		0.03		80		
9/7/2011	10:35	7.2	6.5	18.7	77	1		2		<0.10		0.02		3400		3
9/14/2011	11:00	7.3	6.6	19.7	102	2		<2		<0.10		0.01		430		
9/21/2011	10:45	7.5	4.6	19.7	106	1		<2		<0.10		0.02		660		
9/28/2011	10:25	6.6	5.9	19	111	6		<2		<0.10		0.01		530		
12/7/2011	10:55	7	7.6	13.5	54	17		2		<0.10		0.11		3200		26
12/14/2011	930	7.5	10.1	8.4	111	2		<2		<0.10		0.01		100		
12/21/2011	9:50	7	9.6	13.4	40	9				<0.10		0.05		3500		
12/28/2011	9:40	7.6	11.2	7.4	112	27		<2		<0.10		0.04		550		
3/6/2012	11:20	7.8	14.3	8.5	130	3		<2	1.48	<0.10	0.76	0.01		190		2
3/13/2012	10:45	7.4	15.3	14.6	150	1		<2		<0.10		0.01		60		
3/20/2012	9:20	7.6	8.3	16.6	136	3		<2		<0.10		0.04		140		
3/27/2012	9:30	7.5	7.3	15.2	149	3		<2		<0.10	0.74	0.02		290		
6/7/2012	11:05	7.5	8.1	19.3	85	3		<2		<0.10	0.71	0.02		39000		1
6/14/2012	10:20	7.3	7.9	21.2	64	45		2	1.24	<0.10	0.54	0.03		5100		
6/21/2012	10:00	7.8	8	20.8	134	2		<2		<0.10		0.02		370		
6/28/2012	10:30	7.6	7.8	19.9	96	4		<2		<0.10	0.82	0.02		150		
9/5/2012	10:35	7.7	7.5	22.5	98	8		5		<0.10	0.45	0.03		1100		42
9/12/2012	10:45	7.4	7.8	18.4	118	2		2		<0.10		<0.01		560		
9/19/2012	11:20	6.1	7.3	18.2	69	23		<2		<0.10	0.74	0.06		1800		
9/26/2012	10:30	7.9	8	17.5	127	4		<2		<0.10		<0.01		210		
12/6/2012	10:25	7.4	9.2	13.4	156	2		<2	1.3	<0.10		0.03		20		3
12/13/2012	10:45		7.9	10.3	130	3		<2		<0.10		0.02		200		
12/20/2012	10:25	7.1	10	10.5	98	17				<0.10		0.08		3300		
12/27/2012	10:25	6.9	11.2	7.2	95	47		<2		<0.10		0.05		420		
6/6/2013		7.2	8.2	21.5	77	46		2		<0.10	0.47	0.1		2100		51
6/13/2013		7.4	8.1	21.6	133	3		<2		<0.10	1.09	0.03		620		
6/20/2013		7.6	8.4	20.3	127	4		2		<0.10	0.62	0.02		470		
6/27/2013		7.4	7.9	22.4	113	2		<2		<0.10	0.96	0.03		700		
9/4/2013		7.5	8.7	21.1	119	4		<2	1.29	<0.10		0.02		1600		6
9/11/2013		7.3	8.8	20.8	146	2		<2		<0.10		<0.01		310		
9/18/2013		7.7	9.1	19	141	2		<1		<0.10		<0.01		190		
9/25/2013		7.1	9	19.3	63	45		2		<0.10		0.1		28000		
12/5/2013		7.4	9.4	14.7	105	8		2	0.83	<0.10		0.03		1500		17
12/12/2013		7.6	11.4	6.7	139	2		<2		<0.10		<0.01		80		
12/19/2013		7.8	11.8	5.6	125	2		<2		<0.10		<0.01		80		
12/26/2013		7.7	9.4	7.1	139	3		<2		<0.10		<0.01		110		
3/4/2014		7.6	11.8	8.3	127	5		<2		<0.10		<0.01		200		4

3/11/2014		7.8	10.2	13	127	3		2		<0.10		<0.01		130		
3/18/2014		7.7	11.1	9.3	110	9		<2		<0.10		0.04		340		
3/25/2014		8.4	10.7	10.5	140	3		<2		<0.10	0.81	<0.01		270		
6/5/2014		7.5	7.9	20.7	134	4		<2		<0.10	1.07	0.03		330		4
6/12/2014		7.5	8.4	19.4	88	7		<2		<0.10	1.26	0.03		2000		
6/19/2014		7.3	7.6	21.5	132	2		<2		<0.10		0.02		280		
6/26/2014		7.6	7.9	20.7	114	3		<2		<0.10	1.92	<0.01		650		
9/3/2014		6.7	7.9	21.6	117	2		<2	11.4	<0.10		0.01		320		1
9/10/2014		7.5	8.4	20.3	110	6		3		<0.10		0.04		13500		
9/17/2014		7.6	8.3	20.2	145	2		<2		<0.10		0.02		1700		
9/24/2014		7.9	8.6	17.3	140	3		<2		<0.10		<0.01		580		
12/2/2014		7.6	9.8	12	145	1		<2	0.4	<0.10		0.04		180		1
12/9/2014		7.1	9.8	9.2	139	2		2		<0.10	0.7	0.02		5900		
12/16/2014		7.7	9.9	11.3	143	2		2		<0.10	0.92	0.05		300		
12/23/2014		7.4	10.9	8.4	100	8		2		<0.10	0.5	0.02		1800		
6/5/2014		7.5	7.9	20.7	134	4		<2		<0.10	1.07	0.03		330		4
6/12/2014		7.5	8.4	19.4	88	7		<2		<0.10	1.26	0.03		2000		
6/19/2014		7.3	7.6	21.5	132	2		<2		<0.10		0.02		280		
6/26/2014		7.6	7.9	20.7	114	3		<2		<0.10	1.92	<0.01		650		
9/3/2014		6.7														
9/10/2014		7.6														
9/17/2014		7.9														
9/24/2014																
6/4/2015		7.3	9.3	18.2	128	3		<2		<0.10		0.01		190		
6/11/2015		7.1	8.8	20	125	5		<2		<0.10	1.12	0.02		520		3
6/18/2015		7.5	8.7	21.5	136	3		1		<0.20		0.02		320		
6/25/2015						2				<0.10		0.04		790		

average		7.3	8.4	15.6	117.0	18.4		2.6	2.1	0.1	1.3	0.1		6962.2		12.4
max		8.5	16.6	22.7	190	1072		8	11.4	0.18	5.9	0.9		300000		95
min		5.9	2.7	1.2	21	1		2	0.24	0.1	0.29	0		20		1
median		7.3	8.1	17.9	123	4		2	1.24	0.125	1.01	0.03		480		4
													count	127		
													meet	50		

			exceed w	44
			exceed s	33
149	3	<0.10		

acute criteria acute criteria acute criteria acute criteria = (e (0.8473[ln(hardness)] + 0.884))(0.978) µg/l
chronic criter chronic criter chronic criter chronic criteria = (e (0.8473[ln(hardness)] + 0.884))(0.986) µg/l

CdTotal	CuTotal	PbTotal	ZnTotal	CdDissolve	CuDissolve	PbDissolve	ZnDissolve	Hardness	Alkalinity	Turb- Field
ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L as CaCO3	ng/L as CaCO	NTU
G	G	G	G	G	G	G	G	G		M
1	1	1	1	1	1	1	1	1		1
								53	38	
								55	36	
								27	10	
								56	39	
								47	27	
								51	37	
								36	5	
								53	37	
								46	36	
								44	42	
								40	27	
								40	29	
								48	23	
								40	24	
								56	26	
								52	40	
								54	30	
								42	25	
								44	40	
									35	
									36	
								60	30	
								62	23	
									25	
									42	
									31	
									20	
									35	
									45	
									40	
									32	

									45	
									14	
									17	
									28	
									35	
									24	
									35	
									38	
									35	
									38	
									25	
0.11	5.14	14.4	36.1						35	
									36	
									40	
									32	
0.07	7.11	5.78	21.5						35	
									18	
									26	
									36	
									35	
									40	
									49	
									32	
0.08	7.34	14.5	15						6	
									29	
0.03	1.62	6.11	1.55					47	39	
									41	
									35	
									32	
									37	
									20	
									15	
									31	
								37	40	
<1.0	8.03	9.46	25.4						27	
									44	
									40	
<1.0	2.58	2.49	26.6						31	
									80	
<1.0	18.9	9.21	39.2					13	57	
									78	
									43	

									92	
									51	
									42	
									40	
									38	
								51	41	
<1.0	1.35	6.9	19.2						26	
									45	
									25	
<1.0	12.3	7.18	72.8						22	
									22	
									81	
<1.0	6.63	3.93	28.5						18	
									33	
									19	
									24	
<1.0	<1.0	7.56	41.9					47	41	
									58	
									39	
									30	
								38	23	
									35	
									8	
									32	
<0.02	9.75	5.99	27.6						8	
									20	
<1.00	13.1	6.05	40.1					21	15	
									35	
									36	
								35	30	
									33	
									14	
									30	
									28	
1.4	54.4	11.9	11.9						30	
									37	
									30	
<0.02	<0.02	4.96	17.6						18	
									33	
									30	
									35	
<1.0	34.9	5.36	25.8					25	20	
									31	

									10	
									41	
<1.0	49.3	22.4	18						35	
									40	
									28	
									34	
<1.0	53	4.58	14.5					27	21	
									28	
									25	
									25	
<1.0	36	4.72	14.3					25	15	
									37	
									18	
									23	
<1.0	2.86	3.83	17.5					41	34	
									35	
									40	
									43	
<1.0	3.04	6.55	11.3						28	
									18	
									39	
									38	
<1.0	<1.0	<1.0	2.01					35	33	
									40	
									22	
									35	
<1.0	23.6	1.78	7.39					50	37	
									33	
									31	
									24	
<1.0	5.51	7.15	15.4						27	
									41	
									39	
									35	
<1.0	0.9	1.4	3.6					44	45	
									30	
									39	
									21	
<1.0	34.7	4.39	7.88					50	35	
									35	
									40	
									36	
<1.0	3.11	4.46	9.34					43	35	

									38	
									37	
									38	
<1.0	2.4	9.99	251					50	40	
									28	
									41	
									39	
<1.0	5.82	10.8	24					43	35	
									32	
									42	
									38	
<1.0	47.8	3.32	19.5					55	38	
									38	
									44	
									34	
<1.0	2.24	9.99	251					50	40	
									28	
									41	
									39	
								48	38	
									30	
									43	
									35	

0.3	16.7	7.1	28.9
1.4	54.4	22.4	251
0.03	0.9	1.4	1.55
0.08	7.34	6.05	18.6

APPENDIX D: PRESS RELEASE REGARDING DEKALB COUNTY AGREEMENT WITH EPA, EPD

W. Burrell Ellis, Jr.
Chief Executive Officer

Board of Commissioners
Elaine Boyer, District 1
Jeff Rader, District 2
Larry Johnson, District 3
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DEKALB COUNTY
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DECEMBER 13, 2010 **FOR IMMEDIATE RELEASE**

DeKalb County Reaches Agreement with EPA, EPD

DECATUR – DeKalb County has reached a Clean Water Act settlement in the form of a consent decree with the U.S. Environmental Protection Agency (EPA) and the Georgia Environmental Protection Division (EPD) that formalizes implementation of certain sanitary sewer system programs and improvements, many of which the County is already implementing. These programs and improvements, which focus on the collection and transmission components of the County's sewers, will ensure long-term protection of public health and the environment, particularly with respect to the rivers and streams in the County. The programs and improvements will also ensure compliance with the federal Clean Water Act and the Georgia Water Quality Control Act, and will improve the viability of the County's sewers for generations to come. The consent decree provides a road map for working cooperatively with the EPA and EPD.

Under the Clean Water Act and the Georgia Water Quality Control Act, the County is responsible for overflows that are commonly referred to as spills, from its sanitary sewer system that reach or are presumed to reach waters of the state. DeKalb County's sewer system is one of the largest and oldest in the Southeast United States. With more than 2,600 miles of sewer pipes, a significant portion of which is more than fifty (50) years old, maintaining and operating the sewer system is an enormous task. As the County has grown and the system has aged, certain areas of the sewer system have experienced sewer spills, which are prohibited by federal and state law. The County has recognized that the leading cause of spills from its sewers is fats, oils and grease ("FOG"). As a result, the County began implementing a FOG Management Program following adoption of its FOG ordinance in March, 2007.

In addition, over the last several years, the County has commenced a number of sewer system capacity, management, operation, and maintenance (CMOM) programs including, a Strategic Spill Response Plan to assure expeditious and adequate response to spills, employee training, computer-based hydraulic modeling, flow and rainfall monitoring, sewer mapping, manhole condition assessment, lift station inspections and maintenance, and ongoing sewer system assessment and rehabilitation. The County has already begun to realize some of the benefits of these programs. For instance, the County's sewer spills have decreased from a high of 256 reported spills in 2006 to 135 in 2009.

The EPA began an audit of the County's wastewater system in 2006, and began collecting and evaluating data on the numbers of sewer overflows in the wastewater system. As follow-up to that audit, informed the County in January 2009 that because of the existence of sewer spills, and because the County operates one of the larger systems in the Southeast, that Region 4 EPA believed that it should exercise federal oversight of the County's efforts to eliminate sewer overflows.

Following about fourteen months of negotiations with the EPA and EPD regarding the County's sewer system programs and improvements, the County agreed to enter into a consent decree that formalizes and builds on its ongoing CMOM programs, a major component of which is a continuing sewer assessment and rehabilitation program. The CEO and the Board of Commissioners were briefed periodically in Executive Session on the confidential negotiations with the EPA and EPD. The following is a list of the programs incorporated into the consent decree:

- **Contingency Emergency Response Plan** (CERP). The County's existing strategic spill response plan will be incorporated into a CERP.
- **FOG Program**. The County's existing FOG program will be reviewed for possible improvements.
- **Sewer Mapping Program**. The County's ongoing sewer mapping program will be documented with specific milestones for completion.
- **Maintenance Management Program**. The County's ongoing sewer maintenance management system will be expanded and documented to ensure long-term implementation.
- **Training Program**. The County's ongoing training program will be reviewed for possible improvements. This program ensures that employees are adequately trained to perform their job functions.
- **Flow and Rainfall Monitoring Program**. The County's ongoing flow and rainfall monitoring program will be reviewed for possible improvements.
- **Sewer System Hydraulic Modeling Program**. The County's ongoing sewer system hydraulic modeling program will be documented with specific milestones for completion.
- **Financial Analysis Program**. The County's ongoing financial analysis program will be reviewed for possible improvements.
- **Infrastructure Acquisition Program**. The County's ongoing infrastructure acquisition program will be reviewed for possible improvements.
- **Continuing Sewer Assessment and Rehabilitation Program** (CSARP). The County's ongoing sewer assessment and rehabilitation program will be broken up into two distinct programs: (1) Priority Areas Assessment and Rehabilitation Program (PASARP) and (2) Ongoing Sewer Assessment and Rehabilitation Program (OSARP). The County must complete the assessment and rehabilitation of priority areas identified under the PASARP within 8 ½ years following the date of entry of this consent decree with Federal Court.

These programs will be submitted to the EPA and EPD for review/comment/approval. In addition, under the consent decree, the County will:

- Complete a Supplement Environmental Project (SEP) consisting of a one-time clean up of selected stream segments along the South River, South Fork Peachtree Creek, and Snapfinger Creek. The County has committed to spend at least $600,000 implementing the SEP.
- Pay a civil penalty to EPA and EPD in the amount of $226,500 each based primarily on the number of spills that have occurred over the last several years.

- File periodic reports to the EPA and the EPD on progress and other developments during the 8 ½ year consent decree implementation period.

All of the programs contained in the consent decree are included in the County's Department of Watershed Management capital improvement program, which includes drinking water and sanitary sewer system capital improvement projects. While costly, they are needed to enable the County to continue to reduce spills, protect public health and the environment, comply with federal and state laws and regulations, and improve the sewer system for the long-term. Approximately one-third of the $1.4 Billion proposed five-year Watershed Five-Year CIP is related to the types of wastewater collection system rehabilitation, repair and spill prevention projects called for in the Consent Decree.

DeKalb County remains committed to protecting human health and the environment, as well as providing its citizens with clean water while ensuring that its sanitary sewer system is properly operated and maintained. The County looks forward to working with the EPA and EPD in implementing this consent decree.

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APPENDIX E: TOTAL MAXIMUM DAILY LOAD EVALUATION FOR TWENTY-FIVE STREAM SEGMENTS IN THE CHATTAHOOCHEE RIVER BASIN FOR SEDIMENT (BIOTA IMPACTED)

Total Maximum Daily Load

Evaluation

for

Twenty-Five Stream Segments

in the

Chattahoochee River Basin

For Sediment

(Biota Impacted)

Submitted to:

The U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

Submitted by:
The Georgia Department of Natural Resources
Environmental Protection Division
Atlanta, Georgia

January 2008

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EXECUTIVE SUMMARY

The State of Georgia assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are placed into three categories, supporting, partially supporting, or not supporting their designated uses, depending on water quality assessment results. These water bodies are found on Georgia's 305(b) list, as required by that section of the CWA that defines the assessment process, and are published in *Water Quality in Georgia* (GA EPD, 2000-2001).

Some of the 305(b) partially and not supporting water bodies are also assigned to Georgia's 303(d) list, also named after that section of the CWA. Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard. The TMDL process establishes the allowable pollutant loadings or other quantifiable parameters for a water body based on the relationship between pollutant sources and in-stream water quality conditions. This allows water quality-based controls to be developed to reduce pollution and restore and maintain water quality.

The State of Georgia has identified twenty-five (25) stream segments located in the Chattahoochee River Basin as water quality limited (i.e. 303(d) listed as Biota Impacted) due to sedimentation. The water use classification of all of the impacted streams is Fishing. The general water quality criteria not being met states:

> All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

The Biota Impacted designation indicates that studies have shown a modification of the biological community; more specifically, fish. During 1998-2003, the Department of Natural Resources (DNR) Wildlife Resources Division (WRD) conducted studies of fish populations in the Chattahoochee River Basin. WRD used the Index of Biotic Integrity (IBI) and modified Index of Well-Being (IWB) to identify affected fish populations. The IBI and IWB values were used to classify the populations as Excellent, Good, Fair, Poor, or Very Poor. Twenty-five (25) stream segments in the Piedmont ecoregion with fish populations rated as Poor or Very Poor were listed as Biota Impacted, and were included in the partially supporting or not supporting list. Twenty-eight (28) stream segments in the Piedmont ecoregion were rated as Excellent, Good or Fair and assessed as supporting their designated water use.

The general cause of low IBI scores is the lack of fish habitat due to stream sedimentation. To determine the relationship between the in-stream water quality and the source loadings, each watershed was modeled. The analysis performed to develop sediment TMDLs for the 303(d) listed watersheds utilized the Universal Soil Loss Equation (USLE). The USLE predicts the total annual soil loss caused by erosion. The USLE method considered the characteristics of the watershed including land use, soil type, ground slope, and road surface. National Pollutant Discharge Elimination System (NPDES) permitted discharges were also considered. Modeling assumptions were considered conservative and provide the necessary implicit margin of safety for the TMDL.

The USLE was applied to the partially supporting 303(d) listed watersheds not previously assess, as well as the unimpaired watersheds in the same ecoregion, to determine both the existing sediment loading rates and the sediment load reductions needed to support beneficial use (i.e., unimpacted conditions). The average sediment load of the Chattahoochee River Basin impaired watersheds located in the Piedmont ecoregion is 0.22 tons/acre/yr. The average sediment load of the unimpaired watersheds located within the Piedmont ecoregion is 0.07 tons/acre/yr. This value represents sediment load contributions from all land uses within the unimpaired watersheds.

Table 1 shows that approximately 30.40 percent of the total sediment load in the Chattahoochee River Basin is from roads. Approximately 27.49 percent of the total sediment load results from pastureland with an average sediment load of 0.16 tons/acre/yr. Urban land contributes approximately 17.28 percent of the total sediment load, grasses and wetlands make up about 13.12 percent, and quarries, strip mine and gravel pits contribute approximately 5.55 percent of the total sediment load. Estimates of the sediment contribution from construction are not available, but could represent a relatively high sediment load per acre.

Table 1. Summary of Current Conditions in the Chattahoochee River Basin

Land Use	Average Percent Land Use	Average Percent Sediment Load	Average Sediment Load (tons/acre/yr)
Open Water	0.89%	0.48%	0.16
Urban	13.61%	17.28%	0.32
Bare Rock, Sand and Clay	0.69%	0.00%	0.00
Quarries, Strip Mines, Gravel Pits	1.13%	5.55%	28.01
Forest	50.00%	4.26%	0.02
Pasture/Hay	19.26%	27.49%	0.16
Row Crops	0.13%	1.41%	5.13
Grasses, Wetland	14.28%	13.12%	0.50
Roads		30.40%	

These data indicate that agricultural lands may be a major source of sediment to our rivers and streams. However, over the last century there has been a dramatic decrease in the amount of land farmed in Georgia. Since 1950, there has been a 57 percent reduction in farmland. With the reduction in farmland, there has also been a decrease in the amount of soil erosion. This suggests that the sedimentation observed in the impaired stream segments may be legacy sediment resulting from past land use practices. It is believed that if sediment loads are maintained at acceptable levels, streams will repair themselves over time.

This TMDL determines the sediment loads that can enter the impaired Chattahoochee River Basin streams without causing sediment impairment to the streams. This is based on the hypothesis that if an impaired watershed has a total annual sediment loading rate similar to a biologically unimpaired watershed, then the receiving stream will remain stable and not be biologically impaired due to sediment. The total annual sediment load in the Chattahoochee River Basin unimpaired watersheds located in the Piedmont ecoregion is 0.07 tons/acre/yr. The total annual sediment loads for the impaired watersheds are summarized in Table 2, along with any required sediment load reductions.

Table 2. Total Annual Sediment Loads and the Required Sediment Load Reductions

Name	Current Load (tons/yr)	WLA (tons/yr)	WLAsw (tons/yr)	LA (tons/yr)	Allowable Total Load (tons/yr)	Allowable Maximum Daily Load (tons/day)	% Reduction
Bear Creek	714.2	3.0	495.7	212.4	711.1	91.7	0.43%
Browns Creek	296.6			296.6	296.6	38.3	0.00%
Bull Creek	2,890.1		835.5	722.1	1,557.6	200.9	46.10%
Dean Creek	842.3			266.6	266.6	34.4	68.34%
Deep Creek	1,041.5		729.0	312.4	1,041.5	134.4	0.00%
Flat Creek (PS)	468.2			338.5	338.5	43.7	27.71%
Flat Creek (NS)	539.8	140.3	8.3	4.1	152.8	19.7	71.70%
Hazel Creek	864.5			349.6	349.6	45.1	59.56%
Ivy Creek	632.9		245.3	106.3	351.6	45.4	44.45%
Long Island Creek	395.1		171.0	73.3	244.3	31.5	38.18%
Maple Branch	43.6			43.6	43.6	5.6	0.00%
Mountain Creek	714.1	34.3	58.4	253.6	346.3	44.7	51.51%
Mud Creek	998.4	91.3		353.4	444.7	57.4	55.46%
Nancy Creek	2,629.1	170.8	1,068.5	457.9	1,697.1	218.9	35.45%
Nickajack Creek	2,221.1	30.4	979.6	419.8	1,429.9	184.5	35.62%
North Fork Peachtree Creek	669.3	1.3	346.9	148.7	496.9	64.1	25.77%
Noses Creek	1,356.6	1.2	193.0	82.7	276.9	35.7	79.59%
Pea Creek	276.9		193.8	83.1	276.9	35.7	0.00%
Six Mile Creek	3,885.5	54.1	59.7	25.6	139.3	18.0	96.41%
South Fork Limestone Creek/ Limestone Creek	269.2		56.8	24.3	81.2	10.5	69.85%
Suwanee Creek	1,500.4	91.3	382.3	192.9	666.5	86.0	55.58%
Tributary to Limestone Creek	236.1		46.3	19.8	66.2	8.5	71.97%
Turner Creek	1,062.6			379.8	379.8	49.0	64.26%
Ward Creek	775.8		236.2	101.2	337.4	43.5	56.51%
White Creek	1,047.7			378.7	378.7	48.9	63.86%

Management practices that may be used to help maintain the annual average sediment loads at current levels include:

- Compliance with the requirements of the NPDES permit program;
- Implementation of GFC Best Management Practices for forestry;
- Adoption of NRCS Conservation Practices;
- Adherence to the Mined Land Use Plan prepared as part of the Surface Mining Permit Application;
- Adoption of proper unpaved road maintenance practices;
- Implementation of Erosion and Sedimentation Control Plans for land disturbing activities; and
- Evaluation of the effects of increased flow due to urban runoff on stream bank erosion.

Though the measurement of sediment delivered to a stream is difficult to determine, by monitoring the implementation of these practices, their anticipated effects will contribute to improving stream habitats and water quality, and thus be an indirect measurement of the TMDLs.

1.0 INTRODUCTION

1.1 Background

The State of Georgia assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are placed into three categories, supporting, partially supporting, or not supporting their designated uses, depending on water quality assessment results. These water bodies are found on Georgia's 305(b) list, as required by that section of the CWA that addresses the assessment process, and are published in *Water Quality in Georgia* (GA EPD, 2000-2001).

Some of the 305(b) partially and not supporting water bodies are also assigned to Georgia's 303(d) list, also named after that section of the CWA. Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and in-stream water quality conditions. This allows water quality based controls to be developed to reduce pollution and restore and maintain water quality.

During 1998 through 2003, the Department of Natural Resources (DNR) Wildlife Resources Division (WRD) conducted studies of fish populations in the Chattahoochee River Basin. WRD used the Index of Biotic Integrity (IBI) and modified Index of Well-Being (IWB) to identify affected fish populations. The IBI and IWB values were used to classify the populations as Excellent, Good, Fair, Poor, or Very Poor. Stream segments with fish populations rated as Poor or Very Poor were listed as Biota Impacted, and were included in the partially supporting or not supporting list. Twenty-five (25) stream segments were rated as Poor or Very Poor, placed on the 303(d) list as partially supporting their designated use, and scheduled for TMDL evaluation (Table 3). Twenty-eight (28) stream segments in the Piedmont ecoregion were rated as Excellent, Good or Fair and assessed as supporting their designated water use.

Table 3. 303(d) Listed Stream Segments Located in the Chattahoochee River Basin

Stream	Status	Location	Miles
Bear Creek	Partially Supporting	Little Bear Creek to Chattahoochee River	4
Browns Creek	Partially Supporting	Headwaters to Cedar Creek	5
Bull Creek	Partially Supporting	Flat Rock Creek to Cooper Creek, Columbus	3
Dean Creek	Partially Supporting	Headwaters to Mossy Creek	5
Deep Creek	Partially Supporting	Line Creek to Chattahoochee River	3
Flat Creek	Partially Supporting	Headwaters near Clermont to Lake Lanier	9
Flat Creek	Not Supporting	Headwaters, Gainesville to Lake Lanier	6
Hazel Creek	Partially Supporting	Reservoir No. 12 to Law Creek	4
Ivy Creek	Partially Supporting	Headwaters to Suwannee Creek	10
Long Island Creek	Not Supporting	Headwaters to Chattahoochee River	5
Maple Branch	Partially Supporting	Headwaters to Mountain Creek	4
Mountain Creek	Partially Supporting	Trib. to Mountain Creek (d/s SR 34) to Maple Branch	4

Stream	Status	Location	Miles
Mud Creek	Not Supporting	Headwaters to Little Mud Creek	13
Nancy Creek	Not Supporting	Headwaters to Peachtree Creek, Atlanta	16
Nickajack Creek	Not Supporting	Headwaters to Chattahoochee River	11
North Fork Peachtree Creek	Not Supporting	Headwaters to Peachtree Creek	14
Noses Creek	Partially Supporting	Headwaters to Ward Creek	7
Pea Creek	Partially Supporting	Cedar Grove Lake to Chattahoochee River	6
Six Mile Creek	Not Supporting	Headwaters to Lake Lanier	2
South Fork Limestone Creek/ Limestone Creek	Not Supporting	Headwaters to Limestone Creek Arm of Lake Lanier	2
Suwanee Creek	Partially Supporting	Suwanee Creek Lake (near Buford) to Ivy Creek	6
Tributary to Limestone Creek	Partially Supporting	Breneau Lake to Limestone Creek	1
Turner Creek	Partially Supporting	Headwaters to Tesnatee Creek	6
Ward Creek	Partially Supporting	Headwaters to Noses Creek	6
White Creek	Partially Supporting	Headwaters to Webster Lake, Cleveland	6

1.2 Watershed Description

The twenty-five (25) impaired stream segments are located in the Chattahoochee River Basin are located in Cobb, Coweta, DeKalb, Forsyth, Fulton, Gwinnett, Habersham, Hall, Muscogee, and White Counties. The twenty-eight (28) unimpaired watersheds are located in the following counties: Carroll, Coweta, Douglas, Heard, Meriwether, and Troup.

