

Joint Base Andrews – Department of Defense  
Umbrella Mitigation Banking Instrument

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Addendum 1: Mattawoman Creek Mitigation Site  
Site Specific Mitigation Plan

**Prepared by GreenVest, LLC for the Benefit of the Bank Sponsor GreenTrust Alliance, Inc.  
and for the Benefit of Joint Base Andrews (JBA) & the Department of Defense**

**Interagency Review Team**

**U.S. Army Corps of Engineers Baltimore District-Chair  
Maryland Dept. of the Environment, Wetlands and Waterways Program Co-Chair  
U.S. Environmental Protection Agency  
U.S. Fish and Wildlife Service  
National Marine Fisheries Service  
Maryland Department of Natural Resources  
Maryland Historic Trust**

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**TABLE OF CONTENTS**

- I. Introduction ..... 2
- II. Phasing ..... 2
- III. Mattawoman Creek Mitigation Site ..... 2
  - A. Project Goals and Objectives ..... 2
  - B. Site Selection..... 3
  - C. Site Location and Description ..... 3
  - D. Service Area ..... 4
  - E. Site Protection Instrument ..... 5
  - F. Baseline Information..... 5
  - G. Determination of Credits..... 11
  - H. Mitigation Work Plan..... 12
  - I. Maintenance Work Plan..... 18
  - J. Performance Standards ..... 19
  - K. Monitoring Requirements ..... 20
  - L. Long-Term Management and Maintenance Plan ..... 21
  - M. Adaptive Management Plan ..... 21
  - N. Financial Assurances ..... 23
  - O. Credit Release Schedule ..... 24

**FIGURES**

- Figure 1: Site Location Map
- Figure 2: Watershed Boundaries Map
- Figure 3: Site Map
- Figure 4: Proposed Service Area Map
- Figure 5: FEMA Floodplain Map
- Figure 6: National Wetlands Inventory Map
- Figure 7: NRCS Soil Map
- Figure 8: Monitoring Well Location Map

**TABLES**

- Table 1: Summary of Mattawoman Creek Mitigation Site Proposed Mitigation
- Table 2: List of Various Plant Species at MCMS
- Table 3: List of Rare, Threatened, or Endangered Species at MCMS
- Table 4.1: MCMS Proposed Wetland Credit Generation
- Table 4.2: MCMS Proposed Stream Credit Generation

**APPENDICES**

- APPENDIX A Summary of Mitigation Site Search
- APPENDIX B Site Photographs
- APPENDIX C Stream Functional Assessment Report
- APPENDIX D Wetland Delineation Report
- APPENDIX E Evaluation of Planned Wetlands (Functional Assessment) Report



**APPENDICES (Continued)**

APPENDIX F	Water Budget Report
APPENDIX G	Monitoring Well Logs
APPENDIX H	Agency Correspondence
APPENDIX I	MCMS Credit Ledger
APPENDIX J	Design Plans
APPENDIX K	Material Data Sheets
APPENDIX L	IRT Performance & Monitoring Standards



## Mattawoman Creek Wetland Mitigation Site Project Information

### Bank Sponsor and Property Owner:

Sponsor: GreenTrust Alliance, Inc. for the Benefit of Joint Base Andrews and the Department of Defense  
Property Owner: Morgan Doherty Realty Trust (Hillen J. Morgan & Eileen G. Doherty)

### Property Information:

- **Location:** 38° 35'51"N 77°02'49"W
- **Size:** Total Property: 225.16 ac.  
Perpetual Easement for Mitigation Site: 80.95 ac.
- **Wetland Creation:** 409,464 sf. (9.40 ac.)
- **Wetland Restoration (Re-establishment):** 527,076 sf. (12.10 ac.)
- **Wetland Restoration (Rehabilitation):** 1,076,368 sf. (24.71 ac.)
- **Wetland Enhancement (H&H):** 22,216 sf. (0.51 ac.)
- **Non-tidal Wetland Buffer Enhancement:** 193,842 sf. (4.45 ac.)
- **Non-tidal Wetland Buffer Preservation:** 246,550 sf. (5.66 ac.)
- **Upland Restoration:** 192,100 sf. (4.41 ac.)
- **Non-Tidal Wetland & Upland Preservation:** 623,779 sf. (14.32 ac.)
- **Stream Restoration** 3,798 Linear Feet (1.35 ac.)
- **Stream Buffer** 175,982 sf. (4.04 ac.)

### Mitigation Credits

#### Wetland Credits\*

- **Wetland Creation:** 9.400 Credits (1:1 Ratio)
- **Wetland Restoration (Re-establishment):** 12.100 Credits (1:1 Ratio)
- **Wetland Restoration (Rehabilitation):** 16.473 Credits (1.5:1 Ratio)
- **Wetland Enhancement (H&H):** 0.051 Credits (10:1 Ratio)
- **Non-tidal Wetland Buffer Enhancement:** 0.297 Credits (15:1 Ratio)
- **Non-tidal Wetland Buffer Preservation:** 0.283 Credits (20:1 Ratio)
- **Upland Restoration:** 0.294 Credits (15:1 Ratio)
- **Non-Tidal Wetland & Upland Preservation:** 1.432 Credits (10:1 Ratio)
- **5% Additional for Conservation Easement:** 2.017 Credits
- **Total Credits:** **42.347 Credits**

\*As per results of 2016 wetland delineation and pending Jurisdictional Determination.

#### Stream Credits

- **Stream Restoration:** 3,798.00 LF/Credits (1:1 Ratio)

#### HUC Service Area:

Primary: 02-07-00-10 Middle Potomac-Anacostia-Occoquan  
(Southeastern Plain only)  
02-07-00-11 Lower Potomac  
Secondary: 02-06-00-06 Patuxent



## **Mattawoman Creek Mitigation Site**

### **I. INTRODUCTION**

Green Trust Alliance, Inc. (GTA), the Bank Sponsor, proposes to establish the Mattawoman Creek Mitigation Site (MCMS) within the Joint Base Andrews-Department of Defense (JBA-DoD) Umbrella Mitigation Banking Instrument (UMBI). The Mattawoman Creek site, is located at 4250 Foxburrow Road in Pomfret, Charles County, Maryland. The MCMS is located south of Indian Head Highway (MD 210) and approximately 0.50 miles east of Pomfret Road (MD 227) near Pomonkey (Figure 1). The purpose of the UMBI is to provide compensatory mitigation for unavoidable impacts to streams and wetlands, and their functions as a result of activities authorized under Section 401 and 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, Maryland Nontidal Wetlands Protection Act, and the Maryland Tidal Wetlands Protection Act, and Department of Army Permits provided such activities have met all applicable requirements and are authorized by the appropriate agencies. The Mattawoman Creek Mitigation Site is the first Bank Site to be added to the JBA-DoD UMBI.

### **II. PHASING**

The JBA-DoD UMBI is being submitted concurrently with this Site-Specific Mitigation Plan for approval by the Interagency Review Team (IRT). Upon approval, the final MCMS Mitigation Plan will be attached to the JBA-DoD UMBI and the Site will be deemed a component of the JBA-DoD UMBI. Credits will be released consistent with the approved schedule of credit availability in accordance with the final MCMS Mitigation Plan and the JBA-DoD UMBI. Credits released for the MCMS will be accounted for in the overall Bank Ledger for the JBA-DoD UMBI.

