

Selecting Watershed Restoration Strategies By Using The Analytical Hierarchy Process

Robin Jo Eddy Bolte

A thesis submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Science in the Department of Environmental Sciences and Engineering.

Chapel Hill
2010

Approved by:

Dr. Richard N.L. Andrews

Dr. Gregory W. Characklis

Milton S. Heath, Jr., Esq.

ABSTRACT

ROBIN JO EDDY BOLTE: Selecting Watershed Restoration Strategies By Using The
Analytical Hierarchy Process
(Under the direction of Dr. Richard N.L. Andrews)

While the 1972 Clean Water Act and subsequent Federal judicial rulings indisputably demand TMDL development for assessed impaired waterways, TMDL implementation is less clear. Neither the Federal nor North Carolina TMDL programs prescribe by law or regulation a TMDL implementation plan (i.e. watershed restoration plan) to restore watershed quality. This work addresses the implementation of a TMDL for regulating and mitigating microbial contamination in the Northeast Creek watershed by applying a semi-quantitative Analytical Hierarchy Process (AHP) for the selection of Best Management Practice (BMP) strategies. An AHP decision matrix was developed, and each BMP strategy was compared and weighed against each selected criterion. Results of the analysis indicate a preference for diverse best management practice strategies, with an emphasis on adult stormwater education, stream buffers and enforcement, for successful implementation of a fecal coliform TMDL for Northeast Creek in Durham, North Carolina.

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank the many individuals who contributed their time, expertise, and advice to the successful completion of my master's thesis as well as the academic rigors of the program. My thanks to Dr. Greg Characklis, for his patience and guidance throughout the Environmental Management and Policy practicum, and Milton Heath Jr., Esq., for his willingness to share his vast knowledge of environmental law and North Carolina politics. And without the support, understanding and encouragement of Drs. Pete Andrews and Leigh-Ann Krometis, I am doubtful I would be here today. I am not sure I could thank either of them enough.

I would also like to thank a number of individuals who took the time to help me better understand TMDLs, stakeholders and/or stakeholder values in the development of watershed restoration strategies: Richard Whisnant, Esq. (Professor, North Carolina Institute of Government); Dr. Brian Benham (Professor, Virginia Tech Department of Biological Systems Engineering); John Cox (Water Quality Engineer, City of Durham Stormwater Services); Lisa Martin (Director of Regulatory Affairs, North Carolina Homebuilders Association); Melissa Rooney (member of Northeast Creek Streamwatch and the Durham Fairfield Neighborhood Association); Michael Pollock, Colleen Haithcock, Randall Haithcock and Janet Hitti (members of Northeast Creek Streamwatch).

I would like to thank my employer, namely Jim Palmer and Todd Tucker who gave me the rare opportunity as well as free range to pursue a master's degree full time while continuing work at full pay and benefits.

Last of all, I would like to thank those closest to me. My husband Jeff, whose constant support of all I attempt is never failing, even if he is oceans away. After many years together, he is and continues to be my rock. My son Jack, who reminds me every day of all I have to be thankful for. Loving you is the best thing I do.

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LIST OF ABBREVIATIONS

Abbreviations	Definition
AHP	Analytical Hierarchy Process
BMP	Best Management Practices
CDC	Center for Disease Control
DWQ	Division of Water Quality
EMP	Environmental Management and Policy
EPA	Environmental Protection Agency
GIS	Geographic Information System
HSPF	Hydrological Simulation Program-FORTRAN
LID	Low Impact Development
NCDENR	North Carolina Department of Environment and Natural Resources
NPDES	National Pollutant Discharge Elimination System
TMDL	Total Maximum Daily Load
UDO	Unified Development Ordinance
WIP	Watershed Improvement Plan
WS-IV NSW	Water Supply-IV Nutrient Sensitive Water

Chapter I

Introduction

Decades after the passage of the Federal Clean Water Act and its subsequent amendments, many of the nation's waterways remain impaired (NRC 2001). Per the most recent *National Water Quality Inventory: Report to Congress*, more than 40% of the assessed waters are not meeting their water quality standards prescribed by the states, territories and other jurisdictions (EPA 2009a). As a result, the United States Environmental Protection Agency (EPA) estimates that a majority of Americans live less than ten miles from an impaired waterway. This number is likely to be far greater given that nationally only 25% of all rivers and streams and 44% of all lakes, reservoirs and ponds have been properly assessed for impairments (EPA, 2009b).

1.1 Federal TMDL Regulatory Background

Improvements in water quality have been largely in part to the reduction of point source discharges through the Clean Water Act's principle regulatory tools of technology based standards and the National Pollutant Discharge Elimination System (NPDES) (Boyd 2000; Houck 2002). However, positive progress toward water quality goals has slowed, making it unlikely that these regulatory tools alone will render all United States waters "fishable and swimmable" (NRC 2001). The primary remaining obstacles are non-point sources of microbial pathogens, nutrients, metals and sediments entering waterways (see

Figure 1), such as stormwater runoff (EPA 1996stormwater runoff¹ (EPA 1996; EPA 2000a; NRC 2008).

Pathogen indicators reaching surface waters from stormwater runoff alone have contributed to the contamination of an estimated

5529 waterways (Gaffield et al. 2003), and are the leading cause of water impairment nationally (EPA 2009b). A recent study in North Carolina has indicated that as the amount of impervious surface increases the receiving water concentration of indicator organisms has also shown an increase (Mallin et al. 2000). Additional studies have confirmed that receiving waters in urbanized areas may be at greater risk for microbial contamination (Schueler 1994; CWP 1999; May et al. 1997; Wang 2001).

Improving water quality is necessary to protect the public health. The 1948 Federal Water Pollution Control Act (P.L. 80-845) and its subsequent amendments such as the 1972 Clean Water Act (P.L. 92-500) and the 1987 Water Quality Act (P.L. 100-4), legislatively mandate improving the sanitary conditions of the nation's water bodies as well as the elimination or reduction of all sources of pollution. The Clean Water Act specifically requires states to address ambient water quality by classifying waterways that do not meet state water quality standards for designated uses (e.g. drinking water, swimming, fishing, etc.) as impaired, and develop a Total Maximum Daily Load (TMDL). A TMDL specifies the maximum amount of a pollutant that a waterway can assimilate without violating applicable standards (33 U.S.C. §1313(d) (1)). A TMDL is the sum of all individual waste load allocations for point sources, all load allocations for nonpoint sources, and natural

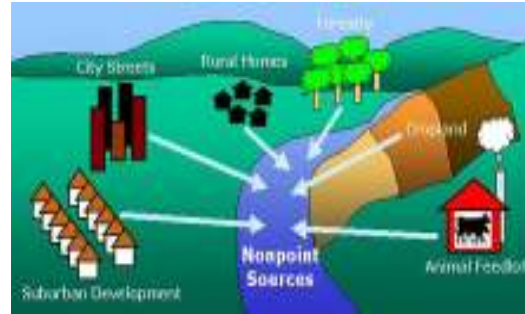


Figure 1: Schematic of Possible Nonpoint Sources of Pollution into a Water Body (NOAA 2006).

¹ Stormwater runoff is a precipitation event where excess water is not absorbed by the ground, and flows untreated into the nearest waterway (EPA 2009c; NCDENR 2009a; Durham, Municipal Code §70-492 2006). In this study, stormwater runoff refers to runoff from urban, suburban and commercial areas, but not agricultural areas.

background with a margin of safety (40 C.F.R. §130.2; 33 U.S.C. §1313(d)(1); Benham and Zeckoski 2005). TMDL development requires the identification and quantification of all pollutant loadings responsible for the water impairment; calculation of the maximum pollutant load the water body can receive; and determination of the pollutant reductions required from each source to meet state applicable water quality standards (Benham and Zeckoski 2005).

Though TMDLs are required by section 303(d) of the 1972 Clean Water Act, both the EPA and states initially failed to implement the program until a number of citizen lawsuits beginning in the 1980's (see Appendix A) finally compelled state agencies to identify impaired waters and establish a schedule for TMDL development. And if the states fail to implement section 303(d) of the Clean Water Act, Federal judicial rulings have concluded EPA is mandated to do so (*Scott v. City of Hammond*, 1984). In twenty-seven of the lawsuits tried or settled to date, the EPA has been placed under court order, or agreed in a consent decree, to establish TMDLs if a state fails to do so within an agreed timeframe (EPA 2009d).

The EPA responded to the lawsuits by reviewing the TMDL program and promulgating regulations and guidance for its implementation. Initial regulations required the first list of impaired waters and TMDLs to be prepared and submitted to the EPA in 1992, and every two years thereafter (EPA 1991). In 1997, EPA issued its first interpretive guidance which called upon states to develop long-term schedules for developing TMDLs (EPA 1997). EPA promulgated revisions to the TMDL regulations in 2000, attempting to clarify as well as strengthen the TMDL program by giving it the necessary regulatory tools for public participation, implementation and enforcement (65 FR 43586). However, the new rule had many opponents, including the United States Congress, state governments and the Bush Administration which in 2001 delayed the effective date of the final rule to allow for

further review (Copeland 2005). Under mounting political pressure, EPA withdrew the rule in March 2003 (68 FR 13608). No further action has been taken to date on revising the TMDL program other than continuation of guidance literature.

Despite EPA's failed attempt to clarify and strengthen the TMDL program, development of TMDLs is being conducted at an increasing pace (see Figure 2) (EPA 2008).

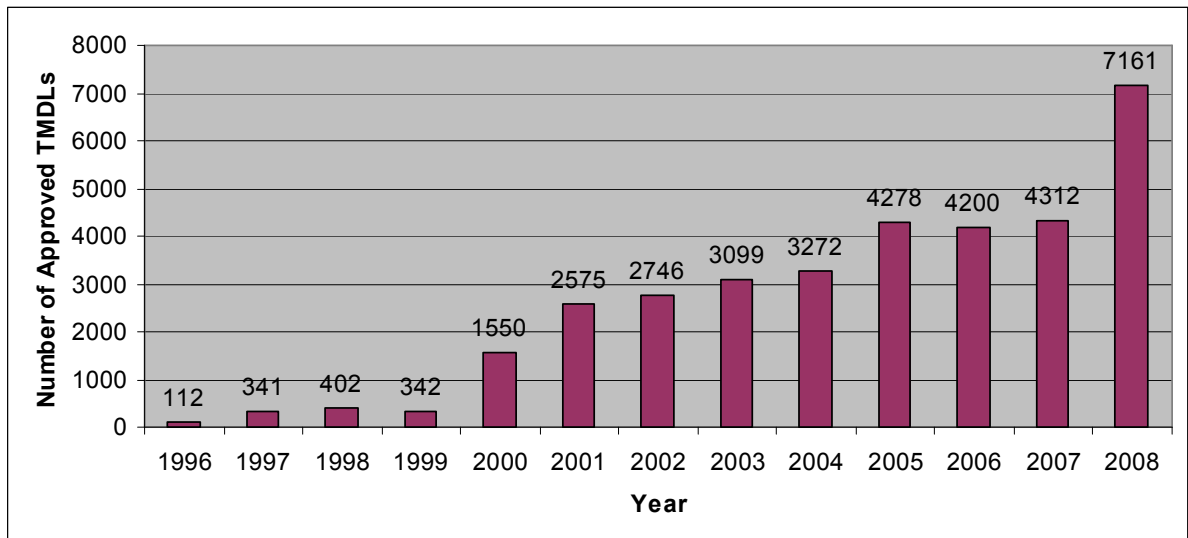


Figure 2 Total Number of TMDLs Approved by EPA, 1995-2008

Even with the progress made, more than 70,000 TMDLs are still needed for the remaining assessed waterways (EPA 2009b). The cost for developing these TMDLs is estimated to be one billion dollars, and another \$65 billion dollars for additional water monitoring and implementation of the TMDLs (EPA 2001a).

1.2 North Carolina TMDL Regulatory Background

In North Carolina, 19% of the 37,662 stream and river miles and 34% of the 311,236 lake, reservoir and pond acres have been assessed (EPA 2009e). Of the assessed waterways, the North Carolina 2006 Water Quality Assessment Report has designated almost half of them impaired. The state report noted 982 causes of impairments, with 485 (~50%) due to pathogens indicators (i.e. fecal coliform bacteria) (see Figure 3) (EPA 2009e).

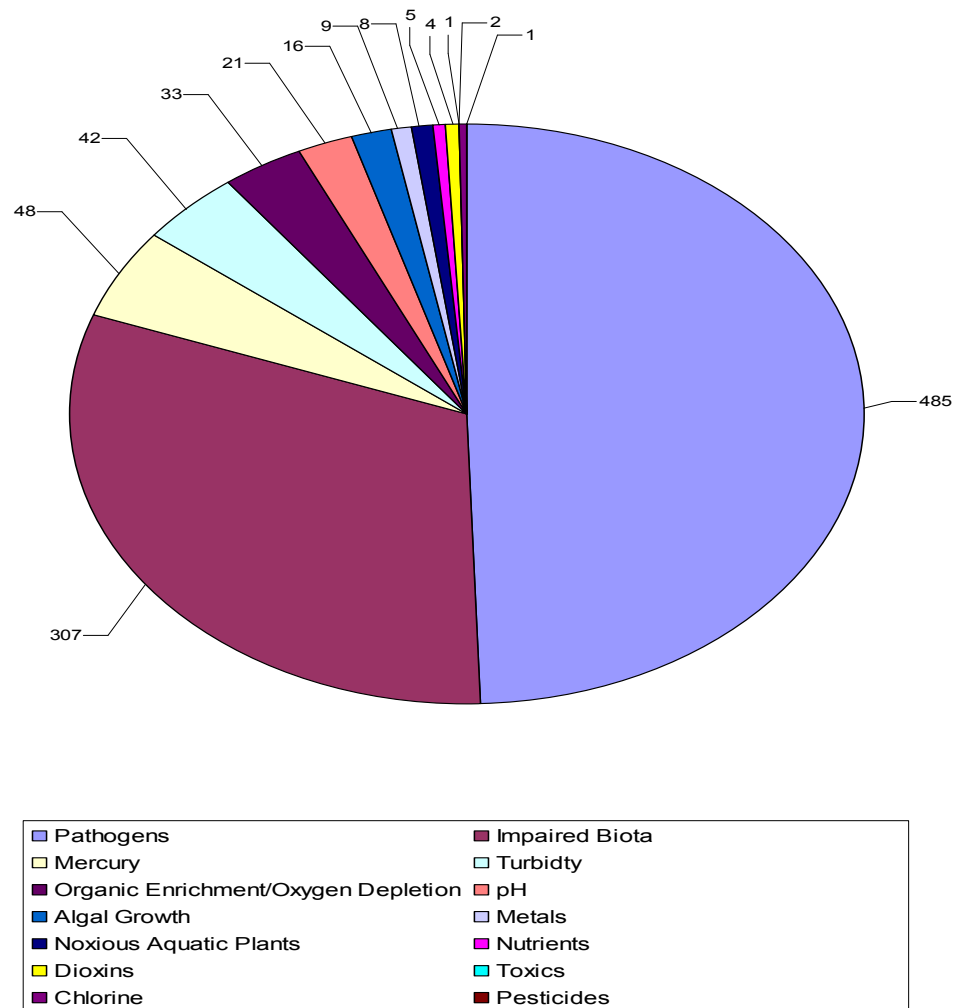


Figure 3 North Carolina Causes of Water Impairment for 303(d) Listed Waters

EPA has approved 131 North Carolina TMDLs, with the most, a total of 56, being developed to address elevated concentration of fecal coliform (EPA 2009e). Fecal coliform is a commonly used indicator organism for enteric pathogens (CWP 1999; Griffen et al. 2001; Whitelock et al. 2002). Using them as surrogates for pathogen detection typically reduces the complexity and cost of analyzing for individual pathogens (Olivieri 1982).

North Carolina currently faces no court order or consent decree forcing TMDL development. However, in 2002 the North Carolina Division of Water Quality (NCDENR) set a goal to develop TMDLs for all impaired waterways within ten years of their first placement on the North Carolina 303(d) list (NCDENR 2005).

While the law and judicial rulings indisputably demand TMDL development, TMDL implementation is less clear. Neither the Federal nor North Carolina TMDL programs prescribe by law or regulation a TMDL implementation plan (i.e. watershed restoration plan) to restore watershed quality. Ideally, a watershed restoration plan would describe and quantify a suite of corrective actions, e.g. best management practices (BMP), permit modifications, ordinance changes, etc., to be implemented within a watershed to achieve load reductions and specify a monitoring plan to evaluate progress towards meeting water quality goals (Borisova et al. 2008; VADEQ 2003). The current absence of a legislative or regulatory mandate for a TMDL implementation plan minimizes the enforcement strength of this regulatory tool, and reduces the ability of TMDLs to achieve significant water quality improvements in North Carolina.

1.3 Effects of Pathogen Pollution

Microbial water contamination is a significant public health issue. Pathogens can cause sickness when humans are exposed to them from ingestion (including ingestion during water-related recreational activities), consumption of contaminated shellfish, and even through dermal contact with contaminated waters (EPA 2001b). Human exposure to waterborne pathogens has caused sickness in the United States in recent years (Hoxie et al. 1997; Mackenzi et al. 1995; Hrudley et al. 2003; Kramer et al. 1998; Curriero et al. 2001; Gaffield et al. 2003; Goldstien et al. 1996; Hayes et al. 1989). In 2005-2006, the Center for Disease Control (CDC) reported a total of 78 waterborne-disease outbreaks related to recreational use, implicating a variety of pathogenic enteric microbes, including *Cryptosporidium*, *Giardia* and *E. Coli* O1456:H7, at beaches, streams and lakes (Yoder et al.

2008). This is the highest number of outbreaks reported to date for the two-year CDC surveillance summary on recreational waterborne disease and outbreaks.

