

TMDL Watershed Plan

for

Sugar, Little Sugar and McAlpine Creeks

developed by

TMDL Stakeholders Group

December 15, 2003

Goal of Watershed Plan: Reduce fecal coliform bacteria levels and comply N.C. water quality standards in accordance with the TMDLs developed for three (3) watersheds as approved on March 28, 2002.

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- Appendix A: Location of TMDL Watersheds in Mecklenburg County
- Appendix B: Source Reduction Strategies

1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to describe the actions that will be taken by the City of Charlotte and Mecklenburg County to reduce fecal coliform bacteria levels in Sugar, Little Sugar and McAlpine Creek in accordance with the Total Maximum Daily Loads (TMDLs) approved for these three (3) watershed areas effective March 28, 2002. A map showing the locations of these watershed in Mecklenburg County is provided in Appendix A. The ultimate goal of this document and the TMDL is to meet the N.C. water quality standard for fecal coliform bacteria as described below. Efforts to meet this standard will continually evolve as more data is collected concerning sources of fecal coliform bacteria and resulting water quality impacts. As these efforts change this document will be revised after review and approval by the TMDL advisory group discussed in Section 5.2 of this document. Approved revisions to this document as well as data relating to the effectiveness of efforts to reduce fecal coliform levels will be maintained at the Mecklenburg County Water Quality Program's (MCWQP) website:

<http://waterquality.charmeck.org>

N.C. Water Quality Standard for Fecal Coliform Bacteria (15A NCAC 02B .0211):

“Organisms of the fecal coliform group: fecal coliforms shall not exceed a geometric mean of 200/100 ml. (MF count) based upon at least five consecutive samples examined during any 30 day period, nor exceed 400/100 ml. in more than 20 percent of the samples examined during such period; violations of the fecal coliform standard are expected during rainfall events, in some cases, this violation is expected to be caused by uncontrollable nonpoint source pollution; all coliform concentrations are to be analyzed using the membrane filter technique unless high turbidity or other adverse conditions necessitate the tube dilution method; in case of controversy over results, the MPN 5-tube dilution technique shall be used as the reference method.”

1.2 Background

Section 303(d) of the Federal Clean Water Act requires each state to list those waters within its boundaries for which technology-based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Listed waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop TMDLs for those water bodies that are not meeting designated uses. The TMDL process establishes the allowable loadings of pollutants or other quantifiable

parameters for a water body based on the relationship between pollution sources and in-stream water quality conditions so that states can establish water quality based controls to reduce pollution from both point and non-point sources and restore and maintain the quality of their water resources.

North Carolina's 2000 303(d) list identifies Sugar Creek (from source to NC/SC border), Little Sugar Creek (from source to NC/SC border) and McAlpine Creek (from source to NC/SC border) as water bodies that do not meet the minimum water quality standard for fecal coliform, due to point sources, urban runoff and storm sewers.

MCWQP in cooperation with the N.C. Department of Environment and Natural Resources (NCDENR) developed TMDLs for Sugar, Little Sugar and McAlpine Creeks in Mecklenburg County that were subsequently approved by the United States Environmental Protection Agency (USEPA) on March 28, 2002. These TMDLs were developed out of a stakeholders' process that included representatives from the following organizations:

- Mecklenburg County Water Quality Program (MCWQP)
(Rusty Rozzelle, David Kroening)
- Charlotte Mecklenburg Utilities (CMU)
(Barry Gullett, Bob Pearson)
- Charlotte Storm Water Services
(Steve Jadlocki)
- Mecklenburg County Storm Water Services
(Dave Canaan)
- N.C. Department of Environment and Natural Resources (NCDENR)
(Michelle Woolfolk)
- Sierra Club
(Rick Roti)
- Catawba Riverkeeper
(Donna Lisenby)
- Private Consultants
(Bill Kreuzberger, Marshall Taylor)
- University of North Carolina at Charlotte
(Dr. J.Y. Wu)
- City of Greensboro
(David Phlegar)
- S.C. Department of Health and Environmental Control (SCDHEC)
(Wayne Hardin)

Under the current regulations, no implementation strategy is required for the TMDLs developed for Sugar, Little Sugar and McAlpine Creeks; however, the stakeholders' believe that such a strategy is necessary to enact the source reduction scenarios defined in the TMDLs (see Appendix B) and reduce in-stream fecal coliform levels. This Watershed Plan has been developed to fulfill that objective.

2.0 SOURCE REDUCTION

2.1 Wastewater Treatment Plants

2.1.1 Actions Necessary to Achieve Reduction

There are three (3) wastewater treatment plants (WWTPs) in the TMDL watersheds including the Irwin, Sugar and McAlpine plants, which are owned and operated by Charlotte Mecklenburg Utilities (CMU). The source reduction target established in the TMDL for these WWTPs is a daily maximum fecal coliform concentration in their effluent of 1000 c.f.u./100ml. To achieve this target, the disinfection systems at the Sugar and Irwin Creek WWTPs are to be upgraded, incorporating the TMDL target into their design criteria. The McAlpine Creek WWTP will incorporate the TMDL target as a design criteria at the time of the next capacity expansion.

As an interim plan until capital improvements upgrades are completed, each WWTP will set the TMDL target as an operating goal taking into account that physical facilities are not in place to always allow it to be met. This could require additional chemical usage and potential changes in standard operating practices (SOP's).

2.1.2 Monitoring

Capital construction will be monitored through CMU's established Capital Improvement Program (CIP) process. CMU will continue to monitor and report daily fecal coliform concentrations in plant effluent through the established Discharge Monitoring Reports (DMRs) required by NCDENR. Data from these DMRs will be provided to MCWQP for measuring the effectiveness of efforts to meet the established TMDL targets.

2.1.3 Time Frame

Sugar and Irwin Creek WWTPs are expected to fully implement the TMDL targets upon completion of disinfection system upgrades no later than July 2006.