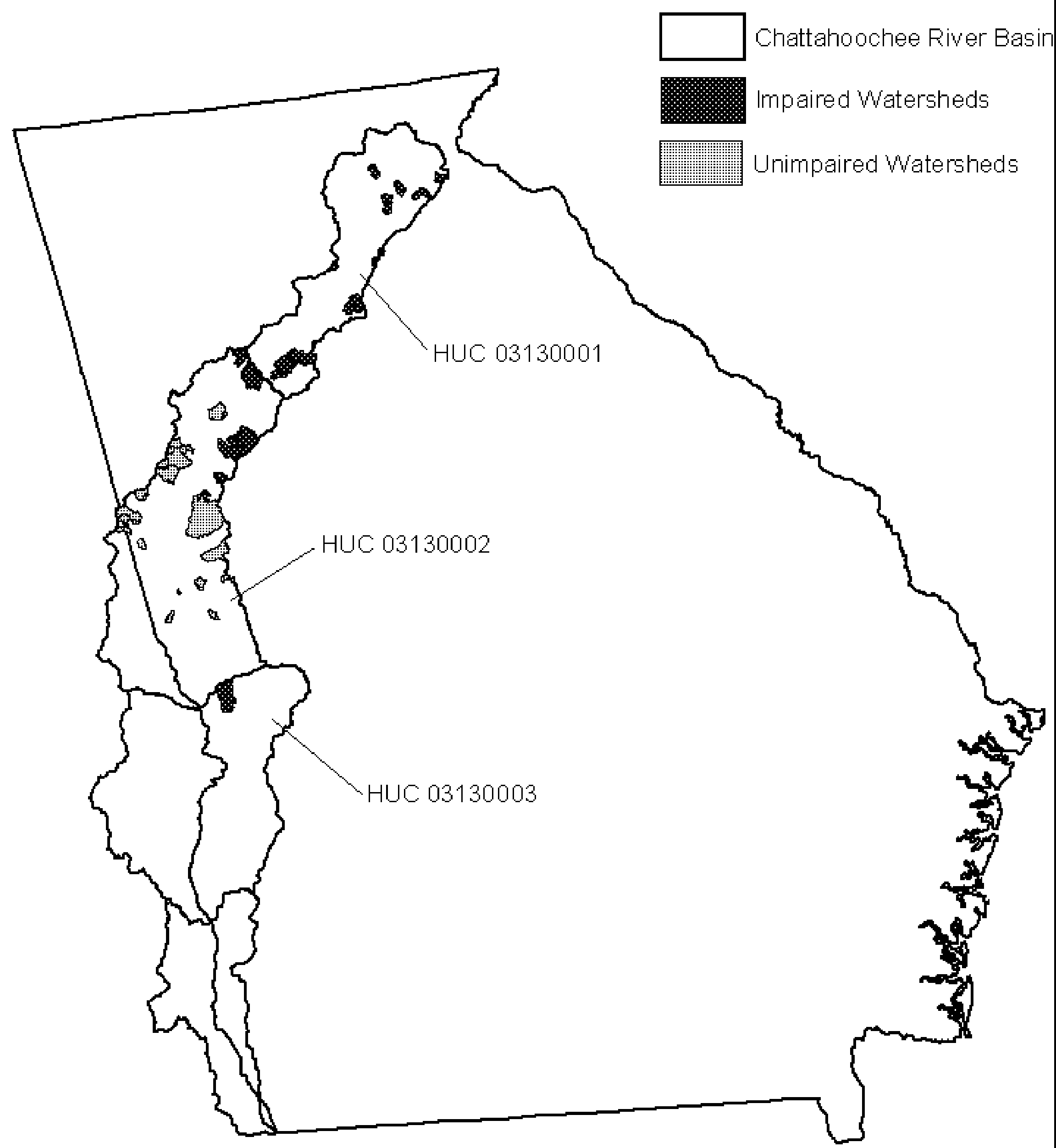
The land use characteristics of the Chattahoochee River Basin watersheds were determined using data from Georgia's National Land Cover Data (NLCD). This coverage is based on Landsat Thematic Mapper digital images developed in 2001. The classification is based on a modified Anderson level one and two system. Table 4 lists the land use distribution of the watersheds located in the Piedmont ecoregion. The watersheds are grouped by those that are unimpaired, followed by those that are impaired. Table 5 lists the land use percentages for all the Chattahoochee River Basin watersheds monitored in a similar fashion. The data show that the watersheds are predominately forested with approximately 50.0 percent (ranging from 10.37 to 92.45 percent) in forest use. Agriculture is the next predominate land use at approximately 19.4%, consisting of approximately 19.26 percent pastureland (ranging from 0.61 to 52.31 percent) and approximately 0.13 percent row crops (ranging from 0.0 to 2.78 percent).

The soil characteristics of the Chattahoochee River Basin watersheds were determined using data from the State Soil Geographic (STATSGO) coverage. This coverage provides major soil type classifications. Table 6 lists the soil type distribution of the monitored watersheds.

1.3 Water Quality Standard

The water use classification for the impaired watersheds in the Chattahoochee River Basin is Fishing. The criterion violated is listed as Biota Impacted, which indicates that studies have shown a significant impact on fish. The potential cause(s) listed include urban runoff, nonpoint sources, and a municipal facility. The narrative standard exists to prevent objectionable conditions that interfere with legitimate water uses, as stated in Georgia's *Rules and Regulations for Water Quality Control*, Chapter 391-3-6-.03(5)(c):

> All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.



TMDL Evaluation - Biota
Chattahoochee River Basin

Figure 1. Impaired and Unimpaired Watersheds Monitored in the Chattahoochee River Basin

Table 4. Land Use Distribution (Unimpaired – Piedmont Ecoregion)

	Area (acres)														
Name	**Open Water**	**Low Intensity Residential**	**High Intensity Residential**	**High Intensity Commercial Industrial Transportation**	**Bare Rock Sand and Clay**	**Quarries Strip Mines Gravel Pits**	**Deciduous Forest**	**Evergreen Forest**	**Mixed Forest**	**Deciduous Shrubland**	**Pasture/Hay**	**Row Crops**	**Other Grasses (Urban Recreational)**	**Woody Wetland**	**Total**
Annewakee Creek u/s	72.1	2,681.1	724.1	586.4	68.3		1,668.8	1,250.7	26.2	58.0	688.1		1,970.1	54.0	9,848.0
Annewakee Creek d/s	79.2	2,875.7	733.9	588.0	82.7		1,874.3	1,418.6	35.1	80.3	894.0		2,198.5	74.9	10,935.2
Beech Creek	17.6	10.7			113.0		565.1	651.8	8.5	64.3	440.8	1.1	63.4	27.6	1,963.7
Big Branch	17.6	18.2	0.7		65.2		654.7	938.5	26.7	25.1	832.6		61.6	79.4	2,720.2
Blue John Creek	14.0	1,133.7	317.8	116.3	6.4		462.3	711.0	85.4	30.2	728.3		839.7	27.1	4,472.4
Brush Creek	19.3	26.0	0.4		46.5	51.1	1,076.1	924.7	6.4	114.5	873.5	1.8	51.8	77.2	3,269.5
Copeland Creek	6.2	6.7			4.0		394.7	327.6	0.9	91.6	299.1		15.8	2.9	1,149.5
Flat Creek	120.3	140.1	6.4		67.6		4,170.9	5,460.5	174.6	337.4	3,783.2	20.2	435.2	914.7	15,631.1
Flat Shoals Creek		1.1					240.4	330.2	4.2	3.1	17.6		15.1	10.0	621.8
Gum Branch	1.1	2.9	0.2				352.5	42.0	4.7	28.5	400.3		28.0	3.1	863.3
Gum Creek	10.7	27.8	7.1		8.9		1,925.6	1,098.8	23.1	71.8	1,503.8		131.2	80.3	4,889.2
Hillabahatchee Creek	17.1	51.8	3.8	1.3	249.5		6,240.4	4,117.9	61.4	485.5	2,631.5		251.5	38.7	14,150.5
Little Snake Creek	8.0	16.7	2.9		8.7		768.1	991.2	3.8	15.1	252.0		70.7	3.3	2,140.5
Long Cane Creek	19.6	18.5		2.4	11.1		1,221.8	1,065.2	50.0	35.4	896.4		104.7	92.3	3,517.5
Long Cane Creek	22.7	19.3		2.4	11.1		1,263.6	1,122.2	52.3	36.2	930.9		117.0	95.8	3,673.6
New River	1,168.0	918.9	123.4	38.7	134.5	79.2	14,297.5	19,028.8	455.4	664.3	14,036.0	38.0	2,377.8	3,270.2	56,630.6
Norman Creek		52.5					624.2	486.6	14.0	54.5	526.2		91.2	10.2	1,859.4
Panther Creek	6.9	4.7	0.4				274.2	411.9	0.9	5.8	268.4		54.7	13.6	1,041.4
Polecat Creek	48.7	42.3	3.1	6.9	9.1		435.7	419.0	42.0	45.1	1,206.2	0.9	136.8	82.5	2,478.3
Red Oak Creek	6.7	11.6			24.5		1,393.0	1,005.9	14.9	109.4	773.5		101.4	10.7	3,451.4
Snake Creek u/s	71.6	174.6	20.7	4.9	11.1		1,349.4	1,516.5	22.7	84.1	1,087.0		270.2	20.7	4,633.4
Snake Creek d/s	174.4	471.0	39.6	9.3	310.7		9,064.9	7,597.9	74.1	625.8	5,803.2	9.6	1,101.5	157.5	25,439.3
Town Creek	28.0	60.5	3.3	0.9	5.6		1,028.1	722.3	12.0	112.8	742.8		117.0	16.5	2,849.7
Trib to Whooping Creek	4.0	7.3	4.7	0.9			160.3	132.5	4.0	15.3	109.6		15.8	5.3	459.9
Whooping Creek u/s	78.9	175.2	13.3	4.9	4.7		969.8	850.0	20.5	39.1	841.1		241.7	42.5	3,281.8
Whooping Creek mid	111.0	366.9	44.0	14.7	20.5	4,689.5	4,495.8	1,039.7	484.4	3,514.6	950.7	462.1	348.3	52.5	16,594.5
Whooping Creek d/s	111.9	380.9	44.0	14.7	21.3	4,689.5	4,756.0	1,322.3	499.3	3,545.3	1,232.5	462.1	404.5	64.0	17,548.3
Wolf Creek	20.9	17.1	0.9		0.9		646.7	392.1	2.0	16.7	532.8		37.1	23.1	1,690.4

Table 4. Land Use Distribution (Impaired – Piedmont Ecoregion)

	Area (acres)															
Name	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial Industrial Transportation	Bare Rock Sand and Clay	Quarries Strip Mines Gravel Pits	Deciduous Forest	Evergreen Forest	Mixed Forest	Deciduous Shrubland	Pasture/Hay	Row Crops	Other Grasses (Urban Recreational)	Woody Wetland	Emergent Herbaceous Wetlands	Total
Bear Creek	125.9	392.3	125.9	42.7	65.2		6,262.9	5,711.8	121.6	282.2	2,269.5	0.9	1,335.2	707.2	1.3	17,444.5
Browns Creek	351.6	253.1	1.8		2.7		1,861.6	1,375.0	19.8	39.6	891.3		312.2	44.3		5,152.9
Bull Creek	366.5	1,645.9	497.5	231.1	98.3	22.5	5,767.4	5,559.5	1,329.0	112.3	2,511.9	336.9	1,645.4	884.4	58.5	21,066.9
Dean Creek	7.3	50.7	21.6	6.7	33.1		1,350.6	240.8	44.7	32.9	1,432.6		385.4			3,606.4
Deep Creek	209.3	777.7	126.3	30.2	244.0		6,808.2	4,670.3	128.3	177.2	2,211.2	4.2	1,885.0	257.1		17,529.0
Flat Creek (PS)	25.1	106.7	34.9	3.1	15.6		1,342.6	225.3	44.5	65.2	2,276.4		387.4	51.4		4,578.1
Flat Creek (NS)	1.3	589.8	368.5	296.9	63.8		190.6	83.4	24.0	1.1	83.4		359.2	4.2		2,066.2
Hazel Creek	58.0	117.9	51.8	4.7	20.7		2,151.6	200.1	63.6	34.7	1,646.8		364.3	14.5		4,728.6
Ivy Creek	15.8	769.2	56.7	6.4	103.6		1,304.5	754.8	24.0	28.7	1,025.2		636.7	29.1		4,754.9
Long Island Creek	16.7	681.6	251.7	125.2	4.4		673.8	456.8	9.1	0.9	22.2		1,059.7	1.8		3,304.0
Maple Branch	22.5	57.8	2.4	0.9	0.9		98.7	174.4	4.4	4.4	295.1		69.8	10.2		741.7
Mountain Creek	20.7	703.0	83.2	75.8	4.9	0.0	1,009.0	1,272.1	116.1	41.4	542.8	0.0	737.7	76.9	0.0	4,683.5
Mud Creek	8.0	496.4	146.6	116.5	57.6		2,287.7	304.4	84.3	47.1	1,721.7		713.4	31.1		6,014.9
Nancy Creek	169.5	4,748.2	2,529.9	1,596.1	91.6	0.0	2,682.4	2,966.2	179.0	6.7	219.7	0.0	7,691.0	73.8	0.0	22,954.1
Nickajack Creek	112.1	5,461.8	1,224.7	477.7	189.3	0.0	3,337.8	1,949.9	93.2	14.7	475.5	0.0	5,859.0	144.6	0.0	19,340.1
North Fork Peachtree Creek	9.1	1,750.6	1,379.0	1,399.9	11.6		276.0	408.1	13.1	2.2	40.7		1,377.9	51.8		6,720.1
Noses Creek	27.1	432.1	102.7	46.5	7.6	9.8	1,269.8	908.7	18.7	4.9	279.3		610.0	28.2		3,745.4
Pea Creek	102.5	84.7	12.2		68.3		2,436.7	1,086.8	35.8	53.8	654.9		362.3	102.7		5,000.8
Six Mile Creek	25.1	27.4	24.9	2.0	16.0	115.6	572.4	97.6	25.4	19.3	839.3		119.6			1,884.7
South Fork Limestone Creek/Limestone Creek	5.3	264.9	93.8	35.4	1.1		237.5	159.0	30.5		62.3		207.9			1,097.7
Suwanee Creek	6.9	1,700.1	599.3	300.2	218.4		2,867.2	844.6	94.3	53.2	696.1		1,472.9	161.5		9,014.7
Trib to Limestone	2.2	170.3	89.4	28.5	3.1		290.2	24.2	7.8	1.1	28.9		249.1			894.9
Turner Creek	85.0	34.2	12.9	1.8	24.9		3,094.3	613.1	227.7	56.3	515.5	2.7	459.5	8.9		5,136.7
Ward Creek	26.7	862.4	134.1	68.3	27.8		740.1	1,097.3	30.7	2.9	141.0		1,384.8	47.4		4,563.4
White Creek	18.0	100.5	33.6	6.9	22.2		1,602.1	227.5	74.1	40.0	2,678.9		317.6			5,121.3

Table 5. Land Use Percentages (Unimpaired – Piedmont Ecoregion)

	Percent Total Land Use													
Name	**Open Water**	**Low Intensity Residential**	**High Intensity Residential**	**High Intensity Commercial Industrial Transportation**	**Bare Rock Sand and Clay**	**Quarries Strip Mines Gravel Pits**	**Deciduous Forest**	**Evergreen Forest**	**Mixed Forest**	**Deciduous Shrubland**	**Pasture/Hay**	**Row Crops**	**Other Grasses (Urban Recreational)**	**Woody Wetland**
Annewakee Creek u/s	0.73%	27.22%	7.35%	5.95%	0.69%	0.00%	16.95%	12.70%	0.27%	0.59%	6.99%	0.00%	20.01%	0.55%
Annewakee Creek d/s	0.72%	26.30%	6.71%	5.38%	0.76%	0.00%	17.14%	12.97%	0.32%	0.73%	8.18%	0.00%	20.10%	0.69%
Beech Creek	0.89%	0.54%	0.00%	0.00%	5.75%	0.00%	28.78%	33.19%	0.43%	3.27%	22.45%	0.06%	3.23%	1.40%
Big Branch	0.65%	0.67%	0.02%	0.00%	2.40%	0.00%	24.07%	34.50%	0.98%	0.92%	30.61%	0.00%	2.26%	2.92%
Blue John Creek	0.31%	25.35%	7.11%	2.60%	0.14%	0.00%	10.34%	15.90%	1.91%	0.68%	16.28%	0.00%	18.78%	0.61%
Brush Creek	0.59%	0.80%	0.01%	0.00%	1.42%	1.56%	32.91%	28.28%	0.20%	3.50%	26.72%	0.05%	1.58%	2.36%
Copeland Creek	0.54%	0.58%	0.00%	0.00%	0.35%	0.00%	34.34%	28.50%	0.08%	7.97%	26.02%	0.00%	1.37%	0.25%
Flat Creek	0.77%	0.90%	0.04%	0.00%	0.43%	0.00%	26.68%	34.93%	1.12%	2.16%	24.20%	0.13%	2.78%	5.85%
Flat Shoals Creek	0.00%	0.18%	0.00%	0.00%	0.00%	0.00%	38.66%	53.11%	0.68%	0.50%	2.83%	0.00%	2.43%	1.61%
Gum Branch	0.13%	0.33%	0.03%	0.00%	0.00%	0.00%	40.83%	4.87%	0.54%	3.30%	46.37%	0.00%	3.25%	0.36%
Gum Creek	0.22%	0.57%	0.15%	0.00%	0.18%	0.00%	39.39%	22.47%	0.47%	1.47%	30.76%	0.00%	2.68%	1.64%
Hillabahatchee Creek	0.12%	0.37%	0.03%	0.01%	1.76%	0.00%	44.10%	29.10%	0.43%	3.43%	18.60%	0.00%	1.78%	0.27%
Little Snake Creek	0.37%	0.78%	0.14%	0.00%	0.41%	0.00%	35.89%	46.31%	0.18%	0.71%	11.77%	0.00%	3.30%	0.16%
Long Cane Creek u/s	0.56%	0.52%	0.00%	0.07%	0.32%	0.00%	34.73%	30.28%	1.42%	1.01%	25.49%	0.00%	2.98%	2.62%
Long Cane Creek d/s	0.62%	0.53%	0.00%	0.07%	0.30%	0.00%	34.40%	30.55%	1.42%	0.99%	25.34%	0.00%	3.18%	2.61%
New River	2.06%	1.62%	0.22%	0.07%	0.24%	0.14%	25.25%	33.60%	0.80%	1.17%	24.79%	0.07%	4.20%	5.77%
Norman Creek	0.00%	2.82%	0.00%	0.00%	0.00%	0.00%	33.57%	26.17%	0.75%	2.93%	28.30%	0.00%	4.90%	0.55%
Panther Creek	0.66%	0.45%	0.04%	0.00%	0.00%	0.00%	26.33%	39.55%	0.09%	0.56%	25.77%	0.00%	5.25%	1.30%
Polecat Creek	1.97%	1.70%	0.13%	0.28%	0.37%	0.00%	17.58%	16.91%	1.70%	1.82%	48.67%	0.04%	5.52%	3.33%
Red Oak Creek	0.19%	0.34%	0.00%	0.00%	0.71%	0.00%	40.36%	29.14%	0.43%	3.17%	22.41%	0.00%	2.94%	0.31%
Snake Creek u/s	1.55%	3.77%	0.45%	0.11%	0.24%	0.00%	29.12%	32.73%	0.49%	1.81%	23.46%	0.00%	5.83%	0.45%
Snake Creek d/s	0.69%	1.85%	0.16%	0.04%	1.22%	0.00%	35.63%	29.87%	0.29%	2.46%	22.81%	0.04%	4.33%	0.62%
Town Creek	0.98%	2.12%	0.12%	0.03%	0.20%	0.00%	36.08%	25.35%	0.42%	3.96%	26.07%	0.00%	4.10%	0.58%
Trib to Whooping Creek	0.87%	1.60%	1.02%	0.19%	0.00%	0.00%	34.86%	28.82%	0.87%	3.34%	23.84%	0.00%	3.43%	1.16%
Whooping Creek u/s	2.41%	5.34%	0.41%	0.15%	0.14%	0.00%	29.55%	25.90%	0.62%	1.19%	25.63%	0.00%	7.37%	1.29%
Whooping Creek mid	0.67%	2.21%	0.27%	0.09%	0.12%	28.26%	27.09%	6.27%	2.92%	21.18%	5.73%	2.78%	2.10%	0.32%
Whooping Creek d/s	0.64%	2.17%	0.25%	0.08%	0.12%	26.72%	27.10%	7.54%	2.85%	20.20%	7.02%	2.63%	2.31%	0.36%
Wolf Creek	1.24%	1.01%	0.05%	0.00%	0.05%	0.00%	38.26%	23.19%	0.12%	0.99%	31.52%	0.00%	2.20%	1.37%

Table 5. Land Use Percentages (Impaired – Piedmont Ecoregion)

	Percent Total Land Use															
Name	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial Industrial Transportation	Bare Rock Sand and Clay	Quarries Strip Mines Gravel Pits	Deciduous Forest	Evergreen Forest	Mixed Forest	Deciduous Shrubland	Pasture/Hay	Row Crops	Other Grasses (Urban Recreational)	Woody Wetland	Emergent Herbaceous Wetlands
Bear Creek	0.72%	2.25%	0.72%	0.24%	0.37%	0.00%	35.90%	32.74%	0.70%	1.62%	13.01%	0.01%	7.65%	4.05%	0.01%
Browns Creek	6.82%	4.91%	0.03%	0.00%	0.05%	0.00%	36.13%	26.68%	0.38%	0.77%	17.30%	0.00%	6.06%	0.86%	0.00%
Bull Creek	1.74%	7.81%	2.36%	1.10%	0.47%	0.11%	27.38%	26.39%	6.31%	0.53%	11.92%	1.60%	7.81%	4.20%	0.28%
Dean Creek	0.20%	1.41%	0.60%	0.18%	0.92%	0.00%	37.45%	6.68%	1.24%	0.91%	39.72%	0.00%	10.69%	0.00%	0.00%
Deep Creek	1.19%	4.44%	0.72%	0.17%	1.39%	0.00%	38.84%	26.64%	0.73%	1.01%	12.61%	0.02%	10.75%	1.47%	0.00%
Flat Creek (PS)	0.55%	2.33%	0.76%	0.07%	0.34%	0.00%	29.33%	4.92%	0.97%	1.42%	49.72%	0.00%	8.46%	1.12%	0.00%
Flat Creek (NS)	0.06%	28.54%	17.83%	14.37%	3.09%	0.00%	9.22%	4.04%	1.16%	0.05%	4.04%	0.00%	17.38%	0.20%	0.00%
Hazel Creek	1.23%	2.49%	1.10%	0.10%	0.44%	0.00%	45.50%	4.23%	1.35%	0.73%	34.83%	0.00%	7.70%	0.31%	0.00%
Ivy Creek	0.33%	16.18%	1.19%	0.14%	2.18%	0.00%	27.44%	15.87%	0.51%	0.60%	21.56%	0.00%	13.39%	0.61%	0.00%
Long Island Creek	0.50%	20.63%	7.62%	3.79%	0.13%	0.00%	20.39%	13.83%	0.28%	0.03%	0.67%	0.00%	32.07%	0.05%	0.00%
Maple Branch	3.03%	7.80%	0.33%	0.12%	0.12%	0.00%	13.31%	23.51%	0.60%	0.60%	39.79%	0.00%	9.42%	1.38%	0.00%
Mountain Creek	0.44%	15.01%	1.78%	1.62%	0.10%	0.00%	21.54%	27.16%	2.48%	0.88%	11.59%	0.00%	15.75%	1.64%	0.00%
Mud Creek	0.13%	8.25%	2.44%	1.94%	0.96%	0.00%	38.03%	5.06%	1.40%	0.78%	28.62%	0.00%	11.86%	0.52%	0.00%
Nancy Creek	0.74%	20.69%	11.02%	6.95%	0.40%	0.00%	11.69%	12.92%	0.78%	0.03%	0.96%	0.00%	33.51%	0.32%	0.00%
Nickajack Creek	0.58%	28.24%	6.33%	2.47%	0.98%	0.00%	17.26%	10.08%	0.48%	0.08%	2.46%	0.00%	30.29%	0.75%	0.00%
North Fork Peachtree Creek	0.14%	26.05%	20.52%	20.83%	0.17%	0.00%	4.11%	6.07%	0.20%	0.03%	0.61%	0.00%	20.50%	0.77%	0.00%
Noses Creek	0.72%	11.54%	2.74%	1.24%	0.20%	0.26%	33.90%	24.26%	0.50%	0.13%	7.46%	0.00%	16.29%	0.75%	0.00%
Pea Creek	2.05%	1.69%	0.24%	0.00%	1.37%	0.00%	48.73%	21.73%	0.72%	1.08%	13.10%	0.00%	7.24%	2.05%	0.00%
Six Mile Creek	1.33%	1.45%	1.32%	0.11%	0.85%	6.14%	30.37%	5.18%	1.35%	1.03%	44.53%	0.00%	6.35%	0.00%	0.00%
South Fork Limestone Creek/Limestone Creek	0.49%	24.13%	8.55%	3.22%	0.10%	0.00%	21.64%	14.49%	2.78%	0.00%	5.67%	0.00%	18.94%	0.00%	0.00%
Suwanee Creek	0.08%	18.86%	6.65%	3.33%	2.42%	0.00%	31.81%	9.37%	1.05%	0.59%	7.72%	0.00%	16.34%	1.79%	0.00%
Trib to Limestone Creek	0.25%	19.04%	9.99%	3.18%	0.35%	0.00%	32.43%	2.71%	0.87%	0.12%	3.23%	0.00%	27.83%	0.00%	0.00%
Turner Creek	1.65%	0.67%	0.25%	0.03%	0.48%	0.00%	60.24%	11.94%	4.43%	1.10%	10.04%	0.05%	8.94%	0.17%	0.00%
Ward Creek	0.58%	18.90%	2.94%	1.50%	0.61%	0.00%	16.22%	24.04%	0.67%	0.06%	3.09%	0.00%	30.35%	1.04%	0.00%
White Creek	0.35%	1.96%	0.66%	0.13%	0.43%	0.00%	31.28%	4.44%	1.45%	0.78%	52.31%	0.00%	6.20%	0.00%	0.00%

Table 6. Soil Type Distribution (Unimpaired – Piedmont Ecoregion)

Name	**Drainage Area (sq miles)**	**AL085**	**AL076**	**GA129**	**GA108**	**GA037**	**GA026**	**GA025**
K-Factor		**0.27**	**0.27**	**0.14**	**0.27**	**0.27**	**0.25**	**0.27**
Annewakee Creek u/s	15.39			8,817.3				1,030.6
Annewakee Creek d/s	17.09			9,847.0			61.9	1,026.3
Beech Creek	3.07							1,963.7
Big Branch	4.25							2,720.2
Blue John Creek	6.99							4,472.4
Brush Creek	5.11				1,747.5		1,522.1	
Copeland Creek	1.80				780.1	369.4		
Flat Creek	24.42							15,631.1
Flat Shoals Creek	0.97							621.8
Gum Branch	1.35						507.7	355.6
Gum Creek	7.64						2,179.0	2,710.1
Hillabahatchee Creek	22.11	328.9	2,119.1		2,417.0	8,133.0		1,152.5
Little Snake Creek	3.34						1,132.8	1,007.7
Long Cane Creek u/s	5.50							3,517.5
Long Cane Creek d/s	5.50							3,673.6
New River	5.74						1,577.1	55,053.6
Norman Creek	2.91						211.0	1,648.3
Panther Creek	1.63						117.9	923.6
Polecat Creek	3.87							2,478.3
Red Oak Creek	5.39	320.9	522.0		1,339.6	1,269.0		
Snake Creek u/s	7.24						1,971.0	2,662.5
Snake Creek d/s	39.75						14,657.9	10,781.4
Town Creek	4.45	754.2	885.6	0.0	718.6	491.2		
Trib to Whooping Creek	0.72						77.6	382.3
Whooping Creek u/s	5.13						1,064.2	2,217.6
Whooping Creek mid	25.93						7,760.4	8,834.1
Whooping Creek d/s	27.42						8,224.9	9,323.4
Wolf Creek	2.64							1,690.4

Table 6. Soil Type Distribution (Impaired – Piedmont Ecoregion)

Name	Drainage Area (sq miles)	GA129	GA128	GA127	GA041	GA039	GA029	GA026	GA025	GA019
K-Factor		**0.14**	**0.13**	**0.03**	**0.17**	**0.13**	**0.24**	**0.25**	**0.27**	**0.25**
Bear Creek	27.26							5,441.4	12,003.1	
Browns Creek	8.05							286.0	4,866.9	
Bull Creek	32.92				2,682.1	8,611.3		5,716.0	4,057.6	
Dean Creek	5.64									
Deep Creek	27.39	1,514.5						792.4	15,222.1	
Flat Creek (PS)	7.15						1,159.4	193.1	3,225.6	
Flat Creek (NS)	3.23							790.0	1,276.2	
Hazel Creek	7.39							86.8	4,641.8	
Ivy Creek	7.43							2,118.3	2,636.6	
Long Island Creek	5.16	3,304.0								
Maple Branch	1.16								741.7	
Mountain Creek	7.32								4,683.5	
Mud Creek	9.40							6,014.9		
Nancy Creek	35.87	22,317.1	1.7	635.3						
Nickajack Creek	30.22	15,619.1	3,721.0							
North Fork Peachtree Creek	10.50	6,720.1								
Noses Creek	5.85	922.3						354.3	2,468.8	
Pea Creek	7.81							508.5	4,492.3	
Six Mile Creek	2.94							1,247.0	637.7	
South Fork Limestone Creek/Limestone Creek	1.72							83.7	1,014.0	
Suwanee Creek	14.09							592.9	8,421.8	
Tributary to Limestone Creek	1.40							473.7	421.2	
Turner Creek	8.03							3,662.8	278.8	1,195.1
Ward Creek	7.13	1,299.6						1,344.0	1,919.9	
White Creek	8.00							4,051.5	1,069.8	

2.0 WATER QUALITY ASSESSMENT

2.1 Fish Sampling

From 1998 to 2003, the Department of Natural Resources (DNR) Wildlife Resources Division (WRD) conducted studies of fish populations at a number of monitoring sites in the Chattahoochee River Basin. Biological monitoring is a method used to evaluate the health of a biological system in order to assess degradation from various sources. It is based on direct observations of aquatic communities. The results of these studies were the basis for the listings of Biota Impacted stream segments on Georgia's 303(d) list.