### **III. MATTAWOMAN CREEK MITIGATION SITE**

#### **A. Project Goals and Objectives**

The MCMS serves as a site within the JBA-DoD UMBI to provide wetland and stream mitigation credits within the MCMS-specific service area (See Section III.D). Development of the bank would provide advance compensatory mitigation for anticipated needs tied to planned capital improvement projects at JBA at potentially other DoD facilities within the proposed service area. The goal of the MCMS is to provide a self-sustaining, functional wetland and stream to replace the functions and values lost from adverse impacts due to various permitted JBA projects within its defined Service Areas. The Bank also serves to provide advanced functional replacement of future functional losses due to unavoidable impacts and thus serves to eliminate temporal loss, which results from alternative mitigation approaches. Functional replacement based on current site conditions include; a combination of freshwater wetland creation and restoration; hydraulic & hydrologic (HH) enhancement; re-establishment of vegetative composition and structure; and upland forest restoration buffering the wetland components of the bank.

As proposed, this project will lift a suite of functions and values including, but not limited to: groundwater recharge/discharge, floodplain connectivity, stormwater management, wildlife habitat, fish habitat, water quality, sediment trapping/stabilization, and nutrient cycling. The project will also result in restoring/creating a linkage to highly functioning aquatic and terrestrial habitats.

This project will add approximately 81 acres of restored, created, enhanced and preserved forested, freshwater wetland and upland habitat in a recognized (MDE, USACE and USEPA) priority restoration and Tier II watershed. This project will be fully integrated into the surrounding forested wetland and upland habitat, which



collectively comprise critical upland and wetland resources that support the chemical, physical and biological integrity of the Mattawoman Creek and its watershed.

## **B. Site Selection**

Most of JBA is located in the Middle Potomac watershed, with a small portion crossing over into the Patuxent watershed (Figure 2). GreenVest conducted an exhaustive search for mitigation sites in the Middle Potomac watershed where JBA is physically located. One larger scale site was located, secured and is being used to provide mitigation for JBA's West Runway Repair Project. Note that 12.5 wetland mitigation units were generated on the Piscataway Creek Mitigation Site (PCMS) using a total of  $63 \pm$  acres. Several other sites, within the Middle Potomac, smaller in scale to the PCMS were identified and ecologically suitable, but could not be secured due to unwilling or unable land owners. Prior to GreenVest's involvement, JBA also conducted their own mitigation site searches within the Middle Potomac Basin which generated no viable results. Details of the site search are provided in Appendix A.

The Mattawoman Creek Site was selected given its proximity to the Middle Potomac Drainage divide, its restorability, economy and ecology of scale given JBA's planned credit needs, and its location within a priority restoration watershed.

## **C. Site Location and Description**

The Mattawoman Creek site, is located at 4250 Foxburrow Road in Pomfret, Charles County, Maryland. The MCMS is located south of Indian Head Highway (MD 210) and approximately 0.50 miles east of Pomfret Road (MD 227) near Pomonkey (Figure 1). The MCMS is located in the Lower Potomac watershed (Federal HUC-8 02060011), which is only two miles from the Middle Potomac-Anacostia-Occoquan watershed (Federal HUC-8 02070010), and less than fifteen miles from JBA (Figure 2).

The MCMS is located on the Morgan Property which is comprised of approximately 225 acres of pasture, active agricultural fields, forest, a single-family residence, and several structures associated with the agricultural operations. The Morgan Property has been a working farm since prior to the 1930's and has been subject to numerous manipulations of drainage, hydrology and vegetation to create crop lands and pasture. The Morgan Property is zoned RC(D) (Rural – Conservation), with almost the entirety of the surrounding land around the Morgan property also zoned as RC(D). The 80.95 acres proposed for inclusion in the MCMS are comprised of two distinct areas: Northern Restoration (Area A) and Southern Restoration (Area B) (Figure 3). Select photographs are included as Appendix B.

Restoration Area A consists of 21.75 acres and is located in the northern portion of the property and primarily consists of three open pastures separated by hedge rows made up of mature trees. The pastures are generally flat and slope slightly to the southeast. Each hedge row has a drainage ditch that was constructed prior to 1930 to support crop cultivation. These hedge row ditches were constructed to convey runoff from the pastures to the south toward perimeter ditches and to the west toward Mattawoman Creek. Perimeter ditches are located on the eastern and southern perimeters of the pastures. These straight-line ditches are man-made and appear to have been constructed (prior to 1930) to convey stream flow from an unnamed tributary to Mattawoman Creek past the pastures before discharging to the forested floodplain of Mattawoman Creek to the west. The perimeter ditch located on the eastern side of the pasture conveys surface water to the southeast before turning to the west and flowing along the southern perimeter of the pastures toward Mattawoman Creek. Restoration for Area A will include wetland creation, wetland restoration (rehabilitation of historic wetlands), creation of nontidal wetland buffer, and preservation of nontidal wetland buffer.

Restoration Area B consists of 59.20 acres and is located within the southern portion of the MCMS and consists of several fields that are currently in agricultural production (sorghum row crop and farmed for hay), Old



Womans Run, and forested wetland areas associated with Old Womans Run. Old Womans Run flows through the Southern Restoration Area from east to west before its confluence with Mattawoman Creek approximately ½-mile west of the MCMS. Old Womans Run naturally divides the Southern Restoration Area into two segments, the cultivated fields to the north (Areas B-1 and B-2) and the fields farmed for hay to the south (Area B-3). Several drainage ditches traverse this area and effectively drain a majority of the fields in this area. The proposed mitigation measures for Area B include wetland creation, wetland restoration (rehabilitation, hydrology and hydraulics enhancement [H&H] and re-establishment of historic wetlands), upland restoration, nontidal wetland buffer enhancement and preservation, preservation (primarily surrounding Old Woman Run), and stream restoration within Old Woman Run.

The MCMS was designed to offset lost water quality, hydrological, and biological functions of wetlands that will be permanently impacted as part of planned capital improvement projects at JBA or other DoD facilities within the service area (See Section III.D). These functions include filtering sediments, pollutants, and excess nutrients, reducing erosion, discharging and recharging groundwater, flood storage, providing wildlife habitat, and furnishing organic matter to the aquatic food web. A total of 80.95 acres of the Morgan Property are proposed for inclusion in the MCMS for restoration and/or preservation. The proposed restoration includes wetland creation, wetland restoration (rehabilitation, hydrology and hydraulics enhancement [H&H] and re-establishment of historic wetlands), creation of nontidal wetland buffer, stream restoration, and preservation of nontidal wetland buffer. The functions provided by the proposed stream and wetland restoration will help to offset losses from the future development in the region and provide water quality benefits from the current agricultural and low density development adjacent to the site. Furthermore, the MCMS provides a high degree of site reliability and predictability concerning sustainability of wetland hydrology, wetland plant communities, and functioning hydric soils. A summary of proposed mitigation is provided in Table 1.

