D.C. DEPARTMENT OF HEALTH
Environmental Health Administration
Bureau of Environmental Quality
Water Quality Division

DISTRICT OF COLUMBIA

FINAL
TOTAL MAXIMUM DAILY LOAD

FOR

FECAL COLIFORM BACTERIA

IN

ROCK CREEK

FEBRUARY 2004

Government of the
District of Columbia
Anthony A. Williams, Mayor

Theodore J. Gordon
Senior Deputy Director for Environmental Health Science and Regulation

GOVERNMENT OF THE DISTRICT OF COLUMBIA
DEPARTMENT OF HEALTH
James A. Buford, Director

DISTRICT OF COLUMBIA

FINAL
TOTAL MAXIMUM DAILY LOAD

FOR

FECAL COLIFORM BACTERIA

IN

ROCK CREEK

DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH ADMINISTRATION
BUREAU OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION

FEBRUARY 2004

INTRODUCTION

Section 303(d)(1)(A) of the Federal Clean Water Act (CWA) states:

> Each state shall identify those waters within its boundaries for which the effluent limitations required by section 301(b)(1)(A) and section 301(b)(1)(B) are not stringent enough to implement any water quality standards applicable to such waters. The State shall establish a priority ranking for such waters taking into account the severity of the pollution and the uses to be made of such waters.

Further section 303(d)(1)(C) states:

> Each state shall establish for the waters identified in paragraph (1)(A) of this subsection, and in accordance with the priority ranking, the total maximum daily load, for those pollutants which the Administrator identifies under section 304(a)(2) as suitable for such calculations. Such load shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality.

In 1998, the District of Columbia developed a list of waters that do not or are not expected to meet water quality standards as required by section 303(d)(1)(A). The list was revised in 2002. The list of water bodies contains a priority list of those waters that are the impaired. This priority listing is used to determine which of those water bodies are in critical need of immediate attention. The list, also known as the 303(d) List, is submitted to the Environmental Protection Agency every two years. For each of the listed waters, states are required to develop a Total Maximum Daily Load (TMDL) which calculates the maximum amount of a pollutant that can enter the water without violating water quality standards and allocates that load to all significant sources. Pollutants above the allocated loads must be eliminated.

This TMDL is for fecal coliform bacteria for Rock Creek. The District of Columbia's section 303(d) list divides Rock Creek into two segments: Upper Rock Creek and Lower Rock Creek. The demarcations are used to isolate the areas not attaining the applicable standards. The same water quality standards for fecal bacteria, however, apply to the entire length of Rock Creek.

In February of 1999, the District of Columbia initiated regular technical TMDL stakeholder meetings which included the Environmental Protection Agency, Region III (EPA), the DC Water and Sewer Authority (DCWASA), the Maryland Department of the Environment (MDE), representatives of the local governments, including the Prince George's and Montgomery Counties, Metropolitan Washington Council of Governments, the Interstate Commission on the Potomac River Basin (ICPRB), and citizen and environmental advocates. The group provided significant input and coordination to the DC TMDLs. In particular, the modeling elements used in the bacteria TMDL were developed in coordination with those utilized in the DC Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP) (DCWASA, 2002). This is in keeping with the 1994 EPA national Combined Sewer Overflow (CSO) policy that required municipalities and authorities to develop and submit a Long Term Control Plan (LTCP) to reduce combined sewer overflows such that water quality standards could be met.

APPLICABLE D.C. WATER QUALITY STANDARDS

Rock Creek is listed on DC's 303(d) lists because of excessive counts of fecal coliform bacteria. The District of Columbia Water Quality Standards (WQS), Title 21 of the District of Columbia Municipal Regulations (DCMR) Chapter 11 (Effective, January 24, 2003), specifies the categories of beneficial uses as:

1. Class A- primary contact recreation,
2. Class B- secondary contact recreation and aesthetic enjoyment,
3. Class C- protection and propagation of fish, shellfish, and wildlife,
4. Class D- protection of human health related to consumption of fish and shellfish, and;
5. Class E- navigation.

The waters are classified on the basis of current use and designated beneficial uses as follows:

Waterbody	Current Use	Designated Use
Rock Creek	B,C,D,E	A,B,C,D,E

Class A and Class B waters must achieve or exceed water quality standard for bacteria as measured by fecal coliform as an indicator organism. While most fecal coliforms, which are microbes that live in the intestinal tracts of warm-blooded animals, are not harmful themselves, their presence indicates the potential for pathogens in the water. Water quality standards are derived from EPA recommendations based on risk levels associated with swimming.

The standard for Class A waters is a maximum 30-day geometric mean of 200 MPN/100 ml, where MPN is a statistically-derived estimate of the "Most Probable Number" of bacteria colonies in a 100 ml sample. This statistical estimate is often called a "count" although it is represented as a concentration. The geometric mean is based on no fewer than five samples within the 30-day period. The standard for Class B waters is a 30-day geometric mean of 1000 MPN/100 ml. However since all the water bodies are designated as Class A waters, which have a more restrictive bacteria standard, the 200 MPN/100ml for Class A designation is used as the not-to-exceed criterion for all the waterbodies in this TMDL.

