RTI Proposal No. 0280700.388

Report on Costs Associated with Providing Nutrient Controls that are Adequate to Offset Point Source and Nonpoint Source Discharges of Nitrogen and Other Nutrients

Volume I
Technical Proposal

Submitted to

Environmental Review Commission
General Assembly of North Carolina
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Submitted by

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RTI Proprietary Statement

Executive Summary

RTI International[1] (RTI) is pleased to present this proposal to provide a Report on Costs Associated with Providing Controls That Are Adequate to Offset Point Source and Nonpoint Source Discharges of Nitrogen and Other Nutrients. RTI is well-qualified to conduct this study for the General Assembly of North Carolina because

- We are a large, established nonprofit based in North Carolina that is not aligned with any of the stakeholder groups.
- We are experienced with conducting practical, authoritative policy and management analyses of government organizations.
- We have extensive background with relevant programs, agencies, and nutrient offset and related management efforts.
- We have a highly qualified, multidisciplinary team with broad technical expertise supported by leading technical consultants.
- We have experience producing high-quality technical documents for decision makers and the public.

RTI has worked on numerous projects to assess opportunities to improve the efficiency and effectiveness of environmental organizations in North Carolina, including the North Carolina Ecosystem Enhancement Program (EEP), the North Carolina Department of Transportation (NCDOT), the North Carolina Division of Water Quality, and grant-making organizations. Our project team includes a project manager with significant experience in evaluating the cost-effectiveness of mitigation options and supporting senior staff who have worked extensively to understand EEP's operations and have experience in nutrient mitigation science, policy, and implementation. RTI's project team includes experts in economic and policy analysis of government institutions and includes environmental scientists and engineers experienced in evaluating nutrient mitigation practices.

This proposal describes our qualifications and proposed approach for conducting this study. Section 1 of this proposal provides a summary of RTI's corporate experience relevant to this work, demonstrating our experience with the methods and subject matter of this analysis. Section 2 contains our financial statement, which shows that RTI is a large, financially stable organization with a consistent record of growth throughout our nearly 50 years of existence. Section 3 summarizes our proposed project staffing and organization, which features a diverse and highly qualified project team. Section 4 contains the technical proposal, which describes our planned technical approach, drawing from our experience developing government institutions and extensive work to understand EEP's business processes, and our knowledge of available resources and people. Our cost proposal for this work is submitted as a separate sealed package. Appendix A provides samples of work products that illustrate our ability to produce high-impact technical reports for decision-makers. Appendix B provides resumes for key personnel. Appendix C provides a letter of commitment from the Center for Watershed Protection for this study.

[1] RTI International is a trade name of Research Triangle Institute.

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Appendices

List of Exhibits

1. Corporate Background and Experience

RTI was founded in 1958 through the combined efforts of the University of North Carolina, North Carolina State University, and Duke University to formulate innovative, responsive solutions integrated across disciplines. Nearly half a century later, our staff of more than 2,500 offers practical research and technical solutions to governments and businesses worldwide. Our status as an independent, nonprofit research organization enables us to operate from a foundation of professional excellence, uncompromising ethical standards, and fiscal integrity. We are uniquely positioned to combine applied research with world-class business management processes, thereby providing our clients with the knowledge and technical support they need to make credible, well-informed decisions.

RTI is well-positioned to meet the needs of the NC General Assembly for this study, having the breadth of analysis experience and the knowledge of the mitigation programs to quickly conduct a thorough and thoughtful analysis. The following selected projects illustrate our experience with policy and institutional support as well as nutrient and watershed modeling with EEP, NCDOT, and other State agencies. In addition, they demonstrate our experience in conducting cost-effectiveness analysis of mitigation options. Examples of work products that RTI has produced are provided in Appendix A.