1.4 Study Location

Northeast Creek is a stream flowing through Southern Durham and Chatham Counties. The hydraulic length of Northeast Creek is approximately 16 miles (NCDENR 2003). The state classified the creek as a Class C water body for the reach above State Highway 55. North Carolina rules identify the best uses for a Class C waterbody as aquatic life (i.e. fishing and fish) and secondary recreation (e.g. kayaking,

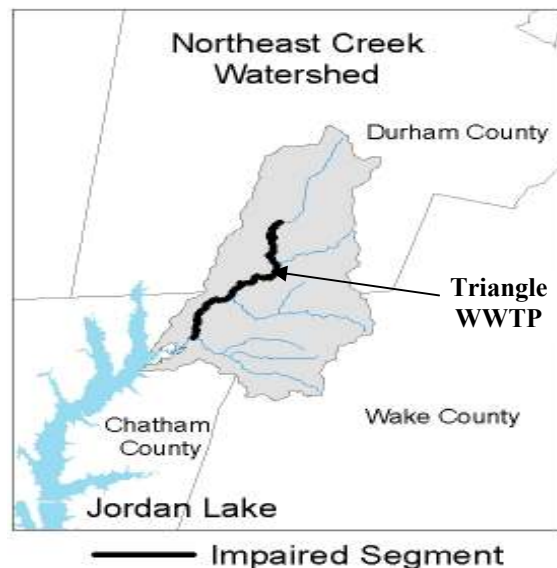


Figure 4 Spatial Representation of Northeast Creek Watershed (Hunn, 2007)

canoeing, some wading, agriculture, etc.). Below State Highway 55, the state classified the creek as a Water Supply-IV Nutrient Sensitive Water (WS-IV NSW). Per North Carolina rules, WS-IV is the least protective classification for waters which are a source of water supply for drinking, culinary or food processing purposes. Northeast Creek's WS-IV NSW classification is primarily due to the creek being a tributary to the Upper New Hope Arm of the B. Everett Jordan Lake Reservoir in the Cape Fear River Basin (see Appendix B) (J. Cox, personal communication, July 25, 2007). Northeast Creek is a good choice for this study as it represents a number of urbanized² 303(d) listed streams in North Carolina, with a 9.8 mile segment (see Figure 4) that is biologically impaired based on elevated fecal coliform

² Urbanized is defined as a land area comprising one or more places, central place(s) and the adjacent densely settled surrounding area (urban fringe), that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile (EPA 2005c).

concentrations (NCDENR 2007a). With fecal coliform impairing more than 200 state stream miles in the mountain and Piedmont river basins alone, studies understanding and mitigating microbial contamination are important for North Carolina water quality (NCDENR 2007a).

The Northeast Creek watershed is approximately 47 square miles in area, spanning parts of Durham, Wake, and Chatham Counties, which includes drainage from parts of the cities of Durham and Cary, as well as Research Triangle Park (Hunn 2007). The water quality of this stream is a particular concern because it is located in rapidly urbanizing Durham, Chatham and Wake counties, (see Table 1 and 2), (USCB 2009; NCOMB 2009; Wise 2009a), and empties into the Jordan Lake Reservoir (see Figure 5).



Figure 5 Sediment flowing from Northeast Creek into Jordan Lake, photo taken in 2006 by Northeast Creek Streamwatch member Carol Young (M. Rooney, personal communication, July 20, 2009)

Jordan Lake serves as a source of recreational activities for nearly a million people as well as a regional source of drinking water (USACE 1992; NCDENR 2009b; NCPARKS 2009).

In this study, land use data from a 2004 USGS dataset characterizes the Northeast Creek watershed as 30% urban, 50% forest, 9% wetland, 8% pasture/rangeland, 2% cropland and 1% barren (see Appendix C). From 1993 to 2004, the urban area of the watershed has increased by approximately 20% (NCDENR 2003).

Table 1 Estimate of the Top Five Population Change in Urban Areas in North Carolina (USBC 2009)

North Carolina Urbanized Areas	Top Five Population Percent Changes 4/1/2000 to 7/1/2006
Raleigh	25.0%
Greenville	16.2%
High Point	13.5%
Durham	11.3%
Charlotte	11.2%

Table 2 Estimate of North Carolina Counties with Double Digit Population Growth (USBC 2009)

NORTH CAROLINA COUNTIES	DOUBLE DIGIT PERCENT POPULATION CHANGE 4/1/2000 TO 7/1/2008
Union	56%
Brunswick	41%
Camden	41%
Wake	38%
Currituck	33%
Hoke	29%
Cabarrus	29%
Mecklenburg	28%
Chatham	28%
Iredell	27%
Pender	25%
Johnston	24%
Franklin	24%
Harnett	23%
Lee	20%
New Hanover	20%
Durham	18%
Granville	18%
Pasquotank	18%
Lincoln	17%
Martin	16%
Henderson	15%
Alamance	13%
Perquimans	13%
Dare	12%
Guilford	12%
Forsyth	12%
Macon	11%
Catawba	11%

1.5 Study Significance

The Environmental Management and Policy (EMP) practicum used its research (see Figure 6) to develop not only a TMDL for a North Carolina 303(d) watershed impaired by fecal coliform, but to devise policy strategies to implement the TMDL via a watershed restoration plan. To propose policy strategies for regulating and mitigating microbial contamination in the affected watershed, the EMP practicum needed a scientific understanding of microbial contamination and its sources as well as regulatory, economic and social implications of the various proposed strategies. Using results from the Hydrological Simulation Program-FORTRAN (HSPF) model developed for the watershed, recommended policy strategies were put into a linear optimization model to develop a least-cost strategy for achieving regulatory compliance (Hunn 2007). However, traditional linear optimization models fall short in resolving watershed restoration strategy decisions because they inherently lack the ability to address multiple influential criteria, including subjective criteria such as public or stakeholder acceptability and fairness (Young et al. 2009). Given much literature on the importance of stakeholder inputs for the successful implementation of a TMDL (Benham et al. 2006; EPA 2005a, 2005b; EPA 2008), a model is needed that is capable of considering any number of quantitative and qualitative attributes. This work addresses the selection of a Best Management Practice (BMP) strategy for a watershed restoration plan by using an Analytical Hierarchy Process (AHP) decision support matrix, which unlike the traditional linear optimization models is capable of addressing multiple as well as subjective criteria. AHP has been applied to various multi-criterion problems including economic planning, conflict resolution, energy policy and supplier assessments (Hanfield et al., 2001; Zahedi 1986; Cox et al. 2000; Schmoldt et al. 2001) as well as one very recent study for improving stormwater runoff BMP development, site selection and placement (Young et al. 2009).

Except for a recommendation to create a ranking table to identify candidate management practices in EPA's *Handbook for Developing Watershed Plans to Restore and Protect Our Waters*, a review of relevant literature has not identified previous work utilizing AHP to select candidate best management practices for a TMDL implementation plan.

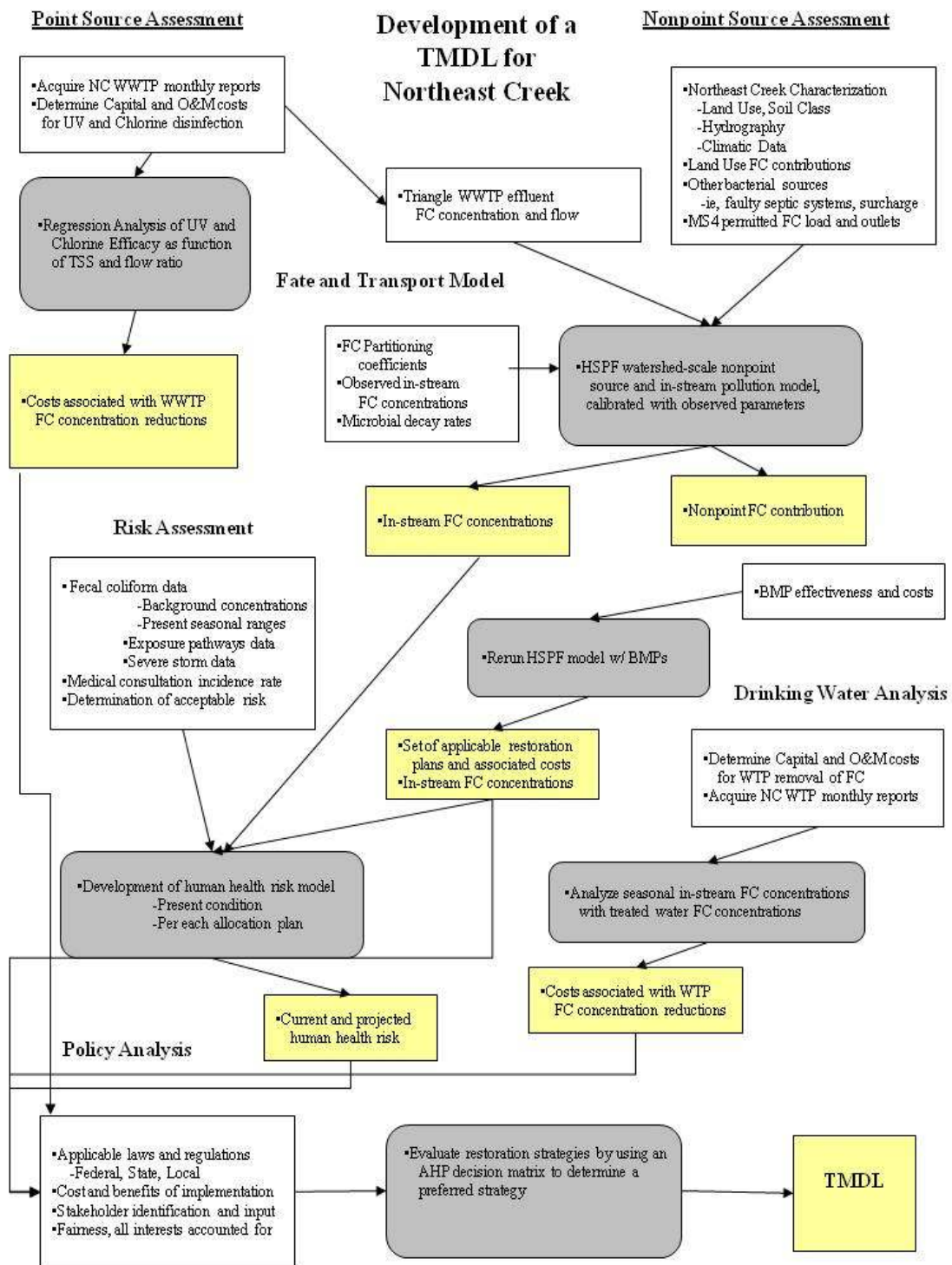


Figure 6 EMP Practicum Research Flow Chart

Chapter II

Methods

An Analytical Hierarchy Process (AHP) is used to facilitate a decision process by clarifying the advantages and disadvantages of the proposed policy options. It is a simple, less quantitative form of multi-attribute or criteria decision method (Crawford-Brown, 2005). An AHP decision framework (see Figure 7) requires the decision maker (user) to describe the objective, relevant criteria or attributes, and the policy options or alternatives to be evaluated (see Figure 8). AHP then asks the user to consider each of the criteria pairwise and assign a relative importance of the criteria to the policy option. Relative importance is assigned using a Likert-type scale where 1 and 2 designate equal or little importance respectively, and 9 extreme importance to a criterion (Handfield et al. 2001; Saaty 2008). The user inputs the relative importance metric into a decision matrix, and applies weightings assigned to criteria to let the decision maker know how important that criterion will be in the final decision (Crawford-Brown 2005). The scores and weightings of the criteria are then combined so that the options can be ranked. The option with the highest ranking, the most preferred option, is then selected.

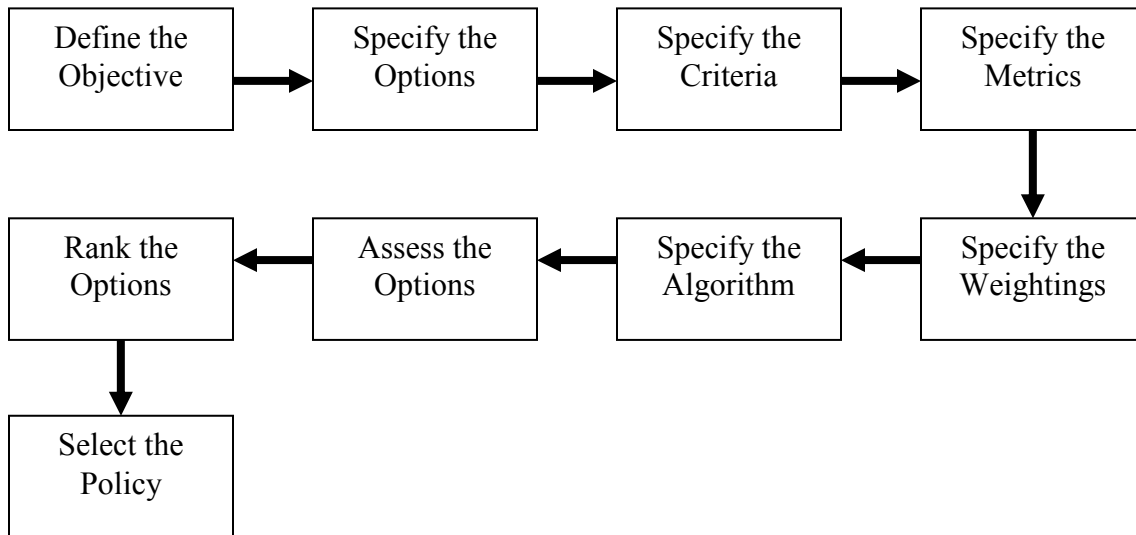


Figure 7 General AHP Framework (Crawford-Brown, 2005)

2.1 Define the Objective

According to North Carolina regulations, fecal coliform concentrations in surface freshwaters should not exceed a 5-consecutive-sample geometric mean concentration of 200 CFU/100mL, nor exceed 400 CFU/100mL in more than 20% of grab samples (NCDENR 2004). Consistent with its impaired designation, Northeast Creek regularly violates this standard. For the period of January 2005 – June 2006, more than 40% of all in-stream geometric mean concentrations in the upper portion of the creek (reach 3, see Appendix C) were in violation of the state water quality standard, while approximately 30% of geometric mean concentrations were in violation for the lower portion (below reach 3, see Appendix C) of the creek (Hunn 2007). As part of the watershed restoration plan to effectively bring the creek into compliance with the state water quality standard for fecal coliform, a decision must be made as to which proposed BMP strategy option should be implemented to achieve the water quality goal.

2.2 Identify the Policy Options

Strategies proposed by the EMP practicum research to control for sources of microbial contamination in Northeast Creek are listed in Table 3.

Table 3 BMP Proposed Strategy Options

Option		BMP Candidates
A		Non-Structural BMPs only (education programs; bi-weekly street sweeping)
B		Structural BMPs only (buffer strips along pasture, cropland, forest; wetlands and stormwater wetlands for all urban drainage)
C		Point Source Control Only, (additional 1-log reduction for the waste water treatment plant over peak effluent load over a period of 18 months)
D		Mixture #1 of BMPs (education programs; bi-weekly street sweeping; 1-log verification for the waste water treatment plant and use of stormwater wetlands to cover at least 90% of all upstream urban areas)
E		Mixture #2 of BMPs (education programs, monthly street sweeping, 1-log verification for the waste water treatment plant, buffer strips for all up-stream cropland, pasture, rangeland and forest, stormwater wetlands for much of the urban areas)

2.3 Select Criteria

In any decision support system, it is important to select criteria that would make a policy option seem more or less important, attractive or preferred (Crawford-Brown 2005). Given the economic and social implications the EMP practicum wanted to consider in choosing a proposed strategy, criteria selected for this decision process were effectiveness, efficiency, fairness and acceptability (see Figure 8). Efficiency, effectiveness and fairness were also identified as important criteria during discussions with three watershed stakeholder representatives in July of 2007. A 2001 study of stakeholder values in the Neuse River Watershed clearly showed that stakeholders cared not only about the health of the Neuse River, but also about efficiency, effectiveness and fairness in the restoration plans (Borsuk et al. 2001).

Stakeholder support (referred to in this study as acceptability) for undertaking the actions necessary to control for microbial contamination is a crucial part of this decision process (Benhem et al., 2006; EPA 2005a, 2005b; EPA 2008). It is important to know if the strategies proposed would be acceptable or opposed by various stakeholders, and to develop a consensus producing an effective solution through a transparent process. If stakeholders do not support the watershed restoration strategies proposed, they could attempt to block their implementation as illustrated recently by the conflict over the Jordan Lake nutrient TMDL. As Jordan Lake is a drinking water reservoir, North Carolina Session Law 2005-190 mandates NCDENR to establish and implement nutrient management strategies. NCDENR adhered to its legislative mandate, developing a TMDL for nutrients in 2007 along with implementation policies to reduce nutrient contamination. The TMDL and subsequent implementation policies proposed by NCDENR was not well received (NCDENR 2009c) and has received many opposition comments from various stakeholder groups, necessitating that regulation to be reviewed by the 2009 session of the North Carolina General Assembly (NCDENR 2009c).