The following sections of the District of Columbia Water Quality Standards are relevant for this TMDL:

1104.3 Class A waters shall be free of discharges of untreated sewage, litter and unmarked, submerged or partially submerged, man-made structures which would constitute a hazard to the users. Dry weather discharges of untreated sewage are prohibited.

1104.4 The aesthetic qualities of Class B waters shall be maintained. Construction, placement or mooring of facilities not primarily and directly water oriented is prohibited in, on, or over Class B waters unless:

(a) The facility is for the general public benefit and service, and

(b) Land based alternatives are not available.

1105.7 Mixing zones may be allowed for point source discharges of pollutants on a case-by-case basis, where it is demonstrated that allowing a small area impact will not adversely affect the waterbody as a whole. The following conditions shall apply:

(e) The positioning of mixing zones shall be done in a manner that provides the greatest protection to aquatic life and for the designated uses of the water;

(f) Within the estuary, the maximum cross-sectional area occupied by a mixing zone shall not exceed ten percent (10%) of the numerical value of the cross-sectional area of the waterway, and the width of the mixing zone shall not occupy more than one third (1/3) of the width of the waterway;

Current use - the use which is generally and usually met in the waterbody at the present time in spite of the numeric criteria for that use not being met sometimes.

Designated use - the use specified for the waterbody in the water quality standards whether or not it is being attained.

Existing use - the use actually attained in the waterbody on or after November 28, 1975.

Mixing zone - a limited area or a volume of water where initial dilution of a discharge takes place; and where numerical water quality criteria can be exceeded but acute toxic conditions are prevented from occurring.

Primary contact recreation - those water contact sports or activities which result in frequent whole body immersion and/or involve significant risks of ingestion of the water.

Secondary contact recreation - those water contact sports or activities which seldom result in whole body immersion and/or do not involve significant risks of ingestion of the water.

Class A and B are not existing uses for Rock Creek, although Class B is listed as a current use. Class A and B are designated uses for Rock Creek. The mixing zone concept implies that even though some area of a water body does not attain the numerical criteria that the use is still attained or protected the water body. The definitions of Class A primary contact recreation and Class B secondary contact recreation make clear the there is a risk level associated with recreational activities. The EPA criteria document estimated that at a geometric mean of 200 organisms per 100 ml that there would be about 8 illnesses out of 1,000 swimmers at a recreational swimming beach. The use of a geometric mean recognizes that there will be occasions where individual samples will be higher than 200 organisms/100ml. Obviously, different types of Class A activities carry different risks, with swimming involving the highest risk. Activities such as windsurfing where the person spends most of the time out of the water but spends significant amounts of time in the water or being splashed with water runs a lesser risk. While in the case of scuba diving, because of increased pressure of the water at depths, may cause a higher prevalence of ear infections than other types of activities. Certain Class A activities may be limited by factors other than disease risk. Issues such as current velocity, floods, clarity of the water and competing uses such as navigation or fishing may restrict these activities to certain areas at certain times and most certainly winter temperatures and heavy ice create limitations. The District of Columbia water quality standards do not guarantee risk free primary contact recreation nor do they guarantee that it can occur everywhere all of the time.

BACKGROUND

The District of Columbia, like many cities in the 19th and early 20th centuries, developed a combined sewer system, which transported both rainfall and sanitary sewage away from the developed areas and discharged them into the rivers. In the 1930s, Blue Plains Wastewater Treatment Plant (WWTP) was constructed and dry weather sewage flows were transported to Blue Plains. This is the only wastewater treatment plant in the District of Columbia and is located at southeast corner of D.C. outside the Rock Creek watershed. However, wet weather flows can exceed the transmission capacity of the pump stations and piping system and result in overflows. As development expanded, sewer system construction techniques utilized two separate systems so that the storm water could be kept isolated from the sanitary sewage. Storm water is transported and discharged via individual pipe networks to the nearest stream channel, while the sanitary sewage is transported to Blue Plains WWTP for treatment. Approximately two third of the city is served by separate sewer systems. The presence of excessive fecal coliform in Rock Creek is caused by upstream loads, storm water runoffs, and combined sewer overflows. Although urban in nature, non-human sources of bacteria are also contributing factors.

LAND USE

Rock Creek

The Rock Creek watershed comprises approximately 76 square miles, with approximately 20% of the drainage area within the District of Columbia and the remaining 80% within Montgomery County, Maryland. Rock Creek stretches 33 miles, but in the District of Columbia it only runs 9.3 miles (USGS, 2002). This creek is predominantly within the Piedmont province, with only the last quarter mile of the creek being tidally influenced. The head of tide is approximately where Pennsylvania Avenue crosses the waterway. Figure 1 shows the Rock Creek watershed in the District of Columbia. Figure 2 shows major tributaries of Rock Creek in D.C.

Land use in Rock Creek is predominantly residential, commercial, and park land/open space. Rock Creek Park is one of the oldest city parks in the nation and is host to many recreation activities, including biking, jogging, golf, and horseback riding. The United States Park Police maintain two horse stables within the Park and a private stable is located in Montgomery County just upstream from the District of Columbia border. The park and watershed are also home to the Smithsonian Institution's National Zoological Park, boasting a wide array of exotic and domestic fauna.