Title: Nutrient Runoff from Highways in NC
Client: NCDOT (subcontract with URS)
RTI Project Lead: Randy Dodd
Contact Name: Andy McDaniel
Phone: 919-250-4100
E-mail: amcdaniel@dot.state.nc.us

RTI has been assessing the ability of available information to characterize nutrient runoff from highways and roads in North Carolina. As part of this effort, RTI compiled nutrient runoff data for North Carolina highways. RTI has also developed the Highway Runoff Screening Tool (HiRuST), a geographic information systems (GIS) application that has initially focused on watershed scale nutrient load estimation. RTI has assessed and differentiated nutrient runoff from highways and roads relative to the more traditional and widely studied approach of roads as a component of "developed" (e.g., urban, suburban, residential, commercial, and industrial) land. As part of this effort, RTI has assessed the applicability of the approach employed in the Tar-Pamlico Stormwater Rule to the highway environment based on highway monitoring data. RTI is also fostering better integration of air quality and water quality research and management for nitrogen deposition through the drafting of a strategy document. For some waterbodies in North Carolina, it is estimated that nitrogen deposition can represent more than 1/3 of the nitrogen loading.

Title: International Cost Analysis of Non-Co2 Greenhouse Gas Emissions Abatement.
Client: USEPA
RTI Project Lead: Mike Gallaher
Client Reference: Christa Clapp
Phone: 202-343-9807
E-mail: clap.christa@epa.gov

RTI has extensive experience developing cost-effectiveness curves for mitigation options. As part of a cost analysis project for the U.S. Environmental Protection Agency (EPA) Climate Change Division, RTI integrated economic analysis with engineering cost analysis to development marginal abatement cost (MAC) curves. These curves are currently used as key inputs into macroeconomic models to estimate climate change impacts. RTI developed cost-effectiveness curves for a wide range of sectors, which included agriculture, forestry, landfills, and industrial point and nonpoint sources.

Title: Jordan Lake Nutrient Modeling Support
Client: TJCOG (subcontract with Tetra Tech)
RTI Project Lead: Randy Dodd
Contact Name: Pat Davis
Phone: 919-968-4421
E-mail: pdavis@owasa.org

RTI developed a watershed model to determine the delivery of nitrogen and phosphorus from point and nonpoint sources in the Jordan Lake watershed. The model was based on EPA's Reach File, flow estimation using the Cape Fear Hydrologic Model, hydraulic calculations using open channel flow techniques and stream routing techniques,

effluent data from wastewater treatment plants, and instream decay rates based on U.S. Geological Survey (USGS) spatially referenced regression analyses. RTI used sophisticated optimization software for calibrating the EUTROWASP application to Jordan Lake. RTI also supported lake assessment activities and stakeholder process for reaching consensus on a nutrient management strategy.

Title: Integrating Technical Change into Marginal Abatement Cost Curves
Client: USEPA
RTI Project Lead: Mike Gallaher
Client Contact Name: Carolyn Rossman
Phone: 202-564-2669
E-mail: rossmann.carolyn@epa.gov

RTI performed an integrated economic impact analysis to support EPA's Climate Change Division. This analysis developed cost-effectiveness curves and developed a methodology to capture future increased efficiency of current technologies, reduction of cost in mitigation technologies over time, and the entrance of new mitigation options. As part of the project RTI used EPA's Landfill Gas Energy Cost Model (LFGcost) to generate emission reduction and cost data for different abatement options for the U.S. population of landfills.

Title: Tar-Pamlico Nutrient Management
Client: NCDWQ, NCDCM, NCDSW
RTI Project Lead: Randy Dodd
Contact Name: Rich Gannon
Phone: 919-733-7015
E-mail: Rich.Gannon@ncmail.net

Over a 5-year period, RTI researched important nutrient management issues and developed database and modeling tools for studying basin-level nutrient loading, point source/nonpoint source trading, and tracking of management efforts. Specific objectives of these projects were to provide recommendations for ongoing implementation of the nutrient trading program; estimate instream nutrient flux; develop a nutrient loading watershed model; and study riparian buffers and the implementation of agricultural best management practices (BMPs). Important policy issues, including pollution prevention, nutrient management, targeting protection and restoration efforts, both field and landscape approaches to nonpoint source control, and the influences of incentive, disincentive, and commodity support programs were also reviewed. RTI also researched and developed cost-effectiveness values for cost-shared agricultural BMPs. RTI calculated yearly BMP costs, incorporating cost-share costs, farmers' contributions, operation and maintenance costs, area benefited, and practice life expectancies; researched the effectiveness of agricultural BMPs in reducing surface and subsurface nutrient loads; and where data permitted, used the cost and effectiveness information to calculate cost-effectiveness for cost-shared BMPs. RTI also produced a map atlas and database of sites participating in the agricultural best management practice cost-sharing program.