**Table 1: Summary of Mattawoman Creek Mitigation Site Proposed Mitigation by Type**

<b>Mattawoman Creek Mitigation Site Proposed Mitigation by Type</b>	
<b>Mitigation Type</b>	<b>MCMS Area</b>
Wetland Creation	9.40 ac.
Wetland Restoration (Re-establishment)	12.10 ac.
Wetland Restoration (Rehabilitation)	24.71 ac.
Wetland Enhancement (H&H)	0.51 ac
Non-tidal Wetland Buffer Enhancement	4.45 ac.
Non-tidal Wetland Buffer Preservation	5.66 ac.
Upland Restoration	4.41 ac.
Non-Tidal Wetland & Upland Preservation	14.32 ac.
Stream Restoration	1.35 ac.
Stream Buffer	4.04 ac
<b>TOTAL SIZE SF (AC)</b>	<b>80.95</b>

**D. Service Area**

The Geographic Service Area (GSA) for the JBA-DoD UMBI is statewide in Maryland and a separate service area is required for each mitigation site under the JBA-DoD UMBI. As discussed above, the primary objective of the MCMS is to provide compensatory mitigation for current and future capital improvement projects at JBA. JBA is primarily located in the Middle Potomac watershed with a small portion of the base located in the Patuxent Watershed. The MCMS is located in the Lower Potomac approximately 2 miles from the Middle Potomac-Anacostia-Occoquan drainage divide. The proposed service area for the MCMS is the Middle



Potomac-Anacostia-Occoquan (02070010) and the Lower Potomac HUC8 (02070011) Watersheds. Additionally, GV requests that the MCMS is considered on a case by case basis as a source of mitigation for permitted impacts outside of the primary service area, in the Patuxent Watershed. In this case, we request approval to utilize credits within a secondary service area (the Patuxent HUC8 [02060006] Watershed) and propose the inclusion of the Patuxent Watershed as a secondary service area. The use of the secondary service area and the credit ratio to satisfy mitigation requirements in the secondary watershed will be evaluated on a case by case basis. The proposed primary and secondary service areas, the location of the MCMS, and the location of JBA are depicted on Figure 4.

### **E. Site Protection Instrument**

The Mattawoman Creek Site is privately owned in fee title by the Morgan Doherty Realty Trust. GreenVest has secured the legal right to advance the mitigation work described herein under a fully executed Mitigation Easement Agreement, which will be recorded in the Land Records. All of the restoration work required to develop the mitigation bank will be protected by a permanent conservation easement in a form acceptable to the IRT. It is anticipated that the revised draft version of the IRT Declaration of Restrictive Covenant will be incorporated as an exhibit to the Conservation Easement to satisfy the site protection mechanism requirement. This will also include granting rights of access to the IRT, as required under both state and federal rules.

After approval of the MCMS Mitigation Plan and prior to construction, GTA shall cause to be executed and recorded a conservation easement encumbering the entire mitigation area located within the proposed bank. The conservation easement shall meet the requirements of 33 CFR Parts 325 and 332 and 40 CFR Part 230. The project team's interest in the MCMS acreage will be acquired by GTA., through a Cooperative Agreement with JBA. Accordingly, it is anticipated that GTA would be the Conservation Easement holder for the MCMS.

In accordance with the MDE comments received on the Draft Prospectus, an additional 5% credit will be requested for the MCMS for the acquisition of the conservation easement (Section III.G).

### **F. Baseline Information**

As indicated above the MCMS has been divided into two primary areas, Restoration Area A and Restoration Area B (Figure 3). Restoration Area A is comprised of 21.75 acres and is in the northern quadrant of the Morgan Property. Area A primarily consists of three (3) open pastures separated by hedge rows made up of mature trees. Restoration Area B is comprised of 59.20 acres and is in the southeastern portion of the Morgan Property. Area B consists of several fields that are currently in agricultural production (sorghum row crop and farmed for hay), Old Womans Run, and forested wetland areas associated with Old Womans Run. The following is a summary of the existing conditions in these areas.

#### **Surface Water**

The MCMS is located in the Lower Potomac Watershed USGS HUC 8 - 02070011 and Mattawoman Creek MD 8-Digit Watershed 02140111 (Figure 2). The Morgan Property and the MCMS are located adjacent to and within the floodplains of Old Womans Run, which flows through the property from east to west, and Mattawoman Creek, which is adjacent to the Morgan Property to the west. The extent of these floodplains relative the Morgan Property and the MCMS is depicted in Figure 5.



The pastures in Area A are generally flat and slope slightly to the southeast with a slope of less than 2%. Runoff from the pastures generally flows towards the southeast; however, surface water pools in low areas and depressions of the pastures. Each hedge row has a drainage ditch that was constructed prior to 1930 to support crop cultivation. These hedge row ditches were constructed to convey runoff from the pastures to the south toward perimeter ditches and to the west toward Mattawoman Creek. The perimeter ditches are located on the eastern and southern perimeters of the pastures. These straight-line ditches are man-made and appear to have been constructed (prior to 1930) to convey stream flow from an unnamed tributary to Mattawoman Creek past the pastures before discharging to the forested floodplain of Mattawoman Creek to the west. The perimeter ditch located on the eastern side of the pasture conveys surface water to the southeast before turning to the west and flowing along the southern perimeter of the pastures toward Mattawoman Creek. The Northern Restoration area (Area A) is almost entirely outside of the FEMA 100-year floodplain with some portions of the flood plain extending to its western extent (Figure 5).

Old Womans Run flows through the Southern Restoration Area from east to west before its confluence with Mattawoman Creek approximately ½-mile west of the MCMS. Old Womans Run naturally divides the Southern Restoration Area into two segments, the cultivated fields to the north and the fields farmed for hay to the south. There are four (4) distinct field segments north of Old Womans Run, each separated by forested hedge rows, each containing a drainage ditch constructed to convey runoff from the fields and surrounding area to the southwest toward Old Womans Run. The ground surface generally slopes to the west and southwest, toward Old Womans Run. Nearly all of the Southern Restoration Area is located within the FEMA 100 Year Floodplain of Old Womans Run (Figure 5). A small portion of the most northern fields are located outside of the 100 Year Floodplain.

A Stream Functional Assessment was completed in November of 2016 on Old Womans Run within the southern restoration area and the perimeter ditches in the northern restoration area. This stream functional assessment was performed using the Function-Based Rapid Stream Assessment Methodology created by the U.S. Fish and Wildlife Service-Chesapeake Bay Field Office (Starr et al., 2015). This methodology is designed to quickly develop an understanding of existing and proposed stream conditions at a site with planned stream and wetland restoration. This includes a watershed assessment and an assessment of stream functions for existing conditions and a proposed restoration design. The watershed assessment section addresses larger scale conditions outside of the stream reach that may affect the health of the stream, and rates them as “Good,” “Fair,” and “Poor.” The function-based stream assessment evaluates parameters related to the hydrology, hydraulics, geomorphology, water quality (physicochemical), and biology of the stream reach. Each component aggregates variables related to stream function and places them in the qualitative categories of “Functioning,” “Functioning-at-Risk,” and “Not Functioning.”

The watershed conditions for both Old Womans Run and the perimeter ditches were “Fair”. The existing condition of Old Womans Run was characterized as “Not Functioning” because hydraulic and geomorphic conditions are adversely impacted (i.e., “Not Functioning”) by severe channel degradation (down-cutting) that has resulted in the channel being disconnected from its floodplain and highly erodible channel banks. The existing condition of the wooded reach of the perimeter ditches was characterized as “Not Functioning” due to stream channel incision that has resulted in a disconnection from the adjacent riparian corridor and floodplain. The field reach of the perimeter ditch was characterized as “Functioning at Risk” due to the lack of riparian vegetation and decreased water quality. The Function-Based Stream Assessment is included as Appendix C.

## **Wetlands**

A review of the National Wetland Inventory (NWI) mapping for the site (Figure 6) identified large areas of wetlands associated with Mattawoman Creek to the west of the Morgan Property. Additional wetland areas located on the southern portion of the Morgan Property and to the east of the Morgan Property associated with Old Womans Run and other unnamed tributaries to Mattawoman Creek were identified. NWI did not

show any mapped wetlands within the creation and restoration areas of the MCMS; however, there are NWI mapped wetlands associated with Old Womans Run located in the MCMS preservation areas.