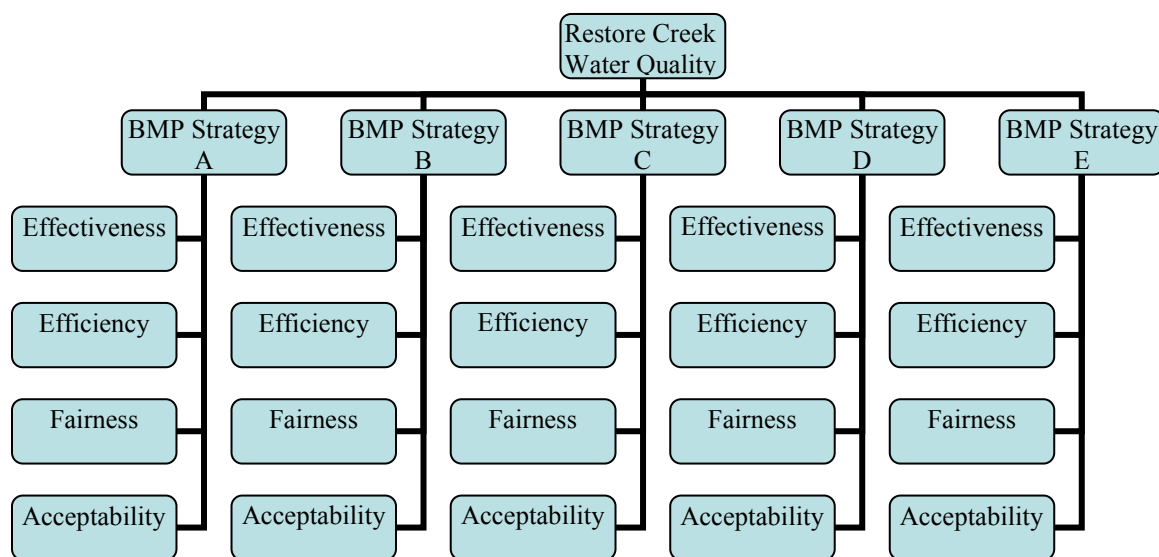


Figure 8 Hierarchy for Northeast Creek Candidate Management Practice Options

2.4 Specify the Metrics

Criteria scores are completed using a semi-quantitative scale. A numeric value of 9 (quantitative score) means the option has satisfied the criterion to a HIGH (qualitative score) degree and is very important or preferred. A numeric value of 5 (quantitative score) means the option has satisfied the criterion to a MEDIUM (qualitative score) degree and is strongly important or preferred. A 2 (quantitative score) numeric value mean the option has satisfied the criterion to a LOW (qualitative score) degree and slightly important or preferred. When applying criteria scores, the given qualitative score (e.g. HIGH) is always assigned the same semi-quantitative score (i.e. 9) both across criteria and across strategy options (Crawford-Brown 2005).

2.5 Specify the Weightings

Weights are assigned to each criterion to demonstrate the significance of the criteria in the final decision, with the sum of the weightings equal to 100 or a fraction of 1.0 (Crawford-Brown, 2005; Saaty 2008). Weightings for this decision process are specified in Table 4.

Table 4 AHP Criteria Weightings

Criteria of Importance	Weight Assigned
Effectiveness: compliance with state water quality standards for fecal coliform	0.5
Fairness: all pollutant sources in the watershed evaluated at the same time to ensure all sources are included and addressed in proposed strategies	0.2
Efficiency: least-cost strategy for bringing waterway into compliance	0.2
Political Acceptability: stakeholder support	0.1
Total	1.0

The most important criterion is effectiveness, which was given a weight of 0.5. The main purpose of the Northeast Creek watershed restoration plan is to restore water quality by controlling and mitigating fecal coliform contamination. No strategy can be selected that

violates state regulatory requirements for fecal coliform concentrations in surface waters. No criterion trumps effectiveness as the most significant criterion.

Efficiency and fairness were chosen as the second and equally most important criteria given that the EMP practicum was to propose strategies regulating and mitigating microbial contamination in Northeast Creek while considering both the economic and social implications of those strategies. In other words, the practicum was to achieve an outcome from which public interests are maximized by correcting deficiencies in the current process in a fair manner (all sources of pollution evaluated in the HSPF model and addressed in proposed management strategies), and equally in an efficient manner (goal achieved at least costs). Weights given to each were 0.2.

Acceptability was given the final, lowest weight, 0.1. A feasible policy must be a supported policy, or not face too much resistance. Though initially this criterion may seem to be the most important, it is assigned the lowest weight as it is more flexible than the other three to change or compromise. The recent Jordan Lake TMDL requirements for nutrients demonstrate the ability of political acceptability to change. The TMDL brought strong opposition from major watershed stakeholder groups, such as city governments responsible for its execution. However, in 2009 a compromise in the legislative process finalizing the TMDL was reached by giving the governments more time and flexibility with the TMDL implementation (Wise 2009b). The North Carolina General Assembly approved the TMDL after the compromise, with the Governor signing it into law in late June of 2009.

2.6 Specify the Algorithm

The scores and weightings for the four criteria in the decision matrix are combined as

follows using the same common scoring system for each criterion (Crawford-Brown 2005; Saaty 2008):

$$U = [SE * WE] + [SL * WL] + [SF * WF] + [SP * WP]$$

- U : utility function
- SE : score efficiency
- WE : weight efficiency
- SL : score effectiveness
- WL : weight effectiveness
- SF : score fairness
- WF : weight fairness
- SP : score political feasibility
- WP : weight political feasibility

2.7 Assess the Options

Policy options, criteria and criteria weightings are now entered into a decision matrix (see Figure 9) and the algorithm to develop a final judgment of the preference of each policy option is applied (Crawford-Brown 2005).

Options	Criteria Scores				Option Utility
	Effectiveness	Efficiency	Fairness	Acceptability	
A					
B					
C					
D					
Criteria Weightings					
	0.5 (HIGH)	0.2 (MEDIUM)	0.1 (LOW)		

Figure 9 AHP Decision Matrix

2.8 Choosing the Most Preferred Option

The ranking of the policy options with respect to their desirability flows deductively from the numerical scores and weightings completed in the previous step. The option with the highest ranking is selected as the preferred policy strategy.

Chapter III

Results

The following decision matrix summarizes the analysis, in which each alternative strategy outcome is weighed against each criterion. Alternate BMP options were given a score of 2, 5 or 9 based on how well they met a criterion. Personal interviews with three stakeholder groups representing a public citizen group (Northeast Creek Streamwatch), government (John Cox, Manager, Durham Stormwater Services) and business (Lisa Martin, Director of Government Relations, North Carolina Homebuilders Association) aided in the determination of scores. The scores and weightings for the four criteria in the decision matrix are combined using an algorithm. Option A, B and C have been eliminated, and Option E ranks slightly higher than Option D (see Figure 10).

Options	Criteria Scores						
	Acceptability						Option Utility
	Effectiveness	Efficiency	Fairness	PC	G	B	
A	---	----	----	---	---	---	----
B	---	----	----	---	---	---	----
C	---	----	----	---	---	---	----
D	2	9	2	5	9	2	4.8
E	5	5	5	9	5	2	6.1
Criteria Weightings							
0.5 (HIGH)		0.2 (MEDIUM)		0.1 (LOW)			

Figure 10 AHP Decision Matrix for Candidate BMP Strategy Selection

3.1 Option A, B and C Analysis

The EMP practicum research determined that Northeast Creek violated state water quality standards for fecal coliform regularly, with a need to reduce microbial contaminant loadings by 43% in the upper portion of the creek (reach 3, which precedes the Triangle

Waste Water Treatment Plant) and 30% in the lower portion (below reach 3 and the Triangle Waste Water Treatment Plant)³. Option A, B and C did not control enough of the microbial loadings to bring the creek into compliance with state water quality standards (Hunn 2007). Due to their failure to improve the water quality to state standards, no further evaluation of these options was applied. They simply could not be justified as they failed to meet the minimum regulatory requirements.

3.2 Effectiveness Strategy Assessment

Option D and E are effective BMP candidates. The HSPF model developed for this watershed indicated that the combination of diverse structural and non-structural BMPs along with point source control reductions would reduce the microbial contamination by the required 43% and 30% (Hunn 2007). The success of the diverse strategy approach presented in both options is consistent with the findings by the Center for TMDL and Watershed Studies for successful TMDL implementation (Benhan et al. 2006).

3.2.1 Durham Ordinances and Programs for Structural BMPs

In addition to the favorable model results, Durham currently has regulations and programs needed to effectively apply both BMP strategies. Durham is one of six NPDES permitted urban locations in North Carolina with separate storm sewer systems (NCDENR 2009d). Under the NPDES permit, the city is required to develop and implement a stormwater management plan as well as reduce levels of pollutant runoff from the city stormwater sewer systems in accordance with the assigned total maximum daily load for the pollutant of concern (Cox and Woolfolk 2008). Since 2005, Durham has developed or

³ The Triangle Waste Water Treatment Plant is located on North Carolina Highway 55 near the Durham and Chatham county border (see Figure 4 for location in Northeast Creek watershed). The facility is permitted by the state to discharge into Northeast Creek, up to twelve million gallons per day.

revised several ordinances and programs to properly comply with its NPDES permit. Three ordinances of importance are the Durham City-County Unified Development Ordinance (UDO) (Durham, UDO §1-16), the Durham City Stormwater Pollution Control and Management (Durham, Municipal Ordinance §70 492-542), and Stormwater Performance Standards for Development (Durham, Municipal Ordinance §70 736-741). All three specify requirements for engineered stormwater runoff controls, such as wetlands and buffer strips, including installation and maintenance. All require a *Stormwater Facility Agreement and Covenant* (see Appendix D and E) in which the private property owners ensure continued maintenance and repair of stormwater BMPs. The city's ability to regulate and mitigate pollutants from stormwater runoff was further strengthened through the passage of the Stormwater Management and Pollution Control ordinance in late 2006. The stormwater-specific ordinance prohibits illegal discharges and connections and establishes rules for drainage system maintenance, inspection, monitoring, citations, and penalties as well as a means to require fees for inspections and monitoring work.

However, the Stormwater Management and Pollution Control ordinance does not give Durham complete legal ability to enforce corrective actions for all illicit discharges found. Durham has no regulatory authority over many on-site wastewater treatment systems directly discharging to its waterways. Durham Stormwater Services has identified these on-site wastewater treatment systems as one significant contributor to fecal coliform contamination. Sand filters are on-site wastewater treatment systems permitted under a state wide general NPDES permit, with Durham County accounting for approximately 35% of the 1238 permitted systems (Woolfolk et al. 2008). A 2008 Durham Stormwater Services study found discharges directly from sand filter systems into Northeast Creek and other Durham waterways to contain a fecal coliform arithmetic mean concentration of 318,570 cfu/100ml,

well in excess of any NPDES permitted system (Woolfolk et al. 2008). Despite Durham's findings, only North Carolina DWQ has the authority to regulate on-site wastewater treatment systems. Unfortunately, they do not routinely monitor these systems, leaving Durham the authority only to suggest corrective measures to the on-site wastewater treatment system owners when illicit discharges are found (M. Woolfolk, personal communication, May 12, 2009).

To remedy illicit discharges from on-site wastewater systems, the city of Durham and Raleigh have worked with State Senator Josh Stein of Raleigh and NCDENR Assistant Secretary Robin Smith to produce North State Senate Bill S1020 (J. Cox, personal communication, August 13, 2009). This bill would require the state nutrient management strategies to include measures to address nutrient inputs from on-site wastewater treatment systems. More importantly, the second provision of S1020 would require:

"SECTION 3. (j) The Department of Environment and Natural Resources, in consultation with the Environmental Management Commission, shall identify improvements needed in the design, operation, and siting of septic tank systems in order to reduce excess nutrient loading from septic tank systems in the watershed of a drinking water supply to which this section applies. The Department shall report its findings and recommendations for specific changes to standards adopted by the Commission for Public Health pursuant to G.S. 130A-355 to the Commission for Public Health and to the Environmental Review Commission no later than March 1, 2010." (S1020 2009).

S1020 was formally adopted by the North Carolina General Assembly on August 11, 2009 and has been presented to the Governor for her signature. Durham believes the implementation of this bill will help to resolve the ongoing pollution from on-site wastewater treatment systems (J. Cox, personal communication, August 13, 2009).

The *Stormwater Facility Agreement and Covenant* is a city-ordinance-required contract between the city and the BMP property owner regarding the construction as well as continuous maintenance and inspection of BMPs. Required by the city since the mid-1990's, the city, in collaboration with the North Carolina Home Builders' Association, recently

modified the agreement to correct ongoing BMP installation and maintenance problems (Brown and Wilbur 2008). The new program, referred to as the BMP Annual Maintenance Certification Program and the As-Built Certification Program, strengthens BMP management by the city as it “requires much more documentation, e.g. stormwater impact analysis, buffers, etc., now than just a so-called As-Built drawing with a best to my knowledge certification statement,” (J. Cox, personal communication, August 13, 2009). It also requires one-time payment (25% of BMP estimated construction cost) into a city-managed replacement fund prior to building permit issuance (Brown and Wilbur 2008). The fund is established to support future BMP maintenance activities throughout Durham.

To help BMP owners with the new requirements, Durham issued a revised BMP maintenance guidance manual in December 2008. The manual provides specific steps to ensure the BMPs are constructed and function as required in the city of Durham. The manual also prepares BMP property owners for their required annual inspection and certification of BMP effectiveness. One of the most notable new requirement under Durham’s new stormwater BMP requirements, the annual inspection and certification must be completed by a third-party Durham-approved North Carolina Professional Engineer, with all results submitted to the city. Under the new requirement, Durham is able to work with BMP owners to ensure that BMPs in need of significant maintenance are repaired and brought into compliance with city standards (Brown and Wilbur 2008).

In 2005, the Unified Development Ordinance (UDO) was revised for the first time in nearly 30 years. The revision to the UDO included a new standard protecting Durham’s natural resources. Under Article 8, Environmental Protection, section 8.5 identifies mandatory stream buffer protections. This section of the UDO currently prescribes a minimum of 50 foot stream buffers widths on each side of all perennial and intermittent

streams in Durham County, with the buffer strips required to be maintained in their natural vegetative state in suburban and rural areas (permitted landscaping within the buffer strip is only allowed in the downtown area).⁴

3.2.2 Durham Programs for Non-Structural BMPs

Option D and E also proposed non-structural BMPs, education and street sweeping programs, in combination with the structural BMPs and 1-log verification from the Triangle Wastewater Treatment Plant. The HSPF model developed for this watershed indicated microbial loading reduction by as much as 16 % in the upper portion (reach 3) of the creek, and 14 % in lower portions of the creek (all reaches below reach 3) from both non-structural BMPs alone (Hunn 2007).

To an extent, both BMPs have been implemented in the city of Durham. Some of the public education services offered by the Durham Department of Public Works, Stormwater Services Division include adopt-a-stream, pollution prevention tips for individuals and businesses, landlord training information, storm drain identification and a waterways newsletter. City representatives have developed presentations on water pollution, local water resources and other related topics to present to schools, civic groups, clubs, religious and



Figure 11 Domestic Pet Waste, Northeast Creek Watershed, photo taken by L.A. Krometis (personal communication, 2009)

other organizations. They also have a dedicated public education coordinator to oversee all public educational outreach.

Most of the city's environmental education

efforts have targeted students to promote more long-

⁴ The UDO Environmental Enhancements Steering Committee has recommended to the joint Durham City-County Planning Committee an increase in the width of stream buffers from 50 feet to 100 feet in urban, suburban and rural areas, with a permitted reduction to 50 feet allowed in urban areas upon planning approval. To date, the UDO has not been modified to implement these recommendations.

term responsible environmental decision making (Smith 2008). In 2005, a NCDENR study demonstrated that more than 50% of urban and suburban adult dwellers believe water quality is good or excellent in North Carolina, and do not know that stormwater flows untreated to the nearest waterway (Bartlett 2005). The study also revealed that nearly 50% of all urban and suburban adult dwellers rarely or never pick up their pet's waste (Bartlett 2005). In light of the study's findings, specific issue campaigns, such as pet waste, targeted at adults to facilitate behavior change are in development at both the State and local level (Smith 2008). Given that Northeast Creek is impaired due to fecal coliform and the ubiquitous presence of domestic pet waste near the creek (see Figure 11) (L. Krometis, personal communication, August 1, 2009, Northeast Creek Streamwatch, personal communication, March 24, 2006, July 25, 2007), such targeted campaigns could be a beneficial educational BMP, as proposed in Option D and E, to reduce microbial sources in the watershed.

Similar to the educational program, the Durham Public Works Department has a street sweeping program. On average, the city's high-efficiency vacuum street sweepers clean approximately 13,500 city curb miles per year (Cox and Woolfolk, 2008). The street sweeping program goal is to sweep all downtown Durham streets weekly and suburban streets monthly, but this is rarely achieved given a number of personnel issues (J. Cox, personal communication, July 27, 2007). Option D proposes bi-weekly street sweeping, while E proposed monthly. It is clear that Durham has a program and equipment to conduct either of the street sweeping proposals. However, their inability to currently sweep on even a monthly basis raises doubt that the city will be able to effectively implement either sweeping proposals in either Option D or E.

3.2.3 Other Possible Strategy Disadvantages

Though illicit discharges are illegal per the Durham ordinance, continued and increased inspections are needed to ensure that BMPs are functioning properly and that streams are not receiving additional pollution from illicit discharges. This is very important to the Northeast Creek watershed restoration plan as each year several illicit discharges, mainly from public sanitary sewer and private lateral overflows, are identified in the watershed (DSS 2006, 2007, 2008). Neither Option D nor E proposes a monitoring and/or inspection non-structural BMP, and one should be proposed to ensure that Durham has the regulatory authority and personnel to vigilantly continue water quality investigations and enforcement of city-county rules and programs.

Another concern with the effectiveness of both options is their reliance on stormwater wetlands to control for microbial contaminations. Though EPA credits wetlands with a 65% pollutant removal rate, recent studies have suggested they are only a moderately sufficient BMP for removing fecal coliform indicators, and in some instances may actually contribute to microbial contamination in waterways (Drummey 2007; Krometis et al. 2009). The 2007 NCDENR Best Management Practices Guidance Manual does not rate wetlands as the best means to mitigate fecal coliform pollution in urban areas, and lists other possible drawbacks, including the size of space needed for installation, public safety concerns, community acceptance and the high temperature of water discharging from the wetlands negatively impacting streams supporting trout (NCDENR 2007b). It may not be physically possible to install stormwater wetlands in 90% of upper portion of the creek's urban areas as Option D requires, and even if installed as proposed in both options, the fecal coliform removal rates may be less than what the HSPF model predicted.