Title: Optimal Phosphorous Trading for Portions of the Chatfield Basin, Colorado
Client: USEPA Region 8
RTI Project Lead: Keith Little
Contact Name: Bruce Zander
Phone: 303-312-6846
E-mail: zander.bruce@epa.gov

This study examined the point source/nonpoint source phosphorous load allocation issue from a cost-effective perspective. The rapid urbanization occurring in portions of the Chatfield watershed have caused concern for future water quality in the Reservoir. Phosphorous has been regarded as the principal nutrient of concern. Significant management issues in the Chatfield Basin have included whether phosphorous should be removed primarily from point sources, nonpoint sources, or some combination of both. This study developed mathematical optimization methods, which included a cost function representing minimum point source treatment costs as a function of total annual phosphorous load removed among the six WWTPs and a cost function representing minimum nonpoint source treatment costs as a function of total annual phosphorous load removed among nonpoint source. Based on these two minimum cost functions, the minimum cost load allocation between point sources and nonpoint sources was determined as a function of total annual phosphorous load removed.

2. Financial Statement

Exhibit 1 shows RTI financial statements for fiscal years 2004 and 2005. RTI's cognizant U.S. government auditor is Fran Cowper, Department of Health and Human Services (DHHS) Office of Inspector General, Office of Audit Services, 4700 Falls of Neuse, Suite 360, Raleigh, NC 27609, Telephone 919-790-2765. Our indirect cost rates have been evaluated and accepted by DHHS Division of Cost Allocation in our commercial rate agreement dated October 3, 2006. Please refer to the ***Cost Proposal*** for additional information.

Exhibit 1. RTI's Financial Statements for Fiscal Years 2005 and 2004 Demonstrate Our Financial Strength and Stability

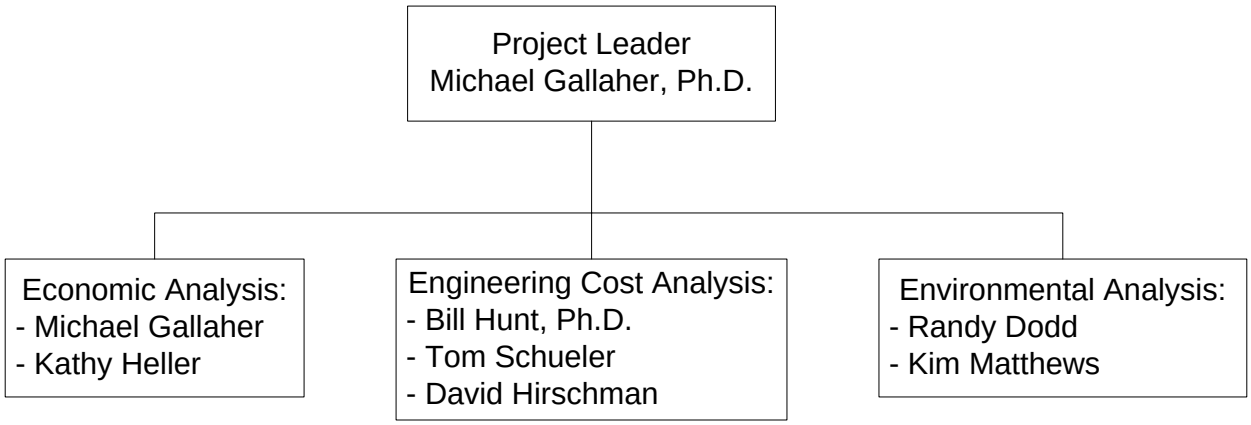
For the year:	FY2005	FY2004
Income Statement (in thousands of dollars)		
Revenue from research operations	$467,697	$509,467
Direct and indirect labor	(211,597)	(207,554)
Other direct costs	(186,647)	(228,959)
Other indirect costs	(53,108)	(55,044)
Other income (net of interest expense)	(1,031)	(703)
Net revenue	$15,314	$17,207
Balance Sheet (in thousands of dollars)		
Assets		
Current assets	$150,130	$124,764
Property and equipment, net	70,931	60,960
Other noncurrent assets	3,383	2,949
Total assets	$224,444	$188,673
Liabilities and Institute Capital		
Current liabilities	$84,936	$65,142
Long-term liabilities	4,204	3,541
Total liabilities	89,140	68,683
Contributed equity (unrestricted)	5,061	5,061
Contributed equity (restricted)	1,804	1,672
Accumulated net revenue	128,439	113,257
Total Institute equity	135,304	119,990
Total Liabilities and Institute Equity	$224,444	$188,673

