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MOGENSEN MITIGATION, INC.
TAR RIVER HEADWATERS STREAM MITIGATION BANK
FINAL PROSPECTUS

I. INTRODUCTION

Mogensen Mitigation, Inc. respectfully submits this prospectus (Prospectus) for the proposed Tar River Headwaters Stream Mitigation Bank (Bank) in Person County, North Carolina. This Prospectus was prepared in accordance with the *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources*; (Federal Register, Vol. 73, No. 70, April 10, 2008), and all appropriate state guidance. The Prospectus is submitted to the U.S. Army Corps of Engineers – Wilmington District (Corps), Chair of the Interagency Review Team (IRT) to formally initiate the planning and agency review process.

A. Purpose, Objective and Need

The purpose of the Bank is to provide stream mitigation for unavoidable impacts to waters of the US, including wetlands, which result from development related activities authorized under Section 401 and Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act of 1899, and all applicable state statutes, provided such use has met those requirements. The Bank's **objective** is to provide ecologically sustainable and economically efficient off-site compensatory mitigation opportunities for the North Carolina Ecosystem Enhancement Program (EEP) and/or other public and private permittees requiring mitigation credits for unavoidable impacts to regulated streams. The Bank would be established to compensate for wetland and other aquatic resource losses anticipated by such authorized development within the Bank Service Area, (USGS HUC 03020101), in a manner that contributes to the long term ecological functioning of the Tar-Pamlico Drainage Basin, with an immediate goal of no-net-loss and a long-term goal of a net gain of stream functions and services. The goals of the Bank include the restoration and permanent preservation of approximately 3,700 linear feet of degraded tributaries to the Tar River.

The **purpose of this Prospectus** is to provide regulatory agencies with sufficient information on the establishment and operation of the Bank and to initiate regulatory review through convening an Interagency Review Team (IRT) with its sponsor, Mogensen Mitigation, Inc. It is expected that this Prospectus will be the basis of a formal Mitigation Banking Instrument (MBI). The MBI will be developed by the Sponsor to establish the Bank operations. The MBI will contain the Site Development Plan and will include location maps, summary of existing conditions and reference sites, hydrologic analysis, design criteria, success criteria, long term real estate instrument, and plans and specifications for construction, operation, monitoring and maintenance of the Bank.

Need. This Bank offers the opportunity to greatly enhance and improve the ecological conditions of the regional watershed. The Bank will provide improved and sustainable ecological and hydrologic functions for the proposed mitigation bank service area. It will be effectively managed in perpetuity and will not impact or degrade any areas with high ecological value. Due to the degraded existing conditions, the site has a very high probability of meeting the prescribed

success criteria, while also meeting the requirements of all other applicable federal and state laws. The adjacent land uses will not adversely affect the perpetual viability of Bank, as much of it is in a protected area of mature Natural Heritage Forest, of High Natural Resource Value. This Prospectus details the above-mentioned information as it relates to the site. The Bank sponsor, Mogensen Mitigation, Inc., does not anticipate any problems meeting the prescribed financial responsibility requirements. Recent 2012 NCEEP Full-Delivery solicitations in this HUC have specifically asked for substantial stream and wetland mitigation sites demonstrating current and future needs for mitigation in this HUC. The proposed Bank will meet the needs of this watershed by restoring approximately 3,700 linear feet of degraded stream from over 50 years of active cattle and agricultural influences.

B. Location and Ownership of the Mitigation Bank

The Bank is located within a 228 acre parcel owned by Roy and Joyce Huff (Figure 1, Table 1). The landowners have agreed to allow the stream restoration and to place the land under a conservation easement so that the site will be protected in perpetuity. Specific information regarding the ownership status is provided in the chart below. A survey will be prepared delineating the area to be protected.

The proposed bank size covers nearly 3,700 linear feet of stream channel headwaters tributaries to the Tar River and is located at (N 36.391302 , W -78.817128). The tributaries are enclosed by a "brown polygon" on the US Geological Survey (USGS) Triple Springs 7.5 Minute Topographic Quadrangle Map (Figure 2), and are denoted as a “light-blue line” on the Soil Survey of Person County Map (Figure 3), (Sink, 1995).

Table 1.

Current Owner	Address	Pin No.	Total Acreage of Tract	Tract No.
Roy N. Huff	155 Old Durham Road, Oxford, NC, 27573	0956-00-32-3145	228.34 Total (Only floodplain acres will be purchased)	8094

C. Project Description


Existing Conditions- Unnamed Tributary

The Bank is located in Person County, near Roxboro, North Carolina, within the Piedmont Physiographic Province. It lies within the NCEEP targeted 14-digit HUC 03020101010010 of the Tar-Pamlico River Basin. The Sponsor proposes to restore approximately 3,700 linear feet of degraded unnamed tributaries to the Tar River within a 14.7 acre project area (Figure 3). The project area is currently used for livestock grazing and contains ditches and channels that convey nutrients, sediment, and other agricultural pollutants into the on-site tributaries. Restoration of the streams and riparian buffers would reduce sediment, nutrient, and pollutant exports from the project area thereby improving the overall water quality of this headwater tributary to the Tar River. The mitigation plan will include the restoration of

dimension, pattern, and profile of these Tar River tributaries. Narrow areas of riverine wetlands may also be restored and/or created for additional habitat diversity in areas of the old, abandoned channels.

The objective of the restoration plan is to restore the primary stream and riparian functions and values associated with nutrient removal and transformation, sediment retention, flood-flow attenuation, and wildlife (both aquatic and terrestrial) habitat. While many of these benefits are limited to the project area, others, such as pollutant removal and improved terrestrial and aquatic habitat, have more far-reaching effects. Project goals relating to water quality, hydrology and habitat, and the objectives for meeting these goals are outlined below.

Project Goals

- Improve water quality by facilitating increased nutrient removal and reducing sediment and pollutant loads to surface waters.
- Restore natural hydrology by increasing water storage and improving hydrologic connections.
- Restore terrestrial and aquatic wildlife habitat and improve wetland habitat connectivity.

Project Objectives

- Remove 14.7 acres of agricultural land from production through livestock exclusion fencing and a permanent conservation easement, thereby reducing sediment, waste and nutrient loads.
- Provide permanent protection through conservation easement for the floodplain of the Tar River headwaters and its tributaries within the project area.
- Significantly reduce sediment loads by stabilizing the stream banks and riparian areas with proper channel geometry and native riparian vegetation.
- Improve water quality by significantly reducing nutrient loads by fencing out cattle and providing a 50 to 200 foot buffer around the stream channel.
- Establish a diverse, ecologically-appropriate, riparian forest community within the conservation easement area.

  Stream restoration will follow methodologies consistent with natural channel design protocols. In addition, riparian buffers, ranging from a minimum of 50 feet, to a maximum of 200 feet in width, will be established along both sides of the tributary. The vegetated buffers help to filter pollutants and nutrients before entering the channels. This, along with stream restoration, will aid in reducing the overall sediment export from the site. Upon completion of restoration activities the project area will be fenced, permanently excluding livestock from the project area, ensuring sediment and nutrient exports from the project area are minimized. Restoration of the stream channels will include changes to the dimension, pattern and overall profile. Natural structures consisting of rock cross vanes, single-arm rock vanes and rootwads will assist in channel stabilization and provide habitat for wildlife, both aquatic and terrestrial. Floodplain benches will be established along both sides of the channels to provide an area for flood attenuation. As a result, more area will be available for flood storage without the increase of flood elevations.

D. Water Rights

Sufficient water rights exist to support the long-term sustainability of the Bank, as there are no "severed" rights on the property. Details on the proposed hydrology of the Bank are provided in Exhibit B.

There are no existing mineral rights issues within the proposed Bank boundaries, and the site is void of any existing easements or utility corridors.

E. Ecological Suitability and Baseline Conditions

Information collected thus far documenting the baseline conditions for the Bank site, including existing topography, hydrology, soil, vegetation, wetlands, and wildlife conditions, are presented in the Ecological Suitability and Baseline Conditions Report, Exhibit B.

F. Establishment and Use of Credits

The exact number of credits will be determined once the site survey, design, and functional assessments are completed by the Sponsor and approved by the IRT. Bank credits will not be released for debiting until specific milestones associated with the Bank's protection and development are achieved. Use of credits will be approved by the Corps and NCDENR during the permit process.

G. Review Team

According to CFR Vol. 60, No. 228 entitled Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, it is expected that the following federal and state agencies may comprise the IRT:

Federal:

1. US Army Corps of Engineers (USACE), Wilmington District – *Chair*

2. US Environmental Protection Agency (USEPA)

3. US Fish and Wildlife Service (USFWS)

State:

1. NC Department of Environment and Natural Resources (DENR)

2. NC Division of Water Quality (DWQ)

3. NC Wildlife Resources Commission (WRC)

H. Exhibits

The following Exhibits are incorporated as appendices to this Prospectus:

Exhibit A: Ecological Suitability and Baseline Conditions Report
Exhibit B: Conceptual Design Plan
Exhibit C: Landowner Authorization Form

II. ESTABLISHMENT OF THE BANK

A. Implementation

The Sponsor agrees to perform all necessary work, in accordance with the provisions of this Prospectus and subsequent MBI, federal and state permits until it is demonstrated to the satisfaction of the Corps, in consultation with the IRT, that the project complies with all requirements, or until all credits are sold, whichever is later.

B. Environmental Documentation

The Sponsor will obtain all appropriate environmental documentation, permits or other authorizations needed to establish and maintain the Bank. This Prospectus does not fulfill or substitute for such authorization.

C. Establishment of the Bank

Establishment of the Bank will be performed as described in this Prospectus and the credits will become available in accordance with the credit generation schedule specified in the subsequent MBI. In the event the Sponsor determines that modifications must be made in the design plans to ensure successful establishment or enhancement of habitat within the Bank, the Sponsor shall submit a written request for such modification to the Corps for distribution to the IRT.

D. Financial Assurance Requirements

Prior to any debiting the sponsor shall provide financial assurances, as acceptable by the Corps, in consultation with the IRT, to ensure a high level of confidence that the Bank will be successfully completed and maintained in perpetuity. The details of these financial assurances will be provided in the MBI

III. OPERATION OF THE BANK

A. Service Area

The Bank will provide mitigation credits to offset impacts within US Geological Survey (USGS) hydrological unit code (HUC) 03020101 of the Tar-Pamlico River Basin.

B. Assessment Methodology

Stream Mitigation Units (SMUs) were determined by using the formula [SMU = (Restoration/1.0) + (Enhancement Level I/1.5) + (Enhancement Level II/2.5) + (Preservation/5.0)] as noted in the Stream Mitigation Guidelines (USACE, 2003). A summary of the stream reaches within the Bank is provided in Table 2. The watershed area indicated for the main stem Unnamed Tributary (UT) to Tar River (UT #2) was measured at the southwestern property boundary. The watershed area for the second UT was measured at its current confluence with UT to Tar River.

Table 2.