The work performed by the WRD looked at patterns of fish communities within the various ecoregions. An ecoregion is a region of relative homogeneity in ecological systems or in relationships between organisms and their environment. Seven major ecoregions have been identified in Georgia based upon soil types, potential natural vegetation, land surface form, and predominant land uses. These include the Blue Ridge Mountains, Ridge and Valley, Southwestern Appalachians, Piedmont, Middle Atlantic Coastal Plain, Southeastern Plains, and Southern Coastal Plain.

Reference sites within the Piedmont ecoregion were established. These sites represented the least impacted sites that exist given the prevalent land use within the ecoregion. Fifty-six (56) sites were sampled within the Chattahoochee River Basin in this ecoregion (see Tables 7, 8, and 9). These sites had to be accessible, wadeable, and representative of the stream under investigation. The length of the fish sampling site was thirty-five times the mean stream width, up to 500 meters. This sampling length was found to be long enough to include the major habitat types present. Electrofishing and seining techniques were used for sampling the fish population (GAWRD, 2000).

Two indices of fish community health were used to assess the biotic integrity of the aquatic systems: the modified Index of Well-Being (IWB) and the Index of Biotic Integrity (IBI). The IWB and IBI scores were classified as Excellent, Good, Fair, Poor, or Very Poor. Segments with fish populations rated as Poor or Very Poor were listed as Biota Impacted.

The modified IWB measures the health of the aquatic community based on the density and diversity or structural attributes of the fish community. The IWB is calculated based on four parameters: the relative density of fish, the relative biomass of fish, the Shannon-Wiener Index of Diversity based on number, and the Shannon-Wiener Index of Diversity based on biomass.

The IBI assesses the biotic integrity of aquatic communities based on the functional and compositional attributes of the fish community. The IBI consists of twelve measurements or metrics, which assess three facets of the fish population: species richness and composition, trophic composition and dynamics, and fish abundance and condition. Each metric is scored by comparing its value to the value of the regional reference site. Factors that affect the structure and function of a fish community include stream location and size. Thus, the metrics were developed for regional drainage basins, e.g. the Apalachicola drainage basin, which includes the Chattahoochee and Flint River Basins. To account for the fact that streams with larger drainage basins normally have greater species richness, Maximum Species Richness plots were developed for the species richness metric (GAWRD, 2000).

To supplement the findings of the fish community data, habitat assessments were performed at each sampling site. Habitat scores evaluate the physical surroundings of a stream as they affect and influence the quality of the water resource and its resident aquatic community. These data may also help clarify the results of the biotic indices. The habitat assessment used was developed by personnel within the Watershed Protection Branch (WPB) of the Georgia Environmental Protection Division (GA EPD) and is a modification of the EPA Rapid Bioassessment Protocol III (GAWPB, 2000). It incorporates different assessment parameters for riffle / run prevalent streams. The habitat assessment evaluates the stream's physical parameters and is broken into three levels. Level one describes in-stream characteristics that directly affect biological communities (in-stream cover, epifaunal substrate, embeddedness, and riffle frequency). Level two describes the channel morphology (channel alteration, sediment deposition, and channel flow status). Level three describes the riparian zone surrounding the stream, which indirectly affects the type of habitat and food resources available in the stream (bank vegetation, bank stability, and riparian zone width). The total habitat scores obtained for each sampling station are compared to a site-specific control or regional reference site. The ratio between the station of interest and the reference site provides a percent comparability that can be used to classify the stream.

Table 7 summarizes WRD's fish community study scores. The IBI, IWB, and Habitat Assessment scores are listed and the watersheds are grouped by the unimpaired watersheds, followed by the impaired watersheds. In addition, the table includes the drainage areas upstream of the monitoring points and the county in which the monitoring points are located. Table 8 provides the detailed habitat assessment scores.

During the fish community studies, physical characteristics of the stream were measured at the monitoring sites. These characteristics included the number of pools, depth of the deepest pool, number of riffles, average stream depth, and average stream width. In addition, stream water quality measurements were taken at the time of the fish sampling. The parameters measured included water temperature, dissolved oxygen, conductivity, pH, turbidity, total hardness and alkalinity. Table 9 provides a summary of these field measurements.

Visual observations of the stream and watershed were also made by WRD personnel. The type of land use and the extent of land-disturbing activities and other pertinent features of the watershed were systematically observed from all available road accesses and were recorded. This information was used to determine the possible sources of eroded soils and other possible contaminants.

Table 7. 1998-2003 WRD's Fish Community Study Scores (Unimpaired – Piedmont Ecoregion)

Stream Name	Drainage Area upstream from the monitoring point (sq mile)	County	Date	IBI Score	IBI Category	IWB Score	IWB Category	Habitat Total
Annewakee Creek u/s	15.7	Douglas	08/20/1999	38	Fair	7.8	Fair	45.6
Annewakee Creek d/s	17.5	Douglas	08/20/1999	42	Fair	8	Fair	55.5
Beech Creek	3.2	Meriwether	05/17/1999	34	Fair	6	Fair	65.4
Big Branch	4.3	Troup	06/09/1999	36	Fair	6.5	Fair	82.4
Blue John Creek	7.2	Troup	04/06/1998	38	Fair	6.2	Fair	91.3
Brush Creek	5.2	Heard	09/27/2000	38	Fair	6.7	Fair	58.0
Copeland Creek	2.1	Heard	08/24/1998	34	Fair	7.2	Fair	163.3
Flat Creek	27.1	Troup	08/10/1999	36	Fair	8.3	Fair	63.1
Flat Shoals Creek	1.0	Meriwether	05/18/1999	34	Fair	6.9	Fair	78.0
Gum Branch	1.4	Heard	08/21/1998	46	Good	6.5	Fair	134.0
Gum Creek	7.7	Heard	08/25/1998	50	Good	8.6	Excellent	120.3
Gum Creek	7.7	Heard	07/16/1999	50	Good	8.1	Good	121.5
Gum Creek	7.7	Heard	09/18/2001	50	Good	8.5	Excellent	116.9
Hillabahatchee Creek	22.6	Heard	09/01/1999	52	Excellent	10	Excellent	149.9
Hillabahatchee Creek	22.6	Heard	09/28/2000	52	Excellent	9.9	Excellent	148.6
Hillabahatchee Creek	22.6	Heard	09/19/2001	46	Good	9.5	Good	141.3
Little Snake Creek	3.4	Carroll	08/19/1998	36	Fair	7.9	Good	154.7
Long Cane Creek u/s	5.6	Troup	06/09/1999	42	Fair	7.8	Good	68.9
Long Cane Creek d/s	5.9	Troup	07/28/1999	40	Fair	7.3	Good	68.5
New River	98.0	Heard	09/27/2000	40	Fair	7.7	Fair	78.0
Norman Creek	3.0	Carroll	08/25/1998	36	Fair	8	Good	144.3
Panther Creek	1.8	Troup	05/20/1999	36	Fair	5.7	Poor	89.7
Polecat Creek	4.4	Troup	08/11/1999	36	Fair	6.3	Fair	76.1
Red Oak Creek	5.7	Heard	08/26/1998	34	Fair	7.1	Fair	114.3
Snake Creek u/s	7.4	Carroll	08/19/1998	46	Good	8.3	Good	147.0
Snake Creek u/s	7.4	Carroll	03/01/1999	40	Fair	8.1	Good	106.4
Snake Creek d/s	40.6	Carroll	09/02/1999	48	Good	9.3	Good	70.2
Town Creek	9.9	Heard	08/31/1999	46	Good	7.9	Good	133.3
Trib to Whooping Creek	0.8	Carroll	08/21/1998	40	Fair	6.5	Fair	122.7
Whooping Creek u/s	5.1	Carroll	08/21/1998	48	Good	8.6	Excellent	112.3
Whooping Creek mid	26.4	Carroll	09/02/1999	56	Excellent	10.4	Excellent	123.1
Whooping Creek mid	26.4	Carroll	09/29/2000	50	Good	10.1	Excellent	142.9
Whooping Creek mid	26.4	Carroll	09/18/2001	54	Excellent	10	Good	134.8
Whooping Creek d/s	28.0	Carroll	04/19/2001	44	Good	8.5	Fair	117.2
Wolf Creek	2.7	Carroll	07/08/1998	38	Fair	6.9	Fair	136.3

Table 7. 1998-2003 WRD's Fish Community Study Scores (Impaired – Piedmont Ecoregion)

Stream Name	Drainage Area upstream from the monitoring point (sq mile)	County	Date	IBI Score	IBI Category	IWB Score	IWB Category	Habitat Total
Bear Creek	28.0	Fulton	10/14/2003	30	Poor	8.30	Fair	57.4
Browns Creek	8.2	Coweta	09/26/2000	24	Very Poor	5.6	Poor	73.1
Bull Creek	33.8	Muscogee	06/14/2000	28	Poor	7.8	Fair	55.9
Dean Creek	5.8	White	07/22/2003	32	Poor	7.00	Fair	74.2
Deep Creek	27.7	Fulton	10/14/2003	30	Poor	6.30	Poor	55.4
Flat Creek (PS)	7.4	Hall	06/10/2003	20	Very Poor	4.90	Very Poor	63.2
Flat Creek (NS)	3.7	Hall	06/10/2003	18	Very Poor	3.50	Very Poor	68.9
Hazel Creek	7.6	Habersham	06/25/2003	24	Very Poor	6.30	Fair	71.4
Ivy Creek	7.7	Gwinnett	08/07/2003	26	Poor	6.2	Fair	53.4
Long Island Creek	5.8	Fulton	06/12/2003	22	Very Poor	7.80	Good	77.2
Maple Branch	1.3	Coweta	09/26/2000	22	Very Poor	3.7	Very Poor	89.6
Mountain Creek	7.7	Coweta	09/27/2000	28	Poor	7.1	Fair	81.7
Mud Creek	10.1	Habersham	06/25/2003	22	Very Poor	6.30	Fair	71.4
Nancy Creek u/s	12.6	DeKalb	07/31/2003	28	Poor	7.70	Good	85.7
Nancy Creek mid	30.9	Fulton	10/07/2003	18	Very Poor	5.40	Very Poor	57.1
Nancy Creek d/s	37.2	Fulton	10/07/2003	24	Very Poor	6.80	Fair	87.4
Nickajack Creek u/s	11.7	Cobb	10/06/2003	28	Poor	7.60	Good	75.0
Nickajack Creek d/s	31.2	Cobb	10/07/2003	24	Very Poor	7.90	Fair	85.1
North Fork Peachtree Creek	10.9	DeKalb	07/31/2003	20	Very Poor	6.10	Fair	68.7
Noses Creek	6.1	Cobb	06/12/2003	26	Poor	6.30	Fair	78.6
Pea Creek	8.5	Fulton	10/14/2003	28	Poor	6.20	Fair	85.4
Six Mile Creek	3.1	Forsyth	05/14/2003	24	Very Poor	5.90	Fair	88.4
South Fork Limestone Creek/Limestone Creek	1.9	Hall	05/14/2003	20	Very Poor	5.50	Poor	78.9
Suwanee Creek	14.4	Gwinnett	08/27/2003	20	Very Poor	6.50	Fair	56.3
Tributary to Limestone Creek	1.6	Hall	05/14/2003	28	Poor	6.50	Fair	86.5
Turner Creek	8.3	White	07/22/2003	26	Poor	7.00	Fair	84.3
Ward Creek	7.3	Cobb	06/12/2003	14	Very Poor	4.30	Very Poor	58.0
White Creek	8.3	White	07/22/2003	20	Very Poor	5.30	Poor	60.8

Table 8. 1998-2003 WRD's Habitat Assessment Scores (Unimpaired – Piedmont Ecoregion)

Stream Name	Date	Embeddedness	Channel Alteration	Sediment Deposition	Riffle Frequency	Channel Flow Status	Bank Vegetation (Left)	Bank Vegetation (Right)	Bank Stability (Left)	Bank Stability (Right)	Riparian Zone (Left)	Riparian Zone (Right)	Instream Cover / Epifaunal	Epifaunal	Velocity Depth	Habitat Total
Annewakee Creek u/s	08/20/1999	1.3	12.3	1.8	0.0	6.8	2.5	2.4	2.2	2.6	4.8	0.6	5.60	2.70		45.6
Annewakee Creek d/s	08/20/1999	1.4	12.0	2.7	0.0	7.7	3.5	3.2	2.9	2.5	9.0	3.0	5.60	2.10		55.5
Beech Creek	05/17/1999	5.5	13.7	6.2	0.0	7.6	3.3	3.1	4.1	3.7	9.0	0.7	2.70	6.00		65.4
Big Branch	06/09/1999	4.7	14.3	3.2	0.0	8.2	3.8	4.7	3.3	4.3	9.0	9.0	5.90	11.90		82.4
Blue John Creek	04/06/1998	6.0	5.3	4.0	10.3	11.0	6.3	6.3	4.0	4.3	6.3	9.0	11.00	7.30		91.3
Brush Creek	09/27/2000	1.7	16.0	3.2	0.0	8.7	4.3	4.3	3.7	3.7	2.3	2.7	6.00	1.77		58.0
Copeland Creek	08/24/1998	15.0	17.0	15.7	20.0	13.7	8.7	8.7	9.0	8.7	9.0	9.0	16.70	12.30		163.3
Flat Creek	08/10/1999	2.8	12.6	3.8	0.0	6.8	2.5	2.8	3.7	3.7	8.0	9.1	5.40	2.00		63.1
Flat Shoals Creek	05/18/1999	2.2	17.7	5.0	0.0	11.0	3.3	4.5	4.3	5.2	8.3	5.2	11.20	0.00		78.0
Gum Branch	08/21/1998	14.3	16.3	13.3	15.3	10.0	4.3	4.0	3.7	2.7	9.7	9.7	15.30	15.30		134.0
Gum Creek	08/25/1998	11.3	8.7	10.0	18.0	12.3	6.3	5.0	6.3	4.7	9.0	2.7	14.00	12.00		120.3
Gum Creek	07/16/1999	7.9	16.4	9.9	19.0	11.0	7.9	6.0	7.3	5.3	9.1	4.2	7.30	10.10		121.5
Gum Creek	09/18/2001	10.6	16.3	10.6	18.0	9.8	3.1	2.7	2.9	2.2	7.2	5.9	13.6		14.0	116.9
Hillabahatchee Creek	09/01/1999	15.0	16.0	15.2	19.0	8.2	9.0	8.3	8.7	8.0	9.7	9.7	14.00	9.57		149.9
Hillabahatchee Creek	09/28/2000	11.8	16.7	12.8	18.0	11.5	7.9	7.1	7.6	7.2	9.7	9.7	16.00	12.97		148.6
Hillabahatchee Creek	09/19/2001	13.2	16.5	12.9	20.0	12.2	5.3	5.2	5.4	5.0	8.2	8.4	14.7		14.3	141.3
Little Snake Creek	08/19/1998	15.7	11.7	14.0	16.3	11.3	8.0	8.3	8.3	8.0	9.3	9.0	17.70	17.00		154.7
Long Cane Creek u/s	06/09/1999	2.1	15.6	3.4	0.0	7.1	3.9	3.7	3.9	4.0	8.9	9.0	5.00	2.00		68.9
Long Cane Creek d/s	07/28/1999	1.5	9.3	6.1	0.0	7.8	5.6	5.3	5.1	4.8	8.7	8.5	6.00	0.30		68.5
New River	09/27/2000	7.2	16.4	7.3	0.0	8.9	3.6	4.2	3.4	3.7	2.3	3.0	12.00	5.90		78.0
Norman Creek	08/25/1998	15.3	11.7	14.7	16.7	15.7	6.3	6.3	6.7	6.7	6.0	7.3	14.00	17.00		144.3
Panther Creek	05/20/1999	3.9	13.3	5.6	13.5	8.8	3.3	4.5	3.7	4.8	8.5	7.2	4.70	8.10		89.7
Polecat Creek	08/11/1999	4.3	12.5	3.8	18.0	8.0	2.9	3.0	3.6	3.7	0.8	1.2	6.00	7.80		76.1

Stream Name	Date	Embeddedness	Channel Alteration	Sediment Deposition	Riffle Frequency	Channel Flow Status	Bank Vegetation (Left)	Bank Vegetation (Right)	Bank Stability (Left)	Bank Stability (Right)	Riparian Zone (Left)	Riparian Zone (Right)	Instream Cover / Epifaunal	Epifaunal	Velocity Depth	Habitat Total
Red Oak Creek	08/26/1998	9.0	9.7	8.7	14.0	12.3	6.0	5.7	4.3	5.0	9.7	9.0	11.00	10.00		114.3
Snake Creek u/s	08/19/1998	11.7	13.7	14.0	18.3	12.0	7.7	7.3	7.0	7.0	9.0	8.3	13.00	18.00		147.0
Snake Creek u/s	03/01/1999	11.9	13.3	11.2	10.3	5.8	4.3	4.5	4.7	5.9	8.1	8.7	7.20	10.50		106.4
Snake Creek d/s	09/02/1999	1.8	15.9	3.8	0.0	6.9	7.0	5.4	6.5	4.6	8.4	3.8	3.50	2.60		70.2
Town Creek	08/31/1999	14.9	16.4	15.0	15.1	8.9	6.1	6.6	5.5	6.5	8.7	9.1	8.00	13.00		133.3
Trib to Whooping Creek	08/21/1998	14.7	7.7	14.3	18.0	10.0	3.3	3.3	2.3	2.0	9.3	9.3	14.00	14.30		122.7
Whooping Creek u/s	08/21/1998	12.0	7.0	11.0	15.3	15.3	4.0	3.7	4.3	4.0	9.0	1.7	13.70	11.30		112.3
Whooping Creek mid	09/02/1999	13.2	16.6	10.6	18.5	6.9	7.2	6.0	6.7	4.8	9.7	4.6	9.30	9.10		123.1
Whooping Creek mid	09/29/2000	13.7	16.0	13.8	17.0	9.1	7.4	6.5	6.6	5.5	9.7	9.7	13.00	15.03		142.9
Whooping Creek mid	09/18/2001	12.4	16.5	12.5	19.0	10.3	4.9	5.3	4.4	3.8	9.8	9.4	13.30		13.2	134.8
Whooping Creek d/s	04/19/2001	7.4	16.7	7.9	12.0	12.2	4.3	4.6	4.3	4.1	9.1	9.3	11.4		14.0	117.2
Wolf Creek	07/08/1998	11.7	14.7	11.3	15.0	10.3	6.3	6.3	7.3	7.3	9.3	9.3	13.70	13.70		136.3

Table 8. 1998-2003 WRD's Habitat Assessment Scores (Impaired – Piedmont Ecoregion)

Stream Name	Date	Embeddedness	Channel Alteration	Sediment Deposition	Riffle Frequency	Channel Flow Status	Bank Vegetation (Left)	Bank Vegetation (Right)	Bank Stability (Left)	Bank Stability (Right)	Riparian Zone (Left)	Riparian Zone (Right)	Instream Cover / Epifaunal	Velocity Depth	Habitat Total
Bear Creek	10/14/2003	0.33	15.00	1.17	0.00	7.67	2.37	1.60	2.03	1.27	6.83	2.00	6.67	10.50	57.4
Browns Creek	09/26/2000	3.67	16.33	7.10	0.00	14.07	3.90	3.87	3.50	3.23	1.77	5.83	8.00	1.60	73.1
Bull Creek	06/14/2000	0.00	11.13	7.02	0.00	9.53	5.10	5.50	4.85	4.65	4.03	4.25	0.00	0.00	55.9
Dean Creek	07/22/2003	1.23	15.10	1.90	14.50	8.67	2.90	4.43	2.90	4.33	0.23	3.67	5.77	8.57	74.2
Deep Creek	10/14/2003	0.00	14.23	0.67	0.00	6.67	1.73	1.73	1.93	1.93	5.50	7.00	5.33	8.67	55.4
Flat Creek (PS)	06/10/2003	1.50	16.23	3.77	0.00	8.00	2.10	1.87	2.87	2.33	3.33	4.20	9.00	8.00	63.2
Flat Creek (NS)	06/10/2003	3.23	13.03	4.43	0.00	7.60	2.37	2.73	2.43	2.03	6.60	1.87	10.40	12.17	68.9
Hazel Creek	06/25/2003	2.57	11.00	5.10	0.00	11.00	4.33	4.50	3.60	4.07	4.10	2.67	8.33	10.10	71.4
Ivy Creek	08/07/2003	0.00	13.33	0.33	0.00	8.33	1.45	1.58	1.67	1.40	8.43	2.87	4.80	9.15	53.4
Long Island Creek	06/12/2003	7.33	14.77	6.90	0.00	8.50	2.00	2.23	2.83	2.40	4.17	3.07	11.00	12.00	77.2
Maple Branch	09/26/2000	1.00	16.33	1.83	19.00	7.83	4.17	6.17	6.50	7.00	2.83	5.67	4.00	6.97	89.6
Mountain Creek	09/27/2000	0.67	13.00	4.33	0.00	11.33	4.67	4.67	7.33	7.33	8.33	9.33	11.00	0.00	81.7
Mud Creek	06/25/2003	1.67	16.17	3.23	0.00	11.33	2.93	1.37	2.43	1.77	7.23	0.93	9.40	12.90	71.4
Nancy Creek u/s	07/31/2003	1.80	16.00	3.43	0.33	11.17	4.10	4.67	3.40	4.43	6.77	9.33	9.50	10.77	85.7
Nancy Creek mid	10/07/2003	0.33	3.67	2.67	0.00	9.50	1.73	1.93	6.93	6.53	3.43	5.07	4.93	10.33	57.1
Nancy Creek d/s	10/07/2003	5.20	15.57	5.07	13.00	10.77	1.55	1.77	2.22	1.97	6.23	3.75	8.70	11.65	87.4
Nickajack Creek u/s	10/06/2003	4.97	7.77	5.90	0.00	8.67	3.10	3.77	4.73	4.43	5.10	5.93	10.50	10.10	75.0
Nickajack Creek d/s	10/07/2003	0.00	15.43	2.67	13.00	8.44	2.87	3.00	2.97	4.11	3.09	6.32	10.43	12.73	85.1
North Fork Peachtree Creek	07/31/2003	2.43	14.67	1.90	0.00	11.67	2.07	2.83	4.50	1.77	2.33	2.67	8.77	13.10	68.7
Noses Creek	06/12/2003	5.43	13.83	5.07	8.00	12.83	0.77	1.33	1.10	1.10	2.50	3.23	11.43	12.00	78.6
Pea Creek	10/14/2003	0.80	17.10	2.23	13.50	7.83	1.40	1.67	1.57	1.50	9.33	9.33	8.10	11.00	85.4
Six Mile Creek	05/14/2003	6.67	17.33	6.27	13.00	7.33	1.67	1.00	3.10	0.87	6.77	7.33	7.77	9.33	88.4

Stream Name	Date	Embeddedness	Channel Alteration	Sediment Deposition	Riffle Frequency	Channel Flow Status	Bank Vegetation (Left)	Bank Vegetation (Right)	Bank Stability (Left)	Bank Stability (Right)	Riparian Zone (Left)	Riparian Zone (Right)	Instream Cover / Epifaunal	Velocity Depth	Habitat Total
South Fork Limestone Creek/Limestone Creek	05/14/2003	6.40	14.17	6.00	16.00	7.67	2.10	1.50	2.77	1.50	4.43	2.00	6.33	8.00	78.9
Suwanee Creek	08/27/2003	0.33	13.53	3.33	0.00	11.10	1.43	1.03	1.77	1.23	1.00	2.00	9.53	10.00	56.3
Tributary to Limestone Creek	05/14/2003	10.87	11.83	9.17	8.00	9.17	2.33	2.50	2.33	3.00	6.00	1.50	8.33	11.50	86.5
Turner Creek	07/22/2003	5.00	9.33	7.17	0.00	14.00	7.50	7.67	6.17	6.17	0.67	0.67	7.50	12.50	84.3
Ward Creek	06/12/2003	0.50	15.00	3.67	0.00	10.00	1.33	1.17	2.00	2.33	5.50	4.00	5.50	7.00	58.0
White Creek	07/22/2003	0.00	15.90	2.00	0.00	11.00	1.33	2.23	1.43	2.43	3.10	3.23	8.10	10.00	60.8

Table 9. 1998-2003 WRD's Field Measurements (Unimpaired – Piedmont Ecoregion)

Stream Name	Date	Average Stream Width (m)	Average Stream Depth (m)	Reach Length (m)	Number of Riffles	Number of Pools	Deep Pool (m)	Water Temp (deg C)	Dissolved Oxygen (mg / L)	Conductivity (uS)	pH (SU)	Turbidity (NTU)	Total Hardness (mg / L)	Alkalinity (mg / L)
Annewakee Creek u/s	08/20/1999	6.3	0.2	220.5	0	6	0.94	26.6	6.97	73	7.04	4.24	21	25
Annewakee Creek d/s	08/20/1999	7.6	0.34	266	0	13	1.2	24.3	5.25	161.3	6.81	6.52	27	30
Beech Creek	05/17/1999	2.9	0.08	101.5	1	1	0.7	18.6	8.71	42.8	7.39	16.4	17	25
Big Branch	06/09/1999	5.5	0.25	192.5	2	6	0.74	20.5	5.88	41.5	6.88	28.6	13	20
Blue John Creek	04/06/1998	5.2	0.1	182	0	3	0	17	8.25	11.5				
Brush Creek	09/27/2000	3.00	0.12	105	0	1	0.75	18.3	7.47	38	6.5	12.3	11	10
Copeland Creek	08/24/1998													
Flat Creek	08/10/1999	7.5	0.27	262.5	0	7	0.85	24.8	6.7	74.5	7.42	10.5	31	40
Flat Shoals Creek	05/18/1999	2.4	0.26	84	0	1	0.77	18.1	3.51	42.9	6.52	307	15	30
Gum Branch	08/21/1998													
Gum Creek	08/25/1998	7.4	0.25	259	7	10	1.65	21.3	7.81	27.8	6.92	10.1		
Gum Creek	07/16/1999	6.9	0.21	241.5	7	6	1.06	20.5	8.02	31.1	6.39	6.56	11	20
Gum Creek	09/18/2001	7.10	0.30	248.5	7	7	0.95	18	8.79	29.5	6.5	5.8	9	20
Hillabahatchee Creek	09/01/1999	18.5	0.29	647.5	6	15	2	20.2	8.16	22.3	7.08	4.51	7	15
Hillabahatchee Creek	09/28/2000	16.50	0.24	577.5	6	16	2	15	9.23	21	7	25.3	6	10
Hillabahatchee Creek	09/19/2001	18.40	0.33	644	11	16	2	18.5	8.8	20.8	7	6.4	8	20
Little Snake Creek	08/19/1998													
Long Cane Creek u/s	06/09/1999	3.9	0.28	136.5	0	7	1.05	19.8	6.72	67.7	7.18	27.3	28	35
Long Cane Creek d/s	07/28/1999	5.6	0.49	196	0	7	1.27	24.3	6.35	74.9	637	15.8	29	40
New River	09/27/2000	10.00	0.27	350	1	13	1.1	17.4	8.56	424.6	7	4.17	171	60
Norman Creek	08/25/1998	5.6	0.1	196	8	7	0.8	18	8.28	24.8	6.78	8.17		
Panther Creek	05/20/1999	2.5	0.1	87.5	1	1	0.55	15.9	8.83	47.1	7.15	15.4	18	25
Polecat Creek	08/11/1999	4.1	0.26	143.5	2	4	0.85	24.2	7.2	44.3	6.59	16.12	12	20