A wetland delineation was completed at the MCMS on multiple days between May and October of 2016. The purpose of the wetland delineation was to identify and delineate regulated nontidal wetlands and waterways within the MCMS per the US Army Corps of Engineers guidelines for the Atlantic Gulf and Coastal Plain areas. These investigations identified seven (7) wetland areas at the MCMS. The Wetland Delineation Report and Wetland Delineation Plan are included as Appendix D.

GV completed a wetlands function and values assessment of the identified wetlands at the MCMS to support the ecological uplift contemplated for the MCMS. The Evaluation of Planned Wetlands (EPW) developed by Bartoldus et. al. was the functional assessment model used to complete this exercise. GV has used this method in many functional wetland assessments to underwrite proposed ecological uplift in mitigation projects approved by the United States Army Corp of Engineers (USACE) in multiple districts. An assessment was also made on the quality, composition and hydroperiod (ephemeral, intermittent or perennial) of each feature identified and the classification of identified wetland features (forested, scrub/shrub, emergent). The complete wetland functions and values assessment is included as Appendix E.

The wetland delineation and the wetland functions and values assessment was used, in conjunction with baseline information, to inform the design of the proposed restoration and selection of mitigation categories and ratios at the MCMS (Section III.G).

### **Groundwater Hydrology**

The MCMS is underlain by the Surficial Upland Aquifer which occurs over much of the western shore of southern Maryland. The Surficial Upland Aquifer is comprised of alluvium and is underlain by the low permeability Marlboro Clay confining unit (Andreasen, et. al., 2013). The Marlboro Clay is reported to occur at depths ranging from near the ground surface to 15 feet below ground surface in the area of the MCMS (Glaser, 1971). The Surficial Upland Aquifer has variable thicknesses largely governed by topography and the presence of the underlying clay. This aquifer is considered a minor aquifer and is used sporadically for domestic and agricultural supply. The Marlboro Clay is underlain by the Upper Patapsco aquifer system which is an important source of water supply in Charles County and much of Southern Maryland (Andreasen, et. al., 2013).

The Surficial Upland Aquifer is highly incised by stream channels, which creates irregular aquifer thicknesses and groundwater flow patterns around the incised streams. At the MCMS, Mattawoman Creek and Old Womans Run both influence local water table elevations and groundwater flow direction and gradient (Andreasen, et. al., 2013). As a result, groundwater flow generally follows local topography.

In the northern restoration area (Area A), groundwater generally flows to the west and southwest toward Mattawoman Creek. The manmade ditch that runs along the eastern edge of the northern restoration area is perennial and is severely incised. This ditch discharges to a second ditch which runs to the west along the southern boundary of Area A. As a result, this feature is likely exerts a local influence on groundwater flow on the eastern portion of this area. Much of Area A can currently be classified as existing farmed wetlands with the exception of two upland inclusions (one slated for creation and one for upland restoration). The existing wetlands in Area A sit atop a shallow confining layer and are predominantly fed by direct precipitation.

In the southern restoration area, groundwater generally flows to the south and southwest toward Old Womans Run. In the Area B south of Old Womans Run, groundwater generally flows to the west and northwest toward Old Womans Run and Mattawoman Creek. Within this area, the Old Womans Run stream channel is severely incised and shallow groundwater enters that stream via baseflow. The stream channel incision has lowered the seasonal high water table in areas surrounding the stream. In addition, several drainage ditches are effectively draining the agricultural fields. The ditches eventually drain to Old Womans Run.

Continuous groundwater observations and measurements commenced in November of 2015, in nine (9) wells outfitted with automated data loggers taking continuous groundwater measurements, and are currently ongoing. Site conditions and hydrology observations were used to develop a water budget that has informed the design of the proposed mitigation at the MCMS. The complete Water Budget Report is included as Appendix F.

### **Soils**

The MCMS is located in the Western Shore Lowlands Physiographic Province of Maryland, which is a part of the Atlantic Coastal Plain Physiographic Province, a region that lies entirely east of the fall line. The Atlantic Coastal Plain Province is underlain by a wedge of unconsolidated sediments including gravel, sand, silt, and clay, which overlaps the rocks of the eastern Piedmont along an irregular line of contact known as the Fall Zone. Eastward, this wedge of sediments thickens to more than 8,000 feet at the Atlantic coastline.

The sediments of the Coastal Plain dip eastward at a low angle, generally less than one degree, and range in age from Triassic to Quaternary. The younger formations crop out successively to the southeast across Southern Maryland and the Eastern Shore. A thin layer of Quaternary gravel and sand covers the older formations throughout much of the area. The MCMS is underlain by unconsolidated alluvial deposits, then by the Pamunkey Group which includes the Nanjemoy Formation, the Marlboro Clay, and the Aquia Formation (Glaser, 1971).

A review of the mapped soil series from the USDA Natural Resource Conservation Service (NRCS) – Web Soil Survey indicated a total of six soil types were mapped at the Morgan Property with only two mapped at the MCMS. The NRCS Soil Map is included as Figure 7 and the mapped soils at the MCMS are described below:

**Is—Issue silt loam:** occasionally flooded. These soils are occasionally flooded and are commonly found in flood plains or drainage ways. They are comprised of an upper layer of silt loam, with lower layers of loam, fine sandy loam and silt loam. They are somewhat poorly draining soils with a depth to water table of about 10 to 20 inches.

**Pu—Potobac-Issue complex:** frequently flooded. These soils are commonly found in flood plains. They are comprised of an upper layer of loam, with lower layers of loam, sandy loam and very gravelly coarse sand. These soils are poorly drained with a depth to water table of 0 to 10 inches.

In November of 2015 and April of 2016, GV completed a soil investigation at the MCMS that included the advancement of nine (9) soil borings and the installation shallow groundwater wells (MW-1 through MW-9). Soil boring and monitoring well construction logs are included as Appendix G and monitoring well locations are depicted in Figure 8.

In August 2016, GV and Princeton Hydro completed additional geotechnical investigations of the MCMS. The geotechnical investigation included the excavation of eleven (11) test pits, the advancement of two (2) additional soil borings, infiltration testing, the collection of soil samples and the completion of laboratory testing including grain size and specific gravity analyses. A Geotechnical Investigation Report including test pit and soil boring logs, geotechnical analytical result, and a sample location map are included as an attachment to the Water Budget Report provided as Appendix F. This data was used to inform the final design and develop the water budget models for the proposed restoration.

### **Plant Communities**

The re-establishment, rehabilitation, and creation activities proposed on the MCMS are chiefly comprised of existing pasture fields in the northern restoration area and agricultural fields in the southern restoration area, with degraded and functionally impaired hedgerows/ditches that divide these fields. The northern creation and restoration areas are comprised of a combination of native vegetation and grasses typical of pastures. The southern restoration area consists of planted fields of sorghum and hay, that are divided by hedgerows/ditch lines and surrounded by floodplain forests along Old Womans Run to be preserved.



The MCMS falls within the USDA plant hardiness zone 7b, meaning plants in this region are tolerant of temperature lows of 5 to 10°F. Additionally, the growing season for this part of Maryland typically starts in April and ends in October.

The most natural community on the MCMS (least disturbed by anthropogenic manipulation) is the floodplain forest of Old Womans Run and Mattawoman Creek which surrounds the northern and southern restoration areas. The ecological quality of this forest varies in quality, composition and structure, generally improving the more distal from the active agricultural and roadway edges. The greatest contiguous areas of forested wetlands and uplands surround the Morgan property to the northeast and east. This site sits within a priority restoration or Tier II Watershed as designated by MDE. The proposed restoration, enhancement and creation areas will be integrated into the surrounding wetland and upland forest thus reducing edge and increasing restored forest interior. The native community composition and healthy structure in the forest surrounding the site indicates a high probability of successfully restoring targeted areas of the MCMS including promoting native recruitment. The interior area of the forested wetlands identified for preservation exhibit very healthy structure and rich community composition typical of this part of the Coastal Plain.