STREAM	LENGTH (linear feet)	WATERSHED		
		SQ. MILES	ACRES	DOMINANT LAND USE
UT#1 (UT to UT Tar River)	516	0.2	124	Actively Grazed Cattle Pasture
UT #2 (UT to Tar River)	3,165	1.5	960	Actively Grazed Cattle Pasture

The Bank exhibits approximately 3,680 linear feet of stream restoration. Table 3 depicts existing linear footages to proposed stream mitigation units (SMUs).

Table 3.

PROPOSED MITIGATION TYPE	EXISTING LENGTH (linear feet)	MITIGATION RATIO	MITIGATION AMOUNT (SMUs)
Stream Restoration (UT#1 Channel)	516	Restoration (1:1)	510
Stream Restoration (UT#2 – R1 Channel)	1,517	Restoration (1:1)	1,820
Stream Restoration (UT#2 – R2 Channel)	1,648	Restoration (1:1)	1,480
TOTALS	**3,681**		**3,810**

The restoration and enhancement of streams associated with the Bank will follow guidelines established by the US Army Corps of Engineers, Wilmington District.

C. Success Criteria

The Sponsor shall be responsible for assuring the ecological success of the Bank and goals described in Exhibit C. The success of the Bank will be measured by performance standards approved by the Corps and NCDENR, in consultation with the IRT, as set forth in the Corps and NCDENR permits and the MBI. The standards define the conditions under which the Bank would be judged successful and provide monitoring and maintenance requirements to uncover and correct deficiencies. The Bank will be considered successful if the Sponsor demonstrates to the Corps and NCDENR that the appropriate areas have been restored, established, enhanced, or preserved and the goals of the Bank have been met. After successful completion of each milestone, the Sponsor shall notify the Corps and NCDENR in writing. Upon completion of construction, the Sponsor will prepare an as-built plan and submit photographs of the completed project task along with a photo location map. The Corps and NCDENR, in consultation with the IRT, will confirm whether or not the tasks are successfully completed for purposes of releasing credits.

D. Conditions on Debiting

Prior to the sale of any credits, the following requirements will be met: (1) the MBI and final mitigation plans will be approved by the Corps and NCDENR, in consultation with the IRT; (2) financial assurances satisfactory to the Corps and NCDENR shall be posted; (3) all applicable regulatory permits and approvals will be secured; and, (4) the MBI will be signed by the Corps and NCDENR and any members of the IRT who choose to sign the instrument.

IV. MAINTENANCE AND MONITORING OF THE BANK

A. Maintenance Provisions

The Bank will be designed to be self-sustaining over time. However, some active management and maintenance is anticipated to ensure the long-term viability and sustainability of the Bank. The Sponsor agrees to perform all necessary work to maintain the Bank consistent with the maintenance criteria established in the MBI. The Sponsor shall continue with such maintenance activities until closure of the Bank. Prior to Bank closure, an acceptable third-party non-profit land steward (such as NCEEP) will be identified and will accept and maintain the conservation easement area. Deviation from the approved maintenance plan is subject to review and written approval by the Corps and NCDENR following consultation with the IRT.

B. Monitoring Provisions

The Sponsor agrees to perform all necessary work to monitor the Bank to demonstrate compliance with the success criteria established in the MBI, and any regulatory permits, for a period of 5 years within the conservation easement or until success criteria are met, whichever is later. The monitoring will begin at the end of the first full growing season following completion of grading and planting (i.e., if the planting is completed in spring 2013, the first monitoring event would occur in fall 2013). After the initial 5 year monitoring period of the Bank, the Sponsor, in consultation with the Corps and NCDENR, shall continue to identify any problems requiring corrective action for an additional 5 years. The Sponsor shall provide annual monitoring reports to the Corps and NCDENR on the long term success of the Bank and to identify any problems requiring corrective action. Any such corrective action shall be taken in accordance with Section E.

C. Reports

The Sponsor shall submit to the Corps and NCDENR, for distribution to the IRT, as-built grading and planting plans of the Bank establishment activities and a post-construction report within 60 days after the date of completion of grading and planting activities. The as-built drawings and report shall include all aspects of the final grading elevations and planting plans of the Bank. In addition, the Sponsor shall submit to the Corps and NCDENR, for distribution to the IRT, eight copies of each annual report on the status of the Bank establishment activities, prepared during the growing season, no later than December 31 of each of the five years following initiation of the riparian planting activities in accordance with the permits. Two copies of each report shall be provided directly to NCDENR.

D. Accounting Procedure

The Sponsor shall submit a Ledger statement to the Corps and NCDENR each time credits are debited or additional credits are approved for release. If requested, the Corps may distribute the statement to other members of the IRT or the public. At a minimum, the Sponsor shall submit an annual ledger to the Corps and NCDENR for distribution to all members of the IRT, showing all transactions at the Bank for the previous year. The Bank sponsor will maintain the Banks ledger within RIBITS as necessary.

E. Contingency Plans/Corrective Actions

Should any report submitted by the Sponsor to the Corps and NCDENR note conditions requiring corrective action, the Sponsor shall determine the cause of the condition, in consultation with the Corps and NCDENR. If the Sponsor, Corps or NCDENR determines the problem is due to design, construction or maintenance deficiencies, then the Sponsor shall be responsible for corrective action. Prior to

commencing corrective actions, the Sponsor shall submit a detailed proposal for such a corrective action to the Corps and NCDENR for review and approval within 60 days of a determination by the Corps and NCDENR, in consultation with the IRT, that corrective measures are warranted. Once approved by the Corps and NCDENR, in consultation with the IRT, the Sponsor shall undertake such corrective action and shall, upon completion, submit to the Corps and NCDENR a summary of the work performed.

F. Long-Term Management

As described in Items IV.A and B of this Prospectus, the Sponsor shall conduct maintenance and monitoring of the Bank for its operational life. The Bank will be closed at the end of its operational life, which is 5 years from the date of the completion of the grading and planting tasks, successful completion of all performance standards, or until the sale of all credits, whichever comes last. After that, land stewardship and management will be the long-term land steward's responsibility. The MBI will include a Long-Term Management Plan that describes the long term management activities to be conducted by the land steward and the maintenance surety for the management activities. The Bank will be protected in perpetuity by restrictions defined in the Conservation Easement recorded in the Person County Register of Deeds.

V. SPONSOR QUALIFICATIONS

A. Mogensen Mitigation, Inc.

The Bank Sponsor, Mogensen Mitigation, Inc. (MMI), was formed by Richard K. Mogensen in March, 2011, after a long career in environmental consulting, and specializing in wetland science and restoration services. MMI principles have been involved in wetland mitigation, stream restoration, and mitigation banking for over 20 years. MMI has managed a $25 million marsh restoration bank over the last 3 years in New Jersey, and was preceeded by the development of over 10 mitigation banks and full-delivery projects for both NCEEP, and private clients. MMI's personnel have substantial experience in all facets of wetland and stream mitigation in North Carolina. MMI has kept current with NCEEP policies and proceedures, and is familiar with and capable of land acquisition services, as well as, all other tasks within the MBI. The Bank Sponsor has also successfully completed the following banks.

- **The Pott Creek Mitigation Bank** is an approximately 40-acre bottomland hardwood wetland and stream restoration project in Catawba County. Over 4,000 linear feet of stream restoration was developed for the NCDOT for future road projects in the Catawba River Watershed.

- **The Forrest Creek Stream and Buffer Mitigation Bank** was one of the first combination stream and buffer mitigation banks in the country, located in Hillsborough, NC. The project consists of 8,000 stream mitigation units and 10 buffer mitigation units.

- **The Richard P. Kane Wetland Mitigation Bank** is over 240 acres of restored marsh and forested wetland, within 5 miles of N.Y. City, N.Y. MMI was directly involved in the design, permitting, and approval, as well as, providing construction inspection services.

VI. PROJECT CONSULTANT QUALIFICATIONS

A. Ecological Engineering, LLP

Ecological Engineering, LLP (Ecological Engineering) is an engineering and environmental firm located in Cary, North Carolina. Established in 2008, the firm specializes in stream/wetland restoration and mitigation design, stormwater management, hydraulic/hydrologic studies, sedimentation and erosion control and natural resources assessment and documentation. Ecological Engineering is currently providing professional engineering and consulting services on a variety of stream and wetland mitigation-related projects in North Carolina and Georgia. **Ms. Jenny Fleming, P.E.**, firm principal, will serve as senior engineer manager for this project. She has over 17 years of experience working in North Carolina. She will be assisted by Lane Sauls, Edward Hajnos and Wyatt Brown, all with extensive experience working on mitigation related assignments. Prior to Ecological Engineering, Ms. Fleming worked with the NC Department of Transportation and several private engineering companies. She specializes in hydrological assessments and design, including stream restoration. She has been extensive training in analyzing fluvial geomorphology and sediment transport processes. Although a firm principal, Ms. Fleming remains thoroughly involved with all of the engineering-related projects at Ecological Engineering. She will be involved with all related aspects of this project.

B. Watershed Science

Watershed Science is a small, flexible, experienced group of water quality professionals that is based in western North Carolina, and is specialized in collecting, analyzing and providing the unbiased scientific information needed to make sound decisions. Watershed Science has extensive experience with the following services:

-Aquatic benthos sampling, assessment and evaluation for water quality
- Stream geomorphic stability monitoring and assessment
- Assessment of watershed health and impact sources
- Vegetative assessment of watersheds, streams, or wetlands
- Open channel water quality sampling, flow/volume based, intermittent or time scheduled
- Erosion and sediment control planning and design for a project
- On site supervision of stream and wetland restoration projects
- Evaluation of proposed stream and wetland restorations
- Wetland delineation
- Impact monitoring of development or construction
- Other similar types of water quality data collection and assessment

Mr. Dave Penrose, currently retired from the Water Quality Group at North Carolina State University, will serve as the primary water quality scientist for the Bank, providing his initial assessment and subsequent annual assessments throughout the monitoring phases. Much of his work in the last 10 years has been assessing the effectiveness of stream restoration projects using biological tools, specifically benthic insects. In addition to Dave's work with stream restoration he has also taught many workshops which focus on taxonomy of aquatic insects. Prior to his work at NCSU Dave was employed with the NC Division of Water Quality as a benthic taxonomist and studied the impacts of both point and non-point sources of water pollution to aquatic insects. While at the NC Division of Water Quality he also worked with the 401 Certification program and became familiar with the policies which govern stream mitigation, including small intermittent stream features. However retirement has proven difficult, Dave continues to conduct research on restored streams, continues to work with students and remains active in national policy and technical review committees.

EXHIBIT A: ECOLOGICAL SUITABILITY AND BASELINE CONDITIONS REPORT

The Tar River Headwaters Restoration site is located approximately 0.5 mile north of Denny Store Crossroads in the eastern portion of Person County, North Carolina (Figure 1). The site lies northwest of the intersection of SR 1536 (Depot Street) and SR 1565 (Gentry Road). It is located in the Tar-Pamlico River Basin within USGS Hydrologic Unit 03020101010010. The 03020101 sub-basin is long and narrow and includes the mainstem of the Tar and Pamlico Rivers plus many small tributary systems before it feeds into the Pamlico Sound. The primary land use within the study area is actively used for grazing of cattle and horses.