An additional concern is that neither proposed option requires a minimum 50 foot buffer strip for the entire creek, as required by Durham ordinances. Option E has a slight advantage over D as it at least requires buffer strips for the forest, pasture and cropland in the upper portion (reach 3) of the creek, but does not mandate buffer strips in any other portion of the creek.

Finally, Durham has little experience with watershed restoration programs. The first watershed restoration project the city has undertaken is the Ellerbe Creek Watershed Improvement Project. This project is still in process, and the success of the project can not be measured at this time. However, the city project coordinator for the implementation of the Ellerbe Creek's watershed restoration plan has stated that Durham is to use this project as a model for future city watershed improvements (Wilbur 2008a), so it may provide an understanding as to how Durham would implement watershed improvements for Northeast Creek.

3.2.4 Option D and E Effectiveness Metric Rating

Considering the outcome of the HSPF model along with the advantages and disadvantages of Durham's regulations and programs, Option D compared with criterion effectiveness is rated LOW (2), while Option E is rated MEDIUM (5). The advantages of Option E over D are less street sweeping (monthly versus bi-weekly), making it possibly more attainable by Durham Public Works, and less dependency on stormwater wetlands. Option E also proposes a buffer strip BMP, which could be expanded to cover the entire creek. A disadvantage with both is Durham's inexperience with the implementation of a watershed restoration plan; they are presently performing their first such work for Ellerbe Creek. It is unknown whether Durham has the ability to implement and enforce the proposed

strategies to the level needed to successfully achieve the results presented by the HSPF model. So far and despite the number of ordinances and programs discussed, all streams in Durham County remain 303(d) impaired waterways.

3.3 Efficiency Strategy Assessment

Using the linear optimization model, the EMP practicum determined the lowest-cost BMP option to mitigate the additional fecal coliform

concentrations in Northeast Creek (see Table 5). Though estimated costs for both options are significant, they are similar to costs to improve both the Ellerbe and New Hope Creek watersheds (Westbrook 2007; Wilbur 2008a; J.

Cox, personal communication, July 25, 2007). Funding for city watershed projects is generated through a variety of mechanisms, including the Durham stormwater utility fee, stormwater permit fees, fines, grants (e.g. Clean Water

Act Section 319, Clean Water Management Trust Fund, North Carolina Ecosystem

Enhancement Program, etc.) and partnerships (e.g. Ellerbe Creek Watershed Association,

Triangle Land Conservancy, etc.). The city is also using a GIS-based Watershed

Improvement Plan (WIP) Tool⁵ to help control costs. The WIP Tool identifies areas in the watershed with more pollutants, and helps to determine where BMPs are the most effective in these areas for the least cost based on the physical conditions of the watershed (Wilbur 2008b).

Table 5: BMP Costs (Hunn 2007)

Option D	Costs
Education	\$0.70 M
Street Sweeping Capital and O& M Structural BMPs Wetlands Capital, O&M, Opportunity	\$3.00 M \$18.00M
Total	\$21.70 M

Option E	Costs
Education	\$0.70 M
Street Sweeping Capital and O&M Structural BMPs Wetlands & Buffer Strips Capital, O&M, Opportunity	\$1.50 M \$81.00M
Total	\$83.20 M

⁵ The Tool is currently being used in the Ellerbe Creek Watershed Restoration Improvement Project.

Based upon the EMP practicum's results, Option D is the least-cost alternative. However, neither option is cost-prohibited. Option D compared with the efficiency criterion is rated HIGH (9). Option E's cost is higher, but not completely undesirable compared to money spent in other watersheds. Option E compared with the efficiency criterion is rated MEDIUM (5).

3.4 Fairness Strategy Assessment

Though both options achieved compliance with state water quality standards per the HSPF model, Option E addressed more possible microbial loading sources by requiring a remedy for non-point sources in urban, forest, pasture, cropland and rangeland areas. Option D did not, allowing for microbial loadings from non-urban non-point sources. Some stakeholders may believe it is unfair for the urban and suburban areas to assume the burden of microbial contamination from the other non-point sources. Others may believe that all loadings sources need to be reduced regardless of whether or not the creek requires it in order to meet state standards (Northeast Creek Streamwatch, personal communication, July 25, 2007).

A disadvantage with both proposed options is the limited stakeholder involvement in the EMP practicum's process. Any proposed Northeast Creek watershed restoration plan would need to be reviewed for public comment and input. There is no law or program dictating how stakeholders are to be involved, but Durham could use the Ellerbe Creek watershed implementation plan work process to involve Northeast Creek stakeholders. The Ellerbe Creek model involved stakeholders at three key decision points in the process, requesting their input on the watershed assessment, candidate BMPs and other proposed creek restoration and preservation projects, and the draft plan, including prioritization of

actions needed to be taken to restore creek water quality (Wilbur 2008a). To ensure that any watershed restoration project is transparent, fair and successful, public meetings are necessary prior to the implementation of the watershed restoration plan.

Option D compared with the fairness criterion is rated LOW (2). Option E compared with the fairness criterion is rated MEDIUM (5) primarily due to additional structural source controls in the non-urban areas. Limited stakeholder involvement in the EMP practicum process is a shortcoming for both options.

3.5 Acceptability Strategy Assessment

Option D and E were presented and discussed with the three stakeholder groups to ascertain their preference.

The government representative felt both options were viable as both included measures already implemented or in progress. The preference for Option D was HIGH (9) as stream quality could be achieved at the least costs. Option E was MEDIUM (5) as costs were significantly more, but not completely prohibitive. The government representative also identified a need to have the proper number of personnel to effectively implement and enforce any of the proposed watershed restoration plan strategies.

The business representative objected to the stormwater wetland BMP proposals in both options. Primary concerns were the inability to select other BMPs, including land banks and Low Impact Development designs (LID)⁶, the burden of cost and liability imposed upon a developer to install stormwater wetlands, and the lack of long-term maintenance to ensure effectiveness. If stormwater wetlands are not going to be properly maintained, she asked, and the developer surely should not be responsible for their ongoing maintenance, why install

⁶ LID controls stormwater and their pollutants at the source by using a site design strategy which replicates pre-development conditions by creating a functionally equivalent landscape (EPA 2000b).

them in the first place (L. Martin, personal communication, July 17, 2007)? Another concern was NCDENR's Stormwater Best Management Practices Manual which rated the effectiveness of wetlands mitigating fecal coliform loadings in urban areas as medium. The business representative's preference for Options D and E was LOW (2), primarily due to their dependence on stormwater wetlands.

The last stakeholder group was the public citizen group, Northeast Creek Streamwatch. They preferred Option E slightly over Option D primarily due to buffer strips which they stated are being required by city-county ordinance. Their primary concern with both options was implementation of the watershed restoration plan, and they recommended an additional non-structural BMP, enforcement. They had concerns that neither option recommended inspection and enforcement to ensure illicit discharges into the creek were not occurring, and the proper implementation of the watershed restoration plan, including monitoring for compliance. They strongly supported a stormwater pollution educational campaign or program for the public, and were very willing to assist with the design and implementation of such a campaign or program for the watershed. They have already been working on educating the public through environmental events (e.g. Big Sweep, Earth Day), guided tours of the creek, presentations to home owners and writing for the Durham Stormwater Services newsletter and the local newspaper. However, a more organized, concerted effort targeting specific watershed needs seemed to them to be essential to them.

Option E is most preferred by this stakeholder group, and rated High (9). Option D is also strongly preferred by this stakeholder group, and rated MEDIUM (5).

3.6 Strategy Preferred BMP Selection

Comparing and adding the final scores from each decision matrix, Option E was slightly preferred to Option D (see Figure 12), and is the suggested BMP strategy.

Options	Total Scores			
	Private Citizens	Government	Business	Total
D	3.7	4.1	3.4	11.2
E	5.4	5	4.7	15.1

Figure 12 AHP Totals

Additional strategy recommendations to be considered for the Northeast Creek watershed restoration plan include: (i) modifying the stream buffer requirements to comply with Durham ordinances, (ii) modifying the educational program strategy to a targeted adult campaign regarding stormwater and actions to reduce stormwater pollution in the watershed, (iii) ensuring the watershed restoration plan identifies a responsible party or project manager to execute and track its implementation, including monitoring for compliance and enforcement, and (iv) a recommendation that the final watershed restoration plan be presented to all stakeholders for their input prior to implementation.

CONCLUSION

All urban streams within the city of Durham, North Carolina fail to meet one or more state water quality standards. Durham is facing significant water quality challenges, and like many other cities throughout North Carolina, must develop a number of watershed restoration plans to improve stream water quality to the state standards. Development and implementation of these plans requires more than just restoring stream water quality; a number of other possible criteria may influence the choice of contaminate mitigation strategies. Choosing an appropriate mitigation strategy becomes more difficult when multiple criteria must be considered.

This work applied a simple AHP decision support matrix in a BMP strategy selection for Northeast Creek. The AHP provided a way to include and organize multiple criteria in the analysis of proposed BMP strategies for Northeast Creek. Results from the AHP decision matrix indicated a preference for a diverse structural and non-structural BMP strategy, with an emphasis on enforcement, stream buffers and targeted adult public educational campaigns. While the application demonstrated a simplified AHP in assisting with the BMP selection process for a specific watershed pollutant, opportunities exist to expand upon AHP application in the watershed restoration development process.

Appendix A

Summation of Key TMDL Litigation

Case	Citation	Summary
<i>Environmental Defense Fund, Inc. v. Costle</i>	<i>657 F.2d 275 (D.C. Cir. 1981)</i>	(1) Court clearly interpreted the Clean Water Act to require development of 303[d] impaired waters list and TMDL for listed waters (2) Also identified appropriate judicial standard of review to be applied when lawsuit filed per Administrative Procedures Act (APA) 706(1): (a) agency failure to act; (b) agency's delay in acting has been unreasonable
<i>Scott v. City of Hammond</i>	<i>741 F.2d 992, 996 (7th Cir. 1984)</i>	(1) Court ruled that a state's prolonged failure to submit proposed TMDLs to EPA may amount to a "constructive submission" by the state of no TMDLs, and EPA is under duty to either approve or disapprove the submission (2) EPA's approval of TMDL may be reviewed under the APA, and if EPA disapproves TMDLs, they are under mandatory duty to issue their own (3) TMDL establishes a set maximum daily discharge of pollutants, and must be obeyed even if a monthly standard was met (4) Cited legislative history from 1972 Clean Water Act indicating Senate wanted Clean Water Act to address states' failure to act regarding water pollution
<i>Alaska Center for the Environment, et al. v. Reilly</i> <i>Kingman Park Civic Association v. EPA</i>	<i>762 F. Supp. 1422 (W.D. Wash. 1991)</i> <i>84 F. Supp.2d 1, 3 (D.D.C. 1999)</i>	(1) first of a number of cases to employ <i>Scott v. City of Hammond</i> decision, state's failure to submit TMDLs to EPA over "x" period of time "constructive submission" and EPA under mandatory duty to promulgate its own TMDLs for the state (2) defined use of word "shall" in Clean Water Act as a mandatory duty on EPA to take affirmative action in a prompt time frame (3) lack of knowledge can not be used an excuse to delay TMDL develop, add margin of safety to compensate for lack of knowledge
<i>Friends of the Wild Swan, Inc. v. EPA</i>	<i>130 F. Supp.2d 1184, 1193 (D. Mont. 1999)</i>	(1) neither CWA or EPA regulations mandate states to assess all waterways before making a 303(d) list submission
<i>Natural Resources Defense Council v. Fox</i>	<i>93 F.Supp.2d 531 (S.D.N.Y. 2000)</i>	(1) all waterway segments on 303(d) list, whether impaired currently or not, requires the development of a TMDL (2) TMDL must address segments that do not meet water quality standards and segments that are not "expected" to meet water quality standards
<i>Pronsolino v. Nastri</i>	<i>291 F.3d 1123 (9th Cir. 2002)</i>	(1) Court ruling upheld EPA's interpretation that states must identified waterways impaired partly or solely by non-point sources of pollution and establish a TDML

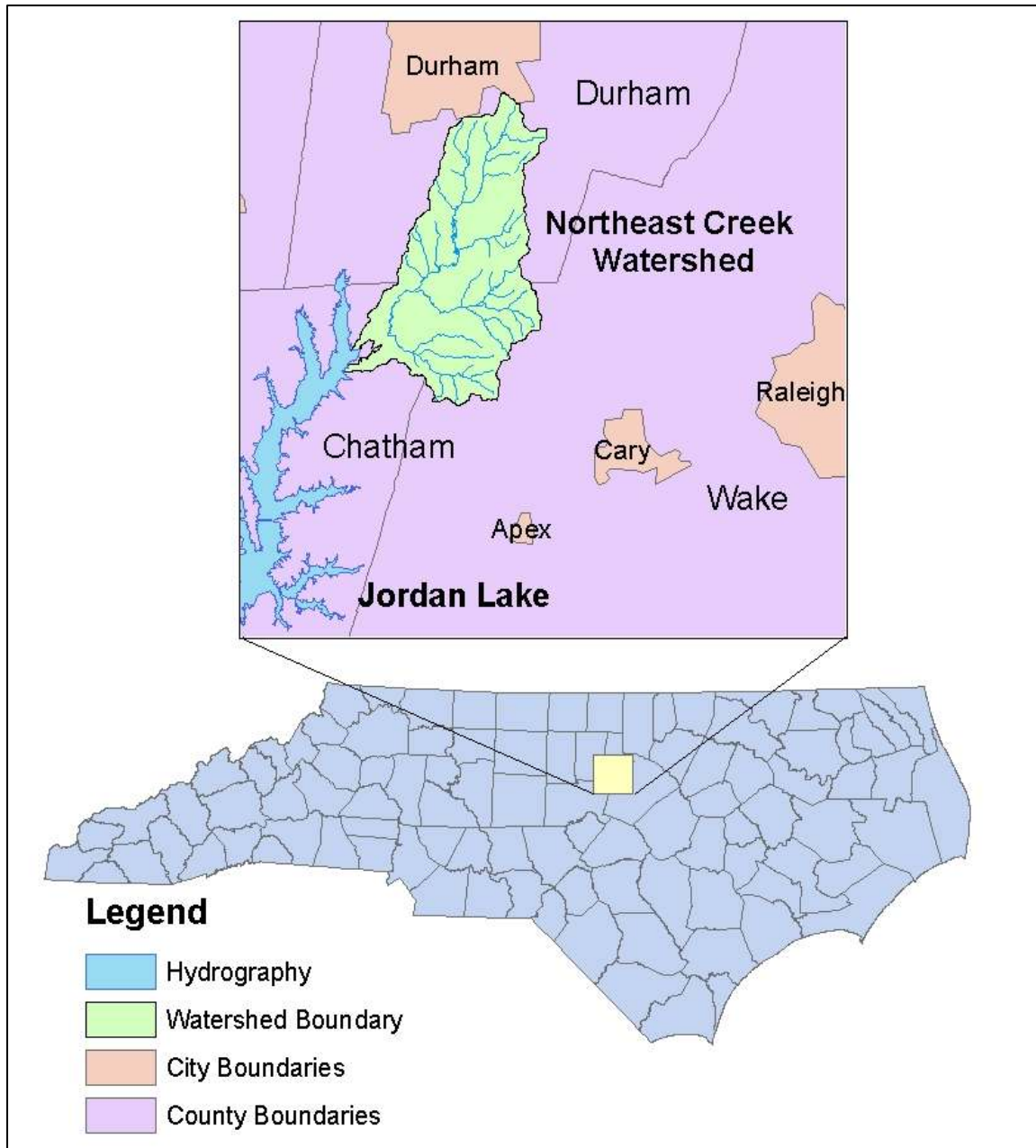
Appendix A

Summatin of Key TMDL Litigation

Case	Citation	Summary
<i>Minnesota Center for Environmental Advocacy v. EPA</i>	<i>2005 U.S. Dist. Lexis 12652 (D. Minn. 2005)</i>	(1) states and EPA may establishment basinwide TMDLs as long as it enables each impaired reach to achieve water quality standards (2) phase or interim TMDL calculations are not acceptable (3) illegal straight-pipe septic systems are point sources that need a wasteload allocation
<i>Pronsolino et al. v. Marcus et al.</i>	<i>91 F.Supp.2d 1337, 1355 (N.D. Cal. 2000)</i>	(1) Clean Water Act nor EPA's regulations require an implementation plan for TMDLs (2) states free to select whatever action necessary to achieve water quality standards
<i>Amigos Bravos v. Green</i>	<i>306 F.Supp. 2d 48 (D.D.C. 2004)</i>	
<i>Sierra Club v. Meiburg</i>	<i>296 F.3d. 1021 (11th Cir. 2002)</i>	
<i>Friends of the Earth v. EPA</i>	<i>446 F.3d 140 (D.C. Cir. 2006)</i>	(1) all TMDLs must be expressed as a "daily" load rather than annual, or seasonal