3. Project Staffing and Organization

RTI's project team brings multidisciplinary staff with relevant experience across key research areas (see ***Exhibit 2***). Our key staff have expertise in economic analysis, engineering cost analysis, and environmental analysis, including extensive work with all aspects of nutrient management. The Project Leader, Dr. Michael P. Gallaher, will be responsible for technical and project management leadership and will be the primary point of contact with the client. Dr. Gallaher has degrees in economics and engineering and has over 10 years of experience managing projects for federal, state, and local government agencies. He reports directly to senior RTI management so that this project has a high level

of visibility in the organization, and Dr. Gallaher can be assured that he will have access to the resources needed for the work.

Exhibit 2. RTI's Team Features Senior Staff with the Multidisciplinary Skills and Experience Needed to Complete this Study



In addition to being the project manager, Dr Gallaher will also lead the economic analysis team. Dr. Gallaher has recently completed a series of studies for EPA, leading the economic analysis of mitigation options in sectors ranging from agriculture to industry. As part of these analyses he developed methods to construct marginal abatement cost (MAC) curves to assess the cost effectiveness and penetration over time of a portfolio of mitigation options. MAC curves are typically used in economic modeling systems to forecast the penetration of competing abatement technologies and will form the underpinning for economic analysis for this study.

Ms. Katherine Heller will support Dr. Gallaher as part of the economic analysis team. Ms. Heller has more than 20 years of experience conducting economic and policy analyses of environmental issues. In addition to managing projects to analyze the economic impacts, costs, and benefits of EPA regulations to reduce air, water, and solid waste pollution, Ms. Heller has conducted economic analyses of policies and projects affecting water quality in North Carolina. She recently directed a project that analyzed the impacts of alternative water level scenarios for the Yadkin Project reservoirs. She also analyzed the economic impacts of the Capacity Use Area Rule for the Central Coastal Plain of North Carolina. For this work, Ms. Heller presented the findings at public meetings and to the General Assembly.

Mr. Randy Dodd will lead the environmental analysis team. Mr. Dodd has extensive experience in providing technical support and managing projects that provide targeted information to support watershed and water quality management decision making. His areas of technical expertise include watershed and landscape assessment, water quality modeling, water quality management, GIS, and data management/database development. In North Carolina, Mr. Dodd has supported the North Carolina Division of Water Quality (NCDWQ), point source regulatory programs, nonpoint source nonregulatory programs, and basinwide management initiatives. He has supported NCDOT's Highway Stormwater Program, a nitrogen total maximum daily load (TMDL) for Jordan Lake, the Tar-Pamlico Nutrient Trading Program, and the Neuse River Nutrient Sensitive Waters designation.

Mr. Dodd will be supported by Ms. Kimberly Matthews. Ms. Matthews has 10 years of experience in wetland and stream ecology. She has experience working on NCDOT and EEP mitigation projects including conducting site searches, conducting feasibility studies, implementing monitoring plans, and collecting design data. Ms. Matthews has experience in urban stormwater management and has conducted monitoring and research associated with a project funded by the North Carolina Clean Water Management Trust Fund.

RTI has augmented its team with the addition of Bill Hunt from North Carolina State University and Tom Schueler and David Hirschman from the Center for Watershed Protection (CWP). Dr Hunt will lead the engineering cost analysis for the construction and maintenance nutrient mitigation options. Dr. Hunt has extensive experience with the benefits and costs of riparian buffer protection/restoration and stormwater management practices. Since 1997, he has either designed, constructed, or monitored over 70 innovative stormwater practices including stormwater wetlands, innovative wet ponds, bioretention, sand filters, level spreaders, green roofs, cistern/rainwater harvesting systems, and permeable pavements.