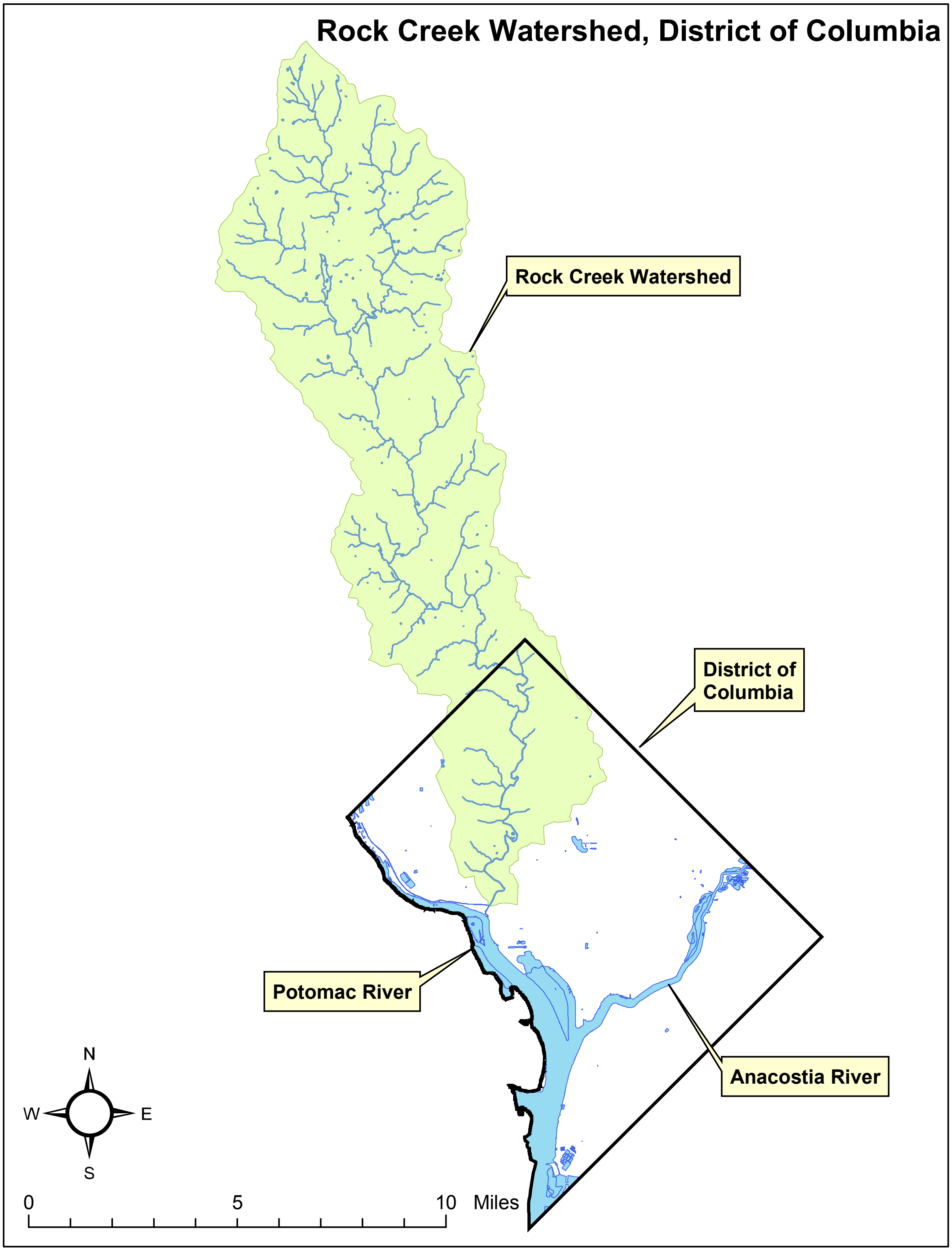

Figure 1: Rock Creek Watershed

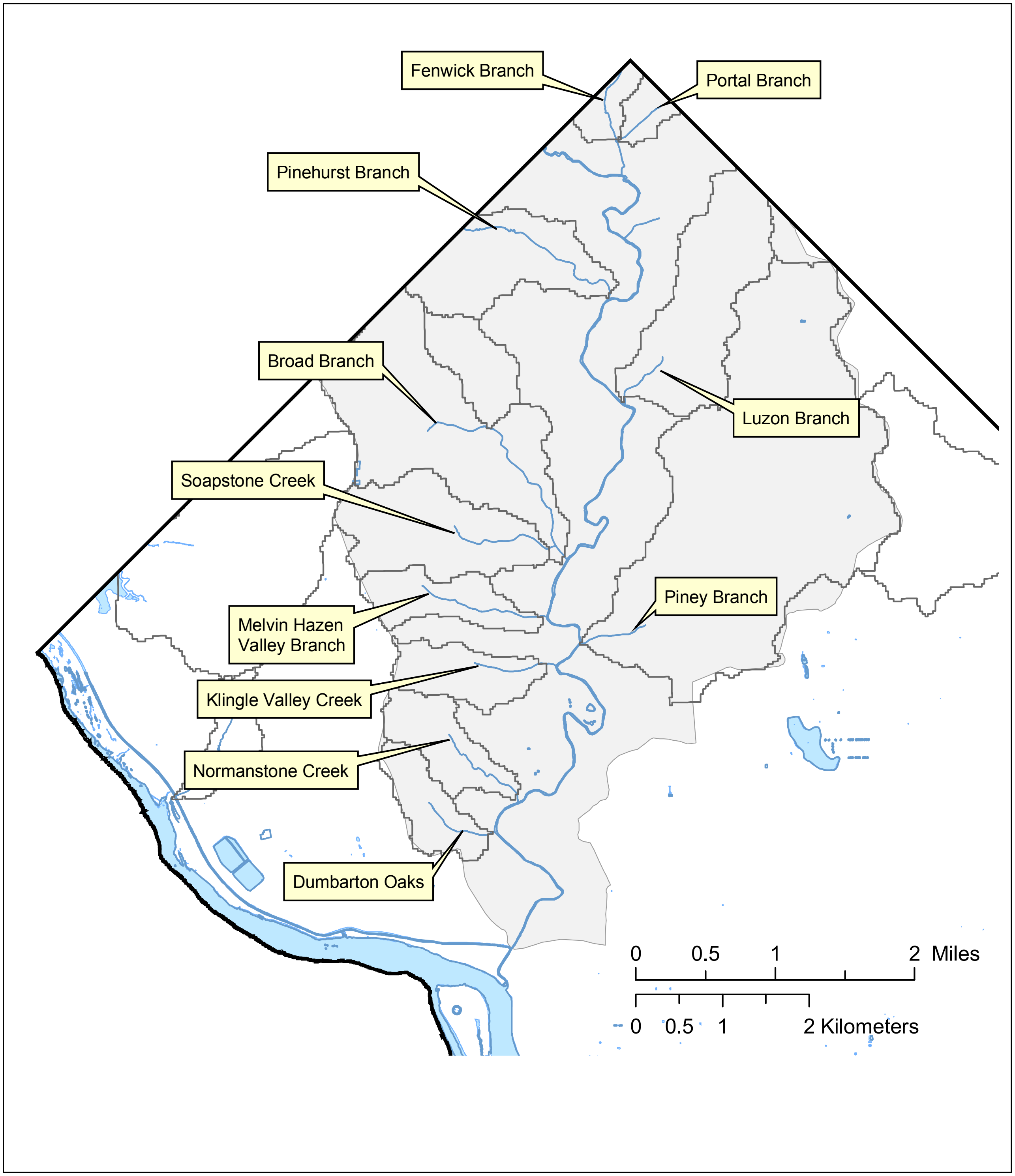

Figure 2: Rock Creek Tributaries

STREAM FLOW

Rock Creek

Rock Creek lies mainly along the fall line between the Piedmont and Coastal Plain provinces, and is fairly shallow, swift, free-flowing stream. It is unaffected by the tide for the majority of its length. The low volume in the creek results in poor dilution potential, but the rapid flow rates allow for good flushing rates. The average flow rate in Rock Creek is approximately 63.7 cubic feet per second.

SOURCE ASSESSMENT

The sources of fecal coliform are ubiquitous. Any means by which fecal matter can be transported to the receiving waters are a potential source. These sources include combined sewer overflows (CSOs); separate sanitary sewer overflows (SSOs), which can result from leaky or undersized sanitary sewer pipes; stormwater runoff, which includes overland flow and flow conveyed through storm sewer pipes, and direct deposits of feces into the water from wildlife sources. A bacteria source tracking study is currently being conducted to help identify these sources, however since the water quality standards do not differentiate between sources, these TMDLs do not address sources directly. In order to assess point and non-point sources in the District of Columbia, it is necessary to describe how storm runoff and sanitary sewage is collected, transported, treated and discharged.

Within the District of Columbia, there are three different types of sewer networks. Originally, a combined sewer system was installed that collected both sanitary waste and storm water and transported it to the wastewater treatment plant. When storm water caused the combined flow