The Tar River Headwaters site consists of first and second order headwater tributaries that make up the Tar River. The mainstem channel is formed from headwater wetlands north of the project site, and is considered a first order stream as it enters the proposed conservation easement. The first tributary (UT1), a first order stream, begins outside the proposed conservation easement below a farm pond. This tributary has a modified channel within the proposed conservation easement and feeds into the mainstem channel, (UT2-R2), from the northeast along the left bank of the mainstem stream channel. The main channel would be considered a second order stream below the confluence with the first tributary. A second tributary (UT2-R1), a modified channel considered a first order stream, flows southeast through pasture into the main channel. There is a relic culvert situated approximately halfway down this stream reach. There is also a holding pond with an outlet located within the eastern floodplain of UT2-R1(Figure 3). The ponds adjacent to UT2-R2 have no outlets and are beyond the borders of this project.

Both degraded sections of stream include proposed areas of riparian buffer restoration and/or nutrient offset mitigation. The mainstem flows south through the pasture to the southern parcel boundary. There is little riparian vegetation along either channel. Hoof shear and mass wasting of the mainstem banks is evident throughout the project area. The main channel south of the existing stream crossing is moderately unstable. Cattle access to and from the channel is unrestricted and cattle-hoof shear, erosion and lack of suitable riparian vegetation have increased sedimentation and nutrient amounts into the stream system. The enhancement of this section of channel via dimension and profile will help to reverse the current channel evolutionary trend. In addition, grade control will be established at the downstream end of the project to ensure and maintain channel integrity throughout the area. The existing at-grade crossing will remain in place and be further enhanced, as necessary. This crossing may require some reinforcement to ensure its integrity over time. A combination of woody and rock-type structures will be integrated throughout all of the channel reaches to enhance both aquatic habitats and provide grade control. The existing channels upstream of the crossing will be restored to a proper dimension, pattern and profile based on reference data. All channels will be re-vegetated with a combination of live stakes and tublings. Transplanting of existing suitable vegetation will occur as applicable.

1.0 PHYSICAL CHARACTERISTICS

1.1 Topography

The Bank Site is situated in the Piedmont Physiographic Province. Elevations at the site range from approximately 560 feet above mean sea level (MSL) near the upstream property boundary at the main channel to approximately 550 feet above MSL at the downstream boundary. Valley slope is estimated at less than one percent and extends downslope from northeast to southwest across the Site.

1.2 Hydrology and Hydraulics

The Tar River Headwaters Site is part of the Tar-Pamlico River Basin, situated within US Geological Survey (USGS) hydrological unit code (HUC) 03020101 and NC Division of Water Quality (NCDWQ) sub-basin 03020101. The stream enters the project site from the northeast and flows in a southwesterly direction across the project site. The calculated drainage area of the site is approximately 960 acres (1.5

square miles). The stream system flows directly into the Tar River approximately 2 miles downstream of the site.

1.3 Soils and Geotechnical Characteristics

Chewacla and Wehadkee loam dominate the channel and floodplain within the project area. These soils are described as gently or moderately sloping, somewhat poorly to poorly drained soils that have a loamy surface layer and clayey subsoil.

Based on the Soil Survey of Person County, North Carolina (Sink, 1995), Chewacla loam dominates the floodplain areas associated with the Tar River Headwaters site (Figure 3). Chewacla loam is classified as a fine-loamy, mixed, thermic Fluvaquentic Dystrochrept. These soils are somewhat poorly drained soils formed in recent alluvium on nearly level floodplains along streams that drain from the Mountains and Piedmont physiographic provinces. Slopes range from 0 to 2 percent. Chewacla loam is noted as a Hydric B soil on the Hydric Soils of North Carolina list (NRCS, 1995). Chewacla soils also have inclusions of Creedmoor coarse sandy loam and small pockets of Wehadkee loam. Wehadkee loam is classified as a fine-loamy, mixed, nonacid, thermic Typic Fluvaquent. Wehadkee loam is a hydric soil that developes within lower swales of the floodplain. Slopes are considered nearly level and the soils are poorly drained.

The Tar River Headwaters site is located in Person County, North Carolina. The site is located within the Carolina Slate Belt portion of the Piedmont physiographic region of North Carolina. Bedrock within the Carolina Slate Belt consists of volcanic argillites, basic and acid tuffs, breccias, and flows. Volcanic igneous rocks rise above the surrounding slates as high rolling hills and small mountains (Daniels *et. al*, 1999).

2.0 CHEMICAL CHARACTERISTICS

2.1 Water Quality

According to the Basinwide Assessment Report for the Tar River Basin, the Tar River in the area under consideration has been listed as "Good" in terms of overall water quality for the last 10 years (NCDWQ, 2010). The surface water classification of the Tar River and its tributaries "From source to a point 0.6 mile upstream of Oxford water supply" is Class WS-IV; NSW (NCDWQ, 2012). The WS classification indicates that the site is within a Water Supply Watershed and the IV indicates that the area is highly developed. The NSW signifies nutrient sensitive waters. It should be noted however, the actual condition of unnamed tributary of Tar River does not reflect this classification. The stream is severely degraded, lacks effective cattle exclusion, and has no riparian buffers along this reach. This project should assist with providing additional protection to the overall watershed. The portion of the Tar River within the project area is not a 303(d) listed waterbody (NCDWQ, 2010).

3.0 BIOLOGICAL CHARACTERISTICS

3.1 Baseline Plant and Wildlife Surveys

The vegetation at the site is separated into two major groupings. These groupings are based primarily on topographical position and current land use. The first grouping is located within the lower section of the site downstream of the stream crossing immediately adjacent to the stream banks. The vegetation is dominated by young to mature green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), ironwood (*Carpinus caroliniana*), willow oak (*Quercus phellos*), white oak (*Quercus alba*), sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), elderberry (*Sambucus canadensis*), Chinese privet (*Ligustrum sinense*), greenbrier (*Smilax sp.*), and sawtooth blackberry (*Rhubus argutus*).

This vegetation is currently partially managed and consist of less than 100 trees per acre less than or equal to five inches dbh trees and less than two feet height trees.

The second grouping is located throughout the project area. This second vegetation grouping is located through land actively used for pasture of cattle and horses. The upper portion of the reach and a small tributary are barren of woody vegetation within their riparian areas and consist primarily of fescue (*Festuca sp.*) and other grasses and weeds. Sparse stands of red cedar (*Juniperus virginiana*) and black willow (*Salix nigra*) are located immediately upstream of the stream crossing.

Invasive species are limited to the Chinese privet (*Ligustrum sinense*), fescue grass (*Festuca sp.*), as well as recent beaver activity discovered beyond the bounds of the easement, downstream of UT2-R2. Invasive species management is discussed further in Exhibit B.

3.2 Wetlands and Waters of the U.S.

Jurisdictional wetlands exist within the proposed bank however they will not be impacted as a result of the proposed action. There is a designated NWI PF01A located beyond the most upstream portion of UT2-R1, outside of the proposed Bank boundaries. Streams are jurisdictional and will be restored and preserved.

3.3 Threatened and Endangered Species

According to the US Fish and Wildlife Service (USFWS), there is only one federally endangered species and nine federal species of concern potentially occurring in Person County (Table 4), (USFWS, 2010). In addition, The North Carolina Natural Heritage Program (NCNHP) identifies another 18 species protected by the State of North Carolina. A review of the NCNHP database of documented occurrences (NCNHP, 2010) revealed one occurrence a of State Rare plants within one mile of the project site and one occurrence of a natural community. An occurrence of Glade wild quinine (*Parthenium auriculatum*) is present approximately 0.6 mile northwest of the site. A 'Basic Oak-Hickory Forest' exists immediately adjacent to the north of the site. Habitat for threatened and endangered species does not currently exist on the project site. The proposed project is not likely to impact any protected species.

Investigations will be conducted for each of these species and their appropriate habitat requirements as part of the Mitigation Plan. A Section 7 (ESA) clearance will be obtained prior to restoration activities.

A review of available databases was conducted to determine the proximity of Significant Natural Heritage areas to the project site. Several Natural Heritage occurrences are located immediately downstream of the project site in the Tar River. The Tar River downstream of the project site is listed as a proposed critical habitat area and a significant aquatic habitat (Figure 2). A clearance letter will be obtained from the NCNHP once the contract award has been made. Restoration of the site will provide additional habitat as well as reducing sediment and nutrient loads to the sensitive waters of the Tar River.

A review of available databases was conducted to determine the proximity of areas eligible for the National Register of Historic Places at the State Historic Preservation Office (SHPO). No sites were identified within a one-mile radius of the study area. A clearance letter will be obtained from the SHPO once the contract award has been made.

Table 4. Federally Protected Species for Person County

Common Name	Scientific Name	Federal Status	Habitat Currently Present	Habitat-Post Restoration
Vertebrates				
Bald Eagle	*Haliaeetus leucocephalus*	BGPA	No	No
Carolina darter	*Etheostoma collis lepidinion*	FSC	No	No
Pinewoods shiner	*Lythrurus matutinus*	FSC	No	No
Roanoke bass	*Ambloplites cavifrons*	FSC	No	No
Invertebrates				
Atlantic pigtoe	*Fusconaia masoni*	FSC	No	No
Dwarf wedgemussel	*Alasmidonta heterodon*	E	No	No
Green floater	*Lasmigona subviridis*	FSC	No	No
Yellow lampmussel	*Lampsilis cariosa*	FSC	No	No
Vascular Plants				
Smooth Coneflower	*Echinacea laevigata*	E	No	No
Prairie birdsfoot-trefoil	*Lotis unifoliolatus* var. *helleri*	FSC	No	No
Sweet pinesap	*Monotropsis odorata*	FSC	No	No
Virginia quillwort	*Isoetes virginica*	FSC	No	No

Note:
BGPA: Bald and Golden Eagle Protection Act
E: Endangered denotes a species in danger of extinction throughout all or a significant portion of its range.
FSC = Federal Species of Concern denotes a species under consideration for listing, for which there is insufficient information to support listing at this time. These species may or may not be listed in the future.

3.4 Water Quality Assessments

***Mr. Dave Penrose*- Watershed Science**

Benthic Macroinvertebrates

Biological monitoring, primarily benthic macroinvertebrates, will be conducted at four locations within the watershed. Data will be collected from these four locations twice each year attempting to determine longitudinal trends in the fauna and potential sources of perturbation and recovery following implementation of nutrient management. We propose that the data are collected during the spring and fall seasons as these time frames are most appropriate for assessing effects of non-point sources of pollution and impacts of summer low flows respectively. These data will then be important as watershed management is initiated.

Collection Methods: Benthic macroinvertebrate samples will be collected from these locations using the protocols developed by the North Carolina Division of Water Quality (DWQ 2006). These methods include a kick net samples from a typical riffle habitat, a sweep net sample from a productive bank habitat (generally this includes fine root hairs in the current along the bank), a sample of leaf pack invertebrates and a 10 minute "visual" inspection for other cryptic organisms. Samples will be identified to the lowest practical taxonomic level (genus and species primarily) and given qualitative abundance values similar to the DWQ. These data can then be compared to other similar sized streams in the piedmont during similar collection periods.