The next major upgrade or expansion to the McAlpine Creek WWTP is not firmly scheduled at this time but is expected to be completed by 2012. CMU will evaluate requirements to reach the TMDL targets and consider an earlier implementation.

2.1.4 Estimated Cost

The estimated cost to upgrade the disinfection systems at Sugar Creek and Irwin Creek WWTPs is approximately \$4,600,000. Costs to upgrade McAlpine Creek are not known at this time.

2.2 Sanitary Sewer Overflows

2.2.1 Actions Necessary to Achieve Reduction

CMU owns and operates the sanitary sewer collection systems that serve the TMDL watersheds. The source reduction target established in the TMDL for this sewer collection system includes reducing the number of sanitary sewer overflows (SSOs) by 33% in Irwin, Sugar and Upper McAlpine Creeks; 25% in Little Sugar and Lower McAlpine Creeks; and a 3 hour maximum flow time for all overflows in the TMDL watersheds. Table 1 indicates the source reduction targets for the percent and number of SSOs allowed by TMDL watershed.

Table 1: SSO Source Reduction Targets by Watershed

TMDL Watershed	Original Source Distribution	Source Reduction Target %	Source Reduction Target #
Irwin Creek	55 SSOs; 228 hour duration	33%; 3 hour duration	36 SSOs; 103 hour duration
Sugar Creek	86 SSOs; 371 hour duration	33%; 3 hour duration	57 SSOs; 165 hour duration
Little Sugar Creek	93 SSOs; 443 hour duration	25%; 3 hour duration	69 SSOs; 206 hour duration
Upper McAlpine Creek	40 SSOs; 206 hour duration	33%, 3 hour duration	21 SSOs; 39 hour duration
Lower McAlpine Creek	39 SSOs, 195 hour duration	25%, 3 hour duration	31 SSOs; 93 hour duration

CMU is undertaking an aggressive program to reduce sewer overflows. Program elements include:

- Capital projects to provide additional capacity;
- Capital projects to rehabilitate/replace existing infrastructure;
- Fat, Oil, and Grease (FOG) program enhancements to reduce the number of FOG related blockages;
- Root removal/control program;
- Review/revise engineering standards and practices; and
- Review/revise collection system operation and maintenance practices.

2.2.2 Monitoring

CMU will monitor the number of overflows and volume by basin and will report these to the public annually as part of the Wastewater Performance Report. Data will also be provided to MCWQP for measuring the effectiveness of efforts to meet the established TMDL targets.

2.2.3 Time Frame

Effective October 2003, CMU initiated efforts to reduce overflows, including pilot projects in several areas. Significant reductions in the number and volume of overflows are expected to occur beginning immediately. By 2008, CMU expects that overflows will be greatly reduced. However, it is also expected that overflow prevention/reduction will be an ongoing effort. At this time, it is not possible to accurately project the time required to meet the TMDL goals.

2.2.4 Estimated Cost

Costs include capital costs of sewer rehabilitation and replacement, lift station upgrades, and construction of flow equalization facilities as well as implementation costs of the FOG program and additional operating costs for collection system operation and maintenance. Capital costs are expected to exceed \$150,000,000 over the next five years. Additional operation and maintenance costs estimates are not available at this time.

2.3 Failing Septic Systems

2.3.1 Actions Necessary to Achieve Reduction

There are an estimated 10,587 septic systems located in the TMDL watersheds, which are all privately owned and operated. The local septic system failure rate is estimated at 1% indicating that within the TMDL watersheds there may be 106 failing systems. The source reduction target established in the TMDL for these septic systems is to reduce the number of failing systems by a minimum of 60% in the Irwin, Sugar and Little Sugar Creek watersheds, 80% in the Upper McAlpine Creek watershed and 40% in the Lower McAlpine Creek watershed. Table 2 indicates the source reduction targets for the percent and number of failing septic systems to be eliminated by TMDL watershed.

Table 2: Septic System Source Reduction Targets by Watershed

TMDL Watershed	Original Source Distribution	Source Reduction Target %	Source Reduction Target #
Irwin Creek	30 failing septic	60%	18 failing systems

	systems		to be eliminated
Sugar Creek	43 failing septic systems	60%	26 failing systems eliminated
Little Sugar Creek	26 failing septic systems	60%	16 failing systems to be eliminated
Upper McAlpine Creek	3 failing septic systems	80%	2 failing systems to be eliminated
Lower McAlpine Creek	35 failing septic systems	40%	14 failing systems to be eliminated

In order to eliminate failing systems from the TMDL watersheds, the following actions will be taken by MCWQP working in cooperation with the Mecklenburg County Health Department.

1. Chronic areas where septic system failures commonly occur will be identified by working closely with the Health Department’s Individual Water and Wastewater Program, which is responsible for enforcement of N.C. septic system rules in Mecklenburg County (15A NCAC 18A .1900). These chronic problem areas will include areas with poor soil conditions, older systems and/or systems with a history of repairs and failures. A GIS map will be produced showing these areas.
2. Stream evaluations and monitoring for fecal coliform bacteria will be performed in the problem areas identified in #1 above to determine if failing systems are impacting water quality
3. Follow-up investigations will be conducted to identify and eliminate problems detected under #2 above in cooperation with the Mecklenburg County Health Department

2.3.2 Monitoring

Fecal coliform monitoring will be performed for the purpose of identifying streams that have been negatively impacted by discharges from failing septic systems. This will be accomplished by collecting fecal coliform bacteria samples during ambient flow conditions in stream sections below identified problem areas for failing septic systems. If lab results indicate elevated bacteria counts, follow up sampling and stream survey activities will be performed to isolate source(s). All failing septic systems found to be sources of fecal coliform will be targeted and actions taken to ensure that discharges are eliminated through cooperation with the Mecklenburg County Health Department. Monthly reports will be developed including all monitoring data collected and number and location of problems corrected.