Small areas of invasive vegetation (listed in Table 2 below) are primarily limited to hedge rows proximate to proposed restoration/creation areas. Existing row crop agricultural fields were planted with sorghum this year. Existing pastures onsite are comprised of a mix of typical grass species including but not limited to orchard grass (*Dactylis glomerata*), timothy (*Phleum pratense*), and brome (*Bromus sp.*) species. The following is a list of plant species that have been observed within the existing communities on the MCMS:

**Table 2: List of Various Plant Species at MCMS**

***Native Species***

Common Name	Scientific Name	Common Name	Scientific Name
River Birch	<i>Betula nigra</i>	Curly Dock	<i>Rumex crispus</i>
American Sycamore	<i>Platanus occidentalis</i>	Green Briar	<i>Smilax rotundifolia</i>
Tulip Poplar	<i>Liriodendron tulipifera</i>	Highbush Blueberry	<i>Vaccinium corymbosum</i>
Sweet Gum	<i>Liquidambar styraciflua</i>	Soft Rush	<i>Juncus effusus</i>
Pin Oak	<i>Quercus palustris</i>	Riverbank Wildrye	<i>Elymus riparius</i>
American Beech	<i>Fagus grandifolia</i>	Spotted touch-me-not	<i>Impatiens capensis</i>
Red Maple	<i>Acer rubrum</i>	Spice Bush	<i>Lindera benzoin</i>
American Holly	<i>Ilex opaca</i>	Trout Lily	<i>Erythronium rostratum</i>
Poison Ivy	<i>Toxicodendron radicans</i>	Tussock Sedge	<i>Carex stricta</i>
Sensitive Fern	<i>Onoclea sensibilis</i>	Deertongue	<i>Dichanthelium clandestinum</i>
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	Broom Sedge	<i>Andropogon virginicus</i>
Jack in the pulpit	<i>Arisaema triphyllum</i>	Pawpaw	<i>Asimina Adans</i>

***Invasive Species***

Common Name	Scientific Name	Common Name	Scientific Name
Japanese Stilt Grass	<i>Microstegium vimineum</i>	Garlic Mustard	<i>Alliaria petiolata</i>
Japanese Barbery	<i>Berberis thunbergii</i>	Tree of Heaven	<i>Ailanthus altissima</i>
Japanese Honeysuckle	<i>Lonicera japonica</i>	Mile-a-minute	<i>Polygonum perfoliatum</i>
Multi Flora Rose	<i>Rosa multiflora</i>	Asian Bittersweet	<i>Celastrus orbiculatus</i>
Field Garlic	<i>Allium vineale</i>		



**Wildlife and Threatened & Endangered Species**

Observations of wildlife on the MCMS outside the floodplain forest have been limited to white tailed deer, bald eagle, Eastern Box Turtle, Eastern Wild Turkey, spring peeper, leopard frog, cricket frog, wood frog, green frog, pickerel frog, several species of butterfly including red spotted purple, monarch, zebra swallow tail, tiger swallow tail and spice bush swallow tail, and several common species of perching birds or passerines. The floodplain forest of Old Womans Run provides habitat for a wider array of neo-tropical migratory birds, resident passerines and forest interior dwelling raptors, microtines, small mammals, white tailed deer and a host of reptiles and amphibians.

The MD DNR-Wildlife and Heritage Service was contacted in the Fall of 2015 requesting an environmental review from the MD DNR Natural Heritage Program Information Services. MD DNR responded via an October 13, 2015 letter (Appendix H) stating that project site falls within the drainage of Old Womans Run, which in turn, flows into the Mattawoman Creek watershed. The Mattawoman Creek watershed harbors an area designated a Habitat Protection Area under Maryland’s Critical Area Law, because it supports populations of rare, threatened or endangered (RT&E) species. The DNR database indicated that the following RT&E species were documented as occurring in Old Womans Run, within close proximity of the project site:

**Table 3: List of Rare, Threatened, or Endangered Species at MCMS**

Scientific Name	Common Name	State Status
<i>Helocordulia sehsyii</i>	Selys’ Sunfly	Threatened
<i>Cordulegaster obliqua</i>	Arrowhead Spiketail	Rare
<i>Cordulegaster bilineata</i>	Brown Spiketail	Watchlist
<i>Tachopteryx thoreyi</i>	Gray Petaltail	Watchlist (globally rare)

The US Fish & Wildlife Service (USFWS) was contacted on August 31, 2016 to request an environmental review of the site. The USFWS official species list indicated that there are no occurrence records for critical habitats, threatened or endangered species on or within the vicinity of the MCMS (Appendix H). Additionally, no USFWS National Refuges are located within the vicinity of the MCMS.

On September 29, 2016, a representative wildlife biologist from Federal Aviation Administration (FAA)/United State Department of Agriculture (USDA)-Animal and Plant Health Inspection Service (APHIS) conducted an inspection of the MCMS with GV personnel. During the site visit and in a formal letter (Appendix H), representatives of APHIS concluded that the proposed MCMS would not pose a significant additional wildlife hazard to flying operations or safety at the nearby Maryland Airport.

**Archeological & Historic Resources**

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires that all Federal agencies take into account the effects of their undertakings on historic properties, and afford their office a reasonable opportunity to comment. Compliance with the federal statute is achieved in consultation with and approval of the proposed actions by the Maryland Historic Trust (MHT) which is the State’s Historic Preservation Office (SHPO).

JBA has conducted investigations to identify potential and known historic properties located in the project's area of potential effect. A portion of the National Register listed property known as McPherson’s Purchase is located in the project area. The property is listed in the NRHP for its association with 19<sup>th</sup> century agriculture and its collection of historic buildings, structures, and landscape features. In addition, a prehistoric (Archaicperiod) archeological site (18CH64) is also located within the central portion of the Morgan property—outside the western boundary of the southern restoration area and slightly overlapping with the southeastern portion of the northern restoration area. Both of the proposed restoration areas are proximate to archeological site 18CH64 are enhancement/restoration areas and will involve no grading or excavation and will ultimately

preserve potential archaeological deposits through the establishment of forested and scrub-shrub vegetative cover and permanent conservation of the enhanced wetland.

Since no grading or excavation is being proposed in these areas, the Maryland Historic Trust determined that the proposed mitigation work will have “NO ADVERSE EFFECT” on historic properties. This was formalized in a November 6, 2016 letter from the Maryland Clearinghouse, summarizing MHT’s review of the MCMS project (Appendix H).

## **G. Determination of Credits**

As per provisions proposed within the JBA-DoD UMBI, credits for the Mattawoman Creek site will be determined by calculating the area (acres) of each mitigation type against its mitigation ratio. Stream mitigation will be determined in the same manner except length in linear feet will be the unit of measure calculated against specific mitigation ratios.