Appendix B

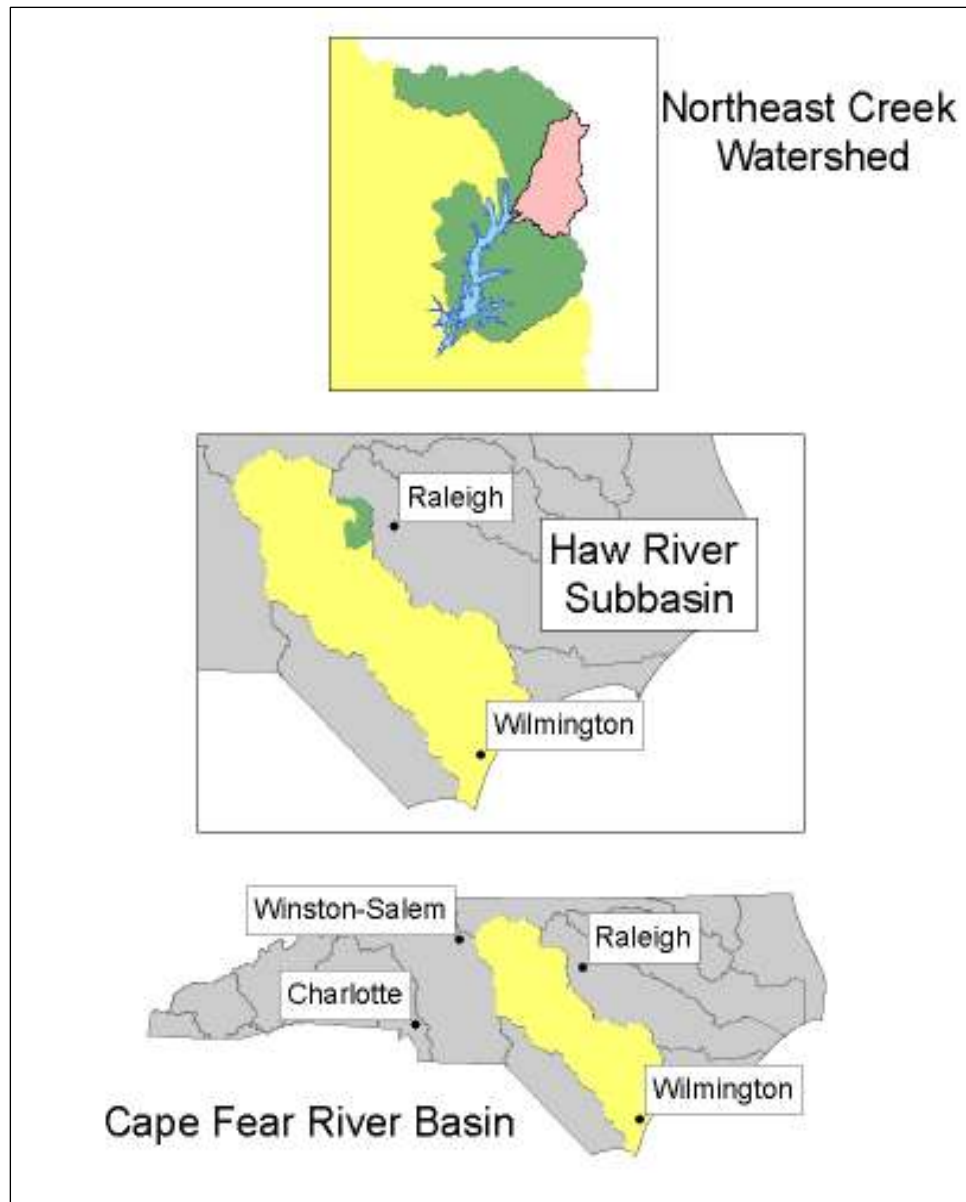
Spatial Representation of Northeast Creek Watershed



Placement of Northeast Creek Watershed within the Piedmont region of North Carolina (Hunn 2007)

Appendix B

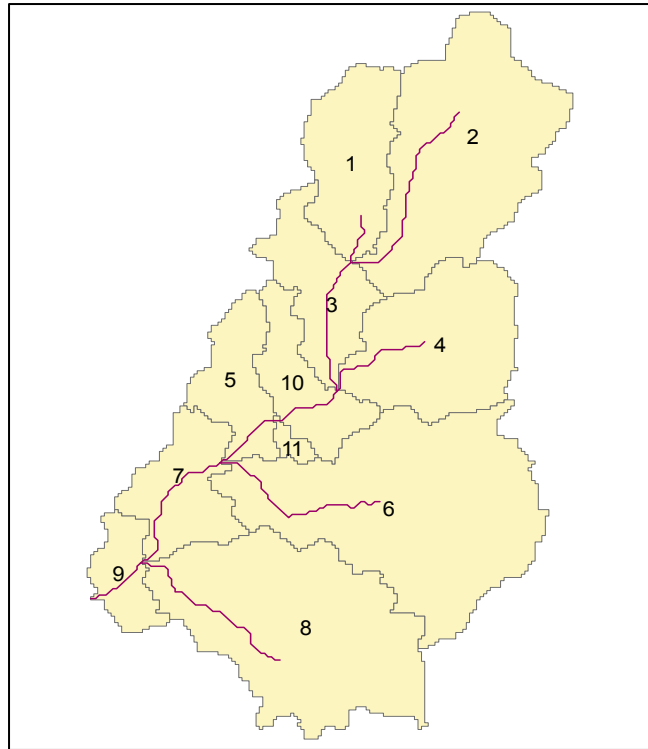
Spatial Representation of Northeast Creek Watershed



Placement of Northeast Creek Watershed within the Haw River SubBasin and the Cape Fear River Basin (Hunn 2007)

Appendix C

BASINS subwatershed land use distribution



Northeast Creek subwatersheds with corresponding assigned reach numbers (Hunn 2007)

Assigned Reach	Pervious							Impervious
	Urban	Cropland	Forest	Wetland	Barren	Pasture	Rangeland	Urban
Subwatershed 1	556	22	807	87	22	65	65	556
Subwatershed 2	1085	52	2221	258	52	310	103	1085
Subwatershed 3	656	18	108	288	-	54	36	656
Subwatershed 4	697	65	1329	227	32	130	65	697
Subwatershed 5	353	-	423	197	-	28	56	353
Subwatershed 6	475	203	4270	668	203	271	203	475
Subwatershed 7	70	52	1095	313	17	52	70	70
Subwatershed 8	258	172	3836	401	-	458	344	258
Subwatershed 9	-	18	622	178	-	45	27	-
Subwatershed 10	358	29	387	172	14	14	100	358
Subwatershed 11	3	3	113	8	-	19	11	3
Percentage of Total Watershed Area								
	14.8%	2.1%	49.8%	9.2%	1.1%	4.7%	3.5%	14.8%

Allocation of landuse by subwatershed using USGS data and ArcGIS tools (Hunn 2007)

Appendix D

Durham Stormwater Facility Residential Agreement and Covenant

Please return to: [Insert Permittee's mailing address]

STATE OF NORTH CAROLINA
COUNTY OF DURHAM

STORMWATER FACILITY AGREEMENT
AND COVENANTS (Residential Version)

THIS AGREEMENT ("Agreement") is made among _____ ("Permittee"), _____ ("Association"), and the City of Durham, a North Carolina municipal corporation ("City") and is effective on the date of its recordation in the Durham County Register of Deeds.

1. Background and Definitions

a. Scope; Purpose. Permittee owns and is developing real property (the "Property") that, upon completion of development, will contain one or more constructed stormwater improvements (the "Facility/ies") to control stormwater runoff and pollution from the Property. After construction, Permittee will transfer portions of the Property, including the Facility/ies, to the Association, which will be responsible for perpetual maintenance, annual inspection, repair, reporting to the City, and reconstruction of the Facility/ies. This Agreement sets forth Permittee's obligations to construct the Facility/ies in accordance with the obligations of this Agreement and other City Requirements, inspect and certify the Facility/ies, pay certain monies toward the replacement of the Facility/ies, and establish the Association and its obligations, through legally binding covenants. This Agreement also sets forth the responsibilities of the Association with regard to the Facility/ies. This Agreement is appurtenant to and runs with the Property, described in Section 1(b) below. The purpose of this Agreement is to ensure construction of the Facility/ies per City Requirements, to ensure the perpetual inspection, maintenance, repair, and reconstruction of the Facility/ies by Lot Owners within the Property, and to allow the City in its discretion to enforce these requirements, if necessary, for the benefit of the Lot Owners collectively, and the public at large.

b. Property to which this Agreement Attaches. The Property is that property shown on the plat entitled _____ and recorded at **Plat Book** _____, **Page** _____, Lots _____ (instructions to staff – after the word "lots" indicate either "all" or identify by number the specific Lots subject to this Agreement.), Durham County Register of Deeds. It is generally located _____ and _____ of the intersection of _____ and _____ and is commonly known as _____. It is part or all of the property acquired by Permittee in deeds recorded in **Deed Book** _____, **Page** _____, Durham County Register of Deeds. The Facility/ies that must be constructed, certified, maintained, inspected annually, repaired, and reconstructed pursuant to this Agreement are located on the following lots on the above described plat and are of the following approximate size and type (*SW staff: describe below each Facility by its general type such as "wet detention facility" or "wetlands", the projected approximate size for each, and identify the lot on the above-described plat where each Facility will be located*):

i.

ii.

iii.

c. Background. This Agreement is intended to comply with City ordinances and policies that implement State and Federal laws that require that development contain stormwater facilities to control runoff and pollution and that such facilities be perpetually maintained and reconstructed.

d. Relationship to Ordinances, Policies, and Guidelines. This Agreement supplements other City Requirements. If this Agreement and such City Requirements conflict, the stricter requirements shall control.

e. Definitions. The terms in this Agreement have the following definitions:

"Association" and "HOA" (the terms being used interchangeably) means the association that has executed this Agreement that was formed by Permittee in compliance with statutory requirements (which may include the North Carolina Nonprofit Corporation Act, NCGS Chapter 55A, and the North Carolina Planned Community Act, NCGS Chapter 47F and successor statutes) for the purpose of owning and maintaining real property and improvements thereon intended for the common benefit of - Lot Owners within the Property-. In the absence of the Association, for whatever reason, the Lot Owners, collectively, shall be considered the Association and shall be responsible for the Association's obligations under this Agreement. The "Association" may also include additional associations or lot owners not shown on the Property where such associations or owners have joined, or have purchased subject to, the obligations of the Association in this Agreement.

"City Manager" means the Durham City Manager or a Deputy City Manager to whom authority to execute contracts has been delegated.

"City Fund" means "Stormwater Facility Replacement Fund" as defined below.

"City Requirements" means the legal obligations and standards set forth in City ordinances, and written City and Public Works policies, guidelines, manuals, protocols, standards, and/or handbooks, as such may be amended from time to time.

"Director" means the City's Director of Public Works or the Director of a successor department to the Department of Public Works and any Person to whom the Director's duties have been delegated pursuant to City Requirements.

"Facility/ies" means one or more stormwater control device(s) and/or areas that are created for the purpose of detaining and/or treating stormwater. Such facilities may include but are not limited to dry detention areas, wet detention ponds, wetlands, level spreaders and all associated constructed and natural features that allow such devices or areas to function as intended.

"Lot" means a lot within the Property, whether developed or undeveloped.

"Lot Owner" means the legal owner of any fee simple interest in a Lot.

"Permittee" means the party that owns the Property at the time of recordation and that executes this Agreement and successors in

interest who take all or a portion of the Property. The term does not include any Person that has only a beneficial interest in the Property. The term also does not include a Person who owns one Lot zoned for single family use where such owner does not own other lots.

"Person" includes but is not limited to natural persons, business trusts, joint ventures, governments, governmental subdivisions, governmental agencies, firms, corporations, limited liability companies, associations, partnerships, and other legal entities.

"Property" is the land described in Section 1(b) above which is owned by the Permittee and which will be served by the Facility/ies described herein.

"Site" means a Lot or parcel within the Property which contains at least one Facility. Where there are multiple Facilities, there shall be multiple Sites.

"Stormwater Facility Replacement Fund" (also "City Fund") is the fund established by the City under ordinance to receive payments from various permittees for future use in the construction, repair, and reconstruction of facilities for which payment into the fund has been made, or for replacement facilities that mitigate the burden on or need for such original facilities.

"Transfer" includes sell, convey, assign or alienate all or a portion of an interest in property.

2. Permittee's Obligations to Create HOA; Record Documents and Covenants; Provide Certification; and Make Fund Payment Prior to Transferring Interest in, or Selling any Lots.

a. Incorporation of Association; Recording Documents and Covenants. Permittee shall incorporate an Association consisting of all Lot Owners in the Property which Association shall be charged with maintaining and repairing common areas within the Property, of which the Facility/ies shall be a part. Permittee shall create covenants for the Association which comply with this Agreement and which include Exhibit A to this Agreement, the Mandatory Covenant Requirements Regarding Stormwater Facilities. At the same time as the final plat for the Property is filed in the Office of the Register of Deeds for Durham County, and before Transfers of any interest in or Lots within the Property, Permittee shall take the following actions and complete the following additional filings in the Register of Deeds for Durham County, in the order indicated below:

- i. Finalize this Agreement by inserting the appropriate plat book and page references for the just-recorded plat for the Property in Section 1(b) above and adding any other missing entries or information;
- ii. Record this Agreement, properly executed by all Parties so as to bind the Permittee, the Association, and the Property;
- iii. Finalize the covenants for the Property by inserting the plat book and page numbers for the Property, the deed book and page numbers for this Agreement, and necessary language to incorporate Exhibit A of this Agreement into the Covenants;
- iv. Record the properly executed Covenants for the Property.

b. Delivery of Recorded Documents and Attorney Certification. Within 5 working days of completing the steps described in 2(a) above, and prior to Transferring any interest in the Property, including but not limited to the sale of any Lot, and prior to applying for and receiving any building permits for any Lot, Permittee shall deliver to the City's Stormwater Services Division an attorney's certification, as described below, and copies of the properly executed and recorded documents described in (a) above – i.e., the recorded plat, the recorded Agreement, and the recorded covenants for the Property. The attorney certification shall be from an attorney licensed to practice law in the State of North Carolina, in form and substance acceptable to the City that certifies to the following:

- i. That the Association was properly formed and incorporated in North Carolina in accordance with law;
- ii. That this Agreement and the Covenants for the Property have been executed by all legally necessary parties, in a legally binding manner, and are binding on the parties and the Property;
- iii. That the Agreement contains necessary references to the recorded plat for the Property, and that the Covenants for the Property contain necessary references to the recorded plat and the recorded Agreement, and incorporate Exhibit A of this Agreement;
- iv. That recordation of instruments described above occurred in the following order – plat, then Agreement, then Covenants;
- v. that the Covenants for the Property require membership for each Lot within the Property (except commonly owned Lots which may be excepted) and a rational allocation of the cost of maintenance, repair, and reconstruction of the Facility/ies amongst all such member Lots exists;
- vi. that the mandatory dues amounts for the two stormwater funds have been included in the Covenants;
- vii. that the Covenants provide a process for assessing the Lot Owners for delinquent payments and for additional payments for stormwater costs and enforcing such assessments and that the City is named as a third party with the right to enforce such assessments in lieu of the Association if necessary.

c. Payment to Stormwater Facility Replacement Fund. At the time of delivery of the recorded documents and certification, Permittee shall pay the estimated Stormwater Facility Replacement Fund payment, prescribed by City Requirements, which shall equal 25% of the estimated cost of constructing the Facility/ies, calculated in accordance with City Requirements. This payment is not intended as a substitute for security that ensures the construction of the Facility/ies, which security may be required at such point in the development process as is specified in City Requirements. Per City Requirements, Permittee may be required to supplement the payment into the Fund Payment upon completion of the Facility/ies, or may be refunded a portion of such payment.

d. Payment of Permit Fee(s). At the time of delivery of the recorded documents and certification, Permittee shall pay the Stormwater Permit Fee for each of the Facility/ies, as prescribed by City Requirements.

3. Permittee's Obligations with Regard to Construction of Facility/ies; Denial of Permits in the Event of Noncompliance.

a. Construction, Inspection, Certification, and Submission of As-Built Construction Drawings. Permittee shall complete the actions described below for the Facility/ies on such timetable as is specified in City Requirements.

- i. Construct the Facility/ies in accordance with the construction plans approved by the Department of Public Works and take various steps toward final completion, and finally complete the Facility/ies, in accordance with such timetables and/or deadlines specified in City Requirements;
- ii. Provide any additional security required by the Director to ensure construction of the Facility/ies if the deadlines

- described in (i) above have not been met, or in the event that Permittee becomes insolvent or otherwise unable to proceed with construction on the Property;
- iii. Cause the Facility/ies to be finally inspected and certified by the engineer who designed the Facility or by such other registered NC Professional Engineer acceptable to the City, in accordance with the City's BMP Certifying Engineer Program and other City Requirements;
- iv. Submit to the Department of Public Works reproducible as-built drawings and as-built calculations acceptable to the Department;
- v. Complete an operation and maintenance manual for each Facility in accordance with City Requirements;
- vi. Submit records to the City Stormwater Services Division in accordance with City Requirements documenting construction costs for the Facility, including but not limited to all costs of construction administration;
- vii. Complete any repairs to the Facility/ies that may be directed in the discretion of the Director;

In the event Permittee does not satisfactorily complete the foregoing obligations on such timetable as may be specified by the City, the City may withhold any permits and approvals related to development of the Property or any Lot and may pursue any other remedy available under this Agreement or applicable law.

b. Transfer of Site and Facility to Association. After satisfactory completion of the steps described in subsection (a) above, Permittee shall Transfer the Site(s) to the Association(s) which shall, thereafter, become responsible for inspection, maintenance, and reconstruction of the Facility/ies as set forth in Section 4 below. Permittee's transfer of the Site prior to completion of the steps described in (a) above shall not relieve Permittee of its obligations under this Agreement.

c. Discharge of Permittee's Obligations; Recordation of Release. Following satisfactory performance of its obligations under this Agreement, Permittee may request a release from the Director in writing. Within 30 calendar days of receipt of such request and receipt of all accompanying documentation and certifications required by the City, upon determination that Permittee has satisfied its obligations, the Director shall issue a release confirming that Permittee has fulfilled its obligations under this Agreement and is discharged from such obligations. Permittee shall record such release at the Durham County Register of Deeds. In its discretion, the City may record any documents indicating that construction of the Facility/ies has been completed and/or that Permittee is released from the obligations of this Agreement.

d. Notice to Lot Owners and Successors in Interest to Permittee. Recordation of this Agreement gives notice to all Lot Owners that building permits may be withheld for Lot(s) in which they have an interest in the event of Permittee noncompliance with Section (2) above or this Section (3). In addition, it gives notice to all Persons who may be considered "Permittee" under the definitions herein that approvals and permits related to development of the Property may be withheld in the event of Permittee noncompliance with this Agreement.