To address future septic system failures, the problem areas identified in #1 above will be surveyed and sampled every two (2) years and actions taken to eliminate all sources of fecal coliform bacteria.

2.3.3 Time Frame

The GIS map identifying potential problem areas will be completed by July 1, 2004. Stream evaluations and monitoring in the identified problem areas will begin July 1, 2004 and be completed by April 30, 2007. Efforts to identify and eliminate failing septic systems will begin on August 2, 2004 and continue through June 30, 2007. Reports will be prepared beginning July 1, 2004 and continue through June 30, 2007. The ongoing sampling to be conducted every two (2) years to identify future problem areas will begin in July 2007.

2.3.4 Estimated Cost

The estimated cost for completion of all activities is \$12,288, which includes all personnel costs associated with field inspections (\$9,288) and sampling costs (\$3,000). This does not include the unknown costs to property owners associated with septic system repairs or connections to the municipal sewer service. It also does not include costs to CMU that may be associated with making sewer service available to residents with failing systems.

2.4 Illicit Discharges/Dry Weather Flows

2.4.1 Actions Necessary to Achieve Reduction

The TMDL watersheds contain piped storm water flow with an unknown number of storm drain outfalls to surface waters. A study conducted between June 2000 and October 2000 of 168 of these outfalls revealed 33 with dry weather flow. Based on the data collected from this study, a fecal coliform load rate was calculated and a reduction target established. A detailed description of the study can be found in Section 2.2.3 of the TMDL Document. Based on this study, the TMDL specifies that contributions to fecal coliform loads from dry weather flows from storm drain systems are to be reduced in TMDL watersheds as follows:

- Irwin Creek – Reduce fecal load by 60%
- Sugar Creek – Reduce fecal load by 60%
- Little Sugar Creek – Reduce fecal load by 60%
- McAlpine Creek above Sardis Rd. – Reduce fecal load by 82%
- McAlpine Creek below Sardis Rd. – Reduce fecal load by 40%

Table 3 indicates the source reduction targets for the percent and number of dry weather flows to be eliminated by TMDL watershed.

Table 3: Dry Weather Flow Source Reduction Targets by Watershed

TMDL Watershed	Original Source Distribution	Source Reduction Target %	Source Reduction Target #
Irwin Creek	70 outfalls with dry weather flow	60%	42 outfalls with dry weather flow to be eliminated
Sugar Creek	105 outfalls with dry weather flow	60%	63 outfalls with dry weather flow to be eliminated
Little Sugar Creek	191 outfalls with dry weather flow	60%	115 outfalls with dry weather flow to be eliminated
Upper McAlpine Creek	65 outfalls with dry weather flow	82%	53 outfalls with dry weather flow to be eliminated
Lower McAlpine Creek	92 outfalls with dry weather flow	40%	37 outfalls with dry weather flow to be eliminated

To achieve these source reduction targets, the perennial and intermittent streams and storm water outfalls in the six square mile sub-basins in each of the TMDL watersheds will be systematically field evaluated for the presence of dry weather flows. This represents 680 stream miles to be evaluated. All dry weather flows detected through this evaluation process will be monitored for the presence of fecal coliform bacteria. Flow rates will also be measured and fecal loads established. In addition, instream monitoring will be performed during the stream evaluations to identify illicit discharges directly to streams not originating from storm drain outfalls. Follow up efforts will be initiated and State and local ordinances enforced to ensure the elimination of illegal discharges of fecal coliform bacteria from these dry weather flows as well as other water quality problems detected.

2.4.2 Monitoring

Sampling for fecal coliform bacteria will be performed when dry weather flows are detected as well as at all tributary confluences and at the 50 acre drainage terminus. Monthly reports will be developed including all monitoring data collected and number and location of problems identified and eliminated.

To address future discharges of fecal coliform bacteria from dry weather flows, an ongoing field evaluation and sampling program will be initiated following the completion of the initial evaluation effort in order to identify and eliminate future illegal discharges.

2.4.3 Time Frame

There are a total of 48 six square mile sub-basins in the TMDL watersheds. These sub-basins will be evaluated over a three (3) year period from July 1, 2004 through April 30, 2007. Follow up actions to eliminate dry weather flows and illicit discharges using applicable State and local regulations will begin August 2, 2004 and conclude by June 30, 2007. Ongoing field evaluations to assess impacts from dry weather flows will be initiated following the completion of the initial evaluation beginning in July 2007.

2.4.4 Estimated Cost

The estimated cost for completion of all activities is \$329,826, which includes all personnel costs associated with field evaluations (\$274,176), monitoring costs (\$44,150), equipment costs for the purchase of four (4) handheld computers with GPS capabilities (\$10,000) and costs associated with travel to the Watershed Initiative workshop (\$1,500). This does not include unknown costs associated with the elimination of dry weather flows.

2.5 Exfiltration from Sanitary Sewer Pipes

2.5.1 Background

The TMDL target for exfiltration from sanitary sewer pipes is to reduce the average fecal coliform concentration in ground water from 58 c.f.u./100 ml to 5 c.f.u./100ml. As part of the TMDL development process, an investigation of the fecal coliform concentration around sanitary sewer lines was conducted in order to assess the possibility of leaking sanitary sewer pipes. A detailed description of the study can be found in Section 2.2.5 of the TMDL Document. Essentially the conclusion of this study was that the presence of fecal coliform was found in groundwater in the vicinity of sanitary sewer lines only where the line was above the water table. Obviously, sewer lines situated below the water table do not have the potential for exfiltration unless the line is under pressure flow. It is noteworthy that no fecal coliform was detected in ground water where the sewer line was below the water table.