to exceed the pipe capacity leading to the treatment plant, the excess untreated flow is discharged, called combined sewer overflows (CSOs), through a number of outfalls to rivers and creeks. Approximately one third of the District of Columbia is served by the combined sewer system.

The remaining two thirds of the District of Columbia is served by a separate sanitary system that collects only sanitary sewage, while storm water is transported and discharged via individual pipe networks to the nearest stream channel. The separate sanitary sewer line should have no storm water inlets to the system and it flows directly to the wastewater treatment facility. Even though sanitary pipes are only intended to carry wastewater flow, they are influenced by rainfall. Infiltration and inflow of stormwater into sanitary pipes has the potential to cause surcharging and overflows. These overflows can reach the storm sewer system or the receiving waters directly. For this TMDL, sanitary sewer overflows (SSO) were not modeled explicitly, as it was assumed that any bacteria from a routine SSO would be represented by the quality of the storm water.

Separate storm water networks collect storm water from streets and parking lots. Storm runoffs are then directly discharged to nearby rivers or streams. In general, the primary sources of bacteria to the storm water are wildlife and pets. Storm sewer pipes should have no sanitary sewer laterals entering the system. However, as in many old cities, illicit and cross connections do exist and can be a significant source of bacterial contamination to the waterways. Currently, DCWASA has active programs to identify and remove illegal connections. For this TMDL, illicit connections were not modeled explicitly.