Metrics: Analytical metrics that can be used to compare population structures between locations and surveys included taxa richness (EPT or Ephemeroptera + Plecoptera + Trichoptera and total taxa richness) and EPT abundance. DWQ protocols use subjective values of 1, 3 and 10 that are given for rare (1-2 organisms), common (3-9 organisms) and abundant (10 or more organisms) specimens within each taxa. Despite the very small size of the upstream reference location we hope that the fauna at this site has some intolerant and/or habitat specialists that may recolonize the newly restored reaches of this stream feature. A simple comparison of dominants in common or observed versus expected comparison of the fauna at these locations may also be used.

Proposed Station Locations: Four collection locations are proposed for this investigation and will be monitored during both spring and fall surveys during the term of this project. An upstream reference location will be surveyed above the project. These data will be used to determine the potential functional uplift for the stream feature. A second site will be surveyed on the mainstem of the stream above the tributary draining the farm and a third site will be selected on the mainstem below this tributary. These data may be useful indicators of recovery and/or impacts from the farm. A fourth location will be surveyed below the project and serve as a downstream recovery location.

Reference:

NC Division of Water Quality (DWQ). 2006. Standard Operating Procedures for Benthic Macroinvertebrates. NC Department of Environment and Natural Resources. Environmental Sciences Section, Biological Assessment Unit. Raleigh, NC.

Baseline Stream Data Worksheets

UT-1

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME UT-1	LOCATION Tar River Headwaters, Oxford, NC	
STATION # _____ RIVERMILE _____	STREAM CLASS Rosgen Type E, 1st Order	
LAT 36.391151° LONG -78.515635°	RIVER BASIN Tar-Pamlico	
STORET #	AGENCY Mogensen Mitigation, Inc.	
INVESTIGATORS Jeremy Poplawski		
FORM COMPLETED BY Jeremy Poplawski	DATE 11/29/12 TIME 1100 (AM) PM	REASON FOR SURVEY Baseline Stream Survey

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☐ ___%
☒	clear/sunny	☒

Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature 12.7 ° C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

* Please refer to attached map and Photograph.

STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☒ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☒ Mixture of origins
☐ Other _____

Catchment Area 0.28 km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
❑ Forest ❑ Commercial
☒ Field/Pasture ❑ Industrial
❑ Agricultural ❑ Other _____
❑ Residential

Local Watershed NPS Pollution
❑ No evidence ❑ Some potential sources
☒ Obvious sources

Local Watershed Erosion
❑ None ☒ Moderate ❑ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
❑ Trees ❑ Shrubs ☒ Grasses ☒ Herbaceous

dominant species present _____

INSTREAM FEATURES

Estimated Reach Length 160.0 m

Estimated Stream Width 0.91 m

Sampling Reach Area 5.0 m^2

Area in km^2 (m^2x1000) 0.005 km^2

Estimated Stream Depth 0.10 m

Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
❑ Partly open ☒ Partly shaded ❑ Shaded

High Water Mark _____ m

Proportion of Reach Represented by Stream Morphology Types
❑ Riffle_____% ❑ Run_____%
❑ Pool_____%

Channelized ☒ Yes ❑ No

Dam Present ❑ Yes ☒ No

LARGE WOODY DEBRIS

LWD 0.0 m^2

Density of LWD 0.0 m^2/km^2 **(LWD/ reach area)**

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☒ Rooted emergent ❑ Rooted submergent ❑ Rooted floating ❑ Free floating
❑ Floating Algae ❑ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation _____%

WATER QUALITY

Temperature_____ ^{0}C

Specific Conductance_____

Dissolved Oxygen _____

pH _____

Turbidity _____

WQ Instrument Used _____

Water Odors
☒ Normal/None ❑ Sewage
❑ Petroleum ❑ Chemical
❑ Fishy ❑ Other_____

Water Surface Oils
❑ Slick ❑ Sheen ❑ Globs ❑ Flecks
☒ None ❑ Other_____

Turbidity (if not measured)
☒ Clear ❑ Slightly turbid ❑ Turbid
❑ Opaque ❑ Stained ❑ Other_____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ❑ Sewage ❑ Petroleum
❑ Chemical ❑ Anaerobic ❑ None
❑ Other_____

Oils
❑ Absent ☒ Slight ❑ Moderate ❑ Profuse

Deposits
❑ Sludge ❑ Sawdust ❑ Paper fiber ❑ Sand
❑ Relict shells ☒ Other Loam

Looking at stones which are not deeply embedded, are the undersides black in color?
❑ Yes ☒ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	0			
Cobble	64-256 mm (2.5"-10")	0	Muck-Mud	black, very fine organic (FPOM)	5
Gravel	2-64 mm (0.1"-2.5")	0			
Sand	0.06-2mm (gritty)	40	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	60			
Clay	< 0.004 mm (slick)	0			

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME UT-1	LOCATION Tar River Headwaters, Oxford, NC	
STATION # _____ RIVERMILE _____	STREAM CLASS Rosgen Type E	
LAT 36.391181° LONG -78.565635	RIVER BASIN Tar-Pamlico	
STORET #	AGENCY Mogensen Mitigation, Inc.	
INVESTIGATORS Jeremy Poplawski		
FORM COMPLETED BY Jeremy Poplawski	DATE 11/29/12 TIME 11:00 (AM) PM	REASON FOR SURVEY Baseline stream survey

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

Total Score 81

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME UT-1	LOCATION Tar River Headwaters, Oxford, NC	
STATION # _____ RIVERMILE _____	STREAM CLASS Rosgen Type E	
LAT 36.311131 LONG -78.815635	RIVER BASIN Tar-Pamlico	
STORET #	AGENCY Mogenson Mitigation, Inc.	
INVESTIGATORS Jeremy Poplawski		LOT NUMBER
FORM COMPLETED BY Jeremy Poplawski	DATE 11/29/12 TIME 11:20 (AM) PM	REASON FOR SURVEY Baseline Stream Survey

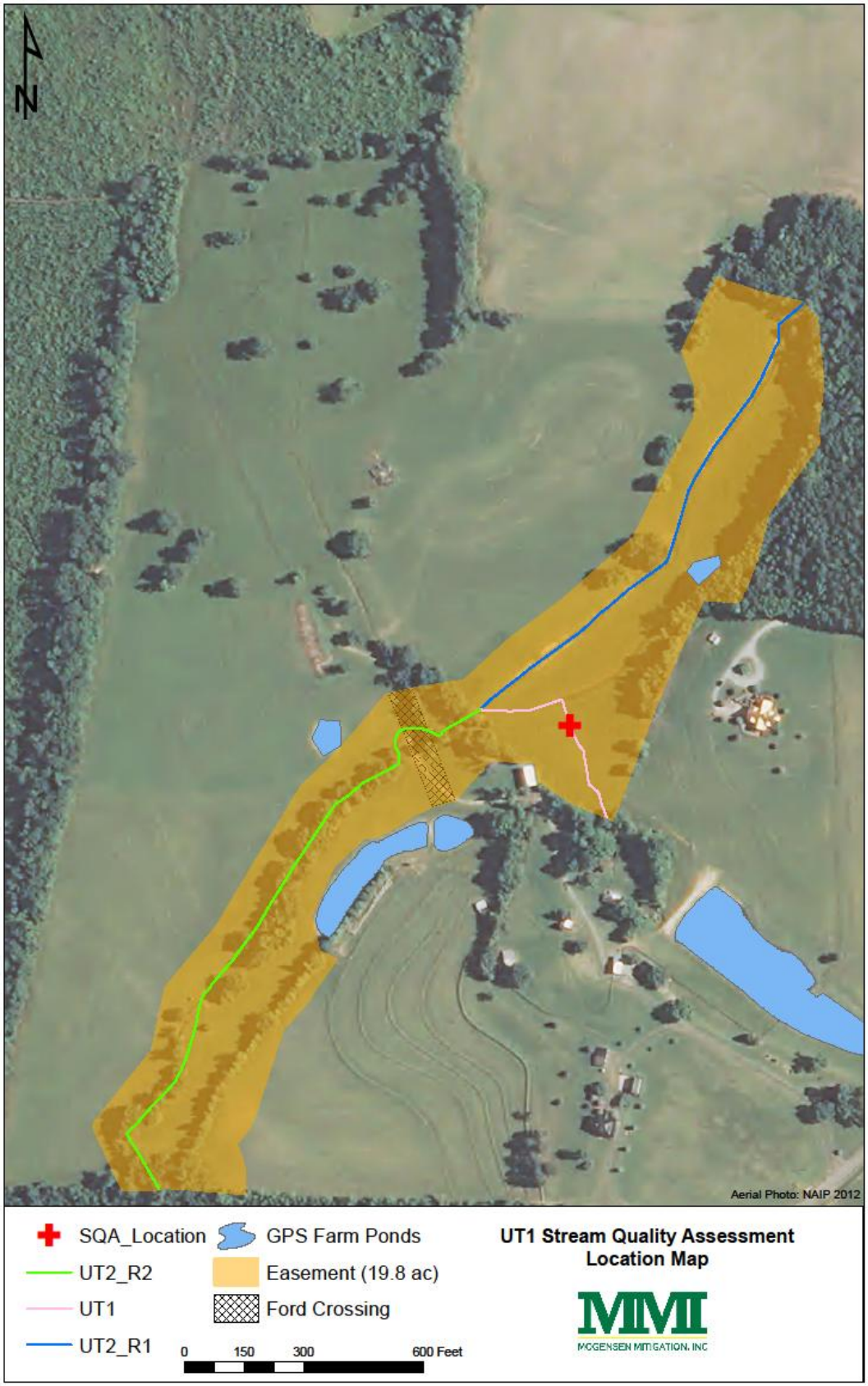
HABITAT TYPES	**Indicate the percentage of each habitat type present** ❑ Cobble____% ❑ Snags____% ☒ Vegetated Banks 50 % ❑ Sand____% ❑ Submerged Macrophytes____% ☒ Other (Loam) 50 %
SAMPLE COLLECTION	**Gear used** ❑ D-frame ❑ kick-net ☒ Other Visual Assessment **How were the samples collected?** ❑ wading ☒ from bank ❑ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ❑ Cobble____ ❑ Snags____ ❑ Vegetated Banks____ ❑ Sand____ ❑ Submerged Macrophytes____ ❑ Other ( )____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	(1)	2	3	4	Slimes	0	1	(2)	3	4
Filamentous Algae	0	(1)	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	0	1	2	(3)	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	0	1	(2)	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	0	(1)	2	3	4	Ephemeroptera	0	1	(2)	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	☒	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	0	(1)	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	0	(1)	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						


N
Aerial Photo: NAIP 2012
SQA_Location
UT2_R2
UT1
UT2_R1
GPS Farm Ponds
Easement (19.8 ac)
Ford Crossing
0
150
300
600 Feet
UT1 Stream Quality Assessment
Location Map
MMI
MOGENSEN MITIGATION, INC

UT1 Stream Quality Assessment Location Photo

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME UT-2R1	LOCATION Tar River Headwaters, Oxford, NC	
STATION # _____ RIVERMILE _____	STREAM CLASS Rosgen Type E, 1st Order	
LAT 36.393531° LONG -78.814238°	RIVER BASIN Tar-Pamlico	
STORET #	AGENCY Mogensen Mitigation, Inc.	
INVESTIGATORS Jeremy Poplawski		
FORM COMPLETED BY Jeremy Poplawski	DATE 11/29/12 TIME 11:30 (AM) PM	REASON FOR SURVEY Baseline stream survey

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☐ ___%
☒	clear/sunny	☒

Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature 12.7 ° C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

* Please refer to attached map and photograph.

STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☒ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☒ Mixture of origins
☐ Other _____

Catchment Area 0.72 km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☒ Field/Pasture ☐ Industrial
☒ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☐ Some potential sources
☒ Obvious sources

Local Watershed Erosion
☐ None ☒ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☐ Shrubs ☒ Grasses ☒ Herbaceous

dominant species present _____

INSTREAM FEATURES

Estimated Reach Length 411.0 m
Estimated Stream Width 1.52 m
Sampling Reach Area 5.0 m^2
Area in km^2 (m^2x1000) 0.005 km^2
Estimated Stream Depth 0.60 m
Surface Velocity (at thalweg) _____m/sec

Canopy Cover
☐ Partly open ☒ Partly shaded ☐ Shaded

High Water Mark _____m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle_____% ☐ Run_____%
☐ Pool_____%

Channelized ☒ Yes ☐ No

Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD Ø m^2
Density of LWD Ø m^2/km^2 **(LWD/ reach area)**

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☒ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation _____%

WATER QUALITY

Temperature_____ ^{0}C
Specific Conductance_____
Dissolved Oxygen _____
pH _____
Turbidity _____
WQ Instrument Used _____

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☒ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☒ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		Ø	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	Ø			
Cobble	64-256 mm (2.5"-10")	10	Muck-Mud	black, very fine organic (FPOM)	5
Gravel	2-64 mm (0.1"-2.5")	10			
Sand	0.06-2mm (gritty)	40	Marl	grey, shell fragments	Ø
Silt	0.004-0.06 mm	35			
Clay	< 0.004 mm (slick)	5			

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME UT2-R1	LOCATION Tar River Headwaters, Oxford, NC	
STATION # _____ RIVERMILE _____	STREAM CLASS Rosgen Type E	
LAT 36.393531° LONG -78.514238°	RIVER BASIN Tar-Pamlico	
STORET #	AGENCY Mogensen Mitigation, Inc.	
INVESTIGATORS Jeremy Poplawski		
FORM COMPLETED BY Jeremy Poplawski	DATE 11/29/13 TIME 11:30 (AM) PM	REASON FOR SURVEY Baseline Stream Survey

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0

Total Score 84

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME UT2-R1	LOCATION Tar River Headwaters, Oxford, NC	
STATION # _____ RIVERMILE _____	STREAM CLASS Rosgen Type E	
LAT 36.393531° LONG -78.581473°	RIVER BASIN Tar-Pamlico	
STORET #	AGENCY Mogensen Mitigation, Inc.	
INVESTIGATORS Jeremy Poplawski		LOT NUMBER
FORM COMPLETED BY Jeremy Poplawski	DATE 11/29/13 TIME 1130 (AM) PM	REASON FOR SURVEY Baseline Stream Survey

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☒ Cobble 10 % ☒ Snags 5 % ☒ Vegetated Banks 50 % ☒ Sand 20 % ☒ Submerged Macrophytes 15 % ☐ Other ( ) ____ %
SAMPLE COLLECTION	**Gear used** ☐ D-frame ☐ kick-net ☒ Other Visual Assessment **How were the samples collected?** ☐ wading ☒ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble ____ ☐ Snags ____ ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☐ Other ( ) ____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	(0)	1	2	3	4	Slimes	0	(1)	2	3	4
Filamentous Algae	0	(1)	2	3	4	Macroinvertebrates	0	(1)	2	3	4
Macrophytes	0	(1)	2	3	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	0	(1)	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	0	(1)	2	3	4	Ephemeroptera	0	(1)	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	0	(1)	2	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	0	(1)	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	0	(1)	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						


N
Aerial Photo: NAIP 2012
SQA Location
GPS Farm Ponds
UT2_R2
Easement (19.8 ac)
UT1
Ford Crossing
UT2_R1
0
150
300
600 Feet
UT2-R1 Stream Quality Assessment
Location Map
MMI
MOGENSEN MITIGATION, INC

UT2-R1 Stream Quality Assessment Location Photo

UT2-R2

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME UT-2 R2	LOCATION Tar River Headwaters, Oxford, NC
STATION # _____ RIVERMILE _____	STREAM CLASS Ecogen Type E, 2nd Order
LAT 36.340524° LONG -78.417798°	RIVER BASIN Tar-Pamlico
STORET #	AGENCY Mogensen Mitigation, Inc.
INVESTIGATORS Jeremy Poplawski	
FORM COMPLETED BY Jeremy Poplawski	DATE 11/29/12 TIME 12:15 AM (PM)
REASON FOR SURVEY Baseline Stream Survey	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☐ ___%
☒	clear/sunny	☒

Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature 12.7 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

* Please refer to attached map and photograph.

STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☒ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☒ Mixture of origins
☐ Other _____

Catchment Area 1.91 km²

Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition - Form 1 A-5

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	**Predominant Surrounding Landuse** ❑ Forest ❑ Commercial ☒ Field/Pasture ❑ Industrial ☒ Agricultural ❑ Other _____ ❑ Residential **Local Watershed NPS Pollution** ❑ No evidence ❑ Some potential sources ☒ Obvious sources **Local Watershed Erosion** ❑ None ☒ Moderate ❑ Heavy
RIPARIAN VEGETATION (18 meter buffer)	**Indicate the dominant type and record the dominant species present** ☒ Trees ❑ Shrubs ☒ Grasses ☒ Herbaceous **dominant species present** _____
INSTREAM FEATURES	**Estimated Reach Length** 505.0 m **Estimated Stream Width** 1.82 m **Sampling Reach Area** 5.0 m² **Area in km² (m²x1000)** 0.005 km² **Estimated Stream Depth** 0.91 m **Surface Velocity (at thalweg)** _____ m/sec **Canopy Cover** ☒ Partly open ❑ Partly shaded ❑ Shaded **High Water Mark** _____ m **Proportion of Reach Represented by Stream Morphology Types** ❑ Riffle _____ % ❑ Run _____ % ❑ Pool _____ % **Channelized** ☒ Yes ❑ No **Dam Present** ❑ Yes ☒ No
LARGE WOODY DEBRIS	**LWD** Ø m² **Density of LWD** Ø m²/km² **(LWD/ reach area)**
AQUATIC VEGETATION	**Indicate the dominant type and record the dominant species present** ☒ Rooted emergent ❑ Rooted submergent ❑ Rooted floating ❑ Free floating ❑ Floating Algae ❑ Attached Algae **dominant species present** _____ **Portion of the reach with aquatic vegetation** _____ %
WATER QUALITY	**Temperature** _____ ° C **Specific Conductance** _____ **Dissolved Oxygen** _____ **pH** _____ **Turbidity** _____ **WQ Instrument Used** _____ **Water Odors** ☒ Normal/None ❑ Sewage ❑ Petroleum ❑ Chemical ❑ Fishy ❑ Other _____ **Water Surface Oils** ❑ Slick ❑ Sheen ❑ Globs ❑ Flecks ☒ None ❑ Other _____ **Turbidity (if not measured)** ❑ Clear ❑ Slightly turbid ☒ Turbid ❑ Opaque ❑ Stained ❑ Other _____
SEDIMENT/ SUBSTRATE	**Odors** ☒ Normal ❑ Sewage ❑ Petroleum ❑ Chemical ❑ Anaerobic ❑ None ❑ Other _____ **Oils** ☒ Absent ❑ Slight ❑ Moderate ❑ Profuse **Deposits** ❑ Sludge ❑ Sawdust ❑ Paper fiber ❑ Sand ❑ Relict shells ❑ Other _____ **Looking at stones which are not deeply embedded, are the undersides black in color?** ❑ Yes ☒ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			**ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)**		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		Ø	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	Ø			
Cobble	64-256 mm (2.5"-10")	Ø	Muck-Mud	black, very fine organic (FPOM)	5
Gravel	2-64 mm (0.1"-2.5")	5			
Sand	0.06-2mm (gritty)	35	Marl	grey, shell fragments	Ø
Silt	0.004-0.06 mm	55			
Clay	< 0.004 mm (slick)	5			

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME UT2-R2	LOCATION Tar River Headwaters, Oxford, NC
STATION # _____ RIVERMILE _____	STREAM CLASS Rosgen Type E
LAT 36.340524° LONG -78.817798°	RIVER BASIN Tar-Pamlico
STORET #	AGENCY Mogensen Mitigation, Inc.
INVESTIGATORS Jeremy Poplawski	
FORM COMPLETED BY Jeremy Poplawski	DATE 11/29/12 TIME 12:15 AM (PM)
REASON FOR SURVEY Baseline Stream Survey	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0

Total Score 103

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME UT2-B2	LOCATION Tar River Headwaters, Oxford, NC	
STATION # _____ RIVERMILE _____	STREAM CLASS Rosgen Type E	
LAT 36.390524° LONG -78.817798	RIVER BASIN Tar-Pamlico	
STORET #	AGENCY Mogensen Mitigation, Inc.	
INVESTIGATORS Jeremy Poplawski		LOT NUMBER
FORM COMPLETED BY Jeremy Poplawski	DATE 11/29/12 TIME 12:15 AM (PM)	REASON FOR SURVEY Baseline Stream Survey