The initial study of exfiltration from sanitary sewer pipes was extremely limited in extent and duration. A total of nine (9) sites were installed and monitored from November 2000 through December 2000. At each site a well was installed both down-gradient and up-gradient of the sewer line. Of the nine (9) sites, four (4) were installed at locations where the sewer line had the potential for leakage, in other words, where the sewer line was above the water table. It is highly questionable whether nine (9) isolated

sites are representative of a sanitary sewer collection system that covers hundreds of square miles. However, fecal coliform was only detected at sites where the sewer line was above the water table and no fecal coliform was detected in the up-gradient wells at these sites.

2.5.2 Additional Assessment

Based upon the results of the study, it is apparent that the critical factor regarding the potential for exfiltration from sanitary sewer lines is the position of the line with respect to the water table. It is impractical to install ground water monitoring wells in sufficient density to provide a direct assessment of the position of the water table throughout the TMDL watersheds. However, indirect methods provide a reasonable solution to determining the position of sewer lines relative to the water table. Based upon the previously discussed study an estimate of the average longitudinal profile of the water table near perennial streams can be made. From this estimate, a GIS coverage representing the water table surface can be compiled for all perennial streams in the TMDL watersheds. This coverage, in combination with a three dimensional digital representation of the sanitary sewer infrastructure (in development), will be used to develop a database of sections of the infrastructure located above the water table.

Upon development of the database described above, a prioritization scheme will be applied to each section of sanitary sewer infrastructure. This scheme will be based upon the following attributes:

- Installation date of the sewer line;
- Composition of the sewer line;
- Location in watersheds within historically high in-stream fecal coliform concentrations;
- Longitudinal distance from the creek;
- Soil type; and
- Distance sewer line is above the water table.

2.5.3 Actions Necessary to Achieve Reduction

Until the assessment of the entire sanitary sewer collection system is complete, an accurate estimation of the actions necessary is not feasible. However, at a minimum a combination of the following activities will be necessary to attain the allocation specified in the TMDL:

- Video inspection of lines to determine their condition;
- Slip-lining of pipes; and
- Replacement of old and/or damaged pipes that are beyond repair.

2.5.4 Monitoring

No additional monitoring is foreseen at this time.

2.5.5 Time Frame

All of the sections of the sanitary sewer collection system identified in Section 2.5.2 will be investigated by December 2008. The time frame for the completion of repairs to failing systems is not currently known but will be dependant on the extent of rehabilitation required and the severity of the problem.

2.5.6 Estimated Cost

Unknown until assessment is completed.

3.0 MEASURING SUCCESS

3.1 Use of Water Quality Data to Measure Success

The success of the Watershed Plan will be measured through the use of “source” and “instream” data. Each of the fecal coliform sources identified in the TMDL have a source reduction target as previously described in this document. Source data relating to these targets will be collected by MCWQP on a monthly basis from the respective responsible agencies and compared to the target established in the TMDL to determine the success of program activities. The overall target for the TMDL is to meet the N.C. water quality standard for fecal coliform bacteria as described in Section 1.1. Measuring the success of efforts to meet this target will be achieved by using the ambient instream water quality monitoring data collected monthly by MCWQP at the monitoring sites described in Table 5 as described in the following Section. This data will be compared to a target of 200 c.f.u./100 ml. to gauge success. In addition, the ambient water quality monitoring and flow data collected by MCWQP will be used to calculate monthly ambient fecal coliform loads at each of the monitoring sites. The loads for each of the watersheds will be compared to the established TMDL loads described in Table 4 as a measure of success. All data will be posted on the MCWQP web site monthly beginning in July 2004.

Table 4: TMDL Loads for Sugar, Little Sugar and McAlpine Creeks

Watershed	Critical Condition	TMDL (fecal coliform count/30 days)
Sugar Creek	July 1, 1999	9.3×10^{12}
Little Sugar Creek	December 21, 1999	6.9×10^{12}
McAlpine Creek	September 6, 1999	1.2×10^{13}

3.2 Instream Compliance Monitoring

Monitoring to determine compliance with the N.C. fecal coliform standard (see Section 1.1) will be performed monthly at the five (5) compliance sites specified by the NCDENR as described in Table 5. This monitoring will be performed during ambient flow (dry weather) conditions following at least three (3) consecutive days measuring less than 0.1 inches of precipitation.

Table 5: NCDENR Water Quality Monitoring Sites in the TMDL Watersheds

Site Number	Description
C8896500	Irwin Creek @ Irwin Creek WWTP
C9050000	Sugar Creek @ N.C. 51 in Pineville
C9210000	Little Sugar Creek @ N.C. 51 in Pineville
C9370000	McAlpine Creek @ Sardis Rd. in Charlotte
C9680000	McAlpine Creek @ S.C. SR 2964 near Camp Cox, S.C.

In order to compare results to the TMDL loads described in Table 4, MCWQP will obtain flow data for each sampling event from the USGS gauging stations specified in Table 6.

Table 6: USGS Gauging Stations in the TMDL Watersheds

Station Number	Description
02146300	Irwin Creek @ Irwin Creek WWTP
02146381	Sugar Creek @ N.C. 51 in Pineville
02146530	Little Sugar Creek @ N.C. 51 in Pineville
02146600	McAlpine Creek @ Sardis Rd. in Charlotte
02146750	McAlpine Creek below McMullen Creek in Pineville

3.3 NCDENR Sampling

Data collected by NCDENR for the monitoring sites listed in Table 5 will be obtained from the Mooresville Regional Office (MRO) on a quarterly basis. This data will be compared with data collected by MCWQP for consistency.

3.4 Time Frame

Beginning July 1, 2004 through June 30, 2007, source data relating to the established targets will be collected by MCWQP on a monthly basis from the respective responsible agencies (including CMU) and compared to the source reduction targets and milestones established in the TMDL to determine the success of program activities. The long-term target for the TMDL is to meet the N.C. water quality standard for fecal coliform

bacteria. Beginning July 1, 2004 through June 30, 2007, MCWQP will perform monthly instream monitoring for fecal coliform bacteria at the five (5) compliance sites specified by the NCDENR as described in Table 5 to measuring the success of efforts to meet this long-term target.