Point Sources

There are a total of 29 CSO outfalls located on Rock Creek. Among the outfalls, one is abandoned (CSO No. 055) and another CSO area (Luzon Valley CSO No. 059) was completely separated in early 2002. Approximately 49 million gallons of CSOs discharged per average year to Rock Creek (DCWASA 2002).

Nonpoint Sources

The Rock Creek watershed is urbanized in nature with major parklands. Direct runoffs from parklands flanking the water bodies and not serviced by storm water sewers also occur along Rock Creek and its tributaries. Therefore, during wet weather events, there is a combination of direct storm water runoff and storm water being carried by pipes to receiving water bodies. Historically considered nonpoint source, storm water runoff discharged from separate storm water systems (SSWS) are permitted under the National Pollution Discharge Elimination System.

Upstream Sources

Eighty percent of the Rock Creek watershed lies in Maryland and drains into D.C.'s portion of the creek. Studies show storm runoffs are a significant source of fecal coliform. Therefore, loads from upstream sources can contribute significantly to the bacteria problem in Rock Creek. This report refers to pollution entering the District of Columbia from Maryland being an upstream source.

TMDL ANALYTICAL APPROACH

Water Quality Standards and TMDL End Points

The majority of the Rock Creek watershed lies in Maryland upstream of the District of Columbia. Therefore in addition to D.C. water quality standards, Maryland water quality standards have also been considered for this TMDL. The following table summarizes both D.C. and Maryland Bacteria Standards.

D.C. and Maryland Water Quality Standards – Fecal Coliform (MPN/100ml**)

D.C.		
Class of Use	A	B
Fecal coliform – maximum 30-day geometric mean for 5 samples	200	1000
Maryland*		
Bacteriological	Public Health	
Fecal coliform – maximum log mean based or not less than 5 samples over any 30 day period, or	200	
Fecal coliform – maximum value which may be exceeded during any 30-day period by less that 10% of total number of samples taken	400	

*COMAR 26.08.02.03-3

** MPN is the statistical estimate of the number of fecal coliform colonies likely to be found in a 100 ml sample.

The purpose of this TMDL is to determine the limit to which fecal coliform counts must be reduced to achieve and maintain the WQS for bacteria. The criteria must be achieved for all flow conditions. Since fecal coliform are not measured in traditional concentrations (mass/volume), the TMDL is not a true maximum load, but rather a statistical estimate of the most probable number of coliform colonies that can be assimilated into the receiving waters without violating the WQS. Computationally, however, this parameter can be represented like a traditional pollutant and so for this TMDL it will be referred as a fecal coliform load. The criterion of 200 MPN/ml in both D.C. and Maryland water quality standards was used as the end point for this TMDL. In addition, Maryland's 400 MPN/ml criterion was considered as a supplement to the analysis.

Seasonal Variations and Critical Conditions

Because of the episodic nature of rainfall and storm water runoff, developing a daily load is not an effective means of determining the assimilative capacity of the receiving waters. Rather, looking at total loads over a range of conditions is a more relevant way to determine the maximum allowable loads. A statistical analysis of rainfall records over a period of fifty years was conducted and a dry year, a wet year, and an average rainfall year, were identified based on total annual rainfall and other factors such as average intensity and number of events per year (DCWASA, 2002a). The consecutive years of 1988, 1989, and 1990, represent a relatively dry year, a wet year, and an average precipitation year, respectively. These three years were considered the period of record for determining compliance with the water quality standards for the TMDL analysis. Determination of compliance with the water quality standards was based on the frequency of violations as calculated by the simulation model for these three years.

Modeling

The framework for this TMDL was established through a rigorous discussion by stakeholders on all aspects of the watershed processes and interpretation of the loadings and receiving water responses to those loadings. The modeling approach applied included two components. The models used to generate loads from the drainage basin, convey them through drainage systems, and then predict their contribution to the receiving waters were formulated as part of the CSO LTCP and called Land Models. The in-stream processes were simulated using the EPA's SWMM model.

Land Models

Two land models were used for simulating loads from drainage basins served by sewer systems: one for the combined sewer system and another for the separate storm sewer system. The models were developed by the DC Water and Sewer Authority (DCWASA) as part of the CSO Long Term Control Plan (LTCP). The models can generate rainfall runoff based on various hydrologic input parameters of the drainage basin, including precipitation, land use, and soil characteristics, and route the runoff through a collection system.

The models were calibrated and verified using data collected for the LTCP between October 1999 and June 2000. The details of the models, including calibration and verification can be found elsewhere (DCWASA, 2002b; DCWASA, 2002c). The models were run for a three-year simulation period of 1988 to 1990, and hourly outputs from the models were input into the Rock Creek Model.