Stream Name	Date	Average Stream Width (m)	Average Stream Depth (m)	Reach Length (m)	Number of Riffles	Number of Pools	Deep Pool (m)	Water Temp (deg C)	Dissolved Oxygen (mg / L)	Conductivity (uS)	pH (SU)	Turbidity (NTU)	Total Hardness (mg / L)	Alkalinity (mg / L)
Red Oak Creek	08/26/1998													
Snake Creek u/s	08/19/1998	7.5	0.16	262.5	10	6	0.71	25.3	7.61	31.8	7.12	11.3		
Snake Creek u/s	03/01/1999	5.3	0.14	185.5	2	1	0.59	22	8.2	31.9		3.76	8	15
Snake Creek d/s	09/02/1999	8.5	0.25	297.5	0	6	0.72	25.6	8.02	33.1		12.3	12	15
Town Creek	08/31/1999	8.8	0.27	308	5	6	1.5	21.3	7.9	24	7.03	4.62	8	15
Trib to Whooping Creek	08/21/1998	2.5	0.1	87.5	5	4	0.9	20.2	8.14	32.8	6.43	8.93		
Whooping Creek u/s	08/21/1998	5.5	0.1	192.5	5	10	0.83	22.7	6.88	36.2	6.64	9.75		
Whooping Creek mid	09/02/1999	11.1	0.2	388.5	8	7	0.95	20.2	7.98	27.9		4.19	9	20
Whooping Creek mid	09/29/2000	11.20	0.17	392	6	7	0.93	16.4	8.95	25.6	7	8.03	6	15
Whooping Creek mid	09/18/2001	13.90	0.29	486.5	7	11	1.25	17.1	8.7	28.7	7	5.8	8	15
Whooping Creek d/s	04/19/2001	11.60	0.45	406	3	9	1.4	9.3	7.52	20.6	6.5	96.15	6	10
Wolf Creek	07/08/1998	4.7	0.1	164.5	5	11	0.84	22.2	7.68	32.8	6.8	6.58		

Table 9. 1998-2003 WRD's Field Measurements (Impaired – Piedmont Ecoregion)

Stream Name	Date	Average Stream Width (m)	Average Stream Depth (m)	Reach Length (m)	Number of Riffles	Number of Pools	Deep Pool (m)	Water Temp (deg C)	Dissolved Oxygen (mg / L)	Conductivity (uS)	pH (SU)	Turbidity (NTU)	Total Hardness (mg / L)	Alkalinity (mg / L)
Bear Creek	10/14/2003	7.10	0.23	248.5	0	5	0.95	20.4	7.73	62.0	7.0	5.3	19	25
Browns Creek	09/26/2000	5.60	0.25	196		5	1.15	17.6	7.32	53.3	7	5.19	18	35
Bull Creek	06/14/2000	8.80	0.38	308	0	5	1.5	24.7	4.82	110.3	7	13.3	44	45
Dean Creek	07/22/2003	5.10	0.24	179	2	5	0.90	19.1	7.81	43.6	6.5	13.5	16	20
Deep Creek	10/14/2003	9.10	0.18	318.5	0	3	0.65	19.3	7.48	74.0	7.5	6.8	31	35
Flat Creek (PS)	06/10/2003	6.30	0.21	220	0	7	1.55	17.1	7.82	51.5	6.5	18.2	16	20
Flat Creek (NS)	06/10/2003	6.50	0.23	227	1	5	0.90	19.2	7.80	132.0	7.5	7.4	68	45
Hazel Creek	06/25/2003	5.10	0.36	179	0	8	1.10	19.9	8.14	34.2	6.5	7.6	11	20
Ivy Creek	08/07/2003	6.80	0.26	238	0	6	1	21.1	7.71	57	6.75	18.5	17	20
Long Island Creek	06/12/2003	4.90	0.22	172	2	8	0.90	22.2	7.08	92.5	7.0	3.3	51	35
Maple Branch	09/26/2000	2.70	0.04	94.5	0	0	0	19	8.25	61.8	7.5	30.7	17	30
Mountain Creek	09/27/2000	7.60	0.42	266	0	10	1.15	17	5.61	703	7	4.07	324.9	100
Mud Creek	06/25/2003	6.50	0.31	227	1	8	1.10	22.4	7.87	134.5	7.0	1.9	27	40
Nancy Creek u/s	07/31/2003	9.30	0.38	326	1	6	1.15	22.4	7.89	77.6	7.0	8.7	29	25
Nancy Creek mid	10/07/2003	10.10	0.46	352	1	6	1.10	18.9	8.52	87.4	7.5	5.6	31	30
Nancy Creek d/s	10/07/2003	12.30	0.39	430	4	3	0.85	18.4	8.25	90.8	7.3	3.4	35	35
Nickajack Creek u/s	10/06/2003	6.80	0.23	236	1	4	0.70	18.9	8.22	131.2	7.0	4.4	46	30
Nickajack Creek d/s	10/07/2003	9.90	0.39	348	4	9	99.00	18.0	7.78	97.1	7.0	6.0	35	30
North Fork Peachtree Creek	07/31/2003	7.70	0.26	271	1	7	1.00	23.2	6.59	81.8	7.0	8.7	32	35
Noses Creek	06/12/2003	4.90	0.26	172	2	4	99.00	21.0	6.94	75.1	7.0	10.6	51	40
Pea Creek	10/14/2003	6.30	0.21	220.5	2	3	0.75	20.1	7.15	62.6	7.0	6.8	18	40
Six Mile Creek	05/14/2003	5.70	0.19	196	2	1	0.62	15.8	8.94	136.0	6.0	3.9	42	25

Stream Name	Date	Average Stream Width (m)	Average Stream Depth (m)	Reach Length (m)	Number of Riffles	Number of Pools	Deep Pool (m)	Water Temp (deg C)	Dissolved Oxygen (mg / L)	Conductivity (uS)	pH (SU)	Turbidity (NTU)	Total Hardness (mg / L)	Alkalinity (mg / L)
South Fork Limestone Creek/ Limestone Creek	05/14/2003	3.00	0.32	105	2	3	0.93	15.3	8.47	114.6	6.5	3.5	95	86
Suwanee Creek	08/27/2003	7.90	0.72	276	0	4	99.00	23.8	6.58	165.7	7.0	13.5	68	35
Tributary to Limestone Creek	05/14/2003	2.90	0.18	98	2	1	0.93	15.7	8.57	73.4	7.0	8.2	35	35
Turner Creek	07/22/2003	5.80	0.48	203	1	5	1.00	21.4	7.60	29.5	6.5	7.7	9	15
Ward Creek	06/12/2003	2.30	0.46	81	0	4	0.90	24.1	7.04	81.9	7.0	8.9	36	40
White Creek	07/22/2003	4.80	0.33	164	0	8	0.92	19.6	7.16	71.1	6.5	15.5	21	20

3.0 SOURCE ASSESSMENT

A healthy aquatic ecosystem requires a healthy habitat. The major disturbance to stream habitats is erosion and sedimentation. As sediment is carried into the stream, it changes the stream bottom and smothers sensitive organisms. Turbidity associated with sediment loads may also impair recreational and drinking water uses (GA EPD, 1998).

A source assessment characterizes the known and suspected sources of sediment in the watershed for use in a water quality model and the development of the TMDL. The general sources of sediment are point and nonpoint sources. National Pollutant Discharge Elimination System (NPDES) permittees discharging treated wastewater are the primary point sources of sediment as total suspended solids (TSS) and / or turbidity.

Nonpoint sources of sediment are diffuse sources that cannot be identified as entering the water body at a single location. These sources generally involve land use activities that contribute sediment to streams during a rainfall runoff event. Nonpoint sources of sediment included in the source assessment analysis are:

- Silviculture,
- Agriculture,
- Grazing areas,
- Mining sites,
- Roads, and
- Urban Development.

For nonpoint sources involving silviculture, the Georgia Forestry Commission (GFC) was consulted for information and parameters regarding silviculture activities. The Natural Resources Conservation Service (NRCS) was consulted for information and parameters regarding agricultural activities.

3.1 Point Source Assessment

For purposes of this TMDL, NPDES permitted facilities will be considered point sources. Discharges from municipal, industrial, private and federal NPDES permitted facilities may contribute sediment to receiving waters as TSS and / or turbidity. There are eleven permitted NPDES discharges identified in the Chattahoochee River Basin watersheds upstream from the listed segments. Table 10 provides the permitted flow, TSS concentrations, and/or turbidity levels for the NPDES permittees located in the impaired Chattahoochee River Basin watersheds. The average levels (whether daily or monthly) and the highest maximum levels (whether daily or monthly) discharged over the last three years (2004-2006) are also given. These data were determined from analysis of the available Discharge Monitoring Reports (DMRs) or Operation Monitoring Reports (OMRs). Where the facility's permitted flow is less than 0.1 MGD, the 2004-2006 values are not given.

Some storm water runoff is covered under the NPDES Permit Program. It is considered a diffuse source of pollution. Unlike other NPDES permits that establish end-of-pipe limits, storm water NPDES permits establish controls. Currently, regulated storm water discharges include those associated with industrial activities, including construction sites one acre or greater, and large and medium municipal separate storm sewer systems (MS4s).

Table 10. NPDES Permit Limits for Facilities in the Impaired Watersheds of the Chattahoochee River Basin

Facility	NPDES Permit No.	Facility Type	Receiving Water	FLOW (MGD)		TSS (mg/L)	
				Monthly Average	Weekly Average	Monthly Average	Weekly Average
Buford - Southside WPCP	GA0023167	Municipal	Suwanee Creek Tributary	2.0	2.5	30	45
				1.58	2.34	12.1	31.0
Cornelia WPCP	GA0021504	Municipal	South Fork Little Mud Creek	3.0	3.75	20	30
				2.32	3.15	1.4	16.0
DeKalb County – Scott Candler WTP	GAG640000	Municipal	Nancy Creek	-	-	30	45
				3.74	9.15	12.9	227.0
Dixie Mobile Home Park	GA0023043	Private	Unnamed Tributary to Flat Creek	0.0043	0.0053	90	120
Fulton County - Little Bear Creek	GA0047104	Municipal	Little Bear Creek	0.1	0.125	20	30
				0.023	0.053	3.8	22.0
Gainesville – Flat Creek WPCP	GA0021156	Municipal	Flat Creek	10.2	12.75	20	30
				7.59	9.90	3.1	17.0
Newnan - Mineral Springs WPCP	GA0021423	Municipal	Mineral Springs Creek	0.75	0.94	30	45
				0.47	0.73	10.0	63.0
				FLOW (MGD)		TSS (mg/L)	
				Daily Average	Daily Max	Daily Average	Daily Max
Buckhorn Ventures LLC[1]	GA0037290	Industrial	Six Mile Creek Tributary	-	-	55	110
				0.43	0.77	8.8	30.0
Lafarge Building Materials, Inc.[2]	GA0025917	Industrial	Tributary to Noses Creek	-	-	-	40
				0.0096	0.0096	14	14
Lafarge Building Materials, Inc.[3]	GA0046906	Industrial	Tributary to North Fork Peachtree Ck	-	-	-	40
				0.0093	0.0096	11.6	19.0
USAF Lockheed (Plant No. 6)	GA0001198	Federal	Nickajack Creek	-	-	-	10
				1.04	2.60	0.7	3.8

permit limits
actual data from monthly Monitoring Reports

[1] Actual flow values are based upon reported values during 2006 (flows were not reported from this facility during 2004 and 2005).

[2] Actual data based upon reported values for the month of February 2005. This facility did not discharge during any other month for the 2004-2006 period.

[3] Actual data based upon months for which there was reported discharge from this facility for the 2004-2006 period.

Storm water discharges associated with industrial activities are currently covered under Georgia's General Storm Water NPDES Permit (GAR000000). This permit requires visual monitoring of storm water discharges, site inspections, implementation of Best Management Practices (BMPs), and record keeping. Table 11 provides a list of those facilities in the Chattahoochee River Basin that have submitted a Notice of Intent to be covered under Georgia's General Storm Water NPDES Permit Associated with Industrial Activities. It is unknown at this time whether these facilities are contributing sediment to the watershed.

Table 11. Facilities with a General Industrial Storm Water NPDES Permit in the Chattahoochee River Basin

Facility Name	NOI No.	County
2 C Optics, Inc.	3851	Forsyth
A. I. T. Atlanta, Inc.	3672	DeKalb
A.R. Brooks Enterprises, Inc.	5171	Cobb
A.T. Aviation, Inc.	4581	DeKalb
AAA Cooper Transportation	4231	Muscogee
ABC Compounding Company, Inc.	2842	Clayton
Advantis Technologies, Inc.		Forsyth
Aeroquip Inoac Corporation	3082	Fulton
Airway Aviation Services, Inc. DBA Air Bp Atlanta	4581	DeKalb
Ajay North America, LLC	2819	Cobb
Akzo Nobel Inks, Corporation	2893	Gwinnett
Alchemy South, Ltd.	2869	Cobb
Allied Foods, Inc.	2047	Fulton
Alpha Metals, Inc.	2899	Forsyth
American Proteins Inc./Cumming Division	2048	Forsyth
Ameron Composites, Inc.	2899	Coweta
Amoco Polymers, Inc.	2821	Forsyth
Amrep, Inc.	2841	Cobb
Anitox Corporation	2879	Gwinnett
Apac Georgia, Inc. - Forsyth Asphalt Plant	2951	Forsyth
Apac-Georgia	2951	Troup
Apl Limited	4231	Fulton
Arnold Transportation Services	4213	Cobb
Atco International	2842	Cobb
Atlanta Web Printers, Inc.	2751	DeKalb
Atlas Roofing Corporation	3086	Troup
Austell Box Board Corporation	2631	Cobb
Averitt Express, Inc.	4213	Gwinnett
Avery Dennison	2672	Hall
B - Line Systems, Inc.	3499	Gwinnett
Barin Quarry	1423	Muscogee
Barton Brands Of Georgia	2085	Fulton
Beaulieu Fibers - Gainesville Division	2281	Hall
Bellsouth Corporation Aviation	4581	Fulton
Bfi Waste Systems Of North America, Inc.	4212	Fulton
Big Creek WPCP	4952	Fulton
Bill Southern Auto Parts, Inc.	5015	Cobb
Billings Freight Systems, Inc.	4231	Douglas
Bj Transfer Station	4212	Gwinnett
Blount Construction Asphalt Plant	2951	Forsyth
Blue Circle Aggregates - Columbus Plant	1423	Harris
Blue Circle Aggregates - Douglasville	1423	Douglas
Boral Bricks - Atlanta Plant	3251	Cobb
Borden Chemical, Inc.	2842	Muscogee
Braddock Metallurgical/GA	3398	Fulton
Buckhorn Ventures, LLC	1429	Forsyth
Builders Transport, Inc.	4213	Coweta
Bulkmatic Transport Company	4231	Fulton
Burnham Service Company	4213	Muscogee
C & S Chemicals, Inc.	2819	Cobb
C. W. Matthews - Plant #14 Bolton	2951	Cobb

Facility Name	NOI No.	County
C. W. Matthews - Plant #5 Big Creek	2951	Forsyth
C. W. Matthews - Plant #9 Cumming	2951	Forsyth
Cadillac Products, Inc.	3083	Paulding
Camp Creek WPCP	4952	Fulton
Candler Concrete Products, Inc.	3273	Habersham
Candler Concrete Products, Inc.	3273	Lumpkin
Carmet Company	3544	Hall
Cascade Road Landfill	4953	Fulton
Caterpillar, Inc.	3531	Troup
Cedar Springs Works - General Chemical Corporation	2819	Early
Centennial Body Division	3713	Muscogee
Central Metals Company	5093	Cobb
Central Metals Company	5093	Fulton
Central Metals Company	5093	Fulton
Central Oil Asphalt Corporation	2951	Douglas
Cessna Columbus Georgia	3728	Muscogee
Chambers Atlanta Landfill	4953	Fulton
Chattahoochee Industrial Railroad	4011	Early
Chemstar Corporation	2899	Douglas
Ciba Vision Corporation	3851	Fulton
Ciba Vision Corporation	3851	Fulton
Circle P Ranch Sand Company, Inc.	1442	Douglas
Circuit Technologies, Inc.	3672	DeKalb
City Of Atlanta - R. M. Clayton WRC		Fulton
Clark - Schwebel, Inc.	2221	White
CMI Industries, Inc. - Clarkesville Plant	2221	Habersham
Cobb Community Transit Multi-Use Center	4111	Cobb
Coca-Cola USA - Beverage Base Plant	2087	Fulton
Coca-Cola USA - Syrup Manf. Plt & Private Truck Ops	2087	Fulton
Columbus Branch Truck Shop	2951	Muscogee
Columbus Metropolitan Airport	4581	Muscogee
Columbus Mills, Inc.	2273	Muscogee
Columbus Quarry	1423	Muscogee
Columbus Wilbert Vault Company	3272	Muscogee
Colwell Construction Company, Inc.	1423	Lumpkin
Consolidated Freightways - NCG	4213	Gwinnett
Consolidated Freightways - NNG	4213	Coweta
Couch Construction, Lp Plant #17	2951	Muscogee
Couch Ready Mix USA- Columbus	3273	Muscogee
County Farm Road Landfill No. 2		Cobb
CPI Plastics, Inc.	3089	Coweta
Crain Oil Company	5171	Coweta
Crooked Creek WRF	4952	Gwinnett
Crystal Farms Mills, Inc.	2048	Hall
CSX Transportation, Inc.	4011	Fulton
Cusseta Timber & Leasing Company	2411	Chattahoochee
Davidson Mineral Properties, Inc.	1423	Habersham
Degussa Construction Chemicals Operations, Inc.	2851	Cobb
DeKalb Peachtree Airport	4581	DeKalb
Dispersions, Inc.	2893	Fulton
Display Systems	3812	DeKalb
Display Systems	3812	Forsyth
Dolly Madison Bakery	2051	Muscogee
Drug Transport, Inc.	4231	DeKalb

Facility Name	NOI No.	County
Dryvit Systems, Inc.	2899	Muscogee
DSI Transports, Inc.	4231	Fulton
Duracell - North Atlanta Group	3692	Troup
Dynatron/Bondo Corporation	2851	Fulton
E. J. Knight Scrap Material Company, Inc.	5093	Muscogee
Eastman Chemical Company	2821	Muscogee
Elan Pharma, Inc.	2834	Hall
Enplas (USA), Inc.	3089	Cobb
Enplas (USA), Inc.	3089	Cobb
Enplas (USA), Inc.	3089	Cobb
Epps Air Service, Inc.	4581	DeKalb
Ethicon, Inc.	3841	Habersham
Exide Technologies	3691	Muscogee
Fairburn Ready Mix, Inc.	3273	Coweta
Fast Food Merchandisers, Inc.	4222	Troup
Federal Express JGLA	4513	Fulton
Federal Express LGCA	4513	Troup
Federal Express MGEA	4513	Gwinnett
Federal Express NCQA	4513	Cobb
Federal Express PDKA	4513	Fulton
Federal Express TOCA	4513	Hall
Federal Mogul Powertrain Systems	3592	Hall
Fieldale Farms Corporation - Baldwin Complex	2015	Banks
Fieldale Farms Corporation - Cornelia Complex	2015	Habersham
Fieldale Farms Corporation - Gainesville/Best Ice	2015	Hall
Fieldale Farms Corporation - Murrayville Complex	2015	Hall
Fieldale Farms Corporation -Gainesville Truck Shop	2015	Hall
Fieldcrest Cannon, Inc.	2261	Muscogee
Filtran - Newman	2295	Coweta
Fleet Transport Company, Inc.	4231	Fulton
Fleet Transport Company, Inc.	4231	Muscogee
Flexible Products Company	2821	Cobb
Flint Ink Corporation	2893	Fulton
Flint Ink Corporation	2893	Hall
Florida Rock & Tank Lines, Inc.	4213	DeKalb
Florida Rock & Tank Lines, Inc.	4213	Muscogee
Foley Products Company	3272	Coweta
Fort McPherson	4231	Fulton
Franklin Aluminum Company	3354	Heard
Freudenberg - Nok General Partnership	3053	Troup
Frito-Lay, Inc.	2096	DeKalb
Fulco Readymix	3273	Fulton
Fulton County Airport - Brown Field	4581	Fulton
Gaang Organizational Shop #5	9711	Muscogee
Gainesville Scrap & Metal Company	5093	Hall
Gaylord Container Corporation	2653	Gwinnett
Geiger International Corporation	2521	Fulton
General Motors Assembly Plant	3711	DeKalb
General Shale Products LLC - Plant #30	3251	Fulton
General Shale Products LLC - Plant #31	3251	Fulton
General Shale Products LLC, Blalock Mine	1459	Fulton
Georgia - Pacific Corporation	2653	DeKalb
Georgia - Pacific Corporation	2436	Meriwether
Georgia - Pacific Corporation - Alto Woodyard	2499	Habersham

Facility Name	NOI No.	County
Georgia - Pacific Corporation - Hilton Annex	2411	Early
Georgia Duck & Cordage Mill	3052	DeKalb
Georgia Marble Company - Jimco Stone Center	3281	Cobb
Georgia Mountain Timber, Inc.	2421	Habersham
Georgia Power Company - Plant McDonough/Atkinson	4911	Cobb
Georgia Power Company - Plant Wansley	4911	Heard
Georgia Power Company - Plant Yates	4911	Coweta
Georgia Sand Company	1442	Carroll
Georgia Sound Company	1442	Carroll
Georgia Tubing Corporation	3644	Early
Golden City Hosiery Mils, Inc.	2252	Carroll
Golden's Foundry & Machine Company	3321	Muscogee
Graphic Packaging Corporation	2657	Coweta
Great Southern Paper	2631	Early
Greif Bros. Corporation	2655	DeKalb
Guardian Chemical Company	2842	Fulton
Guilford Mills - Guilford Fibers Plant	2281	Hall
Gun Club Road Landfill	4953	Fulton
Habersham County Pea Ridge Road MSWLF		Habersham
Habersham Metal Products Company, Inc.	3442	Habersham
Habersham Mills, Inc.	2281	Habersham
Harris Calorific Division	3548	Hall
Heil South	3713	Cobb
Heliserv	4581	DeKalb
Hemphill Pumping Station	4941	Fulton
Henkel Surface Technologies	2899	Fulton
Hercules Aggregate Mine	1442	Meriwether
Hertiage Inks International	2893	Douglas
Holox, Inc.	2813	Carroll
Honey baked Ham Hangar	4581	DeKalb
Hoover Precision Products, Inc.	3562	Forsyth
Hormel Foods Corporation	2013	DeKalb
Hughes Georgia, Inc.	3761	Troup
Inflation Systems, Inc.	3714	Troup
Inland Paperboard & Packaging, Inc.	2411	Coweta
Interface Flooring Systems	2279	Troup
Interface Flooring Systems	2279	Troup
Intermet Columbus Foundry, L.P.	3321	Muscogee
Intermet Machining Columbus	3541	Muscogee
Irwin Lumber Company, Inc.	2421	Habersham
J. H. Williams, Division Of Snap - On Tool Company	3423	Muscogee
Jervis B. Webb Company Of Georgia	3535	Cobb
John's Creek WWTP	4952	Fulton
Johnson Industries - Columbus Mill	2211	Muscogee
Johnston Industries - Cusseta Plant	2269	Muscogee
K & H Enterprises, Inc.	4581	DeKalb
Kaydon Corporation	3999	Troup
Kenan Transport Company	4213	Gwinnett
Ken-Bar Manufacturing & Dist. Co.	3799	Habersham
Kimberly - Clark Corporation	2297	Troup
Kinnett Dairies, Inc.	2026	Muscogee
Kodak Polychrome Graphics LLC	2796	Muscogee
Kose Enterprises, Inc.	4581	DeKalb
Kysor/ Warren Case Plant	3585	Muscogee

Facility Name	NOI No.	County
Kysor/Warren	3585	Muscogee
L. B. Foster Company	3441	Gwinnett
Lafarge Building Materials, Incorporated	3241	Fulton
Lagrange Callaway Airport	4581	Troup
Lagrange Molded Products	3089	Troup
Lipton	2079	Fulton
LJS Grease & Tallow Inc.	2077	Carroll
Lockheed Martin Aeronautics Company	3721	Cobb
Lummus Corporation	3559	Muscogee
Lumpkin County - SLF		Lumpkin
Lumpkin County Wimpy's Airport	4581	Lumpkin
Macdermid Graphic Arts	2821	Fulton
Macs Customized Distribution Service, Inc.	4231	Gwinnett
Maltese Signs	3993	DeKalb
Manna Pro Corporation	2048	DeKalb
Marble Mill Transfer Station	4212	Cobb
Marta - Avondale Maintenance Facility & Yard	4110	DeKalb
Marta - Brady Avenue Paratransit Facility	4110	Fulton
Marta - Chamblee Rail Maintenance Facility	4110	DeKalb
Marta - Laredo Drive Bus Operating Facility	4110	DeKalb
Marta - Perry Blvd. Bus Operating Facility	4110	Fulton
Martin Marietta Aggregates - Junction City Quarry	1422	Talbot
Martin Sprocket & Gear, Inc.	3568	DeKalb
Marubeni Denim	2211	Muscogee
McConnell Drum Service, Inc.	3412	DeKalb
McEver Road Landfill		Gwinnett
McNeilus Truck & Manufacturing, Inc.	3713	Carroll
MD Building Products, Inc.	3354	Hall
Mead Containerboard	2653	Fulton
Mead Packaging - Atlanta	2657	Fulton
Mercury Air Center	4581	DeKalb
Metal Building Components, Inc.	3448	Douglas
Metalico - Evans, Inc.	3356	Fulton
Metalplate Galvanizing, L.P.	3479	Fulton
Metcam, Inc.	3499	Forsyth
Metromont Prestress Company (Hiram Plant)	3272	Paulding
Milliken & Company - Duncan M. Stewart Plant	2258	Troup
Milliken & Company - Elm City Plant	2262	Troup
Milliken & Company - Kex Plant	2281	Troup
Milliken & Company - New Holland Plant	2281	Hall
Milliken & Company - Pine Mountain Plant	2221	Troup
Milliken & Company Unity Plant	2281	Troup
Milliken Live Oak/Milstar Complex	2273	Troup
Mm Systems Corporation	3460	DeKalb
Mobil Chemical Company	3081	Troup
Momar, Inc.	2841	Fulton
Montgomery Tank Lines, Inc.	4213	DeKalb
Montgomery Tank Lines, Inc.	4213	DeKalb
Morgan Concrete Company	3273	Habersham
Mount Vernon Mills - Cleveland Plant	2211	White
Mutec	3691	Muscogee
National Envelope Corporation	2677	Cobb
National Starch & Chemical Company	2891	Fulton
Naval Air Station Atlanta	9711	Cobb