3.5 Estimated Cost

The estimated cost for measuring the success of TMDL source reduction activities is \$31,536, which includes personnel (\$20,736) and lab costs (\$10,800).

4.0 DOCUMENTATION

4.1 Records

Documentation of progress toward fulfilling the source reduction targets and the resulting water quality improvements is extremely important at several levels including:

- The public/local citizens interested in water quality improvement.
- Local agencies responsible for components of the implementation.
- State agencies responsible for assessing water quality and adjusting programs to address concerns.
- Federal agencies, primarily the USEPA, responsible for oversight of State programs and ultimately responsible for TMDL implementation.

To ensure effective documentation and communication of results at all levels, data will be collected and summarized by MCWQP and made available on a monthly basis to the general public via the website and on an annual basis to NCDENR and the S.C. Department of Health and Environmental Control (SCDHEC) via written reports. This reporting regimen will ensure adequate assessment of the TMDL Watershed Plan and the timely implementation of TMDL modifications for maximum effectiveness.

4.1.1 Documentation Methods & Reporting Frequency

The following documentation methods and reporting frequency will be used to measure TMDL effectiveness and report results:

- Monthly “TMDL Monitoring Reports” including data collected from source and instream compliance monitoring activities. This information will be posted monthly on MCWQP’s website.
- Annual “Source Reduction Reports” for each of the major fecal coliform sources included in the TMDLs. This information will be

posted annually on MCWQP’s website and a written copy will be made available to NCDENR and SCDHEC.

- Annual “Water Quality Reports” that use the annual Source Reduction Reports to summarize water quality information regarding compliance with the fecal coliform TMDLs. This information will be posted biannually on MCWQP’s website and a written copy will be made available to NCDENR and SCDHEC.

Effective source and instream monitoring and reporting are essential to the success of the TMDL Watershed Plan. Each agency responsible for a source category will collect data and transmit to MCWQP for summary and inclusion on its website. For instance, CMU will provide monthly reports to MCWQP for its source monitoring of the number, location, frequency, volume and duration of all SSOs. In addition, fecal coliform levels in overflows will be periodically documented by CMU and reported to MCWQP since good local information was not available for this category in developing the TMDL. Table 7 provides the key indicators for the source categories and the agency responsible for collecting and transmitting data to MCWQP on a monthly basis.

Table 7: Data Reporting Requirements

Key Indicators	Responsible Agency	Data to be Reported
SSOs	CMU	location, frequency, volume and duration of overflows
WWTPs	CMU	days with fecal coliform levels exceeding 1000 cfu/100 ml.
Septic Tanks	MCWQP	number of systems evaluated, number failing, and number of failing systems improved/ eliminated
Dry weather flows	MCWQP	number identified with fecal coliform and number eliminated

MCWQP will be responsible for collecting and making available all data relating to instream compliance monitoring at the sites listed in Table 5. This monitoring will be performed monthly and made available via MCWQP’s website.

Source and instream compliance monitoring data will be summarized by MCWQP in a monthly TMDL Monitoring Report and posted on the website monthly. A summary of this information will be included in an annual Source Reduction Report that will also be placed on the website and made available via hard copy to NCDENR and SCDHEC. This annual report will include a summary of instream compliance monitoring

data and a comparison to the target of 200 c.f.u./100 ml. An annual Water Quality Report will be produced that summarizes the Source Reduction Reports and one year of instream compliance monitoring data to assess the level of compliance with N.C. water quality standards. Source information will also be used with the HSPF model to update the model and determine whether the model results match the instream monitoring results in assessing compliance.

MCWQP will provide information and participate in the basinwide plan development processes of both NCDENR and SCDHEC to ensure that the information is appropriately used in the assessments and plans developed at the State level.

4.1.2 Maintaining Records/Sharing Information With Stakeholders

Each agency listed in Table 7 will be responsible for maintaining records concerning the activities performed to fulfill this Watershed Plan and meet the allocation assigned to their source category. In addition, the agency will be responsible for submitting monthly data to MCWQP as described in Table 7. MCWQP will be responsible for maintaining data for each of the instream compliance sites described in Table 5 and updating the website on a monthly basis to include all source and instream data collected for the TMDL. MCWQP will also be responsible for developing and submitting all annual and biannual reports to NCDENR and SCDHEC as described above.

4.2 Time Frame

To ensure effective documentation of the implementation of the Watershed Plan, data will be collected and summarized by MCWQP and made available on a monthly basis to the general public via MCWQP's website and on an annual basis to NCDENR and DHEC via written reports beginning July 1, 2004 through June 30, 2007.

4.3 Estimated Cost

The estimated cost for documentation of TMDL effectiveness is \$19,008, which includes personnel costs for completion of all reports.

5.0 ADAPTIVE MANAGEMENT

5.1 Assessing the Need for Change

A TMDL advisory group will be developed effective July 1, 2004 for the purpose of reviewing program activities and data and assessing the need

for change. This group will consist of a representative from MCWQP, CMU, Charlotte Storm Water Services, NCDENR, and SCDHEC. In addition, a private citizen from the City of Charlotte with an interest and knowledge of the TMDL program will be selected to serve on the committee. The MCWQP representative will take the lead in setting up the meetings, establishing agendas and providing all necessary background information. The purpose of this group will be to assess the effectiveness of the Watershed Plan at meeting TMDL targets and changing the strategy as necessary to ensure the fulfillment of all TMDL objectives. This frequency may be reduced to twice annually in following years based on need.