Rock Creek Model

This one-dimensional model represents the entire length of Rock Creek in the District of Columbia, and was developed using the TRANSPORT Block of SWMM. The model inputs include loads from upstream, CSOs, SSWS, and direct overland flows. Direct in-stream deposit from wildlife is insignificant, therefore, not considered in the modeling. The upstream boundary condition is represented by flows measured at the USGS gage on Rock Creek at Sherill Drive near D.C./Maryland boundary, and concentrations derived from data taken just north of the District of Columbia/Maryland boundary. Details of the modeling, calibration and verification can be found elsewhere (DCWASA, 2000d).

TOTAL EXISTING LOADS

The existing fecal coliform loads are calculated for various sources by different models described earlier. The annual loads are an average estimation over the period of analysis of 1988 to 1990. Annual existing load is determined by averaging loads for the three-year analysis period and considering combined sewer system with Phase I controls.

Rock Creek is divided into upper and lower segments in D.C.'s 303(d) list, where the line of separation is at Pierce Mill Dam near Klingle Road above the National Zoo (see Figure 3). The average loads listed below are broken down by sources: upstream loads representing the in-stream and watershed loads delivered at the D.C./Maryland boundary for upper Rock Creek; and direct runoff, separate storm water, and CSO representing the DC portion of the loads from lateral overland flow, separate storm sewers and combined sewer overflows, respectively.

Rock Creek Existing Average Annual Loads

Upper Rock Creek		Lower Rock Creek	
Source	Average Annual Load (MPN)	Source	Average Annual Load (MPN)
Upstream	9.917E+14	Upstream	2.325E+15
CSO	0.000E+00	CSO	1.860E+15
Separate Storm Water	1.265E+15	Separate Storm Water	4.457E+14
Direct Storm Runoff	6.875E+13	Direct Storm Runoff	5.371E+13
Total	2.325E+15	**Total**	4.685E+15

TOTAL MAXIMUM DAILY LOAD AND ALLOCATION ANALYSIS

Overview

This section summarizes the scenarios that were explored using the models. The assessment investigates water quality responses assuming different loading conditions. Subsequent sections present the modeling results, allocate the TMDL between point sources and nonpoint sources, and describe the rationale for margin of safety.

Scenarios

To set the TMDL, a series of computer simulations were run to determine the amount of reduction of loads that would be needed to meet water quality standards. Water Quality Standards (WQS) are considered to be met if no model segment within the District of Columbia had a maximum 30-day geometric mean exceeding the 200 MPN/100 ml Class A, standard. Exceedance is expressed in the number of months exceeding the geometric mean.

The simulation scenarios consist of model runs made for certain percent reductions for each of the four sources (i.e., upstream, lateral, CSO, and separate storm water sources). A large number of scenarios for a combination of reductions can be constructed and analyzed. For this TMDL, the models were run over a range of reductions in the storm water given a number of CSO scenarios. Two sample scenarios are presented in this report. The geometric mean was calculated for each of the 36 calendar months in the three-year period. Sensitivity runs were evaluated based on a rolling 30-day geometric mean, rather than the calendar month. Figure 3 shows the model segments for the TMDL analysis. The number of months WQS exceeded at selected segments is summarized in the Tables below. Figures showing the results for each month are included in Appendix A.

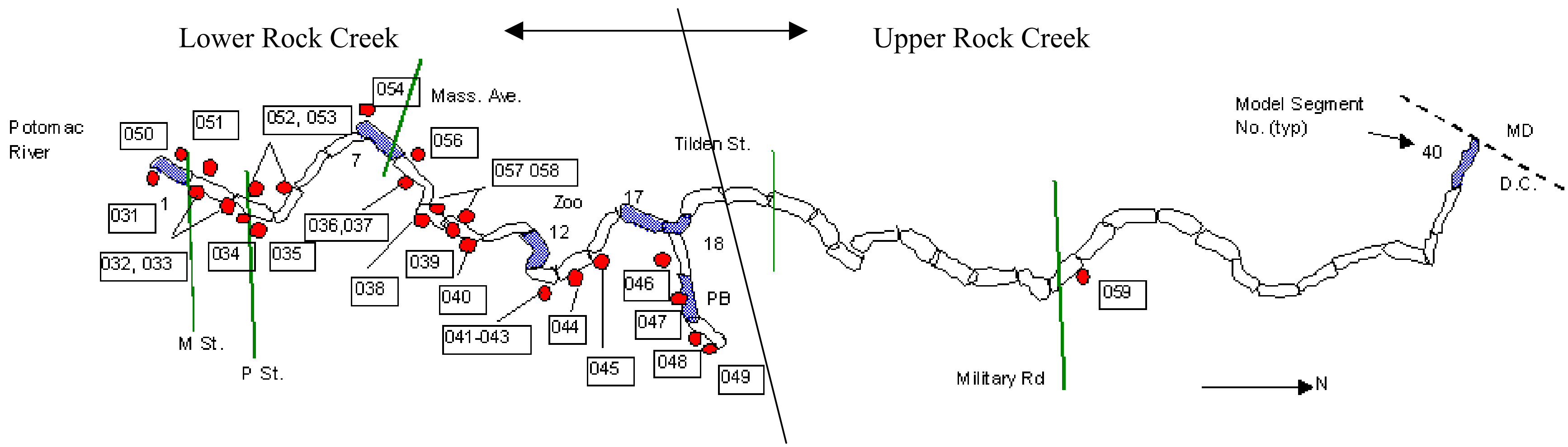

Figure 3: Rock Creek Model Segments

Scenario 1 – 92 percent reduction in CSOs and 50 percent reduction in all other sources per average year.