Tom Schueler is co-founder of CWP and an expert in practical aspects of stormwater runoff control, stream restoration, riparian reforestation and comprehensive watershed restoration. He is also experienced in the design and implementation of innovative urban watershed research strategies. David Hirschman has expertise in planning and implementing water resources projects, including stormwater ordinances and design standards, watershed assessments, stream assessments, stormwater plans and retrofits, water quality monitoring, and municipal programs.

4. Technical Proposal

The Nutrient Offset Fee Payment Program (NOFPP) is one of four main compensatory mitigation programs administered by EEP. During Fiscal Year 2005–06, EEP received $2,349,247 in payments for 213,567.9 pounds of nutrient reduction; use of the program increased by more than 30 percent from 2004–05 to 2005–06. Since its inception, the NOFPP has accepted payments to reduce 526,373 pounds of nitrogen in the Neuse River basin, and has instituted projects that will reduce 527,340 pounds of nitrogen, including both traditional nitrogen mitigation and riparian buffer restoration projects. In 2006, EEP began accepting payments to reduce nitrogen and phosphorus in the Tar-Pamlico river basin, but the mitigation associated with these payments is not yet due.

Senate Bill 1862 describes the issues to be addressed by this study, including “the costs associated with providing nutrient controls that are adequate to offset point source and nonpoint source discharges of nitrogen; whether nutrient offset payments should be authorized for additional nutrients, including phosphorus; and whether the nutrient offset program should be expanded to other areas of the State.”

RTI proposes to conduct this study using a policy analysis framework that we have developed and successfully implemented for a variety of state and federal environmental offices. We will implement our technical approach in two phases. During ***Phase 1***, we will develop the methodology to meet the objectives of the study and produce a First Phase Report. Upon approval of the methodology by the Environmental Review Commission, in ***Phase 2***, RTI will conduct the analysis and prepare the Final Report. The First Phase Report and Final Report will be structured to address the six tasks listed in the RFP:

Task 1: evaluate the sustainability of the program at the current fee of $11/lb of nitrogen

Task 3: develop a proposed fee based on the cost-effectiveness analysis

Task 4: develop a formula for the calculation of the offset payment fee

Task 5: assess the advantages and disadvantages of expanding the nutrient offset payments to other nutrients and additional areas of the state

Task 6: evaluate the ability of public (other than the EEP) and private entities to provide nutrient offsets

Task 7: develop a comprehensive review of potential nutrient mitigation efforts available

Our methodology discussion below will begin with RTI’s approach for developing cost-effectiveness curves based on existing costs data, mitigation efficiencies and GIS characterizations of

North Carolina river basins. The cost-effectiveness curves will provide the underpinning for analysis to complete many of the study tasks. The following provides a preliminary outline of the methods and data we will use to meet the Tasks of the study.

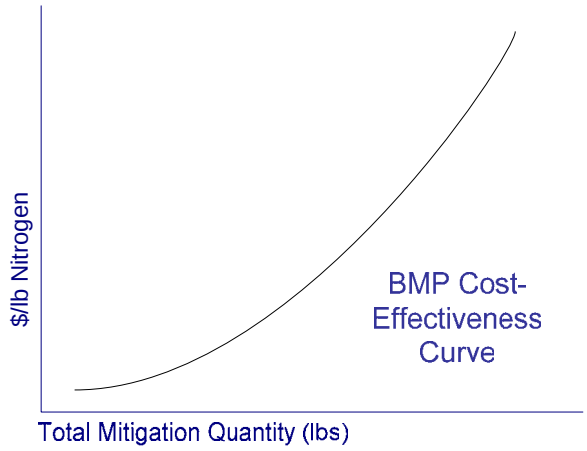
4.1 Develop Best Management Practices Cost-Effectiveness Curves for Nitrogen

The first step in the study will be to develop BMP cost-effectiveness curves for the offset mitigations available for use by the NOFPP (and other potential participating entities). Current offset mitigation options primarily include buffer restoration, but our analysis will also include lesser-used options identified as part of Task 6. An important part of this analysis will be to project the characteristics and availability of future sites, which in turn will determine future construction/maintenance costs and mitigation efficiency.[2] In principle, nutrient offset payments should be based on the actual costs (construction and maintenance) and mitigation efficiencies of the best available offset mitigation options. The cost-effectiveness curves will provide the basis for evaluating the current program's sustainability and proposing revised cost-per-pound factors for nitrogen loading from point and nonpoint sources.