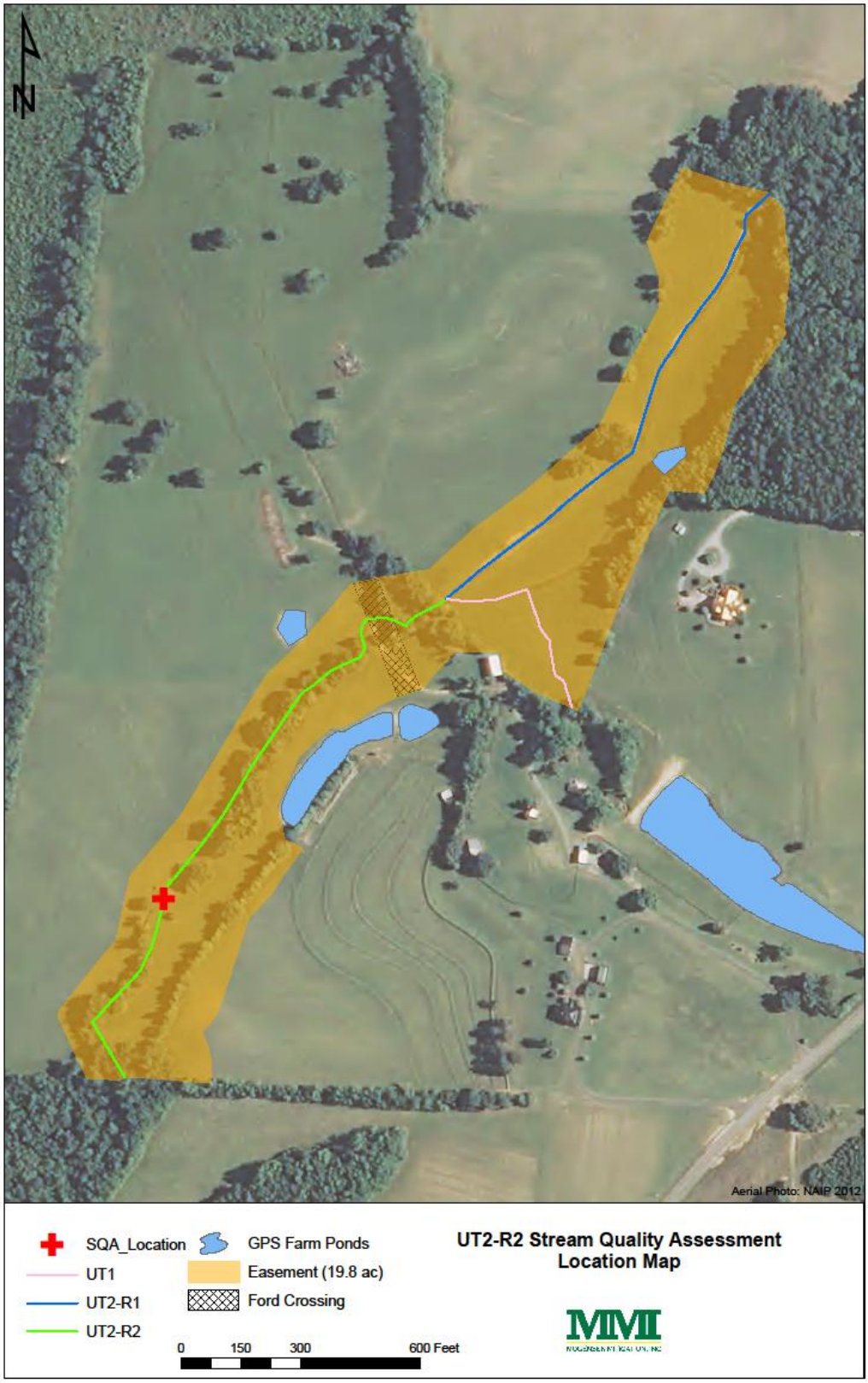
HABITAT TYPES	**Indicate the percentage of each habitat type present** ❑ Cobble____% ☒ Snags 10 % ☒ Vegetated Banks 50 % ☒ Sand 40 % ❑ Submerged Macrophytes____% ☒ Other ( )____%
SAMPLE COLLECTION	**Gear used** ❑ D-frame ❑ kick-net ☒ Other Visual Assessment **How were the samples collected?** ❑ wading ☒ from bank ❑ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ❑ Cobble____ ❑ Snags____ ❑ Vegetated Banks____ ❑ Sand____ ❑ Submerged Macrophytes____ ❑ Other ( )____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	(1)	2	3	4	Slimes	0	(1)	2	3	4
Filamentous Algae	0	(1)	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	0	1	(2)	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	0	(1)	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	0	1	(2)	3	4	Ephemeroptera	0	(1)	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	0	1	(2)	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	0	(1)	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	0	(1)	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						


N
Aerial Photo: NAIP 2012
SQA_Location
UT1
UT2-R1
UT2-R2
GPS Farm Ponds
Easement (19.8 ac)
Ford Crossing
0
150
300
600 Feet
UT2-R2 Stream Quality Assessment
Location Map
MMI

UT2-R2 Stream Quality Assessment Location Photo

4.0 CULTURAL RESOURCES SURVEY

No historic buildings or foundations were seen during initial field investigations. As such, there are no anticipated impacts to cultural resources as a result of the proposed restoration actions. If the Bank is approved, MMI will conduct an environmental screening of the site using the Categorical Exclusion Action Classification Form. This will prevent adverse impacts to protected species or cultural resources from the proposed restoration actions. A review of properties to be determined eligible for the National Register of Historic Places at the State Historic Preservation Office (SHPO) was conducted for the study area and surrounding areas. According to the files, there are no National Register properties within a one-mile radius of the study area. In addition, the SHPO Archaeological Section was contacted in order to determine if documented archaeological sites occur at or near the study area. No sites were identified within a one-mile radius of the study area. MMI will obtain a clearance letter from the SHPO prior to implementing the restoration plan.

5.0 CONCLUSIONS

All information collected to date indicates that the site is ecologically suited to be established as a wetland mitigation bank.

EXHIBIT B: CONCEPTUAL DESIGN PLAN

Overview

The MMI Team has developed a preliminary concept plan for the Bank which is described below. The design plan will be further developed once detailed site topography, soils, hydrology, vegetation and other studies are completed.

Invasive Species

Noxious species will be identified and controlled so that none become dominant or alter the desired community structure of the site. If noxious plants are identified as a problem in the site, MMI will develop a species-specific control plan for approval by the IRT prior to implementation. Through coordination with the IRT during the five-year monitoring period, MMI, where necessary, will remove, treat, or otherwise manage undesirable plant or animal species, including physical removal, use of herbicides, live trapping, confining wires, or nets. The site will be fenced to keep cattle out of the mitigation areas. All vegetation removal from the site shall be done by mechanical means only unless the IRT has first authorized the use of herbicides or algaecides for the control of plants in or immediately adjacent to the site.

Conceptual Design Approach

Water and land areas within the Tar River Headwaters Stream Mitigation Bank provide mitigation opportunities consisting of stream restoration and enhancement, as well as riparian buffer restoration (Figures 4 & 5). Mitigation activities would include the following prescriptions.

- Priority I restoration of 516 linear feet along UT#1 extending north and northwestward from the southern boundary to the confluence of UT#2.
- Priority I restoration of 1,889 linear feet along UT#2 extending southwest from the northeastern property boundary to the existing at-grade stream crossing.
- Priority I restoration of 1,098 linear feet along UT#2 extending from the existing at-grade stream crossing southwest towards the downstream property boundary.

Design Features and Approach

The Sponsor proposes to restore/enhance approximately 3,680 linear feet of onsite streams. Stream restoration would include rerouting the degraded and channelized reaches of UT#1 and UT#2 into C-Type channels that contain stable channel dimensions, patterns, and profiles. Restored C-Type streams would be constructed with sinuosities ranging from 1.2 to 1.4, entrenchment ratios greater than 2.2, and meander width ratios of greater than 4.0. Restoration activities along the lower section of UT#2 would follow the guidelines as mentioned above; however, designs would incorporate only changes to existing dimension and profile, as necessary.

Stream channel design would consist of obtaining soil and topographic data for restoration reaches and the adjacent floodplains to determine the appropriate locations of the rerouted streams. Regional curves, various regime equations, previous project performance on other mitigation sites, and stream survey data from at least one reference stream would be used to determine appropriate channel dimensions, profile, and pattern. Once design criteria have been calculated, construction drawings would be prepared that include, at a minimum, a stream restoration layout plan, channel cross-sections, longitudinal profiles, structure design details and a planting plan for the adjacent riparian area. The design would incorporate Rosgen-based bank stabilization techniques (e.g., log vanes and root wads), grade control structures (e.g., constructed riffles, cross vanes) to prevent channel incision, and structures designed to reduce near bank shear stress (e.g., j-hooks, etc.) and enhance in-stream habitat (e.g., coarse woody debris). Structures would be constructed from materials that are commonly found within stable streams located within comparable geomorphic settings. The use of large boulders for grade control and bank stabilization would be minimized to the extent practicable. In-stream structures would be installed in such a manner as to direct flows from highly erodible portions of constructed channels. Bank stabilization would include removing the cattle from the site to reestablish understory vegetation and stabilize eroded stream banks. Bioengineered structures (root-wads, live fascines, etc.) would be used to stabilize banks susceptible to high velocity flows such as the outside of meander bends. Additional stream bank vegetation will be planted to enhance wildlife habitat and to provide additional stabilization to the existing disturbed soils.

The Sponsor also proposes to the NC-DWQ, in a separate document (Bank Parcel Development Plan), to restore approximately 5.7 acres riparian buffer along UT#1 and UT#2. The widths of the riparian buffers are measured from 50 feet beyond the proposed bankfull location outward to the easement boundary. These widths vary depending on stream locations. Restoration would entail planting riparian buffers with native tree species found either within a reference riparian buffer or within the Piedmont Mesic Mixed Forest *The Natural Communities of North Carolina; Third Approximation* (Shafale and Wheatley, 1979). The goal would be to "jumpstart" the development of a native climactic forest. Proposed stream and riparian restoration would be expected to enhance the geomorphic, hydrologic, and biologic functioning of the tributaries by restoring more natural hydrologic and sediment transport regimes, reducing temperatures, increasing dissolved oxygen levels, stabilizing soils, and improving wildlife habitat.