4. Association/Lot Owner Responsibility for Completed Facility/ies

a. Association's/Lot Owners' Continuing Permanent Responsibility for Facility/ies. Upon release of Permittee as described in Section 3(c) above, or if no release occurs, then upon official notification to the Association from the City, the Association, or in the event there is no legally effective Association, the Lot Owners collectively shall be responsible for inspection, maintenance, repair, reconstruction, and funding for the completed Facility/ies, and shall comply with all City Requirements. The Association shall be responsible for performing these obligations whether or not the Site and/or the Facility/ies have been legally transferred to the Association. The obligations of the Association, or the Lot Owners in the absence of an Association, are further described below.

b. Filing of Responsible Officer for Association with City. The Association file with the City's Department of Public Works, and update such filing yearly, the name and contact information of a responsible officer or agent for the Association who is familiar with the maintenance and upkeep of the Facility. The filing shall also be updated when there is a change in the responsible officer or agent.

c. Maintenance. The Facility/ies shall be maintained in compliance with City Requirements as they may change from time to time. At the time of recordation of this Agreement these are generally found in the City of Durham's "Owner's Maintenance Guide for Stormwater BMPs Constructed in the City of Durham" and in the operation and maintenance manual prepared specifically for the Facility/ies at the time of completion of construction. (As of October 1, 2007, the current version of the "Owner's Maintenance Guide for Stormwater BMPs Constructed in the City of Durham" can be viewed at or downloaded from the City's website at: http://www.durhamnc.gov/departments/works/pdf/draft_owners_maint_guide.pdf)

d. Inspections/Reports to City. In accordance with City Requirements, the Association shall cause the Facility/ies to be inspected (i) annually; (ii) after events that cause visual damage to the Facility; and (iii) upon notification by the Director. The inspection shall be performed by a registered North Carolina Professional Engineer or a North Carolina Registered Landscape Architect certified by the City and shall be in compliance with City Requirements. The inspection shall occur annually during the month in which acceptance of the as-built certification for the Facility/ies occurred, or at such other time as may be reasonably directed by the City. The inspection shall be reported to the City as further described below.

e. Repair and Reconstruction. The Association shall repair and/or reconstruct the Facility/ies as it determines is necessary, and, additionally, as may be directed by the City, to allow the Facility/ies to function for its/their intended purpose, and to its design capacity. The Association shall provide written reports regarding major repair or reconstruction to the City in accordance with City Requirements.

f. Budget Line Items for Stormwater Expenses. The dues of the Association shall include amounts for upkeep and reconstruction of the Facilities and charges for these purposes shall be included in the dues charged to Lots from the point that Lots are charged dues for other common purposes. The Association shall maintain two (2) separate funds in its budget for the Facility/ies. The first ("Inspection and Maintenance Fund") shall be for routine, yearly Facility expenditures -- annual inspections, maintenance, and routine repairs -- and the funds for this purpose may be maintained as part of the Association's general account. The second ("Major

Reconstruction Fund”) shall be dedicated to a separate, increasing reserve fund that will build over time and provide money for major repairs to and eventual reconstruction of the Facility/ies. The Major Reconstruction Fund shall be maintained in an account that is separate from the HOA’s general account as described below. At a minimum, the Association shall earmark _____ annually from its collected dues for the Inspection and Maintenance Fund and _____ annually for the Major Reconstruction Fund. These minimum amounts shall be increased annually by 3% per year over the prior year’s amount. The Association may set a higher amount in its discretion. The Association shall set a higher amount if the Director determines, in his/her reasonable discretion that additional amounts are necessary to provide for adequate inspections and maintenance or for an adequate reserve fund. The Association shall set dues at a sufficient amount to fund each of the two line items in addition to the Association’s other obligations. The Association may compel payment of dues through all remedies provided in the Covenants for the Property or otherwise available under law.

g. Assessments/Liens. In addition to payment of dues, each Lot shall be subject to assessments by the Association for the purpose of fulfilling the Association’s obligations under this Agreement. Such assessments shall be collected in the manner set forth in the covenants. As allowed under NCGS §47F, or successor statutes, or, for condominiums, as allowed under NCGS 47C, or successor statutes, all assessment remaining unpaid for 30 days or longer shall constitute a lien on the Lot. Such lien and costs of collection may be filed and foreclosed on by the Association. In addition, the Association’s rights may, in the discretion of the City, be exercised by the City, as a third party beneficiary of this Agreement and/or as Attorney in Fact for the Association, as provided in Section 7 of this Agreement, without limitation as to other rights the City may have under this Agreement and under law.

h. Stormwater Expenditures Receive Highest Priority. Notwithstanding any contrary provisions of the Association’s recorded covenants, to the extent not prohibited by law, the inspection, maintenance, repair, and replacement/reconstruction of the Facility/ies shall receive the highest priority (excluding taxes and assessments and other statutorily required expenditures) of all Association expenditures.

i. Separate Account for Major Reconstruction Fund; Requirements for Withdrawal. The Association shall maintain the major reconstruction fund for the Facility/ies in an account maintained at a bank or other similar institution and such account shall be separate from the Association’s general account. The Association shall use the Major Reconstruction Fund only for major repairs and reconstruction of the Facility/ies. The Association’s bylaws shall require that signatures of two Association officers are required for withdrawal of funds from the Major Reconstruction Fund.

j. Engineer Report prior to Major Repairs and Reconstruction. Prior to withdrawing funds from this account, the Association shall (i) obtain a written report from an engineer approved in accordance with City Requirements regarding repairs or reconstruction needed and approximate cost of such repair or reconstruction; and (ii) submit such report to the Director and notify the Director of the major repairs or reconstruction to be undertaken on the Facility, the proposed date, and the amount to be withdrawn from the Major Reconstruction Fund. In the event of an emergency withdrawal and expenditure of funds from the Major Reconstruction Fund may be made after telephone notification to the Stormwater Services Division of the Department.

k. Annual Reports to City. The Association shall provide to the Director annual reports in substance and form as set forth in City Requirements. This annual report shall be signed by an officer of the Association, who shall attest as to the accuracy of the financial information in such report. If prepared by a professional management company hired to manage the Association’s affairs, the report shall so indicate. The Officer’s signature and attestation shall be notarized. At a minimum each report shall include:

- i. the annual Facility/ies inspection report described in Section 4(d) above;
- ii. a bank or account statement showing the existence of and balance in the separate Major Reconstruction Fund at the time of submission of the report;
- iii. other information regarding the Facility/ies as may be required under City Requirements;
- iv. the amount of Association dues being set aside for the current year for each of the two purposes – the Inspection and Maintenance Fund, and the Major Reconstruction Fund.

l. Facility/ies to Remain with Association; Lot Owners’ Liability. To the extent not prohibited by law, the Facility/ies shall remain the property of the Association and may not be conveyed by the Association. In the event the Association ceases to exist or is unable to perform its obligations under this Agreement, all Lot Owners with the exception of those Lots owned by the Association shall be jointly and severally liable to the City to fulfill the Association’s obligations under this Agreement. Such Lot Owners shall have the right of contribution from other owners with each Lot’s proportional obligation calculated as set forth in the Covenants for the Association. In addition, the City may exercise the remedies described in Section 7 of the recorded Agreement. This Agreement and all other remedies provided by law.

m. No Public Adoption. The City’s exercise of rights under this Agreement or under City Requirements does not constitute adoption of the Facility/ies by the City. City regulation is not intended to impede or prohibit the Association or Lot Owners from taking all necessary actions to maintain, repair, and reconstruct the Facility/ies so that they function safely and perform the function for which they were created.

5. Stormwater Facility Replacement Payment and Fund.

The Permittee’s payment to the Stormwater Facility Replacement Fund (“City Fund”) shall be calculated, retained, used, and disbursed as provided by ordinance and other City Requirements. The Fund shall be used for the purchase, design, construction, reconstruction, and repair of stormwater facilities that have paid into the Fund or for stormwater facilities that replace or mitigate the need for those facilities for which monies have been paid into the Fund.

6. City Easement/Right of Entry/No City Responsibility

Permittee, the Association, and the Lot Owners hereby grant the City a permanent easement over the Site and Facility/ies for inspection, construction, repair, and other work on the Facility. The terms and conditions regarding the use of such easement may be expanded but not limited by recorded declarations regarding the use of such easements. Permittee, the Association, and the Lot Owners also grant the City a permanent nonrevocable right of ingress, egress, and regress over and across all public or private easements on the

Property, including but not limited to private roads, for inspection, construction, repair, and other work on the Facility/ies. Permittee and Lot Owners grant the City a permanent nonrevocable right of ingress, egress, and regress over individual Lots solely for response to emergencies, public nuisances, or the imminent threat thereof. In this Section, "the City" includes employees, agents, and contractors of the City. The grant of these rights does not obligate the City to exercise them or to take any other action.

7. Remedies for Violations; Lien on Property; Future Obligations Secured.

a. City Performance of Work. If the Permittee and/or Association fail to perform their obligations under this Agreement, the City may send notice to the party(ies) in default demanding performance. If the defaulting party does not cure such default within sixty (60) days from the date notice is mailed, the City may, in the reasonable discretion of the Director, enter the Property and the Site and perform some or all of the defaulting party's obligations under this Agreement. In an emergency the City may perform such work prior to the expiration of the 60 day period. Nothing in this Agreement shall be interpreted to require the City to undertake a party's obligations under this Agreement.

b. Repayment of City. The defaulting party shall reimburse the City for its costs in inspecting, constructing, repairing, and reconstructing the Facility/ies. Such costs may include the cost of administration and overhead. The City shall send written notice to the party in default requesting reimbursement for the costs of the work. The defaulting party shall pay all such costs within sixty days of the date he notice is mailed. Any costs not paid to the City within the sixty day period shall be delinquent, and the defaulting party shall be subject to all legal remedies available to the City under law or equity.

c. Debt Owed in the Event of Nonpayment; Lien. In the event that the defaulting party does not reimburse the City as required in subsection (b) above, the party shall owe the following additional amounts: interest on such costs at the rate of eight percent (8%) per annum, collection costs, late payment charges of three hundred dollars (\$300) for the first ninety (90) days of default and five hundred dollars (\$500) additional charge for each ninety (90) day period thereafter, and reasonable attorneys' fees. The debt may be collected by the City using any remedy authorized by law or in this Agreement. In addition, the debt or a proportional amount thereof calculated using a methodology reflecting number of lots, value of Property, types of uses, or a combination of these factors, as determined in the City's sole discretion, shall be a lien against the Property and the Lots and may be collected as unpaid taxes in accordance with N.C.G.S. 160A-193 or other statutory provisions, with notice as may be required by law. The City may add the debt to any utility bills owed and utilize any remedy provided by law or ordinance for unpaid utility bills. The City may also foreclose on the liens.

d. Right to Act for the Association. In addition to all of the remedies set forth herein, if the defaulting party is the Association and payment has become delinquent as described in paragraph (b) the City may, with additional 30 days' written notice to the Association, pursue the right of the Association to repay the amount due, as calculated in accordance with the Articles of Incorporation, Covenants, and Bylaws of the Association. The Association hereby designates, constitutes and appoints the City as the Association's Attorney in Fact for the express and limited purpose of assessing and pursuing collection of such amounts under the conditions and limitations as set forth herein. This appointment is coupled with an interest and is irrevocable as long as this Agreement is in effect.

e. Withholding of Permits. In the event the defaulting party is the Permittee, the City may withhold any or all permits or other approvals necessary to complete development of the Property or any Lot until such time as Permittee fulfills such obligations.

8. Release of Lien by Certificate.

a. Duty to Furnish a Certificate. On the request of any of the Persons described in subsection (a) (i) below, and upon the condition prescribed by subsection (a) (ii) below, the Director shall furnish a written certificate stating the amount of any monetary liabilities owed pursuant to this Agreement by a party to this Agreement or a Lot Owner.

i. Who May Make Request -- Any of the following Persons shall be entitled to request the certificate:

- A. An owner of the Property;
- B. An occupant of the Property;
- C. A Person having a lien on the Property;
- D. A Person having a legal interest in the Property, including but not limited to a Lot Owner;
- E. A Person having a contract to purchase or lease the Property or Lot or a Person that has contracted to make a loan secured by the Property or Lot;
- F. The authorized agent or attorney of any Person described in subdivisions (a) (i) (A) through (E) above.

ii. Duty of Person Making Request -- The City's duty to furnish a certificate is contingent upon the requester providing the following, as may be specified by the Director: the name of the party regarding whom the certificate is requested; the property regarding which the certificate is requested (the Property as a whole, some portion of the Property, or a Lot); recordation information for the pertinent Agreement; recordation information for pertinent covenants, if the request concerns an Association or Lot; a copy of the first page of this Agreement; a copy of the first page of the Association's Covenants; and payment of the required fee for a certificate.

b. Reliance on the Certificate. When a certificate has been issued as provided in subsection(a) above, all monetary liabilities owed pursuant to this Agreement that have accrued against the Site or the Property or the Lot identified in the request for the period covered by the certificate shall cease to be a lien against the identified property for which the certificate has been issued, except to the extent of monetary liabilities stated to be due in the certificate, as to all Persons obtaining such a certificate and their successors in interest who rely on the certificate by doing one or more of the following:

- i. Paying the amount of monetary liabilities stated therein to be owed;
- ii. Purchasing or leasing a portion of the Property; or
- iii. Lending money secured by all or part of the Property.

c. Oral Representations not Effective. Without limiting the effect of this Section, no oral statement made by any City employee as to the amount of monetary liabilities that are owed by the Permittee or a Lot Owner, or are a lien on all or a portion of the Property pursuant to this Agreement, shall be legally effective, or shall bind the City.

9. **Warranty.** Permittee covenants with the City that Permittee is seized of the Property in fee simple, has the right to convey the same in fee simple, that title is free and clear of all encumbrances, except for those identified in the Opinion of Title furnished to the City as a requirement prior to the City's execution of the Agreement, and that Permittee will warrant and defend the title against the lawful claims of all persons except for the exceptions stated in such opinion of title.
10. **Notice.** When a notice is required or permitted by this Agreement, it shall be given in writing to the City delivered to the Director of Public Works, 101 City Hall Plaza, Durham, NC 27701, FAX: (919) 560-4316 _____ or upon the Permittee, at (*insert name and address of Permittee*) _____. Written notice shall be sent by first class mail, and in addition by facsimile, if a fax address can be determined. Parties' addresses may be changed by sending a notice of the new address attached to a copy of the first page and execution pages of this Agreement.
11. **No Waiver of Breach.** If the City fails to enforce or waives any breach of any obligation or covenant in this Agreement, that failure to enforce or waiver shall not constitute a waiver of any other or future breach of the same or any other obligation or covenant. The City's failure to exercise any right under this Agreement shall not constitute a waiver of that right.
12. **Agreement Binding.** This Agreement and Covenants shall bind the Association in perpetuity and shall bind Permittee and its successors in interest until the City releases such Permittee as described in Section 3 above. A Lot Owner's obligations and liabilities under this Agreement shall cease upon conveyance of his/her Lot.
13. **Amendment of Agreement.** Amendments to this Agreement shall be valid only if made in writing and signed by the parties, provided that the Permittee's signature shall not be required if the Permittee has ceased to exist or has been released by the City as provided in Section 3 above. The City Manager may, on behalf of the City, amend this agreement without approval by the City Council.
14. **Covenants Herein to Run with the Property.** The obligations of this Agreement are a perpetual servitude and appurtenant to and running with the Property, -- the Site, and the Lots.
15. **Successors and Assigns.** The designation of Permittee, Association and the City shall also include their heirs, assigns, and successors in interest.
16. **Liability; Indemnification.**
- a. The approval by the City or any employee of the City of any plans or of any work referred to in this Agreement shall not create any liability in the City or its officers, officials, or employees for the plans or the work. Nothing herein is intended to release any other Person for any liability for those plans or work.
- b. The performance by the City or any employee of the City of any work allowed under this Agreement shall not create any liability in the City or its officers, officials, or employees for the work. Nothing herein is intended to release any other Person for any liability for that work.
- c. The Permittee, prior to release from the City, and the Association, after the Facility/ies are constructed shall indemnify the City and its officers and employees for any costs to the City or such Persons resulting from any claims regarding the construction, operation, maintenance, repair, and/or reconstruction of the Facility/ies, or the failure to perform the same. Costs shall include but are not limited to the expense of counsel chosen by and acceptable to the City.
17. **Remedies not Exclusive.** The provision of specific remedies in this Agreement is not limiting and the City shall have all remedies available in law and in equity to enforce the provisions of this Agreement against the Permittee, the Association, and/or the Lot Owners, and their respective heirs, personal representatives, successors, and assigns.
18. **No Third Party Rights.** Except as may be explicitly provided in this Agreement, this Agreement is not intended to be for the benefit of any Person other than the parties hereto, the Lot Owners, and their heirs, personal representatives, successors, and assigns.
19. **Governmental Functions; Superseding Regulations.** Nothing contained in this Agreement shall be deemed or construed to in any way stop, limit, or impair the City from exercising or performing any regulatory, policing, legislative, governmental, or other powers or functions. In addition, this Agreement does not restrict or prevent the application of ordinances or other enactments which may supplement or supersede the provisions of this Agreement.
20. **Choice of Law and Forum.** This Agreement shall be deemed made in Durham County, North Carolina and shall be governed by and construed in accordance with the law of North Carolina. The exclusive forum and venue for all actions arising out of this Agreement shall be the North Carolina General Court of Justice, in Durham County. Such actions shall neither be commenced in nor removed to federal court. This section shall not apply to subsequent actions to enforce a judgment entered in actions heard pursuant to this section.
21. **Interpretation of this Agreement.** Unless the context requires otherwise, the singular includes the plural, the plural includes the singular, and the neuter includes the masculine and feminine. The captions and titles are for convenience only, and are not to be used to interpret the Agreement. The words "include" and "including" mean, respectively, "include but not limited to", and "including but not limited to".
22. **Severability.** Invalidation of any term or provision in this Agreement by a court of competent jurisdiction shall not invalidate the remaining terms and provisions of this Agreement which may be enforced, at the election of the City, as set forth herein.