Facility Name	NOI No.	County
Neste Polyester. Inc.	2821	Fulton
No Business Creek WRF	4952	Gwinnett
Norfolk Southern - Columbus Yard	4011	Muscogee
Norfolk Southern - Inman Yard	4011	Fulton
Norfolk Southern-Doraville Thoroughbred Trf. Fac.	4011	Gwinnett
North American Van Lines	4213	Fulton
North Fulton Readymix	3273	Forsyth
Norton Construction Products	3425	Hall
Nottingham Company	2869	Fulton
OFS Brightwave Solutions	3357	Gwinnett
Oki Telecom Inc.	3694	Gwinnett
Oldcastle Precast East, Inc.	3272	DeKalb
Owens Corning	2952	Fulton
Owens Corning	3089	Fulton
Packaging Specialties Of Georgia	2759	Hall
Pamarco Southern, Inc.	2796	Fulton
Panduit Of Georgia	3644	Forsyth
Peachtree Hills Readymix	3273	Fulton
Peed Mine	1442	Muscogee
Piedmont Laboratories	2899	Hall
Pine Mountain Concrete Co.	3273	Meriwether
Pine Wood Products, Inc.	2491	Hall
Plastipak Packaging, Inc.	3085	Fulton
Pratt & Whitney	3724	Muscogee
Precision Components International	3724	Muscogee
Primex Plastics	3081	Hall
Quebecor Printing Atlanta, Inc.	2752	DeKalb
R. L. Sutton Water Reclamation Facility		Cobb
Recycling Industries Of Atlanta, Inc.	5093	Fulton
Regional Recycling, LLC	5093	Hall
Road Repair Products Co.	2951	Douglas
Roadway Express, Inc.	4213	Troup
Robert Bosch Corporation	3714	Douglas
Rohrer Corporation	2752	Gwinnett
Rollins, Inc.	4581	DeKalb
Royal Oak Enterprises, Inc.	4581	DeKalb
Ryder/Ate #7450	4111	Cobb
Safa, LLC	3714	Troup
Safety - Kleen Corporation	7389	Muscogee
SBF, Inc.	3560	Gwinnett
Schatulga Road Landfill	4953	Muscogee
Scientific Games, Inc.	2750	Forsyth
Scott Lithographing Company, Inc.	2752	DeKalb
Scovill Fasteners, Inc.	3965	Habersham
Selig Chemical Industries	2842	Fulton
Shaw Industries, Inc. Plant #22	2281	McDuffie
Sherman Concrete Pipe	3272	Muscogee
SKF USA, Inc.	3562	Hall
Smallwood Auto Parts	5015	Fulton
Smoker - Craft, Inc.	3732	Troup
Sonoco Products Company	2631	Fulton
South Cobb Water Reclamation Facility		Cobb
South Commons Water Resource Facility		Muscogee
Southeastern Freight Lines, Inc.	4231	Cobb

Facility Name	NOI No.	County
Southeastern Freight Lines, Inc.	4231	Gwinnett
Southeastern Freight Lines, Inc.	4231	Muscogee
Southeastern Services Maintenance Terminal	4213	Hall
Southeastern Transfer & Storage Company, Inc.	4231	Cobb
Southern Asphalt	2951	Muscogee
Southern Signatures	2752	Fulton
Southern States Cooperative Feed Mill	2048	Hall
Springs Industries - Gainesville Plant	2341	Hall
Star Paper Tube, Inc., Div Of Carrustar Industries	2655	Cobb
State Chemical Manufacturing	2842	Fulton
Stimsonite Corporation	2821	Fulton
Stimsonite Corporation	3531	Fulton
Stimsonite Corporation	2821	Fulton
Stone Container Corporation	2653	Fulton
Stone Container Corporation	2653	Fulton
Storopack, Inc.	3070	Fulton
Strategic Materials, Inc.	5093	Fulton
Superior Printing Ink Company, Inc.	2893	Fulton
Sweetwater Lumber & Land Co. Inc.	2421	Cobb
Swift Textiles, Inc. - Flat Rock Road Plant	2261	Muscogee
SWM - Georgia, LLC	3714	Whitfield
Synthetic Industries, Inc.	2299	Hall
T & S Hardwoods, Inc.	2421	Habersham
Talon, Inc.	3965	White
Target Container Co.	2653	Fulton
Techalloy Company Inc.	3315	Gwinnett
Tecpro Corporation	2899	Fulton
Tenneco Packaging - Hexacomb	2679	Fulton
The Atlanta Coca-Cola Bottling Company	2086	Cobb
The Bird Bath, Inc.	4581	DeKalb
The Concrete Company	3273	Coweta
The Concrete Company - Lagrange	3273	Troup
The Glidden Company, I.C.I. Americas	2851	Hall
The Inx International Ink Company	2893	Cobb
The Lovable Company	2345	Gwinnett
The Proctor & Gamble Manufacturing Company	2841	Richmond
The Torrington Company	3562	Lumpkin
Thomas Concrete Of Georgia, Inc. (Alpharetta)	3273	Fulton
Thomas Concrete Of Georgia, Inc. (Ben Hill Plant)	3273	Fulton
Thomas Concrete Of Georgia, Inc. (Doraville)	3273	Gwinnett
Thomas Concrete Of Georgia, Inc. (Gainesville)	3273	Hall
Thomas Concrete Of Georgia, Inc. (Hiram Plant)	3273	Paulding
Thomas Concrete Of Georgia, Inc. (Johnson Road)	3273	Fulton
Thomas Concrete Of Georgia, Inc. (Suwanee)	3273	Gwinnett
Tightitco, Inc.	3728	Fulton
Tip Top Poultry	2015	Cobb
Tom's Foods, Inc.	2064	Muscogee
Transflo Terminal Services, Inc.	4011	Fulton
Tucco - Cumming Ready-Mix Plant	3273	Forsyth
Tucker Ready-Mix Plant	3273	DeKalb
Tuggle Greer Road Landfill		Gwinnett
Turbine Engine Components Textron	3724	Thomas
Tyson Foods, Inc. Processing Plant	2015	Forsyth
U.S. Army Infantry Center	9711	Chattahoochee

Facility Name	NOI No.	County
U.S. Transport, Inc.	4581	DeKalb
U.S.P.S. Aux Vehicle Maintenance Facility	4311	Muscogee
Union Carbide Corporation	2821	DeKalb
United Parcel Service - Roswell	4215	Fulton
United Parcel Service, Inc.	4215	DeKalb
United Parcel Service, Inc.	4215	Muscogee
United Parcel Service, Inc. - Atlanta Hub	4215	Fulton
United Parcel Service, Inc. - Hall	4215	Hall
United Parcel Service, Inc. - Lagrange	4215	Troup
United States Gypsum Company	2851	DeKalb
Uptown Park Water Resource Facility		Muscogee
UWL/Richland Creek Rd Sanitary Landfill	4953	Gwinnett
Vadco Marble Of Georgia, Inc.	3089	DeKalb
Vinings Industries	2879	Cobb
Vinings Industries	2899	Cobb
Vinings Industries	2869	Fulton
Vulcan Performance Chemicals / B. H. Jackson Plant	2869	Muscogee
Vulcan Performance Chemicals / L. O. Strange Plant	2869	Muscogee
Vulcan Performance Chemicals / Smyrna Plant	2819	Cobb
W. C. Bradley Company - Char-Broil Division	3631	Muscogee
Watkins Motor Lines - Atl	4213	Cobb
Watkins Motor Lines - Col	4213	Muscogee
Wattyl Paint Corporation	2851	DeKalb
Wayne Davis Concrete Company	3273	Douglas
Wayne Davis Concrete Company	3273	Paulding
Weaver Transporation Company	4213	Cobb
Weaver Transporation Company	4213	Cobb
West Point Foundry & Machine Company	3552	Troup
West Point Foundry Assembly Shop	3552	Troup
Westpoint Stevens, Inc. - Dixie	2211	Troup
Westvaco Envelope Division - Atlanta Plant	2677	DeKalb
Weyerhaeuser Company	2653	Muscogee
Whitaker Oil Company	5171	Fulton
Wilbert Burial Vault Company	3911	Fulton
William C. Meredith Company, Inc.	2491	Fulton
Wm. Wrigley Jr. Company	2067	Hall
Wooley & Company, Inc.	3086	Gwinnett
World Color - Dittler Division - Atlanta	2752	Fulton
World Color - Dittler Division/Oakwood	2752	Hall
World Color Direct - Gainesville	2754	Hall
Worthington Cylinder Corporation	3443	Muscogee
Young Refining Corporation	2951	Douglas
Zep Manufacturing Company	2842	Fulton

The MS4 permits have been issued under two phases. Phase I MS4 permits require the prohibition of non-storm water discharges (i.e., illicit discharges) into the storm sewer systems and controls to reduce the discharge of pollutants to the maximum extent practicable, including the use of management practices, control techniques and systems, as well as design and engineering methods (Federal Register, 1990). A site-specific Storm Water Management Plan (SWMP) outlining appropriate controls is required by and referenced in the permit. There are twenty-nine (29) Phase I MS4s in the Chattahoochee River Basin (Table 12).

Table 12. Phase I Permitted MS4s in the Chattahoochee River Basin

Name	Permit No.	Watershed
Alpharetta	GAS000102	Chattahoochee
Atlanta	GAS000100	Chattahoochee, Flint, Ocmulgee
Austell	GAS000103	Chattahoochee
Berkley Lake	GAS000138	Chattahoochee
Buford	GAS000104	Chattahoochee
Chamblee	GAS000105	Chattahoochee
Clarkston	GAS000106	Chattahoochee, Ocmulgee
Cobb County	GAS000108	Chattahoochee, Coosa
College Park	GAS000109	Chattahoochee, Flint
Columbus Consolidated	GAS000202	Chattahoochee
Decatur	GAS000110	Chattahoochee, Ocmulgee
DeKalb County	GAS000111	Chattahoochee, Ocmulgee
Doraville	GAS000113	Chattahoochee
Duluth	GAS000112	Chattahoochee, Ocmulgee
East Point	GAS000114	Chattahoochee, Flint, Ocmulgee
Fairburn	GAS000115	Chattahoochee, Flint
Forsyth County	GAS000300	Chattahoochee, Coosa
Fulton County	GAS000117	Chattahoochee, Ocmulgee, Coosa, Flint
Gwinnett County	GAS000118	Chattahoochee, Ocmulgee, Oconee
Marietta	GAS000125	Chattahoochee, Coosa
Norcross	GAS000127	Chattahoochee, Ocmulgee
Palmetto	GAS000128	Chattahoochee, Flint
Powder Springs	GAS000129	Chattahoochee
Roswell	GAS000131	Chattahoochee, Coosa
Smyrna	GAS000132	Chattahoochee
Sugar Hill	GAS000135	Chattahoochee
Suwanee	GAS000144	Chattahoochee, Ocmulgee
Union City	GAS000136	Chattahoochee, Flint

Source: Nonpoint Source Permitting Program, GA DNR, 2007

As of March 10, 2003, small MS4s serving urbanized areas are required to obtain a storm water permit under the Phase II storm water regulations. An urbanized area is defined as an entity with a residential population of at least 50,000 people and an overall population density of at least 1,000 people per square mile. Thirty counties and 56 communities are permitted under the Phase II regulations in Georgia. There are twelve counties or communities located in the Chattahoochee River Basin that are covered by the Phase II General Storm Water Permit (Table 13).

Table 13. Phase II Permitted MS4s in the Chattahoochee River Basin

Name	Permit No.	Watershed
Cumming	GAG610000	Chattahoochee
Dallas	GAG610000	Chattahoochee, Coosa
Douglas County	GAG610000	Chattahoochee
Douglasville	GAG610000	Chattahoochee
Flowery Branch	GAG610000	Chattahoochee
Gainesville	GAG610000	Chattahoochee, Oconee
Hall County	GAG610000	Chattahoochee, Oconee
Hiram	GAG610000	Chattahoochee
Newnan	GAG610000	Chattahoochee, Flint
Oakwood	GAG610000	Chattahoochee, Oconee
Paulding County	GAG610000	Chattahoochee, Coosa, Tallapoosa
Sandy Springs	GAG610000	Chattahoochee

Source: Nonpoint Source Permitting Program, GA DNR, 2007

Those watersheds located within Phase I or Phase II MS4 city or county urbanized areas are listed in Table 14. The table provides the total area of each of these watersheds, and the percentage of the watershed that is in an MS4 area.

Table 14. Percentage of Watersheds Located in MS4 Areas

Name	Total Area (acres)	% in MS4 area
Bear Creek	27.26	100.0%
Browns Creek	8.05	0.0%
Bull Creek	32.92	76.6%
Dean Creek	5.64	0.0%
Deep Creek	27.39	100.0%
Flat Creek (PS)	7.15	0.0%
Flat Creek (NS)	3.23	95.6%
Hazel Creek	7.39	0.0%
Ivy Creek	7.43	99.7%
Long Island Creek	5.16	100.0%
Maple Branch	1.16	0.0%
Mountain Creek	7.32	26.8%
Mud Creek	9.40	0.0%
Nancy Creek	35.87	100.0%
Nickajack Creek	30.22	100.0%
North Fork Peachtree Creek	10.50	100.0%
Noses Creek	5.85	100.0%
Pea Creek	7.81	100.0%
Six Mile Creek	2.94	100.0%
South Fork Limestone Creek/ Limestone Creek	1.72	100.0%

Name	Total Area (acres)	% in MS4 area
Suwanee Creek	14.09	95.0%
Tributary to Limestone Creek	1.40	100.0%
Turner Creek	8.03	0.0%
Ward Creek	7.13	100.0%
White Creek	8.00	0.0%

Soil erosion from construction sites is also a major source of sediment in Georgia's streams. Georgia requires construction sites over one acre to have a General Storm Water NPDES permit. Since construction sites are regulated by NPDES permits, they will be considered as point sources. It is unknown if there are any construction sites in impaired watersheds of the Chattahoochee River Basin.

3.2 Nonpoint Source Assessment

Eroded soils from forests, cropland, mining sites, and other land can be transported to Georgia streams through runoff. Excessive sediment that reaches the water bodies can cause several changes to the stream. It can make the streams shallower and wider, affecting the stream's temperature, dissolved oxygen, flow rate and velocity. It can affect the ability of the stream to assimilate pollutants. It can change the diversity of fish populations and other biological communities. It can also cause increased flooding. In addition, harmful pollutants attached to the sediment can be transported to rivers and streams.

3.2.1 Silviculture

Georgia has 23.6 million acres of commercial forests. This represents approximately 64 percent of all of Georgia's land use. Approximately 68 percent of the commercial forests are privately owned, 25 percent are owned by industry, and 7 percent are publicly held (GA EPD, 1999).

The majority of soil erosion from forested land occurs during timber harvesting and the period immediately following, and during reforestation. Once the forest is re-established, very little soil erosion occurs. Timber harvesting includes the layout of access roads, log decks, and skid trails; the construction and stabilization of these areas; and the cutting of trees. Both hardwoods and pines are harvested throughout Georgia. A minimum harvest is usually ten acres and the percent of forest that is harvested each year varies from county to county. Table 15 lists the percent timberland and percent harvested per year by county.

3.2.2 Agriculture

Agriculture can be a significant contributor of nonpoint pollutants to rivers and streams. Sediment and nutrients are the major pollutants of concern and cropland is one of the major sources of soil loss due to sheet and rill erosion. Over the last century there has been a dramatic decrease in the amount of land farmed in Georgia. In 1950, there were 208,000 farms encompassing 26 million acres in Georgia (U.S. Department of Agriculture, National Agricultural Statistics Service website). In 2000, there were approximately 11.1 million acres of farmland in Georgia, with the number of farms estimated to be 50,000 and the average farm size being approximately 222 acres. This represents a 57 percent reduction in farmland.

With the reduction in farmland, there has also been a decrease in the amount of soil erosion. The National Resources Inventory found the total wind and water erosion on cropland and

Conservation Reserve Program land in Georgia declined 38 percent, from 3.1 billion tons per year in 1982 to 1.9 billion tons per year in 1997 (USDA-NRCS, 1997). This suggests that the source of sediment in many of the impaired streams in the Chattahoochee River Basin may be the result of past land use practices. Thus, it is believed that if sediment loads are maintained at acceptable levels, streams will repair themselves over time.

3.2.3 Grazing Areas

Farm animals grazing on pastureland can leave areas of ground with little or no vegetative cover. During a rainfall runoff event, soil in the pastures is eroded and transported to nearby streams, typically by gully erosion. The amount of soil loss from gully erosion is generally less than that caused by sheet and rill erosion. Work in small grazed catchments in New Mexico found that gully erosion contributed only 1.4 percent of the total sediment load as compared to sheet and rill erosion. Other research found that gully erosion typically contributes less than 30 percent of the total sediment load; however, contributions have ranged from 0 to 89 percent (USEPA, 2001b).

Beef cattle spend most of their time grazing in pastures, while dairy cattle and hogs are confined periodically. Hog farms confine the animals or allow them to graze in small pastures or pens. On dairy farms, the cows are confined for a limited period each day, during which time they are fed and milked.

In addition, cattle and other unconfined animals often have direct access to streams that pass through pastures. As these animals walk down to the stream, they often damage stream banks. Stream bank vegetation is destroyed and the banks often collapse, resulting in increased sedimentation to the waterway.

3.2.4 Mining Sites

Minerals, rocks, and ores are found in natural deposits on or in the earth. Kaolin, clays, granite, marble, sand, gravel, and other mineral products are the materials primarily mined in Georgia. Surface mining involves the activities and processes used to remove minerals, ores, or other solid material. Tunnels, shafts and dimension stone quarries are not considered to be surface mines. Surface mining encompasses a variety of activities from sand dredging to open pit clay mining to hard rock aggregate quarrying.

Removal of vegetation, displacement of soils and other significant land disturbing activities are typically associated with surface mining. These operations can result in accelerated erosion and sedimentation of surface waters.

3.2.5 Roads

Erosion from unpaved roadways can be a significant source of sediment to rivers and streams. Road erosion occurs when soil particles are loosened and carried away from the roadway, ditch or road bank by water, wind or traffic. The actual road construction (including erosive road-fill soil types, shape and size of coarse surface aggregate, poor subsurface or surface drainage, poor road bed construction, roadway shape, and inadequate runoff discharge outlets or “turn-outs” from the roadway) may aggravate roadway erosion. In addition, external factors such as roadway shading and light exposure, traffic patterns, and road maintenance may also affect

Table 15. Percent Timberland and Percent Harvested per Year by County

County	Total Area (1000 acres)	Timberland (1000 acres)	Percent Timberland	Growing Stock Volume (million ft^3) [a]	Annual Volume Removal (million ft^3)	Annual Percent Removal
Banks	149.6	103.0	68.85%	149.1	5.5	3.69%
Carroll	319.5	185.8	58.15%	291.4	11.0	3.77%
Chattahoochee	159.2	142.0	89.20%	168.6	5.0	2.97%
Cherokee	271.2	176.4	65.04%	347.6	9.8	2.82%
Clay	124.9	82.0	65.65%	105.2	3.1	2.95%
Cobb	217.7	46.0	21.13%	130.5	11.7	8.97%
Coweta	283.6	195.4	68.90%	330.3	5.3	1.60%
Dawson	135.1	101.1	74.83%	212.6	4.9	2.30%
DeKalb	382.0	201.1	52.64%	117.8	1.2	1.02%
Douglas	127.6	79.3	62.15%	182.9	3.6	1.97%
Early	327.2	151.5	46.30%	156.8	8.9	5.68%
Forsyth	144.5	68.1	47.13%	163.2	6.1	3.74%
Fulton	338.4	125.7	37.15%	372.3	14.9	4.00%
Gwinnett	277.0	104.4	37.69%	227.6	13.3	5.84%
Habersham	178.0	121.7	68.37%	263.7	5.3	2.01%
Hall	251.9	133.9	53.16%	240.7	1.3	0.54%
Harris	296.8	238.4	80.32%	260.3	10.0	3.84%
Heard	189.5	151.6	80.00%	169.0	10.2	6.04%
Lumpkin	182.1	139.5	76.61%	305.9	4.2	1.37%
Marion	234.9	188.2	80.12%	126.3	5.3	4.20%
Meriwether	322.1	230.7	71.62%	234.2	21.1	9.01%
Muscogee	138.4	86.2	62.28%	140.6	3.1	2.20%
Paulding	200.7	135.4	67.46%	203.0	8.9	4.38%
Quitman	97.0	80.5	82.99%	103.5	1.2	1.16%
Randolph	274.7	180.7	65.78%	166.6	8.7	5.22%
Seminole	126.7	66.9	52.80%	95.9	11.4	11.89%
Stewart	293.6	253.7	86.41%	203.1	20.7	10.19%
Talbot	251.7	219.5	87.21%	195.0	15.4	7.90%
Taylor	241.6	190.4	78.81%	121.6	7.2	5.92%
Towns	106.6	84	78.80%	131.8	27.9	21.17%
Troup	264.9	182.7	68.97%	334.1	8.3	2.48%
Union	206.5	135.6	65.67%	250.5	8.5	3.39%
White	154.6	98.1	63.45%	200.6	7.8	3.89%

[a] Estimate - does not include trees less than 5" diameter at breast height (DBH).
Source: Thomas, Michael T., 1997. Forest Statistics for Georgia

roadway erosion.

Exposed soils, high runoff velocities and volumes, and poor road compaction all increase the potential for erosion. Loose soil particles are often carried from the roadbed into roadway drainage ditches. Some of these particles settle out satisfactorily, but usually they settle out poorly, causing diminished ditch carrying capacity that results in roadway flooding and, subsequently, more roadway erosion (Choctawhatchee, et. al, 2000).

3.2.6 Urban Development

Soil erosion from land disturbing activities is a major source of sediment in Georgia's streams. Land-disturbing activities are defined as any activity that may result in soil erosion and the movement of sediments into State waters or on lands of the State. Examples of land disturbing activities include clearing, grading, excavating, or filling of land. The following activities are unconditionally exempt from the provisions of the Erosion and Sedimentation Act: surface mining, granite quarrying, minor land-disturbing activities such as home gardens and landscaping, agricultural and silvicultural operations, and any project carried out under the technical supervision of the NRCS.

Conversion of forest to urban land use is often associated with water quality degradation. From 1982 through 1989, the area classified as commercial forest within the Chattahoochee River Basin decreased by approximately 1053 acres or 0.0045 percent (GA EPD, 1998). It should be noted that forest undergoing conversion to another land use is not considered silviculture, but rather a land disturbing activity.

Storm water runoff from developed urban areas can also have an impact on the transport of sediment to and within streams. Urbanization increases imperviousness, resulting in an increase in the volume of runoff entering the streams. In addition, the stream flow rates may increase significantly from pre-construction rates, causing stream bank erosion and stream bottom down cutting.

4.0 MODELING APPROACH

Establishing the relationship between the in-stream water quality and the source loadings is an important component of TMDL development. It provides for both the identification of sources, and their relative contribution, as well as the examination of potential water quality changes resulting from varying management options to meet the water quality standard. This relationship can be developed using a variety of techniques ranging from simple methods based on scientific principles to more complex numerical computer modeling techniques.

In this section, the numerical modeling techniques developed to simulate sediment fate and transport in the watershed are discussed. The limited amount of sediment loading data and in-stream sediment information prevents GA EPD from using a dynamic watershed runoff model, which requires a great deal of data for model development and calibration. Instead, GA EPD determined the annual sediment loads delivered to the stream from the surrounding watershed. This TMDL does not address in-stream sedimentation processes, such as bank erosion and stream bottom down cutting, since computer models that simulate these processes are not available at this time.

4.1 Model Selection

The Agricultural Research Station (ARS) developed the Universal Soil Loss Equation (USLE) over 30 years ago. It is the most widely accepted and most used soil loss equation. It was designed as a method to predict average annual soil loss caused by sheet and rill erosion. The USLE can estimate long-term soil loss, and can assist in choosing proper cropping, management and conservation practices. However, it cannot be used to determine erosion for a specific year or specific storm. Because of its wide acceptance by the forestry, agricultural, and academic communities, the USLE was selected as the tool for estimating long-term annual soil erosion, assessing the impacts of various land uses, and evaluating the benefits of various BMPs.

4.2 Universal Soil Loss Equation

For each of the watersheds monitored in the Chattahoochee River Basin, the existing annual sediment load was estimated using the USLE. The USLE predicts the average annual soil loss caused by sheet and rill erosion. Soil loss from sheet and rill erosion is mainly due to detachment of soil particles during rainfall events. It is the major source of soil loss from crop production and animal grazing areas, logging areas, mine sites, unpaved roads, and construction sites. The equation used for estimating average annual soil erosion is:

$$A = RKLSCP$$

Where:

A = average annual soil loss, in tons / acre
R = rainfall erosivity index
K = soil erodibility factor
LS = topographic factor
  L = slope length
  S = slope
C = cropping factor
P = conservation practice factor

4.2.1 Rainfall Erosivity Index

The R factor, or rainfall erosivity index, describes the kinetic energy generated by the frequency and intensity of the rainfall. It is statistically calculated from the annual summation of rainfall energy in every storm, which correlates to the raindrop size, times its maximum 30-minute intensity. It varies geographically and ranges from 300 to 425 within the Chattahoochee River Basin. The R Factors by county are provided in Table 16.

4.2.2 Soil Erodibility Factor

The K factor, or soil erodibility factor, represents the susceptibility of soil to be eroded. This factor quantifies the cohesive or bonding character of the soil and ability of the soil to resist detachment and transport during a rainfall event. It is a function of the soil type, which is provided by the STATSGO data. Table 6 provides a breakdown of the soil type within each modeled watershed and the corresponding K factor. STATSGO soil data has a resolution of 1:250,000 and is available for all of Georgia. A higher-resolution (1:25,000) soil data, SSURGO, is available for fourteen Georgia counties. For consistency, it was decided that STATSGO data would be used for the first round or phase of sediment TMDLs because of its availability for all of Georgia. During the second phase of sediment TMDLS, if SSURGO data is available for all of Georgia, it may be used.

4.2.3 Topographic Factor

The LS factor, or topographic factor, represents the effect of slope length and slope steepness on erosion. Steeper slopes produce higher overland flow velocities. Longer slopes accumulate more runoff from larger areas and also result in higher overflow velocities. The slope length and slope is based on the grid size and ground slope provided by the USGS 30 by 30 meter Digital Elevation Model (DEM) grids downloaded from the State GIS clearinghouse.

4.2.4 Cropping factor

The C factor, or cropping factor, represents the effect plants, soil cover, soil biomass, and soil disturbing activities have on erosion. It is the most complicated of the USLE factors. It incorporates effects of tillage, crop type, cropping history, and crop yield. Cropping factors for forested, agricultural, and urban lands were provided by the Georgia Forestry Commission (GFC), Natural Resources Conservation Service (NRCS), and U.S. Environmental Protection Agency (EPA), respectively.

The cropland and pastureland C factors for each county were developed by NRCS under the National Resource Inventory Program. Table 17 lists the C factors by county for forest, cropland, and pastureland. These values were developed based on the 2001 NLCD and GFC data. Low-level aerial photography was performed and the photographs are interpreted to identify land features. If data were not available for a given county, the C factor was calculated by averaging the C factors from all the surrounding counties. The cropland and pastureland C factors for watersheds in multiple counties were determined by area-weighting the agricultural land use within each county.

C factors for the road networks were determined based on the road surface and are given in Table 18. Road information, including road surface, was provided by the Georgia Department of Transportation (DOT). Data gaps were filled based on adjacent road surfaces and road types (i.e., state, county, private).

Table 16. R Factors by County

County	R factor
Banks	300
Carroll	325
Chattahoochee	350
Cherokee	300
Clay	362.5
Cobb	300
Coweta	325
Dawson	275
DeKalb	412.5
Douglas	300
Early	400
Forsyth	275
Fulton	300
Gwinnett	300
Habersham	300
Hall	287.5
Harris	325
Heard	337.5
Lumpkin	275
Marion	337.5
Meriwether	325
Muscogee	337.5
Paulding	300
Quitman	362.5
Randolph	350
Seminole	425
Stewart	350
Talbot	325
Taylor	325
Towns	300
Troup	325
Union	300
White	300

Table 17. Forest, Cropland and Pastureland C Factors by County

County	C factor		
	Forested	Cropland	Pastureland
Banks	0.000163	0.070	0.013
Carroll	0.000164	0.272	0.003
Chattahoochee	0.00015	0.418	0.003
Cherokee	0.000148	0.460	0.003
Clay	0.00015	0.307	0.004
Cobb	0.000252	0.401	0.013
Coweta	0.000127	0.433	0.005
Dawson	0.000139	0.295	0.006
DeKalb	0.000176	0.355	0.029
Douglas	0.000133	0.385	0.003
Early	0.000196	0.408	0.004
Forsyth	0.000164	0.406	0.006
Fulton	0.000168	0.476	0.007
Gwinnett	0.000199	0.283	0.018
Habersham	0.000134	0.275	0.012
Hall	0.000109	0.224	0.004
Harris	0.000165	0.418	0.006
Heard	0.000203	0.460	0.007
Lumpkin	0.000123	0.090	0.018
Marion	0.000123	0.090	0.018
Meriwether	0.000253	0.360	0.004
Muscogee	0.000137	0.510	0.003
Paulding	0.000175	0.330	0.003
Quitman	0.00012	0.395	0.003
Randolph	0.000189	0.391	0.003
Seminole	0.000142	0.393	0.003
Stewart	0.000273	0.408	0.003
Talbot	0.000234	0.384	0.003
Taylor	0.000201	0.513	0.003
Towns	0.000144	0.358	0.011
Troup	0.000142	0.418	0.003
Union	0.000158	0.352	0.004
White	0.000166	0.296	0.018

Source: USDA-NCRS, 1997. National Resources Inventory;
USDA-NCRS Athens, Georgia

Table 18. Road C Factors

Road Surface	Type	C factor
Rigid and High Flexible Road	1	0.13
Bituminous Surfaced Road	2	0.25
Gravel or Stone Road	3	0.65
Soil-Surfaced Road	4	0.75
Primitive or Unimproved Road	5	0.75

C factors for other land uses, including urban, mining, transitional, grass and wetlands, are listed in Table 19. These values were provided by the U.S. Environmental Protection Agency (EPA) and are used in all watersheds.