FIGURES

FIGURE 1. SITE LOCATION MAP

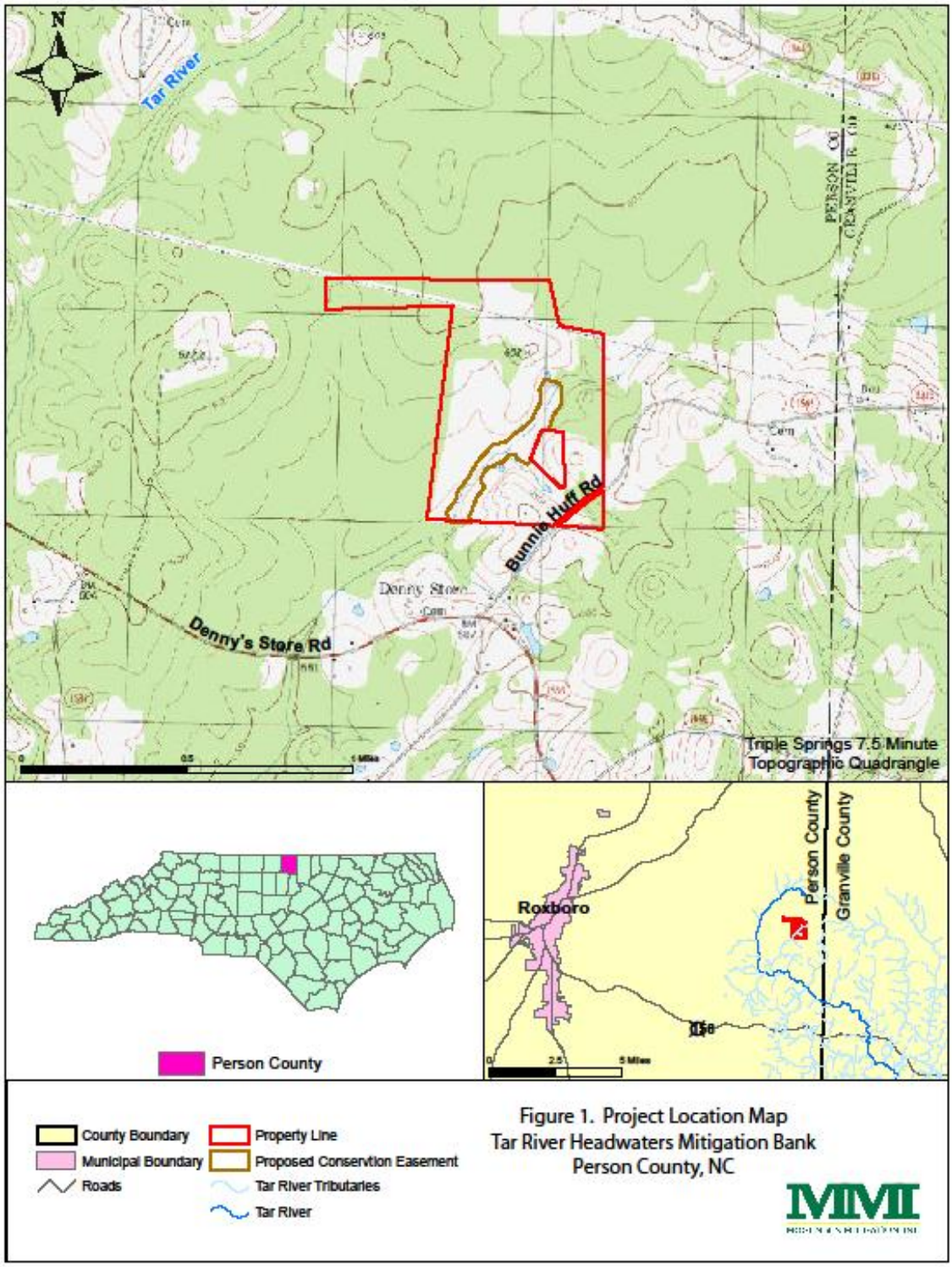


FIGURE 2. EXISTING CONDITIONS

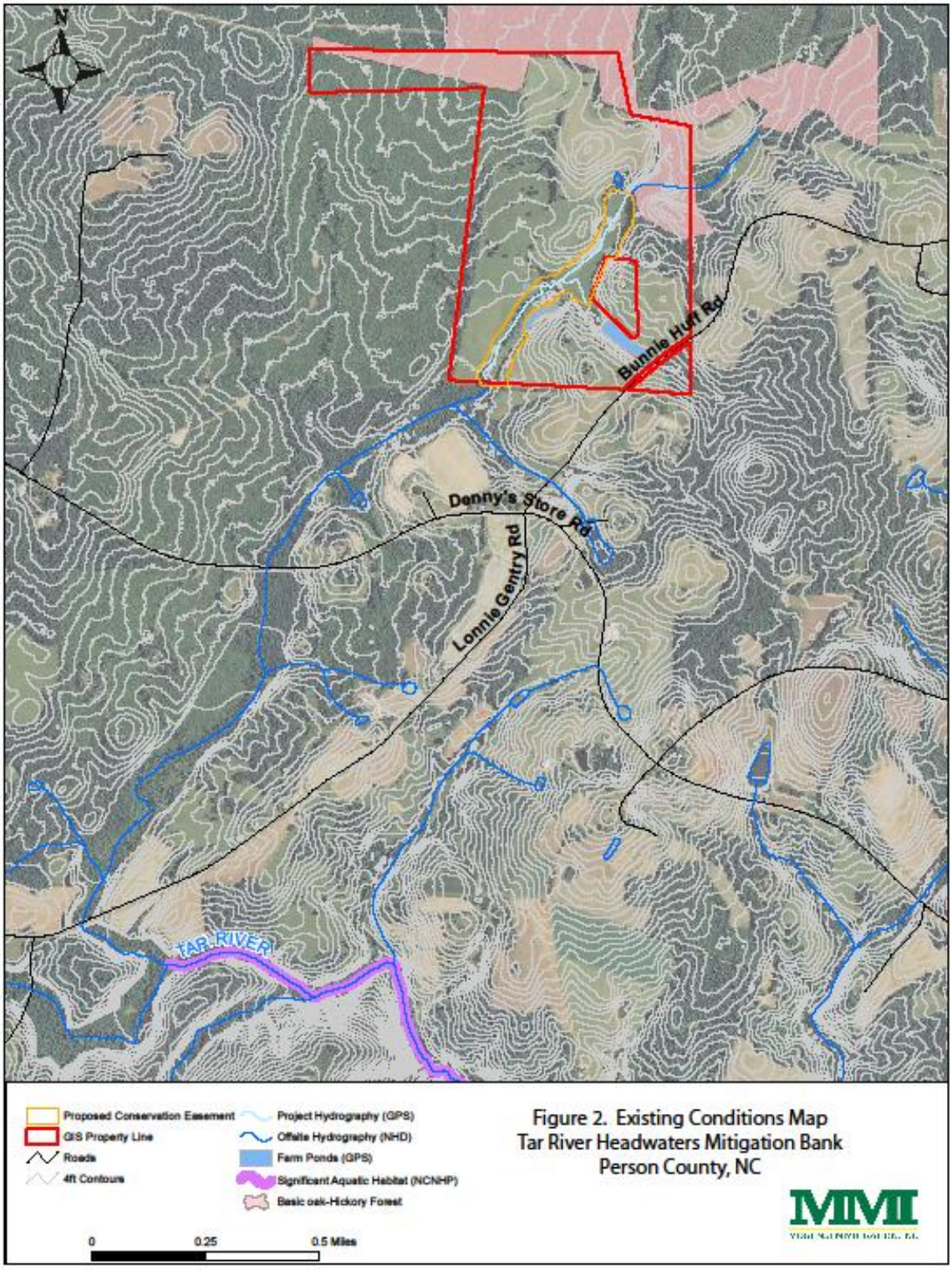


FIGURE 3. SOILS & NWI

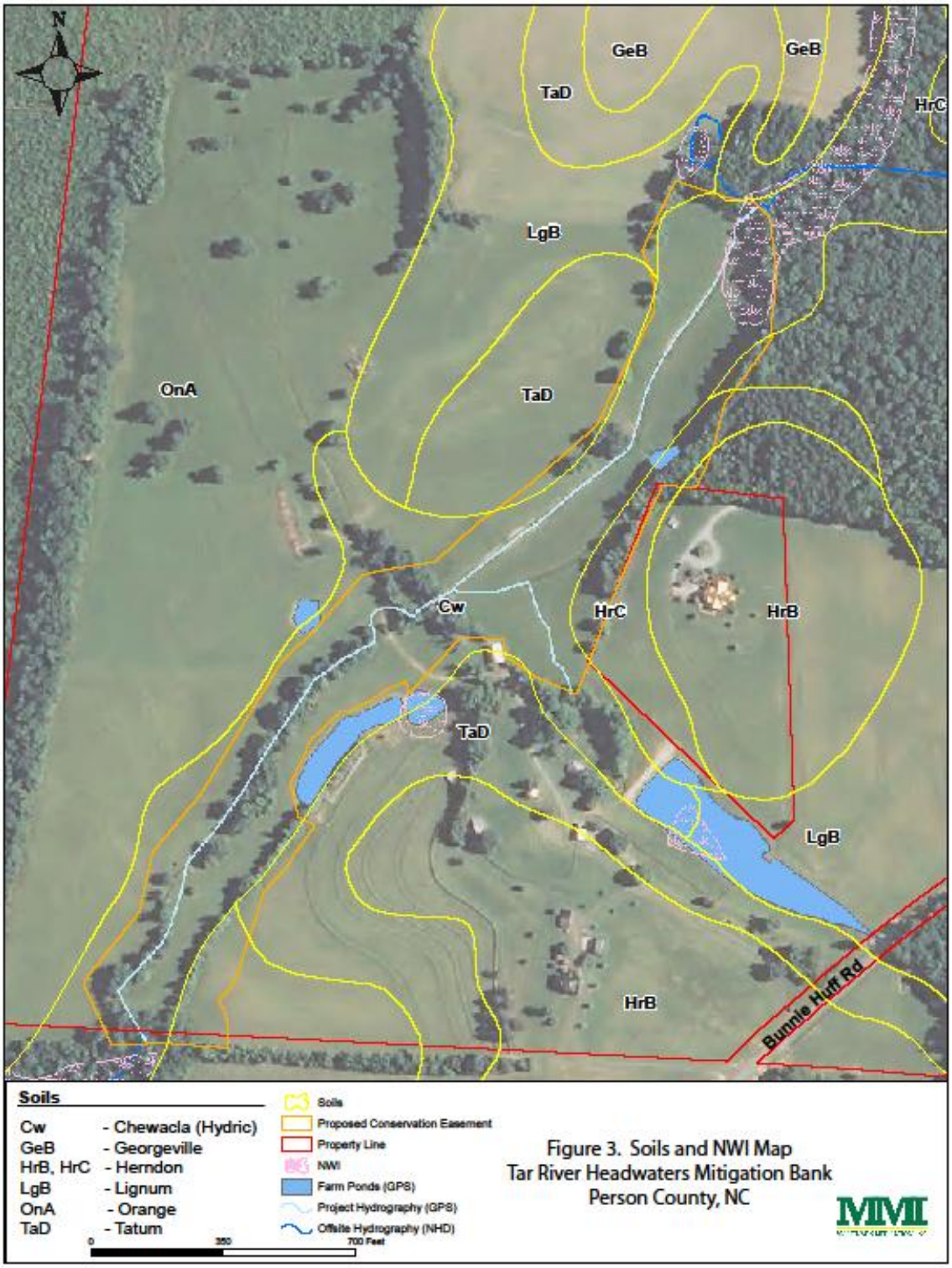


FIGURE 4. CONCEPTUAL DESIGN PART 1

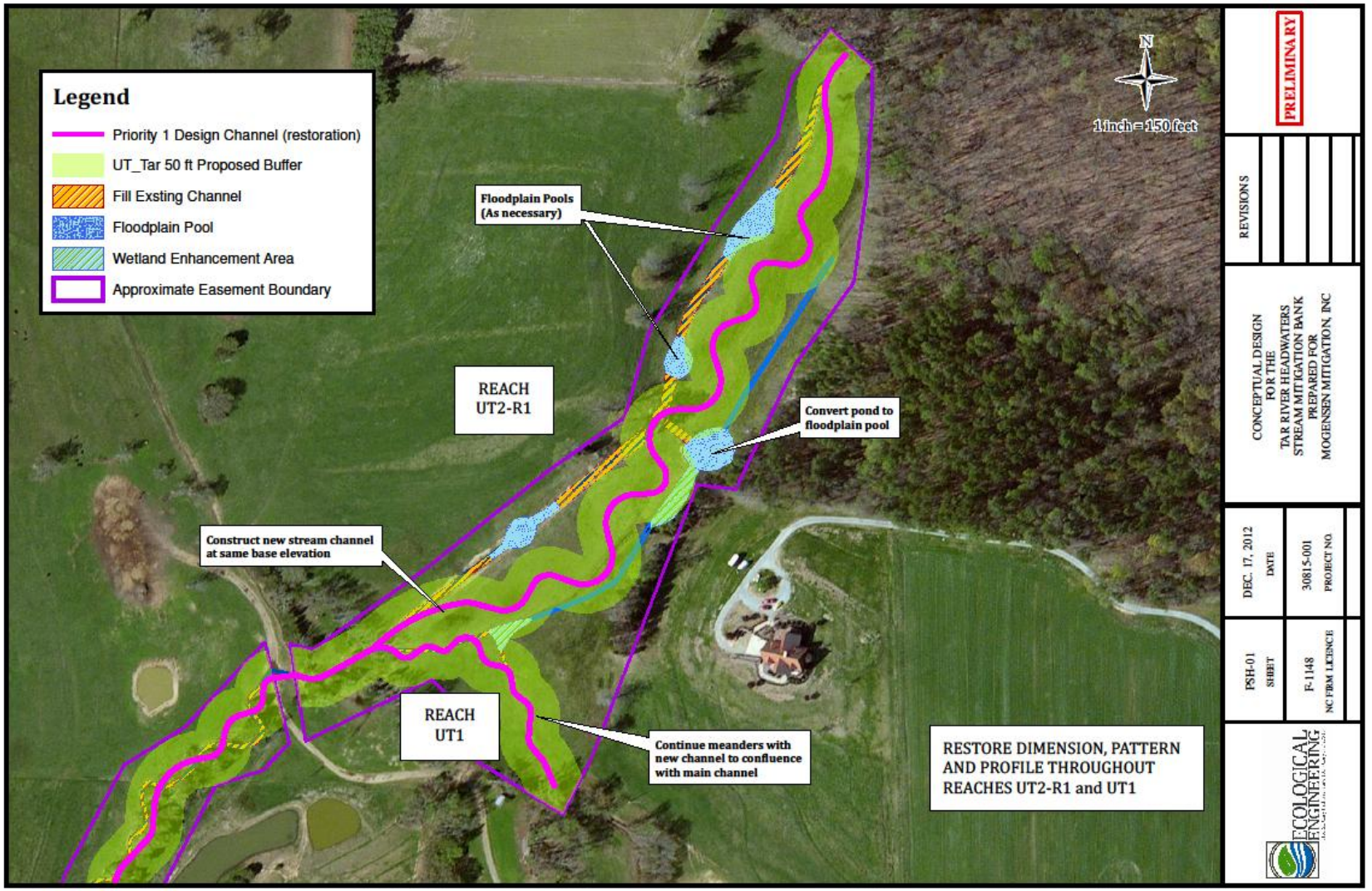


FIGURE 5. CONCEPTUAL DESIGN PART 2

FIGURE 6. Aerial Imagery 5/30/09

FIGURE 7. Aerial Imagery 6/17/08

FIGURE 8. Aerial Imagery 6/30/06

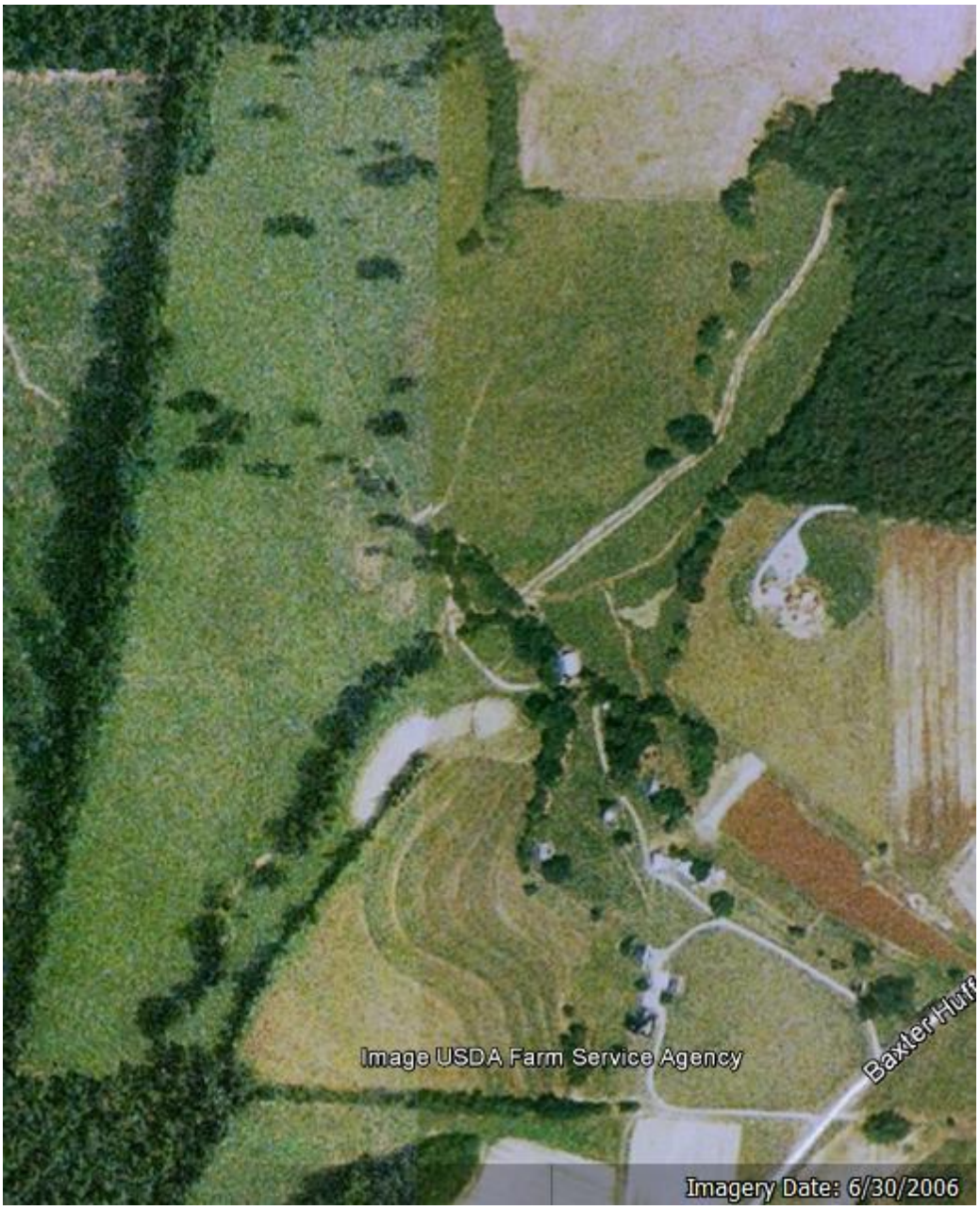


FIGURE 9. Aerial Imagery 6/13/05

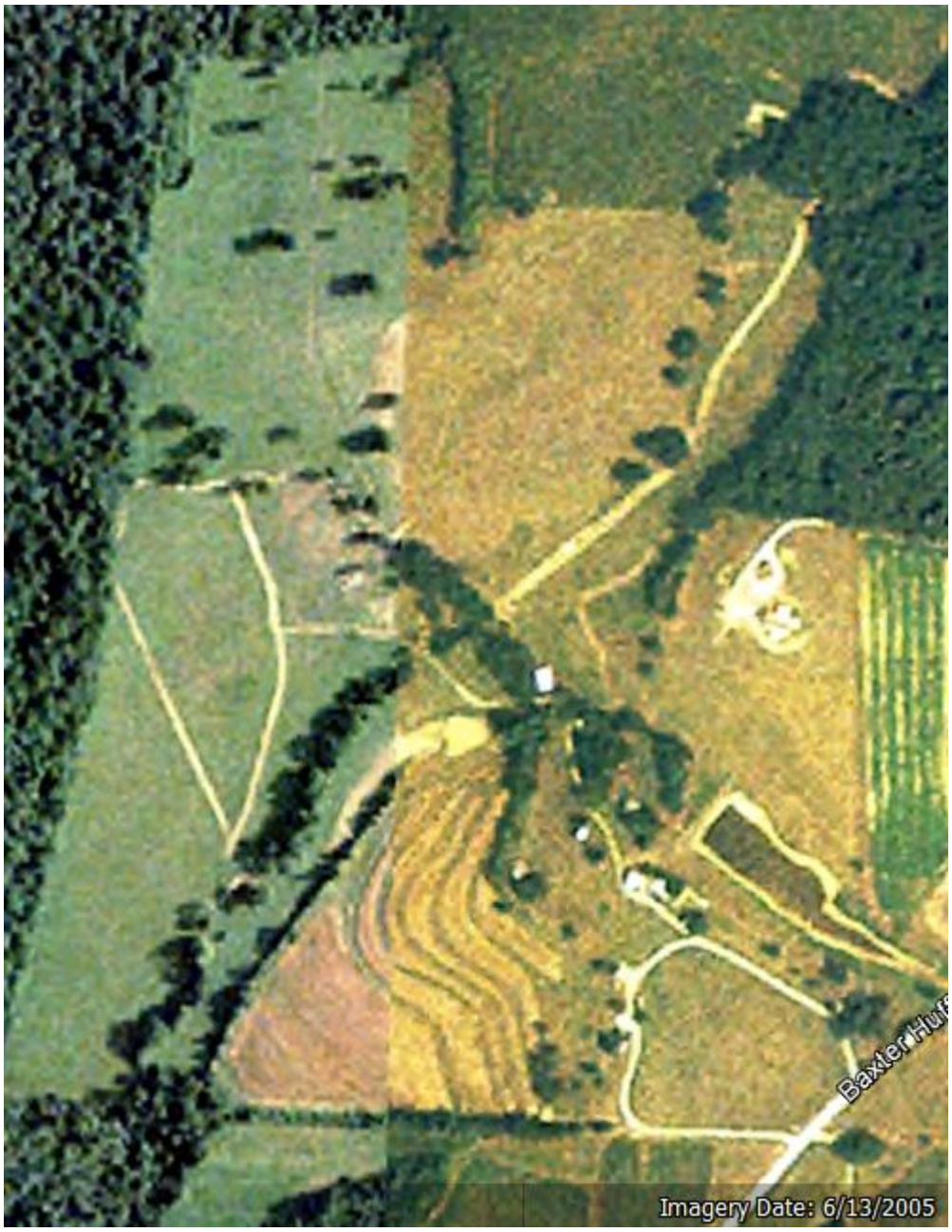


FIGURE 10. Aerial Imagery 3/28/98

FIGURE 11. Aerial Imagery 2/21/98

FIGURE 12. Aerial Imagery 3/29/93

EXHBIT C: Landowner Authorization Form

NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM
LANDOWNER AUTHORIZATION FORM

PROPERTY LEGAL DESCRITION:

Deed Book: 302 **Page:** 041 **County:** Person

Parcel ID Number: 0956-00-42-2361

Street Address: 333 Bunnie Huff
Oxford, NC 27565

Property Owner (please print: Roy N. Huff

Property Owner (please print): Joyce M Huff

The undersigned, registered property owner(s) of the above property, do hereby authorize

_____

Full Delivery Provider[1], the NC Department of Environment and Natural Resources, and the US Army Corps of Engineers, their employees, agents or assigns to have reasonable access to the above referenced property for the evaluation of the property as a potential stream, wetland and/or riparian buffer mitigation project, including conducting stream and/or wetland determinations and delineations, as well as issuance and acceptance of any required permit(s) or certification(s).

Property Owners(s) Address: _____
(if different from above)

_____

Property Owner Telephone Number: (336) 599-0394

Property Owner Telephone Number: (336) 504-4444 Cell

I/We hereby certify the above information to be true and accurate to the best of my/our knowledge.

Roy N. Huff 8-25-12
(Property Owner Authorized Signature) **(Date)**

_____
(Property Owner Authorized Signature) **(Date)**

[1]Name of full delivery company