However, it will be important during the kickoff meeting of this project to discuss the scope of offset mitigation options the NOFPP plans to consider in the future. For example, will future offset projects be limited primarily to rural buffer restoration—or does the NOFPP foresee a shift to more urban offset activities to minimize geographic distortions between construction and offset projects? This distinction will be an important factor in determining the magnitude and shape of the cost curves. For the remainder of this section we will discuss both rural and urban offset mitigation options.

RTI's economists and environmental engineers have significant experience developing mitigation cost-effectiveness curves (also referred to as MAC curves) for EPA and other government agencies.[3] As shown in ***Exhibit 3***, cost-effectiveness curves show total offset mitigation quantity that can be achieved for a given cost-effectiveness "price." The curve is built up by stacking the cumulative offset mitigation opportunities (i.e., projects implementing BMPs). The curve reflects the heterogeneity across projects in terms of the cost of implementing and maintaining mitigation activities, and nitrogen mitigation efficiency. The curve is upward sloping because over time low cost, high mitigation efficiency options may be exhausted—thus the cost-effectiveness increases as the total quantity of nitrogen abated increases.

Exhibit 3. BMP Cost-Effectiveness Curve



[2] Mitigation efficiency refers to the quantity of nutrient (pounds of nitrogen) that can be offset in a given area.

[3] See Gallaher and Delhotal (2005), and Gallaher, Delhotal, and Petrusa (2005) for a discussion of the methodology for developing MAC curves.

Cost-effectiveness (CE) can be expressed as a function of construction/maintenance costs and mitigation effectiveness.

CE = Costs ($/acre)/Mitigation (lbs/acre)

Where: Costs = Function (Current land use, soil type, credits available, etc.)
Mitigation = Function (Soil type, depth to water table, slope, etc.)

As part of this analysis RTI's team will specify the specific cost and mitigation functions and develop the data to calculate cost-effectiveness curves for North Carolina's largest watersheds. The following is a brief discussion of key factors to be considered in the cost-effectiveness analysis.

4.1.1 Factors Impacting Construction Costs

A wide range of factors influence costs associated with different offset mitigation options, such as buffer restoration and stormwater wetlands (e.g., bioretention cells, stormwater wetlands, and wet ponds). In many instances, for a given site the practices are not interchangeable. Factors that influence the selection—and eventual cost—of buffer restoration or a stormwater practice include available land, current use of land, land cost, slope of land, depth to water table, in-situ soil type, size of drainage area, composition of drainage area (e.g., agricultural, residential neighborhood, commercial site, or park), and pollutant removal credit assigned to each practice by the North Carolina Department of Environmental and Natural Resources (NCDENR). Other factors such as aesthetics, liability/safety, educational needs, and accessibility may alter the design or even the practice selection. For example, stormwater wetlands have been frequently installed as stormwater retrofits on school properties. One of the driving factors is that wetlands provide the most educational opportunities, such as studying plant communities, water quality, and fauna.

Maintenance costs of buffer restoration and stormwater practices are impacted by intended use and location of the practice, accessibility to the practice, and the practice type. There are four main objectives for buffer restoration and stormwater practice maintenance: preserving hydraulic function, sustaining water quality performance, maintaining aesthetics, and mosquito/pest control. Often each maintenance task satisfies multiple maintenance objectives. For example, a bioretention cell in a commercial center is likely to need regular trash collection, mulch replenishment, and be pruned. In doing so, the bioretention cell will continue to be aesthetically-pleasing, and also allow for light penetration to kill pathogenic microbes, keep water passing through the soil, and provide a carbon source (mulch) for nitrogen removal. The cost of an individual maintenance activity/task is predicated upon the frequency a task is needed, the amount of time required to complete the task, and the amount of resources (people, equipment, and materials) required to complete the task.