Table 19. Various Land Use C Factors

Land Use	C factor
Water	0
Low Intensity Residential	0.02
High Intensity Residential	0.005
High Intensity Commercial, Industrial, Transportation	0.003
Bare rock, sand, clay	0
Quarries, strip mines, gravel pits	0.75
Deciduous Shrubland	0.005
Other Grasses	0.003
Woody Wetlands	0.011
Emergent Herbaceous Wetlands	0.003

4.2.5 Conservation Practice Factor

The P factor or conservation practice factor represents the effects of conservation practices on erosion. The conservation practices include BMPs such as contour farming, strip cropping and terraces. In all cases, it was assumed that no BMPs were used and the P factor for all land uses was 1.0.

4.3 WCS Sediment Tool

EPA and Tetra Tech developed the Arcview-based Watershed Characterization System (WCS) to provide tools for characterizing various watersheds. WCS was used to display and analyze geographic information system (GIS) data, including land use, soil type, ground slope, road networks, point source discharges, and watershed characteristics.

An extension of WCS is the Sediment Tool, which incorporates the USLE. The Sediment Tool can be used to perform the following tasks:

- Estimate the extent and distribution of potential soil erosion within a watershed;
- Estimate the potential sediment delivery to the receiving water body; and
- Evaluate the effects of land use, BMPs, and road networks on erosion and sediment delivery.

The watersheds of interest were delineated based on the RF3 stream coverage and elevation data. A stream grid for each delineated watershed was created based on elevation data. The stream grid corresponded to a stream network with twenty-five 30 by 30 meter headwater cells (5.5 acres). The stream grid network has flow and can accumulate flow. For each grid cell within the watershed, the WCS Sediment Tool calculates the potential erosion using the USLE based on the specific cell characteristics. The model then calculates the potential sediment delivery to the stream grid network. Sediment delivery can be calculated using one of the four available sediment delivery equations:

- Distance-based equation

  $$MD = M * (1 - 0.97 * D / L)$$

  Where: MD = mass moved (tons/acre/yr)
  M = sediment mass eroded (ton)
  D = least cost distance from a cell to the nearest stream grid (ft)
  L = maximum distance the sediment may travel (ft)

- Distance slope-based equation

  $$DR = \exp(-0.4233 * L * Sf)$$

  Where: $Sf = \exp(-16.1 * r / L + 0.057) - 0.6$
  DR = sediment delivery ratio
  L = distance to the stream (m)
  r = relief to the stream (m)

- Area-based equation

  $$DR = 0.417762 * A^{(-0.134958)} - 1.27097, \quad DR <= 1.0$$

  Where: DR = sediment delivery ratio
  A = area (sq miles)

- WEPP-based regression equation

  $$Z = 0.9004 - 0.1341 * X^2 + X^3 - 0.0399 * Y + 0.0144 * Y^2 + 0.00308 * Y^3$$

  Where: Z = percent of source sediment passing to the next grid cell
  X = cumulative distance downslope
  Y = percent slope in the grid cell

Based on work previously performed by EPA on the Chattooga River Watershed, it was determined that the distance slope-based equation provided the best prediction of the sediment delivery (USEPA, 2001b).

The WCS Sediment Tool estimates the total soil erosion and sediment delivered to the stream from each grid cell due to land use cover and from the grids representing roads.

5.0 TOTAL MAXIMUM DAILY LOAD

A Total Maximum Daily Load (TMDL) is the amount of a pollutant that can be assimilated by the receiving water body without exceeding the applicable water quality standard; in this case, the narrative water quality standard for aquatic life. TMDLs establish allowable pollutant loadings that are less than or equal to the TMDL, and thereby provide the basis to establish water quality based controls. For some pollutants, TMDLs are expressed on a mass loading basis.

This TMDL determines the range of sediment load that can enter the impaired Chattahoochee River Basin watersheds without causing additional impairment to the stream. This is based on the hypothesis that if an impaired watershed has an annual average sediment loading rate similar to a biologically unimpaired watershed, then the receiving stream will remain stable and not be biologically impaired due to sediment. The average sediment load in the watersheds not on the 303(d) list is 0.06 tons/acre/yr.

A TMDL is the sum of the individual waste load allocations (WLA) for point sources and load allocations (LA) for nonpoint sources and natural background (40 CFR 130.2). The sum of these components may not result in an exceedance of water quality standards for a water body. To protect against exceedances, the TMDL must also include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the water quality response of the receiving water body. Conceptually, a TMDL can be expressed as follows:

$$\text{TMDL} = \Sigma\text{WLAs} + \Sigma\text{LAs} + \text{MOS}$$

The following sections describe the various TMDL components.

5.1 Waste Load Allocations

The waste load allocation is the portion of the receiving water's loading capacity that is allocated to existing or future point sources. There are eleven permitted facilities in the Chattahoochee River Basin watersheds that discharge into listed segments or upstream of a listed segment. These include industrial facilities, municipal treatment plants, a private and institutional development (PID) facility, and a federal facility. WLAs are provided to the point sources from municipal and industrial wastewater treatment systems with NPDES effluent limits.

There are eleven (11) active NPDES permitted facilities with TSS permit limits in the Chattahoochee River Basin watershed that discharge into listed segments or upstream of a listed segment. This facility includes process water a municipal treatment plants. The maximum allocated sediment load for these municipal wastewater treatment facility is dependent on the discharge flow. Table 20 provides the WLAs for these facility. The WLA loads are given as concentrations or as a range of daily average and daily maximum TSS limits for these facilities; however, a load can be calculated based on the permitted (where available) or design flows, and the permitted TSS concentrations.

The WLA, as a load, can be represented by the following equation:

WLA = Cpermitted * Q

Where: WLA = Wasteload Allocation sediment load
Cpermitted = permitted concentration, in TSS (mg / L)
Q = permitted (where available) or design discharge flow

Table 20. Waste Load Allocations for Permits with TSS Limits

Facility	NPDES Permit No.	Receiving Water	TSS Monthly Avg (mg/L)	TSS Weekly Avg (mg/L)
Buford – Southside WPCP	GA0023167	Suwanee Creek Tributary	30	45
Cornelia WPCP	GA0021504	South Fork Little Mud Creek	20	30
DeKalb County – Scott Candler WTP	GAG640000	Nancy Creek	30	45
Dixie Mobile Home Park	GA0023043	Unnamed Tributary to Flat Creek	90	120
Fulton County – Little Bear Creek	GA0047104	Little Bear Creek	20	30
Gainesville – Flat Creek WPCP	GA0021156	Flat Creek	5 - 9	5 - 9
Newnan – Mineral Springs WPCP	GA0021423	Mineral Springs Creek	30	45
			Daily Avg (mg/L)	**Daily Max (mg/L)**
Buckhorn Ventures LLC	GA0037290	Six Mile Creek Tributary	25 - 55	55 - 110
Lafarge Building Materials, Inc.	GA0025917	Tributary to Noses Creek	25 - 40	25 - 40
Lafarge Building Materials, Inc.	GA0046906	Tributary to North Fork Peachtree Creek	25 - 40	25 - 40
USAF Lockheed (Plant No. 6)	GA0001198	Nickajack Creek	5 - 10	5 - 10

If there is available assimilative capacity, a new facility may be allowed, or it may be acceptable for an existing facility to expand. Any discharge increases will be allowed dependent on engineering and biological integrity study results.

State and Federal Rules define storm water discharges covered by NPDES permits as point sources. However, storm water discharges are from diffuse sources and there are multiple storm water outfalls. Storm water sources (point and nonpoint) are different than traditional NPDES permitted sources in four respects: 1) they do not produce a continuous (pollutant loading) discharge; 2) their pollutant loading depends on the intensity, duration, and frequency of rainfall events, over which the permittee has no control; 3) the activities contributing to the pollutant loading may include the various allowable activities of others, and control of these activities is not solely within the discretion of the permittee; and 4) they do not have wastewater treatment plants that control specific pollutants to meet numerical limits.

The intent of storm water NPDES permits is not to treat the water after collection, but to reduce the exposure of storm water to pollutants by implementing various controls. It would be infeasible and prohibitively expensive to control pollutant discharges from each storm water outfall. Therefore, storm water NPDES permits require the establishment of controls or BMPs to reduce the pollutants entering the environment.

The stormwater discharges associated with industrial facilities that are not covered under individual NPDES permits are regulated by a Georgia General Storm Water NPDES Permit (GAR000000). Table 11 lists the industrial facilities that are covered under the Georgia General

Stormwater NPDES Permit in the Chattahoochee River Basin. Facilities covered by this permit that discharge storm water associated with industrial activity or within one linear mile upstream and within the same watershed of an impaired stream segment are required to monitor for the pollutant of concern.

The sediment load allocation from future construction sites within the watershed will have to meet the requirements outlined in the Georgia General Storm Water NPDES Permit for Construction Activities. This permit authorizes the discharge of storm water associated with construction activity to the waters of the State in accordance with the limitations, monitoring requirements, and other conditions set forth in Parts I through VII of the Georgia Storm Water Permit. The conditions of the permit were established to assure that the storm water runoff from these sites does not cause or contribute sediment to the stream. Georgia's General Storm Water Permit can be considered a water quality-based permit in that the numeric limits in the permit, if met, will not cause a water quality problem.

The WLA loads were calculated based on the design flow and average monthly permitted TSS concentration for the municipal facilities.

The sediment load allocation from future construction sites within the watershed will have to meet the requirements outlined in the Georgia General Storm Water NPDES Permit for Construction Activities. This permit authorizes the discharge of storm water associated with construction activity to the waters of the State in accordance with the limitations, monitoring requirements, and other conditions set forth in Parts I through VII of the Georgia Storm Water Permit. The conditions of the permit were established to assure that the storm water runoff from these sites does not cause or contribute sediment to the stream. Georgia's General Storm Water Permit can be considered a water quality-based permit in that the numeric limits in the permit, if met, will not cause a water quality problem.

5.2 Load Allocations

The USLE was used to determine the relative sediment contributions from each significant land use. The USLE was applied to those watersheds that are biologically impaired and those that are not, to determine the current sediment loading rates to the streams. The sediment load allocation for each stream by land use, including roads, is reported in Table 21. The watersheds are grouped by: those that are not on the 303(d) list and those that are on the 303(d) list. For comparison purposes, the total sediment load in tons per acre per year is also given. The average sediment load in the watersheds that are biota impacted is 0.05 tons/acre/yr. The average sediment load in the watersheds not on the 303(d) list is 0.06 tons/acre/yr. Table 22 gives each source's percent contribution to the total sediment load.

The Total Allowable Load for each impaired segment is calculated by multiplying the watershed area in acres by an annual load per acre. This annual load is based on the average annual load per acre from all the unimpaired streams within a given ecoregion (Piedmont, 0.06 tons/acre/yr). The unimpaired streams are those with an IBI score greater than or equal to 50. The LA is then calculated by subtracting the WLA from the Total Allowable Load.

Understanding the potential sediment sources and the changes in land use that have occurred over the last century provides insight into the streams' current water quality issues. The average annual sediment load per unit area for the unimpaired and impaired watersheds are generally within the same range. Over the last century there has been a dramatic decrease in the amount of land farmed in Georgia. Since 1950, there has been a 57 percent reduction in farmland. With the reduction in farmland, there has also been a decrease in the amount of soil erosion. This suggests that the sedimentation observed in the impaired stream segments may be legacy sediment resulting from past land use practices. It is believed that if sediment loads are maintained at acceptable levels, streams will repair themselves over time.

5.3 Seasonal Variation

Sediment is expected to fluctuate according to the amount and distribution of rainfall. Since rainfall is greatest in the spring and winter seasons, it is expected that sediment loadings would be highest during these seasons. However, these seasonal fluctuations and other short-term variability in loadings due to episodic events is usually evened out by the response of the annual sediment load was determined.

5.4 Margin of Safety

The MOS is a required component of TMDL development. There are two basic methods for incorporating the MOS: 1) implicitly incorporate the MOS using conservative model assumptions to develop allocations; or 2) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. For this TMDL, the MOS was implicitly incorporated in the use of conservative modeling assumptions, including the selection of average USLE factors, the use of the average sediment loading rates for the numeric targets, and the assumption that no BMPs were used.

5.5 Total Sediment Load

The total annual sediment load was determined by adding the WLA (WLA + WLAsw) and the LA. The MOS, as described above, was implicitly included in the TMDL analysis and does not factor directly into the TMDL equation as shown above.

The USLE method used calculates a total annual sediment load, as opposed to a daily load. The R factor from the USLE (the rainfall erosivity index) is statistically calculated from the annual summation of rainfall energy in every storm, which correlates to the raindrop size, times its maximum 30-minute intensity. Table 23 provides the rainfall statistics from six meteorological stations located throughout Georgia, and shows the variability of rainfall frequency and amount.

The allowable annual average sediment load expressed in terms of tons per acre per year is intended to prevent the cumulative impacts of excessive run-off related sediment in the watershed. The maximum daily allowable sediment load is a subcomponent of the allowable annual load. It is based upon the critical flow event that represents the maximum sediment load capacity for the stream. Research conducted by the Agricultural Research Service-National Sediment Laboratory and USEPA Region 4 has determined that the bankfull flow is the critical flow that has the maximum daily sediment carrying capacity, and therefore has the maximum daily sediment loading capacity. Bankfull flow can be estimated using the one-day flow event that occurs once every one and a half years, 1Q1.5, determined by the Log Pearson recurrence interval statistical analysis.

The National Sediment Laboratory has correlated, by ecoregion, a relationship between the annual average sediment load and the bankfull flow sediment load for stable or unimpaired streams. For the Piedmont ecoregion, the median bankfull flow sediment load expressed as tons per day per square kilometer is 2.54. This is 12.9 percent of the median annual average sediment load of 19.6 tons per year per square kilometer discharged into a stable unimpaired stream. This relationship was used to transform total annual sediment loads to a daily maximum sediment loads.

The total annual sediment loads and daily maximum sediment loads for the impaired watershed are summarized in Table 24, along with any required sediment load reductions.
The WLAs (WLA + WLAsw) provided in Table 24 are for accounting purposes. For kaolin facilities, the WLA (as a TSS load) was calculated using a conversion factor between TSS and turbidity developed from instream data. A Summary Memorandum for each watershed is provided in Appendix A.

The USLE method used indicates that the largest sediment loads come from areas with close proximity to the stream grid, especially dirt roads and croplands. The model does not account for any BMPs that are currently being used to control erosion from these areas, and thus may overestimate some sediment loads.

Table 21. Sediment Load Allocations (Unimpaired – Piedmont Ecoregion)

Name	Sediment Load (tons/yr)																
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial Industrial Transportation	Bare Rock Sand and Clay	Quarries Strip Mines Gravel Pits	Deciduous Forest	Evergreen Forest	Mixed Forest	Deciduous Shrubland	Pasture/Hay	Row Crops	Other Grasses (Urban Recreational)	Woody Wetland	Road	Total	Load (ton/acre/yr)
Annewakee Creek u/s	0.0	360.8	20.0	13.0	0.0		2.5	1.4	0.0	2.0	19.2		55.6	11.9	229.2	715.6	0.07
Annewakee Creek d/s	0.0	372.6	20.2	13.0	0.0		2.7	1.5	0.0	3.3	55.8		58.6	14.5		542.3	0.05
Beech Creek	0.0	1.8			0.0		4.2	3.6	0.0	8.7	36.4	0.2	2.2	6.6	38.8	102.7	0.05
Big Branch	0.0	2.2	0.0		0.0		1.9	1.9	0.1	1.7	44.0		1.4	26.9	18.3	98.4	0.04
Blue John Creek	0.0	245.6	18.5	4.0	0.0		0.9	1.4	0.2	2.4	72.6		32.4	6.0	185.3	569.4	0.13
Brush Creek	0.0	0.8	0.0		0.0	600.1	7.3	4.9	0.0	17.0	97.2	0.0	1.0	23.4		751.8	0.23
Copeland Creek	0.0	0.8			0.0		4.1	1.6	0.0	15.8	43.9		0.3	0.6	2.6	69.6	0.06
Flat Creek	0.0	36.5	0.3		0.0		21.0	15.1	0.6	29.1	224.9	10.8	13.2	134.2	114.8	600.6	0.04
Flat Shoals Creek		0.2					1.3	1.0	0.0	0.3	1.6		0.1	3.2	0.8	8.5	0.01
Gum Branch	0.0	1.0	0.0				3.9	0.4	0.0	6.7	109.8		0.8	1.2	50.5	174.3	0.20
Gum Creek	0.0	3.8	0.3		0.0		14.1	5.4	0.1	11.3	102.6		2.0	19.0	37.4	196.1	0.04
Hillabahatchee Creek	0.0	8.6	0.0	0.0	0.0		63.3	26.3	0.4	49.4	435.6		8.3	13.5	188.1	793.6	0.06
Little Snake Creek	0.0	0.1	0.0		0.0		3.0	4.0	0.0	1.1	6.4		1.4	0.8	16.7	33.6	0.02
Long Cane Creek u/s	0.0	2.1		0.1	0.0		2.3	1.5	0.1	3.6	42.1		3.0	17.3	19.0	91.1	0.03
Long Cane Creek d/s	0.0	2.6		0.1	0.0		2.4	1.6	0.1	3.7	87.6		3.3	18.1	22.2	141.5	0.04
New River	0.0	282.5	8.0	1.3	0.0	3,197.8	43.8	44.7	1.2	79.7	1199.8	41.9	108.6	707.3	624.5	6,341.0	0.11
Norman Creek		4.9					3.1	0.8	0.0	4.7	11.6		1.5	2.5	8.2	37.4	0.02
Panther Creek	0.0	2.8	0.0				0.8	0.7	0.0	0.8	8.1		1.6	3.1	8.0	25.8	0.02
Polecat Creek	0.0	4.1	0.4	0.7	0.0		0.8	0.6	0.1	3.5	49.3	1.0	4.0	26.1	24.5	115.1	0.05
Red Oak Creek	0.0	0.3			0.0		15.0	5.3	0.1	14.8	144.1		4.6	3.6	95.9	283.7	0.08
Snake Creek u/s	0.0	17.8	0.0	0.0	0.0		4.4	3.0	0.1	7.8	31.8		5.8	4.9	46.0	121.6	0.03
Snake Creek d/s	0.0	55.8	1.6	0.0	0.0	0.0	52.5	25.8	0.2	63.5	307.1	28.3	33.8	35.6	358.5	962.8	0.04
Town Creek	0.0	12.1	0.0	0.0	0.0	0.0	7.7	2.6	0.1	17.1	94.3	0.0	4.9	5.4	96.3	240.4	0.08
Tributary to Whooping Creek	0.0	0.9	0.4	0.1			1.9	0.9	0.0	3.5	9.3		1.6	1.5	51.5	71.5	0.16

Name	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial Industrial Transportation	Bare Rock Sand and Clay	Quarries Strip Mines Gravel Pits	Deciduous Forest	Evergreen Forest	Mixed Forest	Deciduous Shrubland	Pasture/Hay	Row Crops	Other Grasses (Urban Recreational)	Woody Wetland	Road	Total	Load (ton/acre/yr)
	Sediment Load (tons/yr)																
Whooping Creek u/s	0.0	41.3	0.1	0.0	0.0		5.7	4.4	0.1	4.5	45.0		7.9	7.3	138.9	255.3	0.08
Whooping Creek mid	0.0	68.3	3.6	0.9	0.0	48.1	28.1	5.6	75.9	196.6	54.3	16.9	44.3	11.1	560.0	1,113.5	0.07
Whooping Creek d/s	0.0	73.0	3.6	0.9	0.0	48.1	30.1	6.9	75.9	197.4	63.0	16.9	46.2	15.9	593.5	1,171.3	0.07
Wolf Creek	0.0	0.8	0.0		0.0		2.1	0.7	0.0	2.0	28.4		0.7	12.7	0.0	47.3	0.03

Table 21. Sediment Load Allocations (Impaired – Piedmont Ecoregion)

Name	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial Industrial Transportation	Bare Rock Sand and Clay	Quarries Strip Mines Gravel Pits	Deciduous Forest	Evergreen Forest	Mixed Forest	Deciduous Shrubland	Pasture/Hay	Row Crops	Other Grasses (Urban Recreational)	Woody Wetland	Road	Total	Load (ton/acre/yr)
	Sediment Load (tons/yr)																
Bear Creek	0.0	73.0	3.2	0.5	0.0		28.2	17.2	0.4	14.9	131.1	1.4	40.5	112.2	288.5	711.1	0.04
Browns Creek	0.0	93.0	0.2		0.0		5.9	3.4	0.0	4.0	76.0		15.8	7.3	91.0	296.6	0.06
Bull Creek	0.0	292.6	17.1	4.4	0.0	392.5	18.0	11.3	1.5	10.3	140.7	1,525.6	57.1	164.5	249.4	2,890.1	0.14
Dean Creek	0.0	18.5	1.7	0.3	0.0		8.3	1.8	0.3	4.6	652.1		21.5		133.5	842.3	0.23
Deep Creek	0.0	172.0	3.2	0.1	0.0		34.0	14.0	0.5	17.4	252.6	29.2	66.4	60.7	391.5	1,041.5	0.06
Flat Creek (PS)	0.0	21.2	1.5	0.2	0.0		6.2	0.5	0.1	4.9	290.7		15.9	10.3	116.7	468.2	0.10
Flat Creek (NS)	0.0	128.3	23.4	7.9	0.0		0.4	0.2	0.1	0.0	4.5		13.1	0.7	220.9	399.5	0.19
Hazel Creek	0.0	45.8	5.7	0.1	0.0		10.4	0.8	0.3	4.0	619.7		24.3	6.7	146.6	864.5	0.18
Ivy Creek	0.0	205.0	2.4	0.0	0.0		5.9	2.8	0.1	3.2	241.0		28.3	11.3	132.9	632.9	0.13
Long Island Creek	0.0	179.7	15.8	1.9	0.0		2.6	1.9	0.0	0.0	4.7		47.8	0.4	140.3	395.1	0.12
Maple Branch	0.0	12.0	0.0	0.0	0.0		0.5	0.2	0.0	0.4	13.8		3.6	4.2	8.9	43.6	0.06
Mountain Creek	182.5	111.0	3.3	0.5	0.0	0.8	4.3	2.6	2.2	23.0	48.2	22.4	28.4	20.9	229.7	679.8	0.15

Sediment Load (tons/yr)																	
Name	**Open Water**	**Low Intensity Residential**	**High Intensity Residential**	**High Intensity Commercial Industrial Transportation**	**Bare Rock Sand and Clay**	**Quarries Strip Mines Gravel Pits**	**Deciduous Forest**	**Evergreen Forest**	**Mixed Forest**	**Deciduous Shrubland**	**Pasture/Hay**	**Row Crops**	**Other Grasses (Urban Recreational)**	**Woody Wetland**	**Road**	**Total**	**Load (ton/acre/yr)**
Mud Creek	0.0	189.0	18.3	8.2	0.0		9.7	0.7	0.2	6.5	490.5		49.1	26.2	108.6	907.1	0.15
Nancy Creek	0.0	1,160.7	116.4	31.9	0.0	0.0	7.8	7.9	0.5	0.5	46.2	0.0	311.9	14.0	760.5	2,458.4	0.13
Nickajack Creek	0.0	838.3	37.4	6.3	0.0	0.0	19.5	6.6	0.5	1.3	80.1	0.0	158.6	34.2	1,007.9	2,190.7	0.11
North Fork Peachtree Creek	0.0	228.2	60.7	19.3	0.0		0.3	0.5	0.0	0.2	7.8		38.1	8.8	304.2	668.1	0.10
Noses Creek	0.0	91.8	1.9	0.4	0.0	928.4	15.4	7.4	0.2	0.8	74.4		26.7	7.4	200.6	1,355.5	0.36
Pea Creek	0.0	18.6	0.1		0.0		13.9	4.0	0.1	3.3	71.7		22.1	16.3	126.8	276.9	0.06
Six Mile Creek	0.0	6.5	4.5	0.2	0.0	3,649.6	5.2	0.8	0.2	4.5	120.0		7.0		32.8	3,831.4	2.03
South Fork Limestone Creek/Limestone Creek	0.0	94.0	9.7	1.5	0.0		0.9	0.6	0.1		9.3		17.5		135.5	269.2	0.25
Suwanee Creek	0.0	538.2	42.7	12.4	0.0		16.7	3.6	0.8	5.6	326.3		71.4	38.1	353.4	1,409.0	0.16
Tributary to Limestone Creek	0.0	41.1	3.6	0.3	0.0		1.2	0.1	0.0	0.4	4.5		11.1		173.8	236.1	0.26
Turner Creek	0.0	14.6	2.6	0.0	0.0		96.8	11.1	4.5	18.3	563.9	113.5	61.0	3.7	172.6	1,062.6	0.21
Ward Creek	0.0	229.4	4.6	0.4	0.0		4.5	5.7	0.3	0.2	23.5		73.1	13.3	420.8	775.8	0.17
White Creek	0.0	19.2	3.0	0.1	0.0		7.8	1.0	0.4	4.4	872.1		11.6		128.3	1,047.7	0.20

Table 22. Sediment Load Percentages (Unimpaired – Piedmont Ecoregion)

	Percent Total Sediment Load														
Name	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial / Industrial Transportation	Bare Rock Sand and Clay	Quarries Strip Mines Gravel Pits	Deciduous Forest	Evergreen Forest	Mixed Forest	Deciduous Shrub	Pasture / Hay	Row Crops	Other Grasses (Urban Recreational)	Woody Wetland	Road
Annewakee Creek u/s	0.00%	50.42%	2.79%	1.82%	0.00%	0.00%	0.36%	0.19%	0.00%	0.28%	2.68%	0.00%	7.77%	1.67%	32.03%
Annewakee Creek d/s	0.00%	68.70%	3.73%	2.40%	0.00%	0.00%	0.51%	0.28%	0.00%	0.61%	10.29%	0.00%	10.80%	2.68%	0.00%
Beech Creek	0.00%	1.75%	0.00%	0.00%	0.00%	0.00%	4.06%	3.54%	0.04%	8.49%	35.49%	0.18%	2.17%	6.46%	37.82%
Big Branch	0.00%	2.24%	0.00%	0.00%	0.00%	0.00%	1.95%	1.90%	0.06%	1.76%	44.76%	0.00%	1.42%	27.30%	18.60%
Blue John Creek	0.00%	43.13%	3.25%	0.71%	0.00%	0.00%	0.15%	0.24%	0.03%	0.43%	12.75%	0.00%	5.70%	1.06%	32.54%
Brush Creek	0.00%	0.11%	0.00%	0.00%	0.00%	79.82%	0.97%	0.65%	0.00%	2.26%	12.93%	0.01%	0.14%	3.12%	0.00%
Copeland Creek	0.00%	1.15%	0.00%	0.00%	0.00%	0.00%	5.91%	2.30%	0.01%	22.65%	63.00%	0.00%	0.41%	0.83%	3.73%
Flat Creek	0.00%	6.08%	0.04%	0.00%	0.00%	0.00%	3.50%	2.51%	0.10%	4.85%	37.45%	1.80%	2.21%	22.35%	19.11%
Flat Shoals Creek	0.00%	2.34%	0.00%	0.00%	0.00%	0.00%	14.92%	11.94%	0.16%	3.55%	18.79%	0.00%	1.32%	37.61%	9.36%
Gum Branch	0.00%	0.57%	0.00%	0.00%	0.00%	0.00%	2.24%	0.21%	0.03%	3.84%	62.99%	0.00%	0.45%	0.71%	28.97%
Gum Creek	0.00%	1.94%	0.15%	0.00%	0.00%	0.00%	7.20%	2.78%	0.04%	5.78%	52.34%	0.00%	1.03%	9.67%	19.07%
Hillabahatchee Creek	0.00%	1.08%	0.00%	0.00%	0.00%	0.00%	7.98%	3.31%	0.05%	6.23%	54.89%	0.00%	1.05%	1.70%	23.70%
Little Snake Creek	0.00%	0.30%	0.04%	0.00%	0.00%	0.00%	8.99%	11.94%	0.01%	3.34%	19.15%	0.00%	4.29%	2.30%	49.65%
Long Cane Creek u/s	0.00%	2.30%	0.00%	0.08%	0.00%	0.00%	2.50%	1.69%	0.08%	3.93%	46.20%	0.00%	3.33%	19.03%	20.85%
Long Cane Creek d/s	0.00%	1.84%	0.00%	0.05%	0.00%	0.00%	1.69%	1.11%	0.06%	2.60%	61.87%	0.00%	2.33%	12.77%	15.68%
New River	0.00%	4.46%	0.13%	0.02%	0.00%	50.43%	0.69%	0.71%	0.02%	1.26%	18.92%	0.66%	1.71%	11.15%	9.85%
Norman Creek	0.00%	13.11%	0.00%	0.00%	0.00%	0.00%	8.29%	2.23%	0.01%	12.54%	31.09%	0.00%	4.00%	6.80%	21.94%
Panther Creek	0.00%	10.84%	0.02%	0.00%	0.00%	0.00%	2.96%	2.52%	0.00%	3.11%	31.52%	0.00%	6.05%	12.01%	30.97%
Polecat Creek	0.00%	3.56%	0.32%	0.65%	0.00%	0.00%	0.66%	0.52%	0.07%	3.02%	42.88%	0.86%	3.48%	22.69%	21.29%
Red Oak Creek	0.00%	0.11%	0.00%	0.00%	0.00%	0.00%	5.30%	1.86%	0.03%	5.20%	50.79%	0.00%	1.63%	1.26%	33.81%
Snake Creek u/s	0.00%	14.64%	0.01%	0.00%	0.00%	0.00%	3.62%	2.48%	0.05%	6.40%	26.18%	0.00%	4.73%	4.05%	37.84%
Snake Creek d/s	0.00%	5.80%	0.17%	0.00%	0.00%	0.00%	5.45%	2.68%	0.03%	6.60%	31.90%	2.94%	3.51%	3.70%	37.23%
Town Creek	0.00%	5.03%	0.00%	0.00%	0.00%	0.00%	3.19%	1.09%	0.02%	7.11%	39.20%	0.00%	2.05%	2.25%	40.06%
Trib to Whooping Creek	0.00%	1.26%	0.52%	0.09%	0.00%	0.00%	2.65%	1.31%	0.04%	4.89%	12.99%	0.00%	2.26%	2.03%	71.97%
Whooping Creek u/s	0.00%	16.16%	0.04%	0.01%	0.00%	0.00%	2.24%	1.72%	0.03%	1.77%	17.62%	0.00%	3.11%	2.87%	54.43%