5.2 Adaptation of TMDL

The TMDL advisory group will adapt the TMDL Watershed Plan as necessary to ensure that source reduction targets are effectively and efficiently fulfilled and that progress is being made toward achieving the ultimate goal of compliance with the N.C. water quality standard for fecal coliform bacteria. These changes will be made as necessary during each January meeting of the group following a minimum of one year of implementation of the TMDL. All changes will be communicated to the agencies responsible for the implementation of the TMDL in the form of an annual report. This report will be posted on the web and made available to both NCDENR and SCDHEC for comment and input.

5.3 Time Frame

A TMDL advisory group will be developed effective August 31, 2004 for the purpose of reviewing program activities and data and assessing the need for change. During 2004 and 2005, meetings will be held at least quarterly. During 2006 and 2007, meetings will be held twice a year. Adaptations to the Watershed Plan will be made as need and communicated to the necessary agencies in the form of a written report. Copies of this report will be provided to NCDENR and SCDHEC.

5.4 Estimated Cost

The estimated cost for the adaptive management component of the Watershed Plan is \$4,896, which includes all personnel costs associated with conducting TMDL advisory group meetings and generating necessary reports.

6.0 PUBLIC PARTICIPATION & OUTREACH ACTIVITIES

6.1 Community Education & Involvement

In July 2004, 2005 and 2006, MCWQP in cooperation with CMU and Charlotte Storm Water Services will conduct workshops for the general public for the purpose of describing the TMDLs for Sugar, Little Sugar and McAlpine Creeks and explaining efforts that will be undertaken to reduce fecal coliform levels through the Watershed Plan. The workshop will also seek involvement by the general public in volunteer efforts to improve water quality conditions in Charlotte-Mecklenburg streams such as the “Adopt-A-Stream Program.” The workshop will be publicized through media releases as a positive step toward addressing elevated bacteria levels in Charlotte-Mecklenburg streams.

6.2 Staff Development Phase

The success of the Watershed Plan will depend upon cooperation between MCWQP, CMU and Charlotte Storm Water Services at all staff levels. Staff will need to be adequately informed of the TMDL program and the specific requirements of the Watershed Plan. Staff will also need to be informed of their specific duties and responsibilities toward fulfilling the Watershed Plan, including providing the necessary reports and information. This will be achieved by holding a series of staff workshops conducted annually in July 2004, 2005 and 2006. These workshops will be tailored to each specific agency and will involve participation by staff at all levels. The purpose of these workshops will be to inform staff of the actions they will need to take to ensure the success of the Watershed Plan.

6.3 Time Frame

In July 2004, 2005 and 2006, workshops will be held for the general public. In July 2004, 2005 and 2006, workshops will also be held for each agency responsible for a source reduction target and milestone.

6.4 Estimated Cost

The estimated cost for the adaptive management component of the TMDL is \$7,920, which includes personnel costs associated with conducting all public outreach meetings and presentations as well as coordinating volunteer activities.

7.0 COST-BENEFIT ANALYSIS OF ELIMINATION OF FECAL COLIFORM BACTERIA SOURCES

7.1 Cost-Benefit Analysis

Using the data collected through stream monitoring and assessments, a cost-benefit analysis of the elimination of the various sources of fecal coliform bacteria in the watersheds will be conducted. The purpose of this analysis will be to determine the most cost effective method of eliminating fecal coliform sources detected in the watersheds through direct stream evaluation. Established fecal coliform loading rates will be compared to the costs to eliminate sources, which might include illicit discharges, septic systems failures, sanitary sewer overflows, illicit connections, domestic animals, and leaking sanitary sewer lines. Actual costs associated with the elimination of each source will be determined through interaction with the source owner including CMU, private landowners, businesses, etc. The results of the analysis will be used to prioritize limited funds for elimination of the greatest fecal coliform load for the least expenditure. It is anticipated that the results of this study will be applicable to other similar sized municipalities in the U.S.

7.2 Time Frame

Efforts will begin with the initiation of stream assessment and monitoring activities on July 1, 2004 and continue through the completion of all follow up activities on June 30, 2007.

7.3 Estimated Cost

The estimated cost for completion of the cost benefit analysis is \$16,200, which includes personnel costs.

8.0 SCHEDULE & TOTAL COST ESTIMATE

8.1 Time Frame and Cost Estimate

Table 8 provides a summary of the source reduction activities to be performed, time frame and measure of success for reducing fecal coliform bacteria levels in Sugar, Little Sugar and McAlpine Creek in accordance with the TMDLs. Table 9 provides a cost estimate for TMDL implementation over the next five (5) years.

Table 8: Schedule

Source Reduction Activity	Initiation Date	Completion Date	Measure of Success
Wastewater Treatment Plants			
TMDL as Operational Goal at Plants	January 1, 2004	Ongoing	Discharge Monitoring Reports
Upgrades at Sugar & Irwin Plants	July 2005	July 2006	Discharge Monitoring Reports
Upgrades at McAlpine Plant	Unknown	2012	Discharge Monitoring Reports