IN WITNESS WHEREOF, the parties hereto have respectively set their hands and seals, or if corporate, have executed this under seal by their proper officers, to be effective as of the date of its recordation in the Durham County Register of Deeds.

XYZ, Inc.

ATTEST:

Signed: _____

Signed: _____

Printed Name: _____

Printed Name: _____

Title: _____ Secretary

Title: _____ President

[Affix Corporate Seal]

STATE OF _____

COUNTY OF _____

I, _____, a notary public for said county and state, certify that _____ personally appeared before me this day, and acknowledged he or she is _____ Secretary of **XYZ, Inc.**, a corporation, and that by authority duly given and as the act of the corporation, the foregoing contract with the City of Durham was signed in its name by its _____ President, whose name is _____ and attested by him/herself as its said Secretary or Assistant Secretary.

This the _____ day of _____, 20__

Notary Public

My commission expires:

HOA, Inc.

ATTEST:

Signed: _____

Signed: _____

Printed Name: _____

Printed Name: _____

Title: _____ Secretary

Title: _____ President

[Affix Corporate Seal]

STATE OF _____

COUNTY OF _____

I, _____, a notary public for said county and state, certify that _____ personally appeared before me this day, and acknowledged he or she is _____ Secretary of **HOA, Inc.**, a corporation, and that by authority duly given and as the act of the corporation, the foregoing contract with the City of Durham was signed in its name by its _____ President, whose name is _____ and attested by him/herself as its said Secretary or Assistant Secretary.

This the _____ day of _____, 20__

Notary Public

My commission expires:

ATTEST:

CITY OF DURHAM

By: _____
City Clerk

City Manager

[Affix Municipal Seal]

STATE OF NORTH CAROLINA

COUNTY OF DURHAM

I, _____, a notary public in and for the County of Durham, North Carolina certify that _____ personally appeared before me this day and acknowledged that he/she is City Clerk of the **CITY OF DURHAM**, a municipal corporation, and that by authority duly given and as the act of the City, the foregoing contract was signed in its name by its _____ City Manager and attested by himself/herself as its said City Clerk or Deputy City Clerk.

Witness my hand and notarial seal, the _____ day of _____, 20__.

My commission expires:

Notary Public

**EXHIBIT A
TO
STORMWATER FACILITY AGREEMENT AND COVENANTS
MANDATORY PROVISIONS FOR DECLARATION OF RESTRICTIVE COVENANTS**

ARTICLE (fill in)

Obligations Regarding Stormwater Facilities

The Property includes one or more stormwater management facilities (hereafter "Facility/ies") that is/are the perpetual responsibility of the Association. Such Facilities are the subject of a Stormwater Facility Agreement and Covenants ("Stormwater Agreement") between Declarant, the Association, and the City of Durham ("the City") that is binding on the Association. The Stormwater Agreement is recorded at DB _____ Page _____, Durham County Register of Deeds. The Property subject to that Stormwater Agreement is the "Property" referred to in this Article. The Stormwater Facilities must be maintained in accordance with City Requirements, which include all ordinances, policies, standards, and maintenance protocols and in accordance with the recorded Stormwater Agreement. In particular the City's current "Owner's Maintenance Guide for Stormwater BMPs Constructed in the City of Durham" (available at the time of recording this document at http://www.durhamnc.gov/departments/works/pdf/draft_owners_maint_guide.pdf and the operation and maintenance manual prepared specifically for the Facility/ies contain requirements that apply to the Association's Facilities.

Nothing in the remaining Article of these Restrictive Covenants filed by Declarant as part of this Declaration or any subsequent modifications of this Declaration may reduce the Association's or Lot Owners' obligations with regard to the Facility/ies. Such additional covenants may increase the obligations or provide for additional enforcement options.

The Stormwater Facility/ies and their location are as follows: *(Insert below the description of Facilities and Plat Book citation and Lot identification from Section 1(b) of the Stormwater Agreement)*. In addition to the above obligations, the Association's obligations with regard to the Facilities are:

1. **Inspections/Routine Maintenance.** In accordance with City Requirements, the Association shall cause the Facility/ies to be inspected i) annually; and, ii) after major storm events cause visual damage to the Facility; and iii) upon notification from the City to inspect. The inspection shall be performed by a registered North Carolina Professional Engineer or a North Carolina Registered Landscape Architect certified by the City who shall document those things mandated under City Requirements. The inspection shall occur annually during the month in which the Facility/ies as-built certification was accepted by the City, which month may be determined through contact with the City of Durham Department of Public Works, Stormwater Division. The inspection shall be reported to the City as further described below.
2. **Repair and Reconstruction.** The Association shall repair and/or reconstruct the Facility/ies as it determines is necessary, and, at a minimum, as set forth in City Requirements or as directed by the City to allow the Facility/ies to function for its intended purpose, and to its design capacity. The Association shall provide written reports regarding major repair or reconstruction to the City in accordance with City Requirements.
3. **Stormwater Budget Line Items & Funding.** The dues of the Association shall include amounts for upkeep and reconstruction of the Facilities which shall be included in dues charged to Lots or members from the point that Lots or members are charged dues for other common purposes. The Association shall maintain two (2) separate funds in its budget for the Facility/ies. The first, the "Inspection and Maintenance Fund," shall be for routine inspection and maintenance expenditures and shall be used for annual inspections, maintenance, and minor repairs. The funds for this purpose may be maintained as part of the Association's general account. The second fund, the "Major Reconstruction Fund," shall be a separate, increasing reserve fund that will build over time and provide money for major repairs to and eventual reconstruction of the Facility/ies. The Major Reconstruction Fund shall be maintained in an account that is separate account from the Association's general account as described below. At a minimum, the Association shall, annually, earmark _____ from its collected dues for the Inspection and Maintenance Fund and _____ for the Major Reconstruction Fund. These minimum amounts shall be increased annually by 3% per year over the prior year's amount. The Association may set a higher amount in its discretion, or if directed by Durham Director of Public Works after an examination of the Facility/ies. The Association shall set dues at a sufficient amount to fund each of the two line items in addition to the Association's other obligations. The Association may compel payment of dues through all remedies provided in these Covenants or otherwise available under law.
4. **Assessments/Liens.** In addition to payment of dues, each Lot shall be subject to assessments by the Association for the purpose of fulfilling the Association's obligations under this Article and under the Stormwater Agreement. Such assessments shall be collected in the manner set forth in these Covenants. As allowed under NCGS §47F, or successor statutes, or, for condominiums, as allowed under NCGS 47C, or successor statutes, all assessment remaining unpaid for 30 days or longer shall constitute a lien on the Lot. Such lien and costs of collection may be filed and foreclosed on by the Association. In addition, the Association's rights may, in the discretion of the City, be exercised by the City, as a third party beneficiary of the recorded Stormwater Agreement and/or as Attorney in Fact for the Association, as provided in Section 7 of the recorded Stormwater Agreement.
5. **Stormwater Expenditures Receive Highest Priority.** Notwithstanding any contrary provisions of the covenants of which this Article is a part, to the extent not prohibited by law, the inspection, maintenance, repair, and replacement/reconstruction of the Facility/ies shall receive the highest priority (excluding taxes and assessments and other statutorily required expenditures) of all Association expenditures.
6. **Separate Account for Major Reconstruction Fund. Engineer's Report.** The Association shall maintain the Major Reconstruction Fund for the Facility/ies in an account separate from the Association's general account. The Association shall use the

Fund only for major repairs and reconstruction of the Facility/ies. No withdrawal shall be made from this fund unless the withdrawal is approved by two Association officials who shall execute any documents allowing such withdrawal. Prior to withdrawing funds from this account, the Association shall (i) obtain a written report from an engineer approved in accordance with City Requirements regarding repairs or reconstruction needed and approximate cost of such repair or reconstruction; and (ii) submit such report to the Director of the City's Department of Public Works, and notify the Director of the repairs or reconstruction to be undertaken on the Facility, the proposed date, and the amount to be withdrawn from the Major Reconstruction Fund. In the event of an emergency, withdrawal and expenditure of funds may be made after telephone notification to the Stormwater Services Division of the Department.

7. **Annual Reports to City.** The Association shall provide to the City annual reports in substance and form as set forth in City Requirements. This annual report shall be signed by an officer of the Association, who shall attest as to the accuracy of the information in such report. If prepared by a professional management company hired to manage the Association's affairs, the report shall so indicate. The Officer's signature and attestation shall be notarized. At a minimum each report shall include:

- i. the annual Facilities inspections report described in section (1) above;
- ii. a bank or account statement showing the existence of the separate Major Reconstruction Fund described in Section (6) above and the balance in such fund as of the time of submission of the report;
- iii. a description of repairs exceeding normal maintenance that have been performed on the Facility/ies in the past year, and the cost of such repairs;
- iv. the amount of Association dues being set aside for the current year for each of the two stormwater funds – the Inspection and Maintenance Fund and the Major Reconstruction Fund.

8. **Facility/ies to Remain with Association; Lot Owners' Liability.** To the extent not prohibited by law, the Facility/ies shall remain the property of the Association and may not be conveyed by the Association. In the event the Association ceases to exist or is unable to perform its obligations under this Agreement, all Lot Owners as defined in the Stormwater Agreement referenced above, excluding the Lots owned by the Association, shall be jointly and severally liable to fulfill the Association's obligations under this Agreement. Such Lot Owners shall have the right of contribution from other owners with each Lot's pro rata share being calculated as Lot Owner's proportional obligations are otherwise defined in these Covenants. The City may also exercise the rights described in Section 7 of the recorded Stormwater Agreement and other remedies provided by law.

9. **City Rights; Liens Against Owners.** In addition to rights granted to the City by ordinance or otherwise, the City shall have the following rights, generally summarized below, and more explicitly set forth in the Stormwater Agreement referenced above:

- a. Direct the Association in matters regarding the inspection, maintenance, repair, and /or reconstruction of the Facility/ies;
- b. If the Association does not perform the work required by ordinance, by these covenants, and by the Stormwater Agreement referenced above, do such work itself, upon 30 days' written notice to the Association.
- c. Access the Facility/ies for inspection, maintenance, and repair, crossing as necessary the lot(s) on which the Facility/ies are located and all other private and public easements that exist within the Property subject to these covenants.
- d. Require reimbursement by the Association of the City's costs in inspecting, maintaining, repairing, or reconstructing the Facility/ies, as provided in the Stormwater Agreement referenced above.
- e. Enforce any debts owed by the Association as described in the Stormwater Agreement referenced above against Lot Owners if such debts are not fully paid by the Association. The debt may be allocated to Lot Owners as provided in the other sections of these Covenants, and may be made a lien on each owner's property, may be added to each owner's utility bills, and may result in foreclosure, as provided in Section 7 of the Stormwater Agreement referenced above.

10. **No Dissolution.** To the extent not prohibited by law, the Association shall not enter into voluntary dissolution unless the Facility is transferred to a person who has been approved by the City and has executed a Stormwater Agreement with the City assuming the obligations of the Association. Under the Stormwater Agreement referenced above, individual Lots and Lot Owners continue to be liable for the Facility/ies in the event the Association is dissolved without a new Stormwater Agreement between the City and a responsible party that is assuming the Association's obligations.

11. **No Amendment.** Without the prior written consent of the City, which may be given by the Durham City Manager, and notwithstanding any other provisions of these Restrictive Covenants, the Association may not amend or delete this Article with the exception of supplementing its provisions in a more detailed manner to better describe members' or Lot Owners' obligations regarding each other.

12. **Stormwater Agreement Supersedes.** The Stormwater Agreement referenced above supersedes any limiting provisions contained elsewhere in other Articles of these Covenants. However, such Articles may supplement the obligations of the Association as set forth in that Agreement, and/or the obligations of and remedies against individual Lot Owners or members bound by these Covenants.

Appendix E

Durham Stormwater Facility Commercial Agreement and Covenant

Please return to: [Insert Permittee's mailing address]

STATE OF NORTH CAROLINA
COUNTY OF DURHAM

STORMWATER FACILITY AGREEMENT
AND COVENANTS (Commercial Version)

THIS AGREEMENT ("Agreement") is made and entered into this ____ day of _____, 20__, by and between **XYZ, Inc.** ("Permittee"), and the City of Durham, a North Carolina municipal corporation ("City"). The obligations of this Agreement run with and are appurtenant to the Property described in this Agreement.

1. Background and Definitions

a. Scope of Agreement. Permittee owns and is developing property ("the Property") that contains one or more constructed stormwater improvements (the "Facility/ies") to control stormwater runoff and pollution. After construction of the Facility/ies, Permittee and its successors in interest will be responsible for perpetual maintenance, annual inspection, repair, reporting to the City, and reconstruction of the Facility/ies. This Agreement sets forth the requirements the Permittee assumes for the construction, perpetual maintenance, annual inspection, repair and reconstruction of the Facility/ies. This Agreement runs with and is appurtenant to the Property, described in (b) below.

b. Property to which this Agreement Attaches. The Property is described at **Plat Book XXX, Page XXX**, Durham County Register of Deeds. It is generally located **west of the intersection of XXXXX XXXXX and XXXX XXXX, and is commonly known as XXXXXXXXXXXXXXXXXXXX**. It is part or all of the property acquired by Permittee in deeds recorded in **Deed Book XXXX, Page XXX**, Durham County Register of Deeds. The Facility/ies subject to this Agreement is/are generally described below: *(Describe approximate size of each facility and main feature – e.g., wetlands, dry pond, wet pond, etc. If any Facility is located on a separate lot or tract within the Property, and the location is known, identify the specific lot or tract where the Facility is located.)*

i. *(description)*

ii. *(description of Facility 2)*

c. Background. This Agreement is intended to comply with City ordinances and policies that implement State and Federal law and that require development to provide stormwater facilities to control runoff and to mitigate pollution. City ordinances require private property owners to perpetually inspect, maintain, and reconstruct these facilities in accordance with City requirements.

d. Relationship to Ordinance and Guidelines. This document does not supersede requirements regarding stormwater facilities found in City ordinances, guidelines, or policies. Such ordinances, guidelines, or policies shall supplement this Agreement and Covenants. When they are in conflict, the stricter requirements shall control.

e. Definitions. The terms in this Agreement have the following definitions:

"City Manager" means the Durham City Manager or a Deputy City Manager.

"City Requirements" means the written ordinances, policies, protocols, procedures, standards, and guidelines of the City of Durham as they may be changed from time to time.

"Director of Public Works" or "Director" means the City's Director of Public Works or his or her designee.

"Facility/ies" means the stormwater control device(s) that is/are the subject of this Agreement and may include more than one such device.

"Lot" means a lot within the Property, whether developed or undeveloped.

"Lot Owner" means the legal owner of any Lot.

"Permittee" means the party executing this Agreement with the City and successor owners of the Property or of any Lot within the Property whether or not successors in interest have executed an Agreement with the City. Permittee does not include an owner who possesses solely a beneficial interest in a Lot.

"Person" includes but is not limited to natural persons, business trusts, joint ventures, governments, governmental subdivisions, governmental agencies, firms, corporations, associations, partnerships, and other legal entities.

"Property" is as described by deed book and page reference and plat book and page reference above, and means the land that is owned by the Permittee at the time of recordation of this Agreement.

"Stormwater Facility Replacement Fund Payment" (hereafter "Fund Payment") is the payment that may be made by Permittee to a fund established by the City which is used for replacement of stormwater facilities or construction of new facilities intended to mitigate the burden on existing facilities

"Transfer" includes sell, convey, assign or alienate all or a portion of an interest in the Property.