Percent Total Sediment Load															
Name	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial / Industrial Transportation	Bare Rock Sand and Clay	Quarries Strip Mines Gravel Pits	Deciduous Forest	Evergreen Forest	Mixed Forest	Deciduous Shrub	Pasture / Hay	Row Crops	Other Grasses (Urban Recreational)	Woody Wetland	Road
Whooping Creek mid	0.00%	6.13%	0.32%	0.08%	0.00%	4.32%	2.52%	0.50%	6.81%	17.66%	4.87%	1.52%	3.98%	1.00%	50.29%
Whooping Creek d/s	0.00%	6.23%	0.30%	0.08%	0.00%	4.10%	2.57%	0.59%	6.48%	16.85%	5.38%	1.44%	3.95%	1.36%	50.67%
Wolf Creek	0.00%	1.63%	0.00%	0.00%	0.00%	0.00%	4.35%	1.54%	0.01%	4.13%	60.05%	0.00%	1.48%	26.82%	0.00%

Table 22. Sediment Load Percentages (Impaired – Piedmont Ecoregion)

Percent Total Sediment Load															
Name	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial / Industrial Transportation	Bare Rock Sand and Clay	Quarries Strip Mines Gravel Pits	Deciduous Forest	Evergreen Forest	Mixed Forest	Deciduous Shrub	Pasture / Hay	Row Crops	Other Grasses (Urban Recreational)	Woody Wetland	Road
Bear Creek	0.00%	10.26%	0.45%	0.08%	0.00%	0.00%	3.97%	2.42%	0.06%	2.10%	18.43%	0.19%	5.69%	15.77%	40.57%
Browns Creek	0.00%	31.35%	0.07%	0.00%	0.00%	0.00%	1.98%	1.14%	0.01%	1.35%	25.62%	0.00%	5.33%	2.47%	30.68%
Bull Creek	0.00%	10.12%	0.59%	0.15%	0.00%	13.58%	0.62%	0.39%	0.05%	0.36%	4.87%	52.79%	1.97%	5.69%	8.63%
Dean Creek	0.00%	2.19%	0.20%	0.03%	0.00%	0.00%	0.99%	0.21%	0.03%	0.54%	77.41%	0.00%	2.55%	0.00%	15.85%
Deep Creek	0.00%	16.51%	0.30%	0.01%	0.00%	0.00%	3.26%	1.35%	0.05%	1.67%	24.26%	2.81%	6.37%	5.83%	37.59%
Flat Creek (PS)	0.00%	4.53%	0.31%	0.03%	0.00%	0.00%	1.33%	0.10%	0.03%	1.05%	62.10%	0.00%	3.40%	2.21%	24.91%
Flat Creek (NS)	0.00%	32.11%	5.85%	1.98%	0.00%	0.00%	0.09%	0.04%	0.02%	0.00%	1.14%	0.00%	3.29%	0.19%	55.29%
Hazel Creek	0.00%	5.30%	0.66%	0.01%	0.00%	0.00%	1.20%	0.10%	0.03%	0.47%	71.68%	0.00%	2.81%	0.77%	16.96%
Ivy Creek	0.00%	32.39%	0.38%	0.01%	0.00%	0.00%	0.93%	0.44%	0.02%	0.51%	38.08%	0.00%	4.47%	1.79%	21.00%
Long Island Creek	0.00%	45.47%	4.00%	0.47%	0.00%	0.00%	0.66%	0.49%	0.01%	0.01%	1.19%	0.00%	12.10%	0.09%	35.50%
Maple Branch	0.00%	27.47%	0.00%	0.00%	0.00%	0.00%	1.04%	0.47%	0.01%	0.83%	31.72%	0.00%	8.36%	9.70%	20.40%
Mountain Creek	26.84%	16.33%	0.48%	0.07%	0.00%	0.12%	0.63%	0.38%	0.32%	3.38%	7.09%	3.30%	4.18%	3.07%	33.80%
Mud Creek	0.00%	20.84%	2.02%	0.90%	0.00%	0.00%	1.07%	0.08%	0.02%	0.72%	54.08%	0.00%	5.42%	2.89%	11.97%

Percent Total Sediment Load															
Name	**Open Water**	**Low Intensity Residential**	**High Intensity Residential**	**High Intensity Commercial / Industrial Transportation**	**Bare Rock Sand and Clay**	**Quarries Strip Mines Gravel Pits**	**Deciduous Forest**	**Evergreen Forest**	**Mixed Forest**	**Deciduous Shrub**	**Pasture / Hay**	**Row Crops**	**Other Grasses (Urban Recreational)**	**Woody Wetland**	**Road**
Nancy Creek	0.00%	47.22%	4.74%	1.30%	0.00%	0.00%	0.32%	0.32%	0.02%	0.02%	1.88%	0.00%	12.69%	0.57%	30.94%
Nickajack Creek	0.00%	38.27%	1.71%	0.29%	0.00%	0.00%	0.89%	0.30%	0.02%	0.06%	3.65%	0.00%	7.24%	1.56%	46.01%
North Fork Peachtree Creek	0.00%	34.16%	9.09%	2.89%	0.00%	0.00%	0.05%	0.07%	0.00%	0.03%	1.16%	0.00%	5.70%	1.32%	45.54%
Noses Creek	0.00%	6.77%	0.14%	0.03%	0.00%	68.49%	1.14%	0.55%	0.02%	0.06%	5.49%	0.00%	1.97%	0.54%	14.80%
Pea Creek	0.00%	6.71%	0.05%	0.00%	0.00%	0.00%	5.02%	1.46%	0.03%	1.19%	25.89%	0.00%	7.98%	5.88%	45.80%
Six Mile Creek	0.00%	0.17%	0.12%	0.01%	0.00%	95.25%	0.14%	0.02%	0.00%	0.12%	3.13%	0.00%	0.18%	0.00%	0.86%
South Fork Limestone Creek/Limestone Creek	0.00%	34.92%	3.61%	0.56%	0.00%	0.00%	0.34%	0.22%	0.05%	0.00%	3.46%	0.00%	6.51%	0.00%	50.33%
Suwanee Creek	0.00%	38.19%	3.03%	0.88%	0.00%	0.00%	1.18%	0.25%	0.06%	0.40%	23.15%	0.00%	5.06%	2.70%	25.08%
Tributary to Limestone Creek	0.00%	17.41%	1.51%	0.13%	0.00%	0.00%	0.50%	0.03%	0.01%	0.19%	1.92%	0.00%	4.69%	0.00%	73.62%
Turner Creek	0.00%	1.37%	0.25%	0.00%	0.00%	0.00%	9.11%	1.05%	0.42%	1.72%	53.07%	10.68%	5.74%	0.35%	16.24%
Ward Creek	0.00%	29.57%	0.59%	0.05%	0.00%	0.00%	0.58%	0.74%	0.04%	0.02%	3.03%	0.00%	9.43%	1.71%	54.24%
White Creek	0.00%	1.83%	0.28%	0.01%	0.00%	0.00%	0.74%	0.09%	0.04%	0.42%	83.23%	0.00%	1.11%	0.00%	12.24%

Table 23. Georgia Meteorological Rainfall Statistics

Station	Normal Monthly Precipitation (in.) / Avg. Days of Precipitation (0.1 in. or more)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Athens, GA	4.6/11	4.4/9	5.5/11	4.0/8	4.4/9	3.9/9	4.9/11	3.7/9	3.4/8	3.3/7	3.7/8	4.1/10
Atlanta, GA	4.8/11	4.8/10	5.8/11	4.3/9	4.3/9	3.6/10	5.0/12	3.7/10	3.4/8	3.1/6	3.9/8	4.3/10
Augusta, GA	4.1/10	4.3/9	4.7/10	3.3/8	3.8/9	4.1/9	4.2/11	4.5/10	3.0/7	2.8/6	2.5/7	3.4/9
Columbus, GA	4.6/10	4.9/10	5.8/10	4.3/8	4.2/8	4.1/9	5.5/13	3.7/10	3.2/8	2.2/5	3.6/8	5.0/10
Macon, GA	4.6/11	4.7/10	4.8/10	3.5/7	3.6/9	3.6/10	4.3/13	3.6/11	2.8/8	2.2/6	2.7/7	4.3/9
Savannah, GA	3.6/9	3.2/9	3.8/9	3.0/7	4.1/9	5.7/10	6.4/14	7.5/13	4.5/10	2.4/6	2.2/6	3.0/8

Table 24. Total Annual Sediment Loads and the Required Sediment Load Reductions

Name	Current Load (tons/yr)	WLA (tons/yr)	WLAsw (tons/yr)	LA (tons/yr)	Allowable Total Load (tons/yr)	Allowable Maximum Daily Load (tons/day)	% Reduction
Bear Creek	714.2	3.0	495.7	212.4	711.1	91.7	0.43%
Browns Creek	296.6			296.6	296.6	38.3	0.00%
Bull Creek	2,890.1		835.5	722.1	1,557.6	200.9	46.10%
Dean Creek	842.3			266.6	266.6	34.4	68.34%
Deep Creek	1,041.5		729.0	312.4	1,041.5	134.4	0.00%
Flat Creek (PS)	468.2			338.5	338.5	43.7	27.71%
Flat Creek (NS)	539.8	140.3	8.3	4.1	152.8	19.7	71.70%
Hazel Creek	864.5			349.6	349.6	45.1	59.56%
Ivy Creek	632.9		245.3	106.3	351.6	45.4	44.45%
Long Island Creek	395.1		171.0	73.3	244.3	31.5	38.18%
Maple Branch	43.6			43.6	43.6	5.6	0.00%
Mountain Creek	714.1	34.3	58.4	253.6	346.3	44.7	51.51%
Mud Creek	998.4	91.3		353.4	444.7	57.4	55.46%
Nancy Creek	2,629.1	170.8	1,068.5	457.9	1,697.1	218.9	35.45%
Nickajack Creek	2,221.1	30.4	979.6	419.8	1,429.9	184.5	35.62%
North Fork Peachtree Creek	669.3	1.3	346.9	148.7	496.9	64.1	25.77%
Noses Creek	1,356.6	1.2	193.0	82.7	276.9	35.7	79.59%
Pea Creek	276.9		193.8	83.1	276.9	35.7	0.00%
Six Mile Creek	3,885.5	54.1	59.7	25.6	139.3	18.0	96.41%
South Fork Limestone Creek/ Limestone Creek	269.2		56.8	24.3	81.2	10.5	69.85%
Suwanee Creek	1,500.4	91.3	382.3	192.9	666.5	86.0	55.58%
Tributary to Limestone Creek	236.1		46.3	19.8	66.2	8.5	71.97%
Turner Creek	1,062.6			379.8	379.8	49.0	64.26%
Ward Creek	775.8		236.2	101.2	337.4	43.5	56.51%
White Creek	1,047.7			378.7	378.7	48.9	63.86%

6.0 RECOMMENDATIONS

6.1 Monitoring

Monitoring is conducted at a number of locations across the State each year. GA EPD has adopted a basin approach to water quality management; an approach that divides Georgia's major river basins into five groups. This approach provides for additional sampling work to be focused on one of the five basin groups each year and offers a five-year planning and assessment cycle. The Chattahoochee River Basin, along with the Flint River Basin, were the basins of focused monitoring in 2000 and will again receive focused monitoring in 2010. One goal of the focused basin monitoring is to continue to monitor 303(d) listed waters. Therefore, additional monitoring of these streams will be initiated as appropriate during the next monitoring cycle to determine if there has been improvement in the biological communities.

6.2 Sediment Management Practices

Based on the findings of the source assessment, it was determined that most of the sediment found in the Oconee River Basin streams is due to past land use practices and is referred to as "legacy" sediment. Therefore, it is recommended that there be no net increase in sediment delivered to the impaired stream segments, so that these streams will recover over time.

The measurement of sediment delivered to a stream is difficult, if not impossible, to determine. Therefore, setting a numeric TMDL may be ineffective given the difficulty in measuring it. In addition, changes in habitat and aquatic communities are usually slow to respond, which is why monitoring will continue according to the five-year monitoring cycle. Thus, this TMDL recommends that compliance with NPDES permits and implementation of Best Management Practices (BMPs) be monitored. The anticipated effects of compliance with NPDES permits and implementation of BMPs will be the improvement of stream habitats and water quality, and thus be an indirect measurement of the TMDL.

Management practices recommended to maintain the total annual sediment loads at current levels include:

- Compliance with NPDES permit limits and requirements;
- Implementation of GFC Best Management Practices for forestry;
- Adoption of NRCS Conservation Practices;
- Adherence to the Mined Land Use Plan prepared as part of the Surface Mining Permit Application;
- Adoption of proper unpaved road maintenance practices;
- Implementation of Erosion and Sedimentation Control Plans for land disturbing activities; and
- Mitigation and prevention of stream bank erosion due to increased stream flow and velocities caused by urban runoff.

6.2.1 Point Source Approaches

Point sources are defined as discharges of treated wastewater or storm water into rivers and streams at discrete locations. Treated wastewater tends to be discharged at relatively stable rates; whereas, storm water is discharged at irregular, intermittent rates, depending on precipitation and runoff. The NPDES permit program provides a basis for developing municipal, industrial and storm water permits, monitoring and compliance with limitations, and appropriate enforcement actions for violations.

In accordance with GA EPD rules and regulations, all NPDES dischargers in the watershed are required to meet their current NPDES permit limits. It is recommended that there be no authorized increase in the mass loading of sediment (TSS) above that identified in the TMDL. However, if there is available assimilative capacity, new discharges may be allowed based on engineering evaluations and current stream biological integrity studies.

The removal of mined material involves water pumped from the mine pit, and mineral processing involves the disposal of process waters. These waters are treated through sedimentation ponds or detention basins prior to being discharged to the stream and are regulated by NPDES permits. It is recommended that the peak flow from mining sites be maintained at pre-development levels in order to control bank erosion and instabilities in the receiving stream. In addition, monitoring frequencies should be such that the total annual sediment loads coming from mining facilities can be characterized.

The GA EPD has developed a General Storm Water NPDES Permit for Construction Activities. The current permit is required for all construction sites disturbing one or more acres. As of 2003, this permit covers all construction sites disturbing one or more acres. All sites required to have this permit are authorized to discharge storm water associated with construction activity to the waters of the State in accordance with the limitations, monitoring requirements, and other conditions set forth in Parts I through VII of the Georgia Storm Water Permit. The permit requires all sites to have an Erosion and Sedimentation Control Plan; to implement, inspect and maintain BMPs; and to monitor storm water for turbidity. Georgia's General Storm Water Permit can be considered a water quality-based permit, in that the numeric limits in the permit, if met and enforced, will not cause a water quality problem.

It is recommended that construction sites within impaired watersheds located within 100 feet of the impaired stream, or its tributaries, use DIRT II techniques to model and manage storm water runoff from these sites. All construction sites will monitor their storm water runoff as required by the General Storm Water NPDES Permit for Construction Activities. It is also recommended that the peak flow from construction sites be maintained at pre-development levels.

6.2.2 Nonpoint Source Land Use Approaches

The GA EPD is responsible for administering and enforcing laws to protect the waters of the State. GA EPD is the lead agency for implementing the State's Nonpoint Source Management Program. Regulatory responsibilities include establishing water quality standards and use classifications, assessing and reporting water quality conditions, issuing point source permits, issuing water withdrawal and ground water permits, and regulating land-disturbing activities. Georgia is working with local governments, agricultural, and forestry agencies such as the Natural Resources Conservation Service, the Georgia Soil and Water Conservation Commission, and the Georgia Forestry Commission to foster the implementation of BMPs that address nonpoint source pollution. In addition, public education efforts are being targeted to individual stakeholders to provide information regarding the use of BMPs to protect water quality. The following sections describe in more detail the specific measures to reduce nonpoint sources of sediment by land use type.

6.2.2.1 Forested Land

In 1978, GA EPD designated the Georgia Forestry Commission (GFC) to be the lead agency in managing and implementing the silvicultural portion of Georgia's Nonpoint Source Management Program. The GFC is responsible for coordinating water quality issues with regard to forested land in Georgia. The GFC is basically responsible for:

- Developing Best Management Practices (BMPs) for the forestry industry,
- Educating the forestry community on BMPs, and
- Conducting site inspections for compliance with the established BMPs.

The GFC formed a Forestry Nonpoint Source Pollution Technical Task Force to assess the extent of water pollution caused by forestry practices, and to develop recommendations for reducing or eliminating erosion and sedimentation. After a three-year field study, the task force developed a set of BMPs that address all aspects of silviculture, including forest road construction, timber harvesting, site preparation, and forest regeneration. The task force recommended the BMPs be implemented through a voluntary program, exempt from permitting under the Georgia Erosion and Sedimentation Control Act, emphasizing educational and training programs instead. In 1997, the original BMP document was revised to incorporate the 1989 Wetland BMP manual developed by the Georgia Forestry Association. The current BMP manual, *Georgia's Best Management Practices for Forestry,* was developed and became effective January 1, 1999 (GA EPD, 1999).

It is the responsibility of the GFC to educate and inform the forest community (landowners, procurement and land management foresters, consulting foresters, loggers, site prep and tree planting contractors) on the importance of BMPs. The GFC statewide coordinator and the twelve district coordinators conduct educational programs across the State. The district coordinators receive specialized training in erosion and sediment control, forest road layout and construction, stream habitat assessment, rapid bioassessment (macroinvertebrate) monitoring, wetland delineation, and fluvial geomorphology. The GFC has developed training videos, slide programs, tabletop exhibits, and BMP billboards that are displayed at wood yards across the State. For the benefit of private landowners selling timber, the GFC has developed a Sample Forest Products Sale Agreement, which includes fill in the blank spaces for specific BMP incorporation. Since December 1995, the GFC has been cooperating with the University of Georgia School of Forest Resources, the Georgia Forestry Association, and American Forest and Paper Association (AFPA) member companies in the ongoing education of loggers and timber buyers through the Sustainable Forestry Initiative (SFI) Master Timber Harvester program. This includes an intensive training session on the BMPs conducted by the GFC.

To determine if educational efforts have been successful and if the BMPs are effective at minimizing erosion and sedimentation, the GFC conducted BMP compliance surveys in 1991 and 1992. In 1998, another BMP survey was conducted using a newly developed and more rigorous protocol recommended by a Southern Group of State Foresters (SGSF) Task Force. The GFC sampled about 10 percent of the forestry operations that occur annually. The number of samples taken in each county was based on the volume of wood harvested as reported in the State's latest Product Drain Report. Sites were randomly selected to reflect various forest types (non-industrial private forest, forest industry, and publicly owned lands). The survey results show that of the number of acres evaluated, the number in BMP compliance for the most part was very good. In 1991, approximately 86 percent of the acres evaluated were in compliance. In 1992, the figure increased to 92 percent compliance and in 1998, compliance rose to 98 percent.

The GFC also investigates and mediates complaints or concerns involving forestry operations on behalf of the GA EPD and the Army Corps of Engineers (COE) when stream water quality and wetlands are involved, respectively. Complaints from citizens are common, particularly in counties growing in population where landowners are living close to commercial forestry operations. After notifying the forest owner, the GFC District Coordinator conducts a field inspection to determine if BMPs were followed, if the potential for water quality problems exists, and who is the responsible party. If the complaint is valid, GFC will work with the responsible party until the problem is corrected. However, the GFC has no regulatory authority. In situations where the GFC cannot get satisfactory compliance, the case is turned over to GA EPD or COE for enforcement actions under the Georgia Water Quality Control Act or Section 404 of the Federal Clean Water Act.

It is recommended that the GFC continue to encourage BMP implementation, educational training programs, and site compliance surveys. The numbers of individuals trained and site compliance inspections should be recorded each year. In addition, the number of complaints received, the actions taken, and enforcement actions written should be recorded.

6.2.2.2 Agricultural Land

There are a number of agricultural organizations that work to support Georgia's more than 40,000 farmers. The following three organizations have primary responsibility for working with farmers to promote soil and water conservation:

- The University of Georgia - Cooperative Extension Service
- Georgia Soil and Water Conservation Commission
- Natural Resources Conservation Service

The University of Georgia (UGA) has faculty, County Cooperative Extension Agents, and technical specialists who provide services in several key areas relating to agricultural impacts on water quality. These include classroom instruction, basic and applied research, consulting assistance, and information on nonpoint source water quality impacts.

The Georgia Soil and Water Conservation Commission (GSWCC) was created in 1937 by a Georgia Legislative Act. In 1977, GA EPD designated the GSWCC as the lead agency for agricultural Nonpoint Source Management in the State. The GSWCC develops nonpoint source management programs and conducts educational activities to promote conservation and protection of land and water devoted to agricultural uses. In September 1994, the GSWCC developed a BMP manual, *Agricultural Best Management Practices for Protecting Water Quality in Georgia,* for the agricultural community (GSWCC, 1994).

The Natural Resources Conservation Service (NRCS) cooperates with Federal, State, and local governments to provide financial and technical assistance to farmers. NRCS develops standards and specifications for BMPs that are to be used to improve, protect, or maintain our State's natural resources. Practice standards establish the minimum level of acceptable quality for planning, designing, installing, operating, and maintaining BMPs. Practice specifications describe the technical details and workmanship required to install a BMP and the quality and extent of materials to be used in a BMP.

The NRCS provides Conservation Practice Standards, found in the electronic Field Office Technical Guide (FOTG), on their website (http://www.nrcs.usda.gov/technical/efotg/). Some of these BMPs may be used for farming operations to reduce soil erosion. It is recommended that the agricultural communities with cropland close to impaired streams, and pastureland where grazing animals have access to the stream, investigate the various BMPs available to them in order to reduce soil erosion and bank collapse.

The 1996 Farm Bill and PL83-566 Small Watershed Program provided new financial assistance programs to address high priority environmental protection goals. Some programs that specifically address erosion and sedimentation are:

- The Environmental Quality Incentives Program
- Conservation Reserve Program
- Small Watershed Program

The Environmental Quality Incentives Program (EQIP) is a USDA cost-share program available to farmers to address natural resource problems. EQIP offers financial, educational and technical assistance funding for installing BMPs that reduce soil erosion, improve water quality, or enhance wildlife habitats.

The Conservation Reserve Program (CRP) was originally designed to provide incentive and offer assistance to farmers to convert highly erodible and other environmentally sensitive land normally devoted to crop production, to land with other long-term resource-conserving cover. CRP has been expanded to place eligible acreage into filter strips, riparian buffers, grassed waterways, or contour grass strips. Each of these practices helps to reduce erosion and sedimentation and improve water quality.

The Small Watershed Program provides financial and technical assistance funding for the installation of BMPs in watersheds less than 250,000 acres. This program is used to augment ongoing conservation programs where serious natural resource degradation has or is occurring. Agricultural water management, which includes projects that reduce soil erosion and sedimentation and improve water quality, is one of the eligible purposes of this program. NRCS is authorized by Public Law 83-566 to conduct river basin surveys and investigations. The NRCS River Basin Planning Program is designed to collect data on natural resource conditions within river basins of focus. NRCS is providing technical assistance to the GSWCC and the GA EPD with the Georgia River Basin Planning Program. Planning activities associated with this program will describe conditions of the agricultural natural resource base once every five years.

Every five years, the NRCS conducts the National Resources Inventory (NRI). The NRI is a statistically based sample of land use and natural resource conditions and trends, and it covers non-federal land in the United States. The NRI found that the total wind and water erosion on cropland and Conservation Reserve Program land in Georgia declined 38 percent from 3.1 billion tons per year in 1982 to 1.9 billion tons per year in 1997 (USDA-NRCS, 1997).

NRCS also provides a web-based database application (Performance Results System, PRS) so conservation partners and the public can gain fast and easy access to the accomplishments and the progress made toward strategies and performance goals. The web site is http://ias.sc.egov.usda.gov/prshome/default.html.

It is recommended that the GSWCC and the NRCS continue to encourage BMP implementation, education efforts, and river basin surveys with regard to River Basin Planning. The five year National Resources Inventory should be continued and GA EPD supports the PRS website.

6.2.2.3 Mine Sites

Surface mining and mineral processing present two threats to surface waters. The first threat is the wastewater from mining and mineral processing operations. These discharges are considered point sources, and are therefore regulated by NPDES permits and were discussed in Section 6.2.1 above. The second threat involves mine reclamation activities. Reclamation occurs throughout the mining operation. From the first cut to the last, overburden is moved twice. With each movement of the soil and rock debris, the overburden must be managed to prevent soil and mineral erosion. Until the mine is re-vegetated, and hence reclaimed, BMPs must be implemented to prevent nonpoint source pollution.

The Georgia Surface Mining Act of 1968 provides for the issuance of mining permits at the discretion of the Director of GA EPD. These permits are administered by the Land Protection Branch of GA EPD. The surface mining permit application must include a Mined Land Use Plan, reclamation strategies, and surety bond requirements to guarantee proper management and reclamation of surface mined areas. The Mined Land Use Plan specifies activities prior to, during, and following mining to dispose of refuse and control erosion and sedimentation. The reclamation strategy includes the use of operational BMPs and procedures. The BMPs used are drawn from the *Manual for Erosion and Sedimentation Control in Georgia*, *Georgia's Best Management Practices for Forestry*, and from other states. Thus, the issuance of a surface mining permit in effect addresses BMPs to control nonpoint source pollutants. The regional GA EPD offices monitor and inspect surface mining sites to assess permit compliance.

It is recommended that special attention be given to those facilities located in impaired watersheds. The implementation and maintenance of BMPs used to control erosion should be reviewed during the site inspections.

The Georgia Mining Association (GMA) is an informal trade association of the mining industry. It serves more than 200 members, 47 mining companies and over 150 associate companies. The association monitors legislative developments and coordinates industry response. It educates miners about laws and regulations that affect them and provides a forum for the exchange of ideas. Through its newsletters, seminars, workshops, and annual conventions, the GMA serves as a source for mining industry information. It has several committees, including the Environmental Committee, that meet three to four times a year. The mining industry is conducting informal discussions on the potential of developing industry-wide standards for BMPs to prevent and reduce nonpoint source pollution. If these standards are adopted, the mining industry would likely conduct demonstration projects to gauge the effectiveness of the BMPs.

6.2.2.4 Roads

Unpaved roads can be a major contributor of sediment to our waterways if not properly managed. The following guidance for the maintenance and service of unpaved roadways, drainage ditches, and culverts can be used to minimize roadway erosion. One publication that may include some additional guidance is *Recommended Practices Manual, A Guideline for Maintenance and Service of Unpaved Roads* (Choctawhatchee, et. al, 2000).