GreenVest conducted an Evaluation of Planned Wetlands (EPW) (Bartoldus, 1994), Functions and Values Assessment in an effort to quantitatively document our justification for certain mitigation type (Wetland Restoration & Enhancement) ratios proposed herein. EPW was developed by Environmental Concern, Inc. and initially used to evaluate Maryland wetlands. This evaluation focused on four proposed wetland mitigation types establishment, reestablishment, rehabilitation and wetland enhancement (H&H). The EPW evaluation indirectly evaluated the existing condition of reference wetlands referred (commensurate with proposed wetland preservation areas) to as WAA’s in the report which support their existing function and value. Note that EPW is not used to evaluate functions or values (existing or proposed) in upland systems. GreenVest has used EPW to document and justify proposed ecological uplift and requested credit ratios in other USACE Districts including New York, Philadelphia and Wilmington. The mitigation ratios proposed for the all of the proposed mitigation types were either taken from the most recent IRT Guidance Document governing Non-Tidal Wetland Mitigation or were supported by this functional assessment or other assessments made in connection with the preparation of the mitigation bank prospectus. Results of the EPW evaluation fully supported the proposed wetland establishment, reestablishment, rehabilitation and wetland enhancement (H&H) ratios proposed herein. Refer to the EPW report in Appendix E for details.

GreenVest commissioned Princeton Hydro (pH) to conduct a stream functional assessment. This stream functional assessment was performed using the Function-Based Rapid Stream Assessment Methodology created by the U.S. Fish and Wildlife Service-Chesapeake Bay Field Office (Starr et al., 2015). This methodology is designed to quickly develop an understanding of existing and proposed stream conditions at a site with a planned restoration. It includes a watershed assessment, and an assessment of stream functions for existing conditions and a proposed restoration design. Results of the stream assessment fully support the proposed ratios for stream restoration per this site-specific mitigation plan.

The 80.95 acres of land used to establish this primary bank site would be categorized as restoration (re-establishment), creation (establishment), restoration (rehabilitation), enhancement, upland restoration, and preservation pursuant to 33 CFR 332. The Sponsor proposes a 1:1 ratio of wetlands *established* and *reestablished* to credits allotted; .1.5:1 ratio of (farmed) wetland acres *re-habilitated* to credits allotted; 10:1 ratio of wetland acres *enhanced (H&H)* to credits allotted; 10:1 ratio of wetland acres *preserved* to credits allotted; a 20:1 ratio for non-tidal wetland buffer acres preserved to credits allotted; and a 15:1 ratio of wetland buffer and upland acres *restored* to credits allotted. In this case there is only one type of stream restoration proposed at a 2:1 mitigation ratio where 1 stream credit is allotted for every two linear feet of restoration proposed. Refer to the mitigation work plan (Section H) for a detailed description of the proposed stream restoration components.

All of the proposed credit ratios are supported by the projected ecological uplift underwritten by the proposed design, the functional stream and wetland assessments respectively.



Proposed utilization of credits will be submitted to the IRT and the relevant permitting agencies (MDE and USACE) in conjunction with specific permit actions and applications. Allocation of credits to specific permit actions will be determined on a case-by-case. Final approval from the permitting agencies, Corps and MDE, will be required regarding use and withdrawal of mitigation credit from the UMBI. The Bank Sponsor (GreenVest) will maintain a ledger of all credits and debits to and from the bank and this specific site. The Bank Sponsor will submit an accounting statement to the IRT each time credits are debited or additional credits are approved for release, and will maintain a credit ledger depicting all credits to and debits from the bank. The MCMS Credit Ledger is included as Appendix I. Reporting requirements, as outlined in the approved UMBI, will be followed for all interim debits as well as annual summaries.

Upon submittal of all appropriate documentation by the Operator and subsequent approval by the IRT, the Sponsor proposes that credits would become available for use by JBA or potentially for sale/transfer to approved permittees/buyers (other DoD facilities within the MCMS service area) in accordance with the proposed credit totals presented in *Table 4*.

**Table 4.1: MCMS Proposed Wetland Credit Generation**

Mitigation Category	Ratio	Acres	Credits
Wetland Creation	1:1	9.40	<b>9.400</b>
Wetland Restoration (Re-establishment)	1:1	12.10	<b>12.100</b>
Wetland Restoration (Rehabilitation)	1.5:1	24.71	<b>16.473</b>
Wetland Enhancement (H&H)	10:1	0.51	<b>0.051</b>
Nontidal Wetland Buffer - Enhancement	15:1	4.45	<b>0.297</b>
Nontidal Wetland Buffer - Preservation	20:1	5.66	<b>0.283</b>
Upland Restoration	15:1	4.41	<b>0.294</b>
Wetland Preservation	10:1	14.32	<b>1.432</b>
**5% Additional Credit for Cons. Group Easement	NA	NA	<b>2.017</b>
<b>Total</b>		75.56	<b>42.347</b>

**Table 4.2: MCMS Proposed Stream Credit Generation**

Mitigation Category	Ratio	Linear Ft.	Credits
Stream Restoration	2:1	3,798.00*	1,899.000
**5% Additional Credit for Cons. Group Easement	NA	NA	90.203
<b>Total</b>		3,798.00	<b>1,989.203</b>

*\*Note that an additional 1,230 lf of stream along the main stem of Old Womans Run will be preserved as part of the wetland preservation acreage. The Sponsor reserves the right to restore this acreage in the future in an effort to generate additional stream credit.*

## H. Mitigation Work Plan

The proposed creation/restoration and enhancement elements consist of establishing (9.40 ac), re-establishing (12.10 ac), rehabilitating (24.71 ac), hydraulically and hydrologically (H&H) enhancing (0.51 ac) headwater wetlands as well as restoring upland (4.41 ac) and buffer area (4.45 ac). This 55.58 acres is adjacent to, and will be fully integrated with, the 14.32 acres of existing, high quality, forest (Preservation areas) and 5.66 acres of existing wetland buffer (preservation)—thus providing an expansion of contiguous high quality, forested, wetland and upland habitat. The proposed project will also restore 3,798 lf of Old Womans Run and associated stream buffer (5.39 acres). The wetland creation/restoration will be accomplished by modifying existing

topography lowering grades to connect with seasonal high groundwater and to manage both vertical and horizontal surface and groundwater movement, strategically plugging existing ditches, reconnecting Old Woman Run with its historic floodplain (Area B), increasing the local groundwater table surrounding Old Woman Run by placing instream structure (Area B), increasing surficial soil porosity (primarily Area A) and utilizing existing sources of ground and surface water.

The following text provides additional detail for the proposed stream restoration including Old Woman Run and the unnamed tributary to Mattawoman Creek (UTMC). Additional detail beyond what is provided here may be found on the Mitigation Plans and in the Functional Stream Assessment (Appendix C). The existing geomorphic functionality in the reach of Old Woman Run proposed for restoration is limited due to incision, bed, and bank erosion. To reconnect the stream to its floodplain a series grade control structures will be installed in the stream over the 3,798-foot length. The grade control structures are to be set at various heights ranging from 12 to 18 inches in the stream to ensure that the flows in the stream are able to access the floodplain during more frequent events (i.e. the 5-year storm). The grade control structures to be installed are engineered rock riffle structures to be installed at key points in the stream to initiate aggradation of the stream bed. The engineered rock riffle structures will be constructed of cobble material intermixed with the native instream gravel to resist headcuts and future stream instabilities. The downstream face of the grade control structures will be set with a maximum slope of 10H:1V and the upstream face will have a maximum slope of 4H:1V.

In the stream, bank stability issues will be addressed using bioengineering techniques. These are designed using the in-stream shear stresses and velocities for the bank forming event. The anticipated stabilization measures will be employed incorporating large woody debris for additional habitat function. It is anticipated that areas of the stream that are under open canopy will have live stakes installed to establish dense vegetation increasing the roughness coefficient of the banks and dissipating in-stream energy. Additionally, sections of the streambank in half a dozen locations will be lowered to allow the stream access to the floodplain more readily.