Construction costs for buffer restoration and retrofit stormwater practices are available through NC State University Facilities Management, NC State University Biological and Agricultural Engineering Department, the North Carolina Clean Water Management Trust Fund, the EEP, and several municipalities. All of these organizations have funded buffer restoration and stormwater retrofit construction in North Carolina since 2000. When possible, these costs will be divided into grading and excavation, soil and soil amendments, vegetation, inlet and outlet construction, and erosion and sediment control. Extensive work was recently conducted by the North Carolina Cooperative Extension in developing maintenance recommendations for stormwater management practices (Wossink and Hunt, 2003). Other information regarding maintenance is available from out-of-state resources including the New York City Department of Environmental Protection and the Northern Virginia Regional Council of Governments.

4.1.2 Factors Impacting Mitigation Effectiveness

The actual mitigation effectiveness and cost-effectiveness of mitigation options for nutrient reduction for any given site depends not only on land availability but on a number of different hydrologic,

topographic, soil, vegetative, and other ecological and management variables. Nitrogen and phosphorus also behave differently; phosphorus mitigation effectiveness is generally more a function of management of erosion and sedimentation whereas nitrogen is generally more soluble and mobile, with mitigation effectiveness being influenced by ability to allow runoff to infiltrate into environments that encourage plant uptake and processes such as denitrification. Given this variability and the site-specific effectiveness of management efforts, RTI will use GIS and landscape analyses and literature compilations of buffer effectiveness to investigate the need to develop regionalized/geographically based mitigation effectiveness/cost-effectiveness project outputs. RTI's extensive work with riparian buffer analyses in North Carolina and state-of-the-art GIS capabilities will greatly facilitate this effort.

As discussed above, the quantity and characteristics of available land is a key input into the development of the cost-effectiveness curves. RTI's GIS professionals possess a broad range of skills in GIS research and applications, as well as in information technology. For example, RTI was instrumental in the creation of the National Hydrography Dataset (NHD), a nationwide GIS database of surface water. NHD is widely used by government, commercial, and industrial organizations to manage and protect surface water resources.

4.2 Task 1. Estimate Length of Time for Self-Sustained NOFPP at Current Fee

Currently, the offset costs of reducing nitrogen and phosphorus exceed the fee payments for those nutrients. In January 2006, the Environmental Management Commission adopted 15A NCAC 2B. 0240, which established higher fees per pound of nitrogen and per 0.1 pound of phosphorus; however, under Senate Bill 1862, implementation of the higher fees was postponed so that the study called for by this RFP could be completed.

Task 1 will estimate the length of time that the existing NOFPP will be able to continue as a completely self-sustaining program and will be calculated based on

- the current offset payment fee of $11 per pound of nitrogen,
- the projected future demand for nitrogen loading purchases (offsets), and
- the construction/maintenance costs and reduction efficiency of the projected inventory of offset projects available to the NOFPP (i.e., reflected in the cost-effectiveness curves described above).

4.3 Task 2. Develop Proposed Nitrogen Cost per Pound

As noted in EEP's annual report for 2005–06, the fee associated with reduction requirements has been insufficient to implement offset mitigation projects. As a result the NCDWQ investigated increasing the fees for nitrogen payments in the Neuse River Basin and established fees for phosphorus and nitrogen in the Tar-Pamlico River Basin. These fee revisions became effective in March of 2006. However, the N.C. General Assembly subsequently retracted the new fees and called for a study to determine what they should be (see Senate Bill 1862 and Senate Bill 927).

Task 2 will estimate the offset payment fee required for the NOFPP to cover all its costs. Because mitigation costs will likely increase over time (as low-cost options are exhausted), RTI will calculate both a single fee estimate (based on a length of time, 20 to 30 years for example, to be determined by EEP) and a sliding fee estimate that would trend upward over time to reflect increasing costs.

4.4 Task 3. Make Recommendations for Determining Offset Payments

Equations for calculating nutrient offset payments typically include permitted flow including expansion (MGD), best-available-technology discharge rates, and a variety of other factors. As part of this task we will develop a formula and all specific factors that will be incorporated into the total nutrient offset payment fee.