Number of Months Exceeding WQS

Criteria	Model Segment					
	1	7	12	17	18	40
No. of Months Geomean > 200/100ml	12	12	12	12	12	12
No. of Months Geomean > 1000/100ml	0	0	0	0	0	0

Scenario 2 - 92 percent reduction in CSOs and 75 percent reduction in all other sources per average year

Number of Months Exceeding WQS

Criteria	Model Segment					
	1	7	12	17	18	40
No. of Months Geomean > 200/100ml	7	7	8	9	8	3
No. of Months Geomean > 1000/100ml	0	0	0	0	0	0

ALLOCATIONS, REDUCTIONS, MARGIN OF SAFETY, AND THE TMDL

The total allowable load of fecal coliform reflects the reduction needed to meet the 30-day geometric mean during the three-year (1988, 1989 and 1990) period of analysis. For this TMDL analysis, the load reductions needed to meet water quality standards were from the upstream and direct lateral loads, storm water loads and combined sewer flows. The allocation is based on 92.7 percent reduction for CSOs, and 95 percent reduction for all other sources, including upstream loads at the DC/MD boundary. A uniform reduction is considered for all separate storm sewers and direct runoffs. For CSOs, the recommended long-term control plan scenario (DCWASA, 2002) was used for the selected TMDL analysis.

Selected Allocation Scenario

The selected allocation scenario meets the District of Columbia Water Quality Standards of 200MPN/100ml for Class A waters. In the analysis, the rolling 30-day geometric mean was used to determine compliance. For the load allocation scenario, the number of months where the maximum 30-day geometric mean exceeds 200 MPN/100ml must be zero. The results of the selected scenario run are shown below.

Scenario 3 – Allocation Run - Number of Months Exceeding WQS

Criteria	Model Segment					
	1	7	12	17	18	40
No. of Months Geomean > 200/100ml	0	0	0	0	0	0
No. of Months Geomean > 1000/100ml	0	0	0	0	0	0

In selecting the allocation scenario, the number of days fecal coliform count of 400 MPN/100ml exceeded was also considered. Analysis of various scenario runs shows upstream loads bear significantly on the exceedances in Rock Creek in the District of Columbia. The following table shows the number of days fecal coliform count of 400 MPN/100ml exceeded for the selected allocation scenario.

Number of Days Exceeding 400 MPN/100ml

	FECAL COLIFORM # of days >400 MPN/100ml					
Month	Segment No					
	1	7	12	17	18	40
1	<1	<1	<1	<1	<1	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	<1	<1	<1	<1	0	0
6	<1	<1	0	0	0	0
7	1	<1	0	0	0	0
8	<1	<1	0	0	0	0
9	1	1	<1	<1	<1	0
10	1	1	1	1	<1	0
11	<1	<1	<1	<1	0	0
12	<1	<1	<1	<1	<1	0
Total	4	4	2	2	1	0
% Year	1%	1%	1%	1%	0%	0%

Waste Load Allocation (WLA) and Load Allocation (LA)

Combined sewer overflows occur in between model segments 1 and 18, Lower Rock Creek, in the main-stem. The following table shows load allocations for Upper and Lower Rock Creek.

TMDL for Fecal Coliform Bacteria in Rock Creek (Average Annual Loads)

Upper Rock Creek		Lower Rock Creek	
Source	Average Annual Load (MPN)	Source	Average Annual Load (MPN)
Upstream	4.909E+13	Upstream	1.151E+14
CSO	0.000E+00	CSO	1.346E+14
Separate Storm Water	6.266E+13	Separate Storm Water	2.206E+13
Direct Storm Runoff	3.403E+12	Direct Storm Runoff	2.659E+12
1%MOS	1.163E+12	1%MOS	2.772E+12
Total	1.163E+14	**Total**	2.772E+14

Other Sources and Reserve

The allocation of fecal coliform to reserve is considered zero.

Margin of Safety

The loading reductions in Rock Creek are 92.7% for CSOs and 95% for all other sources. The margin of safety for allocated loads is implicit in the load allocation as conservative approach in selecting number of days exceeding 400 MPN/ml was considered in addition to the rolling geomean criteria of 200 MPN/ml. There is additional implicit margin of safety regarding CSOs. It is the recognized "first flush" effect during storms. Although the combined sewer model assumes a constant average concentration all the time, in reality capturing over 90 percent of the volume will capture initial highly concentrated flows, leaving flows that are less concentrated and diluted. An additional explicit margin of safety of one percent is provided for all sources.

Beneficial Use

The allocation will achieve the District of Columbia's water quality Standards for Class A-Primary Contact recreation and Class B - Secondary contact recreation.

The DC Water Quality Standards Section 1104.3 provides narrative criteria for Class A use. These narrative criteria were developed by the District of Columbia and are not commonly in use in the other states. The TMDL requires a 92.7% reduction of CSO loads to Rock Creek. Analysis of the computer simulations indicates that the remaining CSOs will have only localized impacts in Rock Creek. The LTCP, page 14-9 deals with the degree of treatment provided, and indicates that 99.6% of the time Rock Creek will be free from overflows. According to the LTCP, there will be a total capture of the first flush loads containing the most concentrated combined sewage as well as screening of floatables and large solids prior to discharge. The Department of Health interprets the remaining CSO discharges to be "partially treated sewage."