Proposed restoration measures are listed below.

- Stockpiling and re-use of organic material, trunks for log sills, root wads and large woody debris to add habitat complexity.
- Site preparation, including installation of a stabilized construction entrances, establishment of dedicated staging areas, implementation of soil erosion and sediment control measures and limited clearing and grubbing.
- Excavation, soil decompaction, and grading to create and re-establish wetlands areas, grading/contouring to shape re-habilitation areas.
- Stream channel restoration including; selective bank paring to create access points between the stream and its historic floodplain; placement of in-channel grade control structures and large woody debris re-establishing an active connection between the stream and its historic floodplain; stream bank instability will be addressed at multiple locations using soil bioengineering techniques (soil lifts, branch packing and live stakes); large areas of riparian wetlands restored adjacent to the stream.
- Strategic plugging of onsite drainage ditches to restore/enhance wetland hydrology and partial plugging of the UTMC channel flanking the eastern edge of Area A.
- Implementing a native species planting/seeding plan and re-establishing targeted community composition, structure and diversity.
- Installing perimeter deer fence to prevent whitetail deer browse and facilitate plant community re-establishment.
- Implementation of a proactive and diligent invasive/exotic vegetation control and management plan.



- Implementation of a native species planting/seeding plan to re-establish targeted community composition, structure and diversity.
- Implementation of adaptive management maintenance and monitoring plans, assuring successful achievement of mitigation objectives.

### **Soils**

Hydric soil is the medium within which plants root, many chemical and physical transformations occur, and available nutrients are stored for uptake by plants in wetlands. Section F above describes the condition and subsurface composition of soils in the pre-construction condition. Both Restoration Areas A and B are underlain by a shallow confining layer generally located between 1.5 and 3.0 feet below ground surface, albeit more pronounced in Area A. A formal geotechnical investigation was implemented to confirm the surface elevations of the confining layer and define soil zonation and texture above this layer. Finish grades within creation areas were designed to intercept seasonal high groundwater based upon groundwater well information obtained onsite. Creation areas will also be graded in such a way as to retain surface water, both precipitation and overland flow, with a goal of increasing time of concentration. This strategy will also be applied to re-establishment areas inclusive of strategic ditch plugging. Creation, re-establishment and rehabilitation areas proximate to Old Woman Run (Area B) and the UTMC (Area A) will also benefit from floodplain reconnection (bankfull discharge) and a localized increase in the local groundwater table coupled with less sub-surface flashiness in storm related fluctuations. Finish grades within creation and re-habilitation areas were designed to retain surface water in a series of broad shallow depressions to manage lateral movement of shallow groundwater and increase residence time. These broad and shallow depressional features were designed to respect the hydroperiod of adjacent re-habilitation areas. Decompaction (spader or discing) over all establishment, re-establishment and rehabilitation areas will enhance surficial soil porosity, water holding capacity and thus promote hydric soil development or achievement of target hydrology. The result will maximize both surface and groundwater retention, control both vertical and horizontal loss, re-establish a connected floodplain and meaningful interaction between the restored wetland and stream elements and restore groundwater elevations proximate to restored stream channels.

The soils and topography will be modified from their current condition in order to implement the proposed mitigation project. The surficial soils within the footprint of the MCMS will be de-compacted, ameliorating impacts caused by decades of active pasture use, and will remain that way as a result of implementing this restoration project, in conjunction with a land use change where cattle will no longer occupy these areas. Proposed grading will result in more gently sloping topography and depressional features within the areas slated for wetland creation/restoration, where the toe of slope will be graded to retain surface and groundwater. This will be coupled with strategic ditch plugging and redirecting channelized surface flows. All graded areas will be permanently stabilized following the completion of construction.

Between 3 inches and 2+ feet of cut will be required in order in order to achieve design grades. Excavation and grading activities are projected to generate approximately 14,000 cubic yards of material, all of which will be placed in designated upland locations to be restored onsite or be used to plug ditches. All relocated material will be graded to a stable slope, not exceeding 6:1, and permanently stabilized with native vegetation.

### **Hydrology**

The establishment/re-establishment of wetlands on the site will be accomplished through directed grading, ditch plugging and stream restoration designed to maximize the retention of surface water, flood skimming, and groundwater inputs. In both Restoration Areas (A & B), hydrology will be supported through a combination of direct precipitation, surface water runoff, and increased soil porosity, and groundwater which is perched in the case of Restoration Area A re-habilitation areas. Stream overbank flooding, or flood skimming, will contribute to wetland hydrology in areas proximate to the main stem of Old Woman Run plus the UTMC; however, this specific parameter was not included in the water budget modeling effort as the aforementioned hydrologic sources were sufficient to support the stated wetland hydrology goals. Wetland

hydrology will be established/re-established by managing the lateral movement of ground and surface water within both mitigation areas that comprise the MCMS. Precipitation is the primary hydrologic driver for Area A including increasing soil porosity to encourage greater capacity in the existing perched groundwater table underlying areas slated for re-habilitation. Direct precipitation, overland runoff and groundwater inputs will drive Restoration Area B as augmented by bankfull discharges from Old Woman Run during and after storm events. Surface runoff and direct precipitation will be captured/retained by plugging ditches, redirecting channelized flow (via breaking ditches/spoil banks) and slowing/retaining surface flows by recontouring. Stream Restoration activities within Restoration Area B will raise the local groundwater elevation which was lowered by deep channel incision and floodplain disconnection along the entire restoration reach of Old Woman Run.

Generally, proposed grading will lower existing elevations within the creation areas while a lighter touch will be taken to shape grades within the re-establishment and rehabilitation areas to manage lateral/vertical groundwater movement and promote better connectivity with the seasonal groundwater table. Extensive grading will not be required within Rehabilitation areas as these areas contain adequate wetland hydrology in their current conditions. Proposed grading will also target existing swales/ditches and groundwater seeps by gently pulling the grades back to broaden these features. The combination of excavation/grading, strategic ditch plugging and/or breaking existing spoil banks (Old Woman Run), plus the surficial soil decompaction will capture and retain precipitation and surface runoff intercept or more frequently intercept groundwater increasing residence time and better managing both horizontal and vertical movement of water through the system. This simple but effective set of prescriptions will result in the establishment, re-establishment, rehabilitation and/or enhancement of wetland hydrology characterized by a seasonally saturated hydroperiod typical of headwater systems.

Princeton Hydro developed a wetland water budget for the MCMS. This water budget, which we have included as Appendix F, was developed to determine if sufficient water is available to establish/re-establish headwater wetland hydrology on the MCMS. The water budget was used to evaluate both existing and proposed conditions inclusive of all establishment, re-establishment, re-habilitation and enhancement areas. The water budget was also used to inform design development, including proposed grading and plant community composition. The standard of measurement for the water budget was the USACE/MDE definition of wetland hydrology as 14 days of flooding or ponding, or a water table at 12 inches (30 cm) or less below the soil surface, during the growing season at a minimum frequency of 5 years in 10 (50%). Proposed hydrology will be supported through a combination of direct precipitation, surface water runoff, increased soil porosity, groundwater and flood skimming/floodplain reconnection. The grading plans for MCMS were developed in parallel with the water budget.

The water budget concluded that proposed establishment, re-establishment and rehabilitation is feasible and will result in the achievement or maintenance of jurisdictional (target) hydrology across the site. This conclusion was reached for all model runs for wet, average and dry precipitation conditions. Therefore, the wetland mitigation elements as proposed are technically feasible and fully supported by the water budget. Please see Appendix F for a full copy of the water budget report including associated analysis and computations.