4.5 Task 4. Assess Expanding Program to Other Nutrients and/or Geographic Area

The NOFPP program has been in place for Neuse River Basin since 1998. Payments to offset exports of nitrogen and phosphorus in the Tar-Pamlico River Basin began in mid-2006. As part of this task, RTI will investigate the advantages and disadvantages of (a) expanding offset payments to other nutrients (including phosphorous), and (b) expand the program to other areas of the state, specifically the Tar-Pamlico River Basin. As part of this analysis we will consider ongoing nutrient management initiatives as reflected in river basin and watershed planning, TMDLs, and associated monitoring and assessment efforts. For example, several other estuaries and Piedmont reservoirs have historically been identified by DENR through regulatory provisions as impaired by nutrients, with additional waterbodies being reviewed for future consideration. In addition, a recently completed EPA study has implicated nutrients as the leading stressor for wadeable streams on a national scale. Nutrient management therefore is geographically a relatively pervasive surface water concern. While some waterbodies are distinctly limited by either phosphorus or nitrogen, the weight of evidence in North Carolina suggests that it is usually prudent to manage both nutrients simultaneously. Nitrogen and phosphorus also behave differently from a biogeochemical perspective, which is reflected in different management approaches having differing cost-effectiveness for each nutrient. Decisions about geographic expansion and consideration of new nutrient offset requirements will require careful policy and technical analysis based on these environmental and economic considerations.

4.6 Task 5. Evaluate the Ability of Public and Private Entities to Provide Nutrient Offsets

The EEP is interested in the ability of other public entities to provide nutrient offsets in terms of their cost-effectiveness and timeliness. For example, the Clean Water Management Trust Fund, the North Carolina Divisions of Water Quality and Soil and Water Conservation, and other state agencies and several federal agencies significantly engage in activities that have nutrient management components. By amendment to the Clean Water Act Section in 1987, the Section 319 grant program was established to provide funding for efforts to curb nonpoint source pollution, including that which occurs though stormwater runoff. These agencies may have the potential to expand activities. In addition, we will investigate private entities, such as mitigation bankers. In North Carolina, mitigation bankers purchase, design, build, and monitor stream and wetland restoration projects and sell the credits from these projects. They can sell the credits directly to the party that needs to offset impacts. As part of this task we will collect information to assess how these entities compare with the EEP in terms of cost effectiveness and timeliness.

4.7 Task 6. Review Potential Nutrient Mitigation Efforts Available

To date, nitrogen reductions in the Neuse River Basin have been achieved primarily through buffer restoration, which is one of the most cost-effective manner of meeting reduction requirements. However, many nutrient management plans and controlled drainage are highly cost-effective management measures for agriculture. In addition, most retrofits supported by state-administered grants have been stormwater wetlands, wet ponds, and bioretention cells. The former two have been implemented to treat larger watersheds, or drainage areas, ranging from 10 acres to nearly 1 square mile. The latter practice has been specifically used on smaller, urbanized drainage areas of less than 1 acre. Retrofit application is loosely dependent upon the region of the state (coastal plain versus piedmont) and very much dependent upon the degree of urbanization within the drainage area.

As part of this task RTI will provide a comprehensive review and discussion of the types of potential nutrient mitigation offset options available.

4.8 Project Schedule

Exhibit 4 provides an overview of the project schedule, showing the completion dates for each individual task and the delivery dates for the First Phase Report, Draft Final Report, and Final Report. In addition, we have also budgeted for a kickoff meeting and a presentation of draft final results at the General Assembly of North Carolina.

Exhibit 4. Project Schedule

Tasks	Jan	Feb	March	Apr	May
Develop cost-effectiveness curves					
Task 1: Estimate Length of Time for Self-Sustained NOFPP at Current Fee					
Task 2: Develop Proposed Nitrogen Cost per Pound					
Task 3: Make Recommendations for Determining Offset Payments					
Task 4: Assess Expanding Program to Other Nutrients and/or Geographic Area					
Task 5: Evaluate the Ability of Public Entities to Provide Nutrient Offsets					
Task 6: Review Potential Nutrient Mitigation Efforts Available					
Deliverables and meetings	a	b		c, d	e

LEGEND

a Kickoff meeting (January 25, 2007)
b First Phase Report (February 16, 2007)
c Presentation of draft final results (April 20, 2007)
d Draft Final Report (April 20, 2007)
e Final Report (May 1, 2007)

5. Cost

Cost proposal is included in a separate sealed package.

6. References

Gallaher, M.P., and K.C. Delhotal. 2005. “Modeling the Impact of Technical Change on Emissions Abatement Investments in Developing Countries.” *Journal of Technology Transfer*, 30(1/2):211-225.

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