Sanitary Sewer Overflows			
Systematic Reductions in Sewer Overflows	January 1, 2004	Ongoing	Number and Volume of Overflows
Failing Septic Systems			
GIS Map of Problem Areas	Currently underway	July 1, 2004	Completion of GIS map & identify problem areas
Field evaluations & monitoring	July 1, 2004	April 30, 2007	Identify failing septic systems
Follow up field evaluations & enforcement actions	August 2, 2004	June 30, 2007	Septic system discharges eliminated
Illicit Discharges/Dry Weather Flows			
Field evaluations & monitoring	July 1, 2004	April 30, 2007	Identify dry weather flows & illicit discharges
Follow up field evaluations & enforcement actions	August 2, 2004	June 30, 2007	Eliminate all illicit discharges
Exfiltration from Sanitary Sewer Pipes			
Investigation of Suspected Problem Areas	January 1, 2005	December 2008	Completion of Assessment
Completion of Necessary Rehabilitation Efforts	Dependant on Results of Assessment	Dependant on Results of Assessment	Completion of Rehabilitation
Measuring Success			
Collect & assess source data	July 1, 2004	June 30, 2007	Source reduction targets and milestones met
Collect & assess instream data	July 1, 2004	June 30, 2007	Instream target of 200 c.f.u./100 ml. met
Documentation			
Complete TMDL Monthly Report	July 1, 2004	June 30, 2007	Data available on website
Complete annual Source Reduction Report	June 30, 2005	June 30, 2007	Report available on website & hard copy to NCDENR & SCDHEC
Completion of annual Water Quality Report	June 30, 2005	June 30, 2007	Report available on website & hard copy to NCDENR & SCDHEC
Adaptive Management			
TMDL Advisory Group established & first meeting held	July 1, 2004	June 30, 2007	Meeting held to discuss implementation of Watershed Plan & measures of success
Ongoing meetings held	Quarterly	June 30, 2007	Review TMDL monthly reports & evaluate success of Plan
Revise Work Plan	As necessary	As necessary	Improve effectiveness of Plan at meeting TMDLs
Public Participation & Outreach Activities			
Public outreach workshop	July 1, 2004	June 30, 2007	Involve community in activities to reduce fecal coliform levels

Staff workshop	July 1, 2004	June 30, 2007	Inform staff from MCWQP and CMU of the measures necessary to implement Watershed Plan
Cost-Benefit Analysis of Elimination of Fecal Coliform Sources			
Cost-Benefit Analysis	July 1, 2004	June 30, 2007	Complete written cost analysis report

Table 9: Cost Estimate for TMDL Implementation Over the Next Five (5) Years

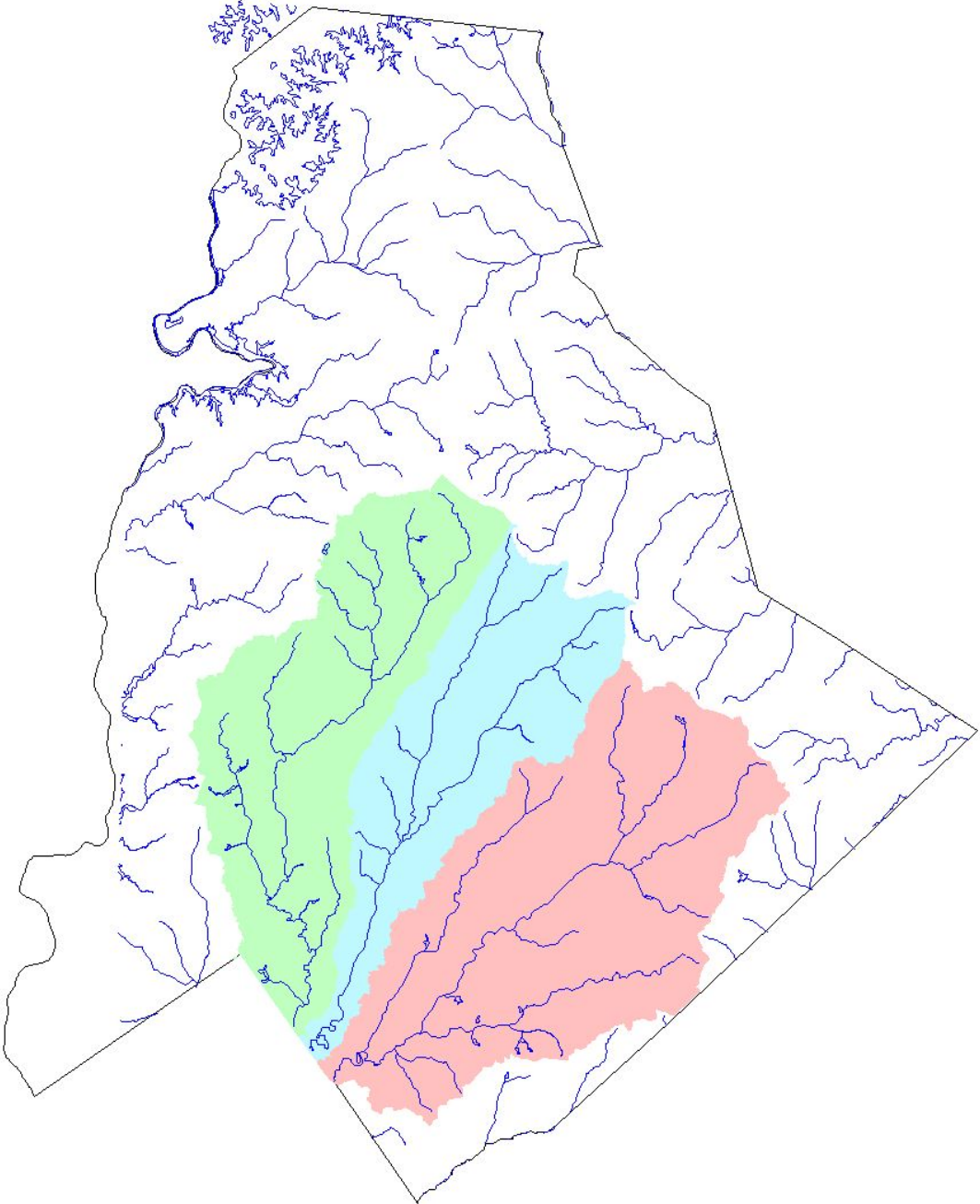
Program Activities	Estimated 5 Year Cost⁽¹⁾
Wastewater Treatment Plants	\$4,600,000
Sanitary Sewer Overflows	\$150,000,000
Failing Septic Systems	\$12,288
Illicit Discharges/Dry Weather Flows	\$329,826
Exfiltration from Sanitary Sewer Pipes	Unknown at this time
Monitoring/Measuring Success	\$31,536
Documentation of Effectiveness of Efforts	\$19,008
Adaptive Management	\$4,896
Public Participation/Outreach Activities	\$7,920
Cost-Benefit Analysis	\$16,200
Totals	\$155,021,674



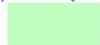
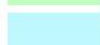
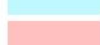


⁽¹⁾ Does not include private sector costs.