The Department of Health does not advocate swimming nor complete prolonged immersion in the discharge plume or mixing zone or near vicinity of any point source discharge whether sewage or industrial pollutant. Some Class A uses may occur which have a lower risk. However, the fact that for a few areas for a few days of the year the risk will be higher than other days and other areas does not negate the attainment of the designated use of the waterbody. This variation in risk is implicit in the criteria adoption as a regulation of the District of Columbia. Installation of signs and warning lights concerning CSOs will further guide users in managing and reducing risks. Because of the urban nature of the watershed, Rock Creek is subject to flood conditions frequently. In addition, being a small stream it has many log jams.

IMPLEMENTATION

On June 28, 2000, DC Mayor Williams, Maryland Governor Glendening, U.S. EPA and others signed the new Chesapeake Bay Agreement. The goals of the agreement include:

> "Achieve and maintain the water quality necessary to support the aquatic living resources of the Bay and its tributaries and to protect human health"
> and
> "By 2010, correct the nutrient- and sediment-related problems in the Chesapeake Bay and its tidal tributaries sufficiently to remove the Bay and the tidal portions of its tributaries from the list of impaired waters under the Clean Water Act"

Thus, an agreement is in place that clearly demonstrates a commitment to the restoration of the river by the year 2010. This establishes a completion date for implementation of those activities necessary to achieve the load reductions allocated in this TMDL.

Source Control Plan

Upstream Target Load Reductions for Maryland

Maryland has committed to a 40% nitrogen and phosphorus reduction in the Bay Agreement and has developed tributary strategies. Both Prince Georges and Montgomery Counties have aggressive and effective stormwater management programs. These storm water management programs include various BMPs that will reduce and improve quality of runoffs, consequently reducing bacteria pollution.

CSO Load Reductions

The DC WASA is currently engaged in the implementation of the following CSO reduction programs.

1. Nine Minimum Controls Plan.
2. East side interceptor cleaning to remove sedimentation and restore transmission capacity.
3. Pump station rehabilitation to increase transmission capacity to the treatment plant.

4. Inflatable dam rehabilitation to restore the dam's ability to hold sewage inside the pipe, hence reduce overflows.
5. Swirl concentrator rehabilitation and performance enhancements to improve treatment.

In addition to the above, the DC WASA has proposed storage systems, including one in Rock Creek, in the Final CSO LTCP to reduce CSOs. The CSO LTCP has been approved by DCDOH.

Storm Water Load Reductions

The District of Columbia Water Pollution Control Act (DC Law 5-188) authorizes the establishment of the District of Columbia's Water Quality Standards (21 DCMR, Chapter 10) and the control of sources of pollution such as storm water management (21 DCMR, Chapter 5).

The DC Department of Health has an extensive storm water management, sediment, and erosion control program for construction activities. It also has a Nonpoint Source Management Plan to address the reduction of nonpoint source pollution.

A number of activities to reduce pollutant runoff are carried out as part of the Municipal Separate Storm Sewer Permit for the District of Columbia. The most pertinent of these are contained in the storm water management plan. The plan provides additional mechanisms for achieving the load reductions needed.

Major currently operating programs in DC that reduce loads are as follows:

1. Street sweeping programs by the Department of Public Works.
2. Requirements for storm water treatment on all new development and earth disturbing activities such as road construction.
3. Regulatory programs restricting illegal discharges to storm sewers.
4. Environmental education and citizen outreach programs to reduce pollution causing activities.
5. DC WASA has launched a citywide Sanitary Sewer System Investigation. The activities under this program will eliminate infiltration from sanitary sewer to the storm water system.

Monitoring

The Department of Health maintains an ambient monitoring network that includes the Potomac and Anacostia Rivers and Rock Creek. Data is collected on fecal coliform typically monthly. In addition, many tributaries are monitored on a monthly basis.

BIBLIOGRAPHY

DC WASA, 2002, Combined Sewer System Long Term Control Plan, prepared by Greeley and Hansen, LLC for the District of Columbia Water and Sewer Authority, Washington, D.C.

DCWASA, 2002a, Study Memorandum LTCP-3-2: Rainfall Conditions, Washington, D.C.

DCWASA, 2002b, Study Memorandum LTCP-5-4: CSS – Model Documentation, Washington, D.C.

DCWASA, 2002c, Study Memorandum LTCP-5-7: SSWS – Model Documentation, Washington, D.C.

DCWASA, 2002d, Study Memorandum LTCP-6-6: Rock Creek Model Documentation, Washington, D.C.

District of Columbia Water Quality Standards, 21 DCMR 1100 Chapter 11, Effective January 24 2003, Washington, D.C.

USGS, 2002, Water Quality, Sediment Quality, and Stream-Channel Classification of Rock Creek, Washington, D.C., 1999-2000, Baltimore, Maryland.

APPENDIX A

Scenario Run Results