Disturbances to unpaved roadway surfaces and ditches, and poor road surface drainage, result in deterioration of the road surface. This leads to increased roadway erosion and, thus, stream sedimentation. Unpaved roads are typically maintained by blading and / or scraping of the roads to remove loose material. Proper, timely, and selective surface maintenance can prevent and minimize erosion of unpaved roadways. This in turn lengthens the life of the road and reduces maintenance costs. Roadway blading that occurs during periods when there is enough moisture content allows for immediate re-compaction. In addition, roadwork performed near streams or stream-crossings during "dry" months of the year can reduce the amount of sediment that enters a stream.

Roadside ditches convey storm water runoff to an outlet. A good drainage ditch is shaped and lined with appropriate vegetative or structural material. A well-vegetated ditch slows, controls and filters the storm water runoff, providing an opportunity for sediments to be removed from the runoff before it enters surface waters. Energy dissipating structures to reduce velocity, dissipate turbulence or flatten flow grades in ditches are often necessary. Efficient disposal of runoff from the road helps preserve the roadbed and banks. Properly installed "turn-outs" or intermittent discharge points help to maintain a stable velocity and proper flow capacity within the ditch by timely outleting water from them. This in turns alleviates roadway flooding, erosion, and maintenance problems. Properly placed "turn-outs" distribute roadway runoff and sediments over a larger vegetative filtering area, helping to reduce road side ditch maintenance to remove accumulated sediment.

Culverts are conduits used to convey water from one side of a road to another. Installation, modification, and / or improvements of culverts when stream flows and expected rainfall is low can reduce the amount of sediment that enters a stream. If the entire installation process, from beginning to end, can be completed before the next rainfall event, stream sedimentation can be minimized. Diverting all existing or potential stream flows while the culvert is being installed can also help reduce or avoid sedimentation below the installation. The culvert design can have a significant impact on the biological community if the size and species of fish passing through it are not considered. Changes in water velocities and the creation of vertical barriers affect the biological communities.

6.2.2.5 Urban Development

The Erosion and Sedimentation Act, established in 1975, provides the mechanism for controlling erosion and sedimentation from land-disturbing activities. This Act establishes a permitting process for land-disturbing activities. Many local governments and counties have adapted erosion and sedimentation ordinances and have been given authority to issue and enforce permits for land-disturbing activities. Approximately 32 counties and 240 municipalities in Georgia have been certified as the local issuing authority. In areas where local governments have not been certified as an issuing authority, the GA EPD is responsible for permitting, inspecting, and enforcing the Erosion and Sedimentation Act.

To receive a land-disturbing permit, an applicant must submit an erosion and sedimentation control plan that incorporates specific conservation and engineering BMPs. The *Field Manual for Erosion and Sediment Control in Georgia*, developed by the State Soil and Water Conservation Commission, may be used as a guide to develop erosion and sedimentation control plans (GSWCC, 1997).

Local governments, with oversight by the GA EPD, and the Soil and Water Conservation Districts, are primarily responsible for implementing the Georgia Erosion and Sedimentation Act, O.C.G.A. §12-7-1 (amended in 2003). Reports of suspected violations are made to the agency that issued the permit. In cases with local issuing authority, if the violation continues, the complaint is referred to the appropriate Soil and Water Conservation District. If the situation remains unresolved, the complaint is then referred to GA EPD for enforcement action. Enforcement may include administrative orders, injunctions, and civil penalties. It is recommended that the local and State governments continue to work to implement the provisions of the Georgia Erosion and Sedimentation Act across Georgia.

Storm water runoff from developed urban areas (post-construction) can also have an impact on the transport of sediment to and within streams. Urbanization increases imperviousness, resulting in an increase in the volume of runoff that enters the streams. In addition, the stream flow rates may increase significantly from pre-construction rates. These changes in the stream flow can result in stream bank erosion and stream bottom down cutting. It is recommended that local governments review and consider implementation of practices presented in the *Land Development Provisions to Protect Georgia Water Quality* (GA EPD, 1997). Additional information on site design and best management practices to address stormwater run-off may be found in the *Georgia Stormwater Management Manual* (the "Blue Book") (ARC, 2001) and Georgia's *Green Growth Guidelines* (GADNR, 2005), both of which are available electronically via the internet.

6.3 Reasonable Assurance

Permitted discharges will be regulated through the NPDES permitting process described in this report. Through its NPDES permitting process, GA EPD will determine whether a new discharger has a reasonable potential of discharging sediment levels equal to or greater than the total allocated load. The results of this reasonable potential analysis will determine the specific requirements in an individual facility's NPDES permit. As part of its analysis, the GA EPD will use its EPA approved 2003 NPDES Reasonable Potential Procedures to determine whether monitoring requirements or effluent limitations are necessary.

Georgia is working with local governments, agricultural and forestry agencies, such as the Natural Resources Conservation Service, the Georgia Soil and Water Conservation Commission, and the Georgia Forestry Commission, to foster the implementation of best management practices to address nonpoint sources. In addition, public education efforts will be targeted to individual stakeholders to provide information regarding the use of best management practices to protect water quality.

6.4 Public Participation

A thirty-day public notice is being provided for this TMDL. During that time, the availability of the TMDL will be public noticed, a copy of the TMDL will be provided as requested, and the public is invited to provide comments on the TMDL.

7.0 INITIAL TMDL IMPLEMENTATION PLAN

GA EPD has coordinated with EPA to prepare this Initial TMDL Implementation Plan for this TMDL. GA EPD has also established a plan and schedule for development of a more comprehensive implementation plan after this TMDL is established. GA EPD and EPA have executed a Memorandum of Understanding that documents the schedule for developing the more comprehensive plans. This Initial TMDL Implementation Plan includes a list of best management practices and provides for an initial implementation demonstration project to address one of the major sources of pollutants identified in this TMDL while State and / or local agencies work with local stakeholders to develop a revised TMDL implementation plan. It also includes a process whereby GA EPD and / or Regional Development Centers (RDCs) or other GA EPD contractors (hereinafter, “GA EPD Contractors”) will develop expanded plans (hereinafter, “Revised TMDL Implementation Plans”).

This Initial TMDL Implementation Plan, written by GA EPD and for which GA EPD and / or the GA EPD Contractor are responsible, contains the following elements.

1. EPA has identified a number of management strategies for the control of nonpoint sources of pollutants, representing some best management practices. The “Management Measure Selector Table” shown below identifies these management strategies by source category and pollutant. Nonpoint sources are the primary cause of excessive pollutant loading in most cases. Any wasteload allocations in this TMDL will be implemented in the form of water-quality based effluent limitations in NPDES permits issued under CWA Section 402. See 40 C.F.R. § 122.44(d)(1)(vii)(B). NPDES permit discharges are a secondary source of excessive pollutant loading, where they are a factor, in most cases.

2. GA EPD and the GA EPD Contractor will select and implement one or more best management practice (BMP) demonstration projects for each River Basin. The purpose of the demonstration projects will be to evaluate by River Basin and pollutant parameter the site-specific effectiveness of one or more of the BMPs chosen. GA EPD intends that the BMP demonstration project be completed before the Revised TMDL Implementation Plan is issued. The BMP demonstration project will address the major category of contribution of the pollutant(s) of concern for the respective River Basin as identified in the TMDLs of the watersheds in the River Basin. The demonstration project need not be of a large scale, and may consist of one or more measures from the Table or equivalent BMP measures proposed by the GA EPD Contractor and approved by GA EPD. Other such measures may include those found in EPA’s “Best Management Practices Handbook”, the “NRCS National Handbook of Conservation Practices,” or any similar reference, or measures that the volunteers, etc., devise that GA EPD approves. If for any reason the GA EPD Contractor does not complete the BMP demonstration project, GA EPD will take responsibility for doing so.

3. As part of the Initial TMDL Implementation Plan, the GA EPD brochure entitled “Watershed Wisdom -- Georgia’s TMDL Program” will be distributed by GA EPD to the GA EPD Contractor for use with appropriate stakeholders for this TMDL, and a copy of the video of that same title will be provided to the GA EPD Contractor for its use in making presentations to appropriate stakeholders on TMDL implementation plan development.

4. If for any reason an GA EPD Contractor does not complete one or more elements of a Revised TMDL Implementation Plan, GA EPD will be responsible for getting that (those) element(s) completed, either directly or through another contractor.

5. The deadline for development of a Revised TMDL Implementation Plan is the end of September 2010.

6. The GA EPD Contractor helping to develop the Revised TMDL Implementation Plan, in coordination with GA EPD, will work on the following tasks involved in converting the Initial TMDL Implementation Plan to a Revised TMDL Implementation Plan:

   A. Generally characterize the watershed;
   B. Identify stakeholders;
   C. Verify the present problem to the extent feasible and appropriate, (e.g., local monitoring);
   D. Identify probable sources of pollutant(s);
   E. For the purpose of assisting in the implementation of the load allocations of this TMDL, identify potential regulatory or voluntary actions to control pollutant(s) from the relevant nonpoint sources;
   F. Determine measurable milestones of progress;
   G. Develop a monitoring plan, taking into account available resources, to measure effectiveness; and
   H. Complete and submit to GA EPD the Revised TMDL Implementation Plan.

7. The public will be provided an opportunity to participate in the development of the Revised TMDL Implementation Plan and to comment on it before it is finalized.

8. The Revised TMDL Implementation Plan will supersede this Initial TMDL Implementation Plan once GA EPD accepts the Revised TMDL Implementation Plan.

Management Measure Selector Table

Land Use	**Management Measures**	**Fecal Coliform**	**Dissolved Oxygen**	**pH**	**Sediment**	**Temperature**	***Toxicity***	***Mercury***	**Metals (copper, lead, zinc, cadmium)**	**PCBs, toxaphene**
Agriculture	1. Sediment & Erosion Control	_	_		_	_				
	2. Confined Animal Facilities	_	_							
	3. Nutrient Management	_	_							
	4. Pesticide Management		_							
	5. Livestock Grazing	_	_		_	_				
	6. Irrigation		_		_	_				
Forestry	1. Preharvest Planning				_	_				
	2. Streamside Management Areas	_	_		_	_				
	3. Road Construction & Reconstruction		_		_	_				
	4. Road Management		_		_	_				
	5. Timber Harvesting		_		_	_				
	6. Site Preparation & Forest Regeneration		_		_	_				
	7. Fire Management	_	_	_	_	_				
	8. Revegetation of Disturbed Areas	_	_	_	_	_				
	9. Forest Chemical Management		_			_				
	10. Wetlands Forest Management	_	_	_		_		_		

Land Use	**Management Measures**	**Fecal Coliform**	**Dissolved Oxygen**	**pH**	**Sediment**	**Temperature**	***Toxicity***	***Mercury***	**Metals (copper, lead, zinc, cadmium)**	**PCBs, toxaphene**
Urban	1. New Development	—	—		—	—			—	
	2. Watershed Protection & Site Development	—	—		—	—		—	—	
	3. Construction Site Erosion and Sediment Control		—		—	—				
	4. Construction Site Chemical Control		—							
	5. Existing Developments	—	—		—	—			—	
	6. Residential and Commercial Pollution Prevention	—	—							
Onsite Wastewater	1. New Onsite Wastewater Disposal Systems	—	—							
	2. Operating Existing Onsite Wastewater Disposal Systems	—	—							
Roads, Highways and Bridges	1. Siting New Roads, Highways & Bridges	—	—		—	—			—	
	2. Construction Projects for Roads, Highways and Bridges		—		—	—				
	3. Construction Site Chemical Control for Roads, Highways and Bridges		—							
	4. Operation and Maintenance-Roads, Highways and Bridges	—	—			—			—	

REFERENCES

ARC, 2001. *Georgia Stormwater Management Manual*, Atlanta Regional Commission, August 2001.

Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority, 2000. *Recommended Practices Manual, A Guideline for Maintenance and Service of Unpaved Roads*, February 2000.

Coastal Georgia RDC, 2005. *Green Growth Guidelines: A Low Impact Development Strategy for Coastal Georgia*, Coastal Georgia Regional Development Center, 2005.

GA EPD, 1997*. Land Development Provisions to Protect Georgia Water Quality*, Georgia Department of Natural Resources, Environmental Protection Division, October 1997.

GA EPD, 2000-2001. *Water Quality in Georgia,* 2000-2001, Georgia Department of Natural Resources, Environmental Protection Division*.*

GA EPD, 1998. *Chattahoochee River Basin Management Plan 1997,* Georgia Department of Natural Resource, Environmental Protection Division*.*

GA EPD, 1999. *Georgia's Best Management Practices for Forestry*, Georgia Department of Natural Resources, Georgia Forestry Commission, Georgia Forestry Association, January 1999.

GA EPD, 2000. *Georgia Nonpoint Source Management Program FFY 2000 Update*, Georgia Department of Natural Resources, Environmental Protection Division, Water Protection Branch, August 2000*.*

GA EPD, *Rules and Regulations for Surface Mining, 391-3-3,* Georgia Department of Natural Resources, Environmental Protection Division.

GA EPD, *Rules and Regulations For Water Quality Control, Chapter 391-3-6,* Georgia Department of Natural Resources, Environmental Protection Division, Revised Nov. 2005.

GA EPD, *Rules for Erosion and Sedimentation Control, Chapter 391-3-7,* Georgia Department of Natural Resources, Environmental Protection Division, Revised January 2005.

GSWCC, 1994. A*gricultural Best Management Practices for Protecting Water Quality in Georgia*, Georgia Soil and Water Conservation Commission, Athens, Georgia, September 1994.

GSWCC, 2005. *Field Manual for Erosion and Sediment Control in Georgia*, Georgia Soil and Water Conservation Commission, Athens, Georgia, 2005.

GAWDR, 2000. *Draft Standard Operating Procedures for Conducting Biomonitoring on Fish Communities in the Piedmont Ecoregion of Georgia*, Georgia Department of Natural Resources, Wildlife Resources Division, Fisheries Section, Revised June 9, 2000.

GAWPB, 2000. *Draft Standard Operating Procedures Freshwater Macroinvertebrate Biological Assessment*, Georgia Department of Natural Resources, Water Protection Branch, 2000.

Thomas, Michael T., 1997. *Forest Statistics for Georgia*.

USDA-NRCS, 1997. National Resources Inventory, USDA-NCRS, Athens, Georgia.

USEPA, 1991. *Guidance for Water Quality –based Decisions: The TMDL Process.* U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-440 / 4-91-001, April 1991.

USEPA, 1998. *Better Assessment Science Integrating Point and Nonpoint Sources (BASIN*S), *Version 2.0 User's Manual,* U.S. Environmental Protection Agency, Office of Water, Washington D.C.

USEPA, 1999a. *1999 Update of Ambient Water Quality Criteria*, U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-822-R-99-014, December 1999.

USEPA, 1999b. *Protocol for Developing Sediment TMDLs*, First Edition, U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

USEPA, 2000. *Watershed Characterization System - User's Manual*, U.S. Environmental Protection Agency, Region IV, Atlanta, Georgia, 2000.

USEPA, 2001a. Watershed Characterization System (WCS) Data, Georgia, U.S. Tetra Tech, Environmental Protection Agency, Region IV, Atlanta, Georgia, Jan. 31, 2001.

USEPA, 2001b. *Total Maximum Daily Load (TMDL) Development for Sediment in the Chattooga River Watershed*, April 2001.

APPENDIX A

Annual Average Sediment Load
Summary Memorandum

SUMMARY MEMORANDUM
Annual Average Sediment Load
Bear Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Fulton

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130002

Waterbody Name: Bear Creek
Location: Little Bear Creek to Chattahoochee River
Stream Length: 4 miles
Watershed Area: 27.3 square miles
Tributary to: Chattahoochee River
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA): 3.0 tons/yr
Fulton Co. – Little Bear Creek: 20 mg/L (3.0 tons/yr)
Future Construction Sites: Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 495.7 tons/yr

Load Allocation (LA) : 212.4 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 711.1 tons/yr

Maximum Daily Sediment Load: 91.7 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Browns Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Coweta

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130002

Waterbody Name: Browns Creek
Location: Headwaters to Cedar Creek
Stream Length: 5 miles
Watershed Area: 8.1 square miles
Tributary to: Cedar Creek
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Load Allocation (LA) : 296.6 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 296.6 tons/yr

Maximum Daily Sediment Load: 38.3 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Bull Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Muscogee

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130003

Waterbody Name: Bull Creek
Location: Flat Rock Creek to Cooper Creek, Columbus
Stream Length: 3 miles
Watershed Area: 32.9 square miles
Tributary to: Chattahoochee River
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 835.5 tons/yr

Load Allocation (LA) : 722.1 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 1,557.6 tons/yr

Maximum Daily Sediment Load: 200.9 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Dean Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: White

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: Dean Creek
Location: Headwaters to Mossy Creek
Stream Length: 5 miles
Watershed Area: 5.6 square miles
Tributary to: Mossy Creek
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Load Allocation (LA) : 266.6 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 266.6 tons/yr

Maximum Daily Sediment Load: 34.4 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Deep Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Fulton

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130002

Waterbody Name: Deep Creek
Location: Line Creek to Chattahoochee River
Stream Length: 3 miles
Watershed Area: 27.4 square miles
Tributary to: Chattahoochee River
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 729.0 tons/yr

Load Allocation (LA) : 312.4 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 1,041.5 tons/yr

Maximum Daily Sediment Load: 134.4 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Flat Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: White/Hall

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: Flat Creek
Location: Headwaters near Clermont to Lake Lanier
Stream Length: 9 miles
Watershed Area: 7.2 square miles
Tributary to: Lake Lanier
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Load Allocation (LA) : 338.5 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 338.5 tons/yr

Maximum Daily Sediment Load: 43.7 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Flat Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Hall

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: Flat Creek
Location: Headwaters, Gainesville to Lake Lanier
Stream Length: 6 miles
Watershed Area: 3.2 square miles
Tributary to: Lake Lanier
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (not supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA): 140.3 tons/yr
Dixie Mobile Home Park: 90 mg/L (0.6 tons/yr)
Gainesville – Flat Creek WPCP: 5 – 9 mg/L (77.6 – 139.7 tons/yr)
Future Construction Sites: Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 8.3 tons/yr

Load Allocation (LA) : 4.1 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 152.8 tons/yr

Maximum Daily Sediment Load: 19.7 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Hazel Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Habersham

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: Hazel Creek
Location: Reservoir No. 12 to Law Creek
Stream Length: 4 miles
Watershed Area: 7.4 square miles
Tributary to: Soquee River
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Load Allocation (LA) : 349.6 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 349.6 tons/yr

Maximum Daily Sediment Load: 45.1 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Ivy Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Gwinnett

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: Ivy Creek
Location: Headwaters to Suwannee Creek
Stream Length: 10 miles
Watershed Area: 7.4 square miles
Tributary to: Suwannee Creek
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 245.3 tons/yr

Load Allocation (LA) : 106.3 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 351.6 tons/yr

Maximum Daily Sediment Load: 45.4 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Long Island Creek

1. 303(d) Listed Waterbody Information

State:	**Georgia**
County:	**Fulton**
Major River Basin:	**Chattahoochee**
8-Digit Hydrologic Unit Code(s):	**03130001**
Waterbody Name:	**Long Island Creek**
Location:	**Headwaters to Chattahoochee River**
Stream Length:	**5 miles**
Watershed Area:	**5.2 square miles**
Tributary to:	**Chattahoochee River**
Ecoregion:	**Piedmont**
Constituent(s) of Concern:	**Sediment**
Designated Use:	**Fishing (not supporting designated use)**

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):

Future Construction Sites	**Meet requirements of General Storm Water Permit**
Wasteload Allocations (WLA_{SW}):	**171.0 tons/yr**
Load Allocation (LA) :	**73.3 tons/yr**
Margin of Safety (MOS):	**implicit**
Annual Average Sediment Load:	**244.3 tons/yr**
Maximum Daily Sediment Load:	**31.5 tons/day**

SUMMARY MEMORANDUM
Annual Average Sediment Load
Maple Branch

1. 303(d) Listed Waterbody Information

State: Georgia
County: Coweta

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130002

Waterbody Name: Maple Branch
Location: Headwaters to Mountain Creek
Stream Length: 4 miles
Watershed Area: 1.2 square miles
Tributary to: Mountain Creek
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Load Allocation (LA) : 43.6 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 43.6 tons/yr

Maximum Daily Sediment Load: 5.6 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Mountain Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Coweta

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130002

Waterbody Name: Bear Creek
Location: Tributary to Mountain Creek (d/s SR 34) to Maple Branch
Stream Length: 4 miles
Watershed Area: 7.3 square miles
Tributary to: New River
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA): 34.3 tons/yr
Newnan – Mineral Springs WPCP 30 mg/L (34.3 tons/yr)
Future Construction Sites Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 58.4 tons/yr

Load Allocation (LA) : 253.6 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 346.3 tons/yr

Maximum Daily Sediment Load: 44.7 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Mud Creek

1. 303(d) Listed Waterbody Information

State:	**Georgia**
County:	**Habersham/Hall**
Major River Basin:	**Chattahoochee**
8-Digit Hydrologic Unit Code(s):	**03130001**
Waterbody Name:	**Mud Creek**
Location:	**Headwaters to Little Mud Creek**
Stream Length:	**13 miles**
Watershed Area:	**9.4 square miles**
Tributary to:	**Chattahoochee River**
Ecoregion:	**Piedmont**
Constituent(s) of Concern:	**Sediment**
Designated Use:	**Fishing (not supporting designated use)**

Applicable Water Quality Standard:

All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:

Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):	**91.3 tons/yr**
Cornelia WPCP	**20 mg/L (91.3 tons/yr)**
Future Construction Sites	**Meet requirements of General Storm Water Permit**
Load Allocation (LA) :	**353.4 tons/yr**
Margin of Safety (MOS):	**implicit**
Annual Average Sediment Load:	**444.7 tons/yr**
Maximum Daily Sediment Load:	**57.4 tons/day**

SUMMARY MEMORANDUM
Annual Average Sediment Load
Nancy Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: DeKalb/Fulton

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: Nancy Creek
Location: Headwaters to Peachtree Creek, Atlanta
Stream Length: 16 miles
Watershed Area: 35.9 square miles
Tributary to: Peachtree Creek
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (not supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA): 170.8 tons/yr
DeKalb Co. – Scott Candler WTP 30 mg/L (170.8 tons/yr)
Future Construction Sites Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 1,068.5 tons/yr

Load Allocation (LA) : 457.9 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 1,697.1 tons/yr

Maximum Daily Sediment Load: 218.9 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Nickajack Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Cobb

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130002

Waterbody Name: Nickajack Creek
Location: Headwaters to Chattahoochee River
Stream Length: 11 miles
Watershed Area: 30.2 square miles
Tributary to: Chattahoochee River
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (not supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA): 30.4 tons/yr
USAF Lockheed (Plant No. 6): 5 – 10 mg/L (15.2 – 30.4 tons/yr)
Future Construction Sites: Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 979.6 tons/yr

Load Allocation (LA) : 419.8 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 1,429.9 tons/yr

Maximum Daily Sediment Load: 184.5 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
North Fork Peachtree Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Gwinnett/DeKalb/Fulton

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: North Fork Peachtree Creek
Location: Headwaters to Peachtree Creek
Stream Length: 14 miles
Watershed Area: 10.5 square miles
Tributary to: Peachtree Creek
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (not supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA): 1.3 tons/yr
Lafarge Building Materials (GA0046906) 25 – 40 mg/L (0.8 – 1.3 tons/yr)
Future Construction Sites Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 346.9 tons/yr

Load Allocation (LA) : 148.7 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 496.9 tons/yr

Maximum Daily Sediment Load: 64.1 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Noses Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Cobb

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130002

Waterbody Name: Noses Creek
Location: Headwaters to Ward Creek
Stream Length: 7 miles
Watershed Area: 5.9 square miles
Tributary to: Sweetwater Creek
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA): 1.2 tons/yr
Lafarge Building Materials (GA0025917) 25 – 40 mg/L (0.7 – 1.2 tons/yr)
Future Construction Sites Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 193.0 tons/yr

Load Allocation (LA) : 82.7 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 276.9 tons/yr

Maximum Daily Sediment Load: 35.7 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Pea Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Fulton

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130002

Waterbody Name: Pea Creek
Location: Cedar Grove Lake to Chattahoochee River
Stream Length: 6 miles
Watershed Area: 7.8 square miles
Tributary to: Chattahoochee River
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 193.8 tons/yr

Load Allocation (LA) : 83.1 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 276.9 tons/yr

Maximum Daily Sediment Load: 35.7 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Six Mile Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Forsyth

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: Six Mile Creek
Location: Headwaters to Lake Lanier
Stream Length: 2 miles
Watershed Area: 2.9 square miles
Tributary to: Lake Lanier
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (not supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA): 54.1 tons/yr
Buckhorn Ventures, LLC: 25 – 55 mg/L (24.6 – 54.1 tons/yr)
Future Construction Sites: Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 59.7 tons/yr

Load Allocation (LA) : 25.6 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 139.3 tons/yr

Maximum Daily Sediment Load: 18.0 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
South Fork Limestone Creek/Limestone Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Hall

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: South Fork Limestone Creek/Limestone Creek
Location: Headwaters to Limestone Creek Arm of Lake Lanier
Stream Length: 2 miles
Watershed Area: 1.7 square miles
Tributary to: Lake Lanier
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (not supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 56.8 tons/yr

Load Allocation (LA) : 24.3 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 81.2 tons/yr

Maximum Daily Sediment Load: 10.5 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Suwanee Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Gwinnett

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: Suwanee Creek
Location: Suwanee Creek Lake (near Buford) to Ivy Creek
Stream Length: 6 miles
Watershed Area: 14.1 square miles
Tributary to: Chattahoochee River
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA): 91.3 tons/yr
Buford – Southside WPCP 30 mg/L (91.3 tons/yr)
Future Construction Sites Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 382.3 tons/yr

Load Allocation (LA) : 192.9 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 666.5 tons/yr

Maximum Daily Sediment Load: 86.0 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Tributary to Limestone Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Hall

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: Tributary to Limestone Creek
Location: Breneau Lake to Limestone Creek
Stream Length: 1 mile
Watershed Area: 1.4 square miles
Tributary to: South Fork Limestone Creek/Limestone Creek
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 46.3 tons/yr

Load Allocation (LA) : 19.8 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 66.2 tons/yr

Maximum Daily Sediment Load: 8.5 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
Turner Creek

1. 303(d) Listed Waterbody Information

State:	**Georgia**
County:	**White**
Major River Basin:	**Chattahoochee**
8-Digit Hydrologic Unit Code(s):	**03130001**
Waterbody Name:	**Turner Creek**
Location:	**Headwaters to Tesnatee Creek**
Stream Length:	**6 miles**
Watershed Area:	**8.0 square miles**
Tributary to:	**Tesnatee Creek**
Ecoregion:	**Piedmont**
Constituent(s) of Concern:	**Sediment**
Designated Use:	**Fishing (partially supporting designated use)**

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):

Future Construction Sites	**Meet requirements of General Storm Water Permit**
Load Allocation (LA) :	**379.8 tons/yr**
Margin of Safety (MOS):	**implicit**
Annual Average Sediment Load:	**379.8 tons/yr**
Maximum Daily Sediment Load:	**49.0 tons/day**

SUMMARY MEMORANDUM
Annual Average Sediment Load
Ward Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: Cobb

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130002

Waterbody Name: Ward Creek
Location: Headwaters to Noses Creek
Stream Length: 6 miles
Watershed Area: 7.1 square miles
Tributary to: Noses Creek
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Wasteload Allocations (WLA_{SW}): 236.2 tons/yr

Load Allocation (LA) : 101.2 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 337.4 tons/yr

Maximum Daily Sediment Load: 43.5 tons/day

SUMMARY MEMORANDUM
Annual Average Sediment Load
White Creek

1. 303(d) Listed Waterbody Information

State: Georgia
County: White

Major River Basin: Chattahoochee
8-Digit Hydrologic Unit Code(s): 03130001

Waterbody Name: White Creek
Location: Headwaters to Webster Lake, Cleveland
Stream Length: 6 miles
Watershed Area: 8.0 square miles
Tributary to: Chattahoochee River
Ecoregion: Piedmont

Constituent(s) of Concern: Sediment

Designated Use: Fishing (partially supporting designated use)

Applicable Water Quality Standard:
All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

2. TMDL Development

Analysis/Modeling:
Universal Soil Loss Equation was used to determine the average annual sediment load

3. Allocation Watershed/Stream Reach:

Wasteload Allocations (WLA):
Future Construction Sites — Meet requirements of General Storm Water Permit

Load Allocation (LA) : 378.7 tons/yr

Margin of Safety (MOS): implicit

Annual Average Sediment Load: 378.7 tons/yr

Maximum Daily Sediment Load: 48.9 tons/day