9.0 CONCLUSION

The objective of this TMDL Watershed Plan is to reduce fecal coliform bacteria levels in Sugar, Little Sugar and McAlpine Creek and comply with N.C. water quality standards in accordance with the established TMDLs. This is a difficult task that will involve a great deal of trial and error as much remains unknown regarding fecal coliform bacteria in these streams and the methods that are effective at achieving the desired reductions. The ability to adapt strategies based on new and better data is essential to the success of this effort; therefore, this document will be subject to significant changes as this process moves forward. Equally important is the ability to effectively monitor and report successful source reduction measures. The objective of this Watershed Plan is to learn what works and consistently apply those proven techniques toward achieving the desired reductions. In some situations, these techniques may be simple to apply but more often than not they will be time consuming and costly. The overriding objective of this Plan is to spend resources wisely based on a careful assessment of the problem and a thorough evaluation of outcomes.

Appendix A: Location of TMDL Watersheds in Mecklenburg County



<h2>Legend</h2>	
<p> Meck. Co. Streams</p> <p> Sugar Creek</p> <p> Little Sugar Creek</p> <p> McAlpine Creek</p> <p> Mecklenburg County</p>	
<p><small>This map comprises information from multiple sources. It is for illustrative purposes only and should not be used for regulatory decisions. MCDP assumes no liability for damages caused by inaccuracies in this map or supporting data.</small></p> <p><small>For more information contact the Mecklenburg County Department of Environmental Protection.</small></p>	

Appendix B: Source Reduction Strategies

Irwin Creek

Source Category	Original Source Distribution	Source Reduction Target %	Source Reduction Target #
WWTP	No Daily Max	Max 1000 c.f.u./100 ml conc. In effluent	NA
SSOs	55 SSOs; 228 hour duration	33% Reduction and 3 hr duration	36 SSOs; 103 hour duration
Wildlife	NA	NA	NA
Septic Systems	30 Failing Septic Systems	60% Reduction	18 Failing Septic Systems Eliminated
Dry Weather Flow	70 Outfalls with Dry Weather Flow	60% Reduction	42 Outfalls with Dry Weather Flow Eliminated
Sewer Exfiltration	58 c.f.u./100 ml in Ground Water	5 c.f.u./100 ml in Ground Water	NA

Sugar Creek

Source Category	Original Source Distribution	Source Reduction Target %	Source Reduction Target #
WWTP	No Daily Max	Max 1000 c.f.u./100 ml conc. In effluent	NA
SSOs	86 SSOs; 371 hour duration	33% Reduction and 3 hour duration	57 SSOs; 165 hour duration
Wildlife	40 Geese 20 Ducks	NA	40 Geese 20 Ducks
Septic Systems	43 Failing Septic Systems	60% Reduction	26 Failing Septic Systems Eliminated
Dry Weather Flow	105 Outfalls with Dry Weather Flow	60% Reduction	63 Outfalls with Dry Weather Flow Eliminated
Sewer Exfiltration	58 c.f.u./100 ml in Ground Water	5 c.f.u./100 ml in Ground Water	NA

Little Sugar Creek

Source Category	Original Source Distribution	Source Reduction Target %	Source Reduction Target #
WWTP	No Daily Max	Max 1000 c.f.u./100 ml conc. In effluent	NA
SSOs	93 SSOs; 443 hour duration	25% Reduction and 3 hour duration	69 SSOs; 206 hour duration
Wildlife	150 Geese 50 Ducks	NA	150 Geese 50 Ducks
Septic Systems	26 Failing Septic Systems	60% Reduction	16 Failing Septic Systems Eliminated
Dry Weather Flow	191 Outfalls with Dry Weather Flow	60% Reduction	115 Outfalls with Dry Weather Flow Eliminated
Sewer Exfiltration	58 c.f.u./100 ml in Ground Water	5 c.f.u./100 ml in Ground Water	NA

Upper McAlpine Creek

Source Category	Original Source Distribution	Source Reduction Target %	Source Reduction Target #
WWTP	No WWTP	-	-
SSOs	40 SSOs; 206 hour duration	33% Reduction and 3 hour duration	21 SSOs; 39 hour duration
Wildlife	40 Geese 10 Ducks	NA	40 Geese 10 Ducks
Septic Systems	3 Failing Septic Systems	80% Reduction	2 Failing Septic Systems Eliminated
Dry Weather Flow	65 Outfalls with Dry Weather Flow	82% Reduction	53 Outfalls with Dry Weather Flow Eliminated
Sewer Exfiltration	58 c.f.u./100 ml in Ground Water	5 c.f.u./100 ml in Ground Water	NA

Lower McAlpine Creek

Source Category	Original Source Distribution	Source Reduction Target %	Source Reduction Target #
WWTP	No Daily Max	Max 1000 c.f.u./100 ml conc. In effluent	NA
SSOs	39 SSOs; 195 hour duration	25% Reduction and 3 hour duration	31 SSOs; 93 hour duration
Wildlife	160 Geese 90 Ducks 10 Beavers	NA	160 Geese 90 Ducks 10 Beavers
Septic Systems	35 Failing Septic Systems	40% Reduction	14 Failing Septic Systems Eliminated
Dry Weather Flow	92 Outfalls with Dry Weather Flow	40% Reduction	37 Outfalls with Dry Weather Flow Eliminated
Sewer Exfiltration	58 c.f.u./100 ml in Ground Water	5 c.f.u./100 ml in Ground Water	NA