2. Permittee's Obligations to Record Documents; Provide Security for Continuing Maintenance and Reconstruction; Construct Facility.

a. Recordation of Executed Agreement/Timing. Permittee shall cause this Agreement to be legally executed by all necessary parties so as to bind the Permittee, the Property, and all successors in interest in the Property, and shall record the executed Agreement with the Durham County Register of Deeds. The recordation shall be at such point in the development process as specified in City Requirements, which shall be prior to City construction drawing approval or issuance of any utility permits for the Property and prior to transfers by Permittee of any Lots within the Property. If a plat has been submitted to subdivide the Property, this Agreement shall be recorded prior to or contemporaneously with the recordation of such plat.

b. Delivery of Recorded Documents/Payment to Ensure Maintenance and Reconstruction. At such time as is specified in City Requirements, which shall be prior to City construction drawing approval or issuance of any utility permits on the Property, Permittee shall deliver to the City copies of the following:

- i) a certificate of an attorney licensed to practice law in the state of North Carolina in form and substance satisfactory to the City that the Agreement has been legally executed by all necessary parties in such a manner as to bind the Permittee and the entire Property, that recordation occurred prior to any transfer of the Property or Lot within the Property, and such other things as may be specified by the City;
- ii) this Agreement, recorded;
- iii) the estimated Stormwater Facility Replacement Fund Payment as prescribed in City Requirements or an alternative security of 20 times the maintenance cost of the Facility/ies, as calculated under City Requirements;
- iv) pay the Stormwater Permit Fee for each of the Facility/ies, as prescribed in City Requirements.

c. Construction/Inspection/Certification/Submission of As-Built/Deadlines. Permittee shall construct the Facility/ies in accordance with the plans approved by the Director of Public Works. Permittee shall complete construction and cause the Facility/ies to be finally inspected and certified, in accordance with the City of Durham's BMP Certifying Engineer Program, by the design engineer of record or such other registered North Carolina Professional Engineer acceptable to the City, complete any repairs necessary to the Facility/ies, provide reproducible as-built drawings and as-built calculations acceptable to the City, and submit any records regarding the cost of the Facility as may be required by the City.¹ If these steps have not been completed prior to issuance of a certificate of compliance for occupancy of a building on the Property, Permittee shall provide a Letter of Credit or other security instrument acceptable to the City in an amount calculated under City Requirements to ensure completion. If construction of the Facility/ies and the further obligations of this Section 2 are not completed in a timely manner as described in City Requirements, the City may also withhold any permits relating to development of all or a portion of the Property and take any other actions available under law².

d. Obligations Run with Property; Joint and Several Liability; Property Owners' Association. The obligations of this Agreement shall run with and are appurtenant to the Property and shall bind any successors in interest, including owners of any Lots within the Property. With regard to the City's rights under this Agreement, responsibility and liability against Permittee and its successors in interest, including but not limited to Owners of a Lot within the Property, are joint and several. With regard to rights amongst Owners of Lots within the Property, such Owners may elect to establish an association to be responsible for Permittee's obligations under this Agreement and other responsibilities relating to the Property. Creation of an association does not reduce the City's rights under this Agreement. If Permittee creates an association Permittee shall ensure that (i) dues and regular payments made by Lot owners are sufficient to ensure compliance with this Agreement, (ii) special assessments to comply with the obligations of this Agreement may be made; and (iii) enforcement mechanisms are available to compel payment by each member as necessary to comply with the obligations of this Agreement.

e. Release of Permittee. The original Permittee in this Agreement and successors in interest who, in writing, join in this Agreement may be released from the obligations of Section 2 of this Agreement upon the filing of a release signed by the City's Director of the Department of Public Works. The City shall provide such release within 30 days of submission of required forms, information, and fees³.

3. Permittee to Maintain, Inspect, Repair, and Reconstruct Facility.

a. Compliance with City Requirements. After construction of the Facility(ies) in accordance with City Requirements, the Permittee shall be responsible for inspection, maintenance, repair, reporting to the City, reconstruction, and funding for the completed Facility/ies, and shall comply with all City Requirements regarding the same⁴.

b. Responsible Person for Facility. Permittee, including successor Lot Owners, shall maintain with the Director the name and contact information of a Person knowledgeable about the care and upkeep of the Facility/ies. Such Person may be a Lot Owner, agent or officer for an association of Lot Owners, or management company⁵.

c. Maintenance. The facility/ies shall be maintained in compliance with City Requirements and with the operations and maintenance manual prepared specifically for the Facility/ies. Standards for maintenance of Facility/ies are located in the City of Durham's "Owner's Maintenance Guide for Stormwater BMPs Constructed in the City of Durham" as it may be modified from time to time. The current version of the "Owner's Maintenance Guide for Stormwater BMPs Constructed in the City of Durham" can be viewed at or downloaded from the City's website at http://www.durhamnc.gov/departments/works/pdf/draft_owners_maint_guide.pdf⁶

d. Inspections. In accordance with the City of Durham's current BMP annual maintenance certification protocols, policies, procedures, and requirements, the Permittee shall cause the Facility/ies to be inspected, at a minimum, annually by a registered North Carolina Professional Engineer or a North Carolina Registered Landscape Architect, certified by the City. The inspection shall occur annually during the month in which the Facility/ies as-built certification was accepted by the City. Without specific request of the City, two copies of the inspection report shall be provided to the Director of Public Works. Permittee shall also cause the Facility to be inspected after events that cause visible damage to the Facility and when notified by the Director that the Facility/ies requires inspection⁷.

¹ See the following BCE Program Documents: (1) BMP Certifying Engineer Program; (2) General Certification Assessment Checklist; (3) General As-Built and Construction Certification; (4) Geotechnical Certification

² See Letter to Industry 12-18-08

³ See BMP Certificate of Acceptance

⁴ See the following BMC Program Documents: (1) BMP Annual Maintenance Certification Protocol; (2) BMP Maintenance Certifier Program; (3) Certification; (4) Conditional Certification; (5) EMR Submittal Form; (6) Inspection Report Form(s)

⁵ See BMP Owner's Financial Disclosure Certification Statement

⁶ See the following BMC Program Documents: (1) BMP Annual Maintenance Certification Protocol; (2) Owner's Maintenance Guide for BMPs Constructed in the City of Durham

⁷ See the following BMC Program Documents: (1) BMP Annual Maintenance Certification Protocol; (2) BMP Maintenance Certifier Program; (3) Certification; (4) Conditional Certification; (5) EMR Submittal Form; (6) Inspection Report Form(s)

e. Repair and Reconstruction. Permittee shall repair and/or reconstruct the Facility/ies as needed to allow the Facility/ies to function as designed. Permittee shall make any repairs identified in the inspection report provided under (d) above and as may be reasonably directed by the City from time to time based on City requirements or City inspections of the Facility/ies. Compliance with inspection reports or City directives shall not limit Permittee's repair obligations⁸.

f. No Public Adoption. The City's regulation of the Facility/ies does not constitute adoption of the Facility/ies by the City, nor does it prohibit Permittee from taking all necessary actions to maintain the Site and Facility/ies in a safe manner.

g. Automatic Release of Successor Owners. Successor Permittees or Lot Owners within the Property, not including the original Permittee or a Permittee who executes an agreement joining in this Agreement, shall be released from the obligations of this Agreement upon Transfer of all interest in the Property without the requirement of any writing from the City effecting such release. The Person acquiring the Property or an interest therein shall assume the obligations of this Agreement. Permittee and successors that execute a written agreement joining in this Agreement shall be released from the obligations of this Agreement only through a written document from the City as described in 2(e) above.

4. Stormwater Facility Replacement Payment and Fund.

If Permittee makes a payment to the Stormwater Facility Replacement Fund, such payment shall be calculated, retained, used, and disbursed as provided by ordinance and other City Requirements. The Fund shall be used for the purchase, design, construction, reconstruction, and repair of stormwater facilities that have paid into the Fund or for stormwater facilities that replace or mitigate the need for those facilities for which monies have been paid into the Fund.

5. City Easement/Right of Entry/No City Responsibility

Permittee grants to the City, including employees, agents, and contractors of the City, a permanent easement for inspection, repair, and other work on the Facility which easement shall be located as shown on existing or future recorded plats for all or a portion of the Property. Permittee also grants to the City, including employees, agents, and contractors of the City, a permanent nonrevocable right of ingress, egress, and regress over and across all other public and private utility easements and public and private streets that exist on all or a portion of the Property and all land that may be owned or controlled by an association created amongst owners of lots in the Property. The City shall use this right of access solely to inspect and perform construction or other work on the Facility/ies that the City determines in its reasonable discretion is necessary. The creation of these rights does not limit the City's access to or across Lots within the Property if such is necessary to respond to a public nuisance or emergency. The City's rights under this section and under any plats filed for all or a portion of the Property do not obligate the City to take any actions regarding inspection, repair, or reconstruction of the Facility/ies.

6. Remedies for Violations; Lien on Property; Future Obligations Secured.

a. City Performance of Work. In the event of a failure to comply with the obligations under this Agreement, or evidence of a substantial problem with or potential failure of the Facility/ies, the City may send notice to the Permittee or the agent identified in Section 3 above to demand performance under this Agreement. If the Permittee fails to comply with such demand within thirty (30) days from the date of mailing thereof, the City may enter the Property and perform some or all of the obligations under this Agreement, as determined in the reasonable discretion of the Director. In addition, the City may enter the property without notice in the event of an imminent failure of the Facility/ies or other imminent emergency related to the Facility/ies. Nothing in this Agreement shall be interpreted to require the City to perform such work or obligations.

b. Repayment of City. The City shall deliver to the Permittee or Agent identified in Section 3 written notice of the costs of actions or work performed under Paragraph (a) above, which shall include but are not limited to the City's costs of administration and overhead for such work, and Permittee shall pay all such costs within sixty (60) days after receipt of such notice. Any costs not paid to the City within the sixty (60) day period shall be delinquent, and Permittee shall be considered in default of this Agreement. In the event of such default, the City may bring an action at law against Permittee for the cost of the actions and work, plus interest at the rate of eight percent (8%) per annum, collection costs, late payment charges of three hundred dollars (\$300) per calendar day during the first ninety (90) days of default and five hundred dollars (\$500) per calendar day for each ninety (90) days thereafter, and reasonable attorneys' fees. In addition, the debt shall be a lien against the Property and the Lot(s). With notice to the Permittee and Lot Owner(s), such lien may be collected as unpaid taxes in accordance with N.C.G.S. 160A-193. The City may also foreclose on the lien.

c. Other Remedies. The remedies provided above do not limit the City's remedies and the City retains the right to use all remedies available in law and in equity to enforce this Agreement.

d. Withholding of Permits. The City may withhold any or all permits or other approvals necessary to complete the development of the Property if the Permittee has failed to perform its obligations under this Agreement⁹.

7. Release of Lien by Certificate.

a. Duty to Furnish a Certificate. On the request of any of the Persons described in subdivision (a) (i) below, and upon the condition prescribed by subsection (a) (ii) below, the Director of Public Works shall furnish a written certificate stating the amount of any monetary liabilities owed by the Permittee to the City pursuant to this Agreement (together with any interest and costs accrued thereon) that are a lien on the Property or the Lots.

- i. Who May Make Request -- Any of the following Persons shall be entitled to request the certificate:
- A. An owner of the Property;

⁸ See the following BMC Program Documents: (1) Conditional Certification; (2) EMR Submittal Form; (3) BMP Owner's Financial Disclosure

⁹ See Letter to Industry 12-18-08

B. An occupant of the Property;
C. A Person having a lien on the Property;
D. A Person having a legal interest or estate in the Property;
E. A Person having a contract to purchase or lease the Property or a Person having contracted to make a loan secured by the Property;
F. The authorized agent or attorney of any Person described in subdivisions (a) (i) (A) through (E) above.

ii. Duty of Person Making Request. -- The Director of Public Works shall not be required to furnish a certificate unless the requester specifies the name of the Permittee, specifies the recordation information in the office of Register of Deeds where this Agreement and all subsequent Agreements related to this Agreement are recorded, and provides a copy of the first page of this Agreement, and pays the required fee for provision of a certificate, if any.

b. Reliance on the Certificate. When a certificate has been issued as provided in Section 7(a) above for the Property or a Lot, all monetary liabilities owed pursuant to this Agreement that have accrued against the Property or Lot for which the certificate was issued shall cease to be a lien against such property identified, except to the extent of monetary liabilities stated to be due in the certificate, as to all Persons obtaining such a certificate and their successors in interest who rely on the certificate:

- i. By paying the amount of monetary liabilities stated therein to be a lien on the Property;
- ii. By purchasing or leasing the Property; or
- iii. By lending money secured by the Property.

c. Oral Representations not Binding. Without limiting the effect of this Section 7, it is agreed that no oral statement made by any City employee as to the amount of monetary liabilities that are a lien on the Property pursuant to this Agreement shall bind the City.

8. Warranty. The Permittee covenants with the City that Permittee is seized of the Property in fee simple, has the right to convey the same in fee simple, that title is free and clear of all encumbrances, except for those identified in the Opinion of Title furnished to the City as a requirement prior to the City's execution of the Agreement, and that Permittee will warrant and defend the title against the lawful claims of all persons except for the exceptions stated in such opinion of title.

9. Notice. When a notice is required or permitted by this Agreement, it shall be given in writing to the City delivered to the Director of Public Works, 101 City Hall Plaza, Durham, NC 27701, or upon the Permittee, at **XYZ, Inc., XXXXXXXXXXXXX, XXXXXXXX, NC 27xxx, Attention: Donald Duck (919) XXX-XXXX**. Written notice shall be by certified mail, return receipt requested. These addresses may be changed by sending a notice of the new address attached to a copy of this Agreement.

10. No Waiver of Breach. If the City fails to enforce or waives any breach of any obligation or covenant in this Agreement, that failure to enforce or waiver shall not constitute a waiver of any other or future breach of the same or any other obligation or covenant. The City's failure to exercise any right under this Agreement shall not constitute a waiver of that right.

11. Agreement Binding. This Agreement and Covenants shall bind the Permittee and its successors in interest, as defined in this Agreement, until the City releases the Permittee as provided in Section (2) above, or until an automatic release of successor owners occurs as provided in Section (3) above.

12. Amendment. Amendments to this Agreement made after Permittee has fulfilled its obligations under this Agreement or made after Permittee has ceased to exist need not be signed by the Permittee. Amendments may be made if signed by all owners of and within the Property and the City, and such amendments may modify the obligations of this Agreement. The City may void or cancel its rights under the Agreement through a release or other filing executed by the City Manager, who is authorized by the City Council to determine whether a release is in the City's best interest and to execute such release.

13. Covenants Herein to Run with the Property. The obligations of this Agreement are a perpetual servitude and run with and are appurtenant to the Property.

14. Successors and Assigns. The designation of Permittee and the City shall also include their heirs, assigns, and successors in interest.

15. Liability; Indemnification.

- a. The approval by the City or any employee of the City of any plans or of any work referred to in this Agreement shall not create any liability in the City or its officers, officials, or employees for the plans or the work. Nothing herein is intended to release any other Person for any liability for those plans or work.
- b. The performance by the City or any employee of the City of any work allowed under this Agreement shall not create any liability in the City or its officers, officials, or employees for the work. Nothing herein is intended to release any other Person for any liability for that work.
- c. The Permittee shall indemnify the City and its officers and employees for any costs to the City or its agents or employees from the construction, operation, maintenance, repair, and/or reconstruction of the Facility/ies, or resulting from a claim regarding the same.

16. No Third Party Rights. Except as may be explicitly provided in this Agreement, this Agreement is not intended to be for the benefit of any Person other than the parties hereto and their heirs, successors, and assigns.

17. Interpretation of this Agreement. Unless the context requires otherwise, the singular includes the plural, the plural includes the singular, and the neuter includes the masculine and feminine. The captions and titles are for convenience only, and are not to be used to interpret the Agreement. The words "include" and "including" mean, respectively, "include but not limited to", and "including but not

limited to”.

18. Severability. Invalidation of any term or provision in this Agreement by a court of competent jurisdiction shall not invalidate the remaining terms and provisions.

IN WITNESS WHEREOF, the parties hereto have respectively set their hands and seals, or if corporate, have executed this under seal by their proper officers, the date first above written.

XYZ, Inc.

ATTEST:

Signed: _____

Signed: _____

Printed Name: _____

Printed Name: _____

Title: _____ Secretary

Title: _____ President

[Affix Corporate Seal]

STATE OF _____

COUNTY OF _____

I, _____, a notary public for said county and state, certify that _____ personally appeared before me this day, and acknowledged he or she is _____ Secretary of **XYZ, Inc.**, a corporation, and that by authority duly given and as the act of the corporation, the foregoing contract with the City of Durham was signed in its name by its _____ President, whose name is _____ and attested by him/herself as its said Secretary or Assistant Secretary.

This the _____ day of _____, 20__

Notary Public

My commission expires:

ATTEST:

CITY OF DURHAM

By: _____

City Clerk

[Affix Municipal Seal]

City Manager

STATE OF NORTH CAROLINA

COUNTY OF DURHAM

I, _____, a notary public in and for the County of Durham, North Carolina certify that _____ personally appeared before me this day and acknowledged that he/she is City Clerk of the **CITY OF DURHAM**, a municipal corporation, and that by authority duly given and as the act of the City, the foregoing contract was signed in its name by its _____ City Manager and attested by himself/herself as its said City Clerk or Deputy City Clerk.

Witness my hand and notarial seal, the _____ day of _____, 20__.

My commission expires:

Notary Public

IN WITNESS WHEREOF, the parties hereto have respectively set their hands and seals, or if corporate, have executed this under seal by their proper officers, the date first above written.

XYZ, Inc.

ATTEST:

Signed: _____

Signed: _____

Printed Name: _____

Printed Name: _____

Title: _____ Secretary

Title: _____ President

[Affix Corporate Seal]

STATE OF _____

COUNTY OF _____

I, _____, a notary public for said county and state, certify that _____ personally appeared before me this day, and acknowledged he or she is _____ Secretary of **XYZ, Inc.**, a corporation, and that by authority duly given and as the act of the corporation, the foregoing contract with the City of Durham was signed in its name by its _____ President, whose name is _____ and attested by him/herself as its said Secretary or Assistant Secretary.

This the _____ day of _____, 20__

Notary Public

My commission expires:

ATTEST:

CITY OF DURHAM

By: _____

City Clerk

City Manager

[Affix Municipal Seal]

STATE OF NORTH CAROLINA

COUNTY OF DURHAM

I, _____, a notary public in and for the County of Durham, North Carolina certify that _____ personally appeared before me this day and acknowledged that he/she is City Clerk of the **CITY OF DURHAM**, a municipal corporation, and that by authority duly given and as the act of the City, the foregoing contract was signed in its name by its _____ City Manager and attested by himself/herself as its said City Clerk or Deputy City Clerk.

Witness my hand and notarial seal, the _____ day of _____, 20__.

My commission expires:

Notary Public

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