### **Proposed Plant Communities**

Our planting strategy is designed to initiate a restoration trajectory culminating in establishment of a species rich, diverse, native plant community with complex structure. This objective required carefully selecting plant species, by planting zone, including early successional species that favor the characteristics of targeted environs. The underlying objective of this restoration effort is to reestablish a forested, headwater wetland community with both riparian and palustrine components. As described above the grading plan was designed to retain water (ground and surface) and manage both the lateral and vertical movement of groundwater. The grading as proposed provides a unique opportunity to create habitat diversity and thus a great deal more ecological value.

This topography and associated gradient from seasonally semi-permanently saturated and riparian to palustrine sets the stage to create a diverse mosaic of habitats that, at maturity, will be under a forested canopy.

Planting is proposed on 10-foot centers for all trees, 8-foot centers for shrubs and 2-foot centers for all herbaceous plants (if included). The planted density at over 500 stems per acre will provide insurance for unexpected mortality and attainment of a minimum of 435 woody plants per acre of preferred species. The list of preferred species developed for this project were identified in both onsite and nearby offsite reference settings.

Tree, shrub and emergent species will be planted within specific planting zones based on tolerance to saturation and inundation. A planting plan/schedule is included as Sheet 14 of 14 of the MCMS Design Plans (Appendix J). In wetland settings, hydrology and topography are the primary factors affecting a plant's ability to establish and thrive following planting. In upland settings, topography, soil moisture/texture and sunlight exposure are the key factors affecting primary establishment and survival.

### **Construction Details & Sequencing**

**Site Preparation.** Prior to the commencement of construction, stabilized construction entrances will be installed and staging areas will be established both will be maintained as needed. Clearing and grubbing will commence upon completion of mobilization and staging. Approved soil erosion and sediment control measures will be installed and required prior to commencing any earthwork activities and will be maintained throughout the construction process (see Sheets 8 through 12 of 13 in Appendix J).

**Excavation & Grading.** Overall, the earthwork as proposed requires pulling key, existing grades back within creation areas to intercept shallow groundwater and lighter shaping of flat shelves and depressions to create undulations in establishment, re-establishment and rehabilitation areas. These measures will control the lateral movement of both surface and ground water. Additional earthwork measures will include installation of strategic ditch plugs and bank paring along the main stem of Old Womans Run. All excavated material will be placed in designated placement locations, stabilized and restored. Note that all areas subject to excavation and grading will be temporarily stabilized in accordance with the E&S measures shown on the design drawings or as otherwise approved by MDE.

As stated above, Stream Restoration activities include placing of instream structure to reverse channel incision/increase stability and the installation of floodplain benches, rock riffles, new stream/floodplain connections and stone bentway weirs to reconnect the floodplain and increase overland flow within adjoining wetland creation/restoration areas. Large woody debris will be placed in the stream to further stabilize and add habitat features. Bank stabilization will include installing soil lifts, branch packs and live stakes. These measures are illustrated in detail on the enclosed design drawings (Appendix J).

**Herbivory Controls.** Deer fence will be installed around the entire perimeter of all areas to receive plant material. All deer will be driven from the site during the installation process, near the completion of earthwork and prior to commencement of planting. These controls will be maintained throughout the life of the project until the plant material has established to the point where it can resist the deleterious effects of deer browse. Herbivory controls will be implemented in accordance with details shown on the design drawings (Appendix B).

**Planting & Seeding.** Following completion of excavation, grading and perimeter deer fence installation, the site will be planted and seeded. Refer to the attached Planting Plan and Schedule (see Sheet 14 of 14 in Appendix J) for details on the proposed planting/seeding composition, means and methods. The plans indicate the species selection, including quantities and conditions for each planting zone. The anticipated schedule calls for a dormant season (Fall) planting of containerized woody material and seeding to take place upon completion of earthwork. The balance of the plantings, including woody bare root material, will be installed during the earliest

possible spring planting window. The planting schedule is subject to change based on what time of year earthwork is completed.

Plants will be delivered to the site, inspected for overall health and condition, and, if accepted, staged onsite prior to planting. The plants will be watered immediately upon staging (if necessary) and as needed to maintain all specimens in a healthy vigorous condition until planted. All plant material will be obtained from either a local nursery or one that specializes in providing native species for restoration planting within the region. Given the proposed list and quantities of species, we will pre-order the plant material to ensure its availability for this project. We have already consulted with Aquaniche and the Maryland State Nursery and Environmental Concern Nursery, and supplied each with a proposed plant list and estimated timeline for planting. Planting crews will be installing plants by hand and broadcasting seed by hand or with a hand crank.

Bareroot individuals, and containerized material of woody species will be interspersed in natural patterns and planted at 10 feet on center. Containerized and bareroot individuals of the shrub species will be planted on 8 foot centers. Placement and installation of all plant material will occur under the direction of the project biologist, according to planting zone, with the objective of achieving natural densities and distributions of preferred species.

Holes excavated for trees and shrubs shall have a diameter at least 1.5 times the diameter of the container or burlap ball. In addition, 6 to 12 inches of soil at the surface around each hole shall be disced, or worked otherwise, prior to planting. The soil removed from the holes will be set aside and top soil will be used to refill the holes around the root balls. Fertilizer will not be broadcast spread on the site, but will be installed within each planting hole as prescribed by the manufacturer. In addition, Plant Health Care, Inc. mycorrhizal inoculum with Terrasorb (or approved equal) will be applied in each planting hole for all planted material (Appendix K). If containerized plants are used, the plants will be removed from their containers immediately prior to planting and roots gently freed.

At each location, a sufficient amount of topsoil shall be placed at the bottom of the hole to elevate the plant so that it is seated at the same depth above ground surface (ags) as it was in the container. The plant shall be gently lowered into the hole, situated upright, and watered. The sides of the hole will be filled in with the topsoil and lightly compacted to facilitate its settlement. The hole shall be intermittently watered during its filling. Soil remaining from planting shall be moved and placed outside of the restoration area to avoid altering the final grade of the area.

Bareroot individuals, and containerized material of tree species will be interspersed in natural patterns, planted at 10 feet on center. Containerized and bareroot individuals of the shrub species will be planted on 8 foot centers. Placement and installation of all plant material will occur under the direction of the project biologist, according to planting zone, with the objective of achieving natural densities and distributions of preferred species.

Prior to installing woody plant materials and immediately following completion of earthwork (which will occur in sections), specified seed mixes shall be broadcast as shown on the Planting and Seeding Schedule. The native seed mix will be broadcast first and a cover crop (*Lolium multiflorum* or approved equal) will be over seed as a temporary stabilization measure. The seed mixture will be broadcast throughout the areas specified on the plans and at the rates recommended by the supplier. The seeded area shall be gently, but thoroughly, watered as needed following initial application and until cover has established. The site will be irrigated, as needed, until the vegetation has adequately established to the point where it is no longer needed.

All work described above, shall take place under the direct supervision of the project biologist.

A holistic and integrated approach to design will be translated in the field under the direct supervision of GV and Princeton Hydro's (PH's) ecologists and engineers. Please note that building living systems requires a high degree of responsiveness to prevailing site conditions which will be accomplished by strategically applying the

principals of adaptive management focused by our team's years of experience in successfully designing and implementing similar projects.

### **Anticipated Construction Sequencing**

1. Stabilized construction entrance will be installed prior to the commencement of and maintained throughout the construction process. Equipment and materials staging areas will also be prepared prior to commencement of construction. Installation of all necessary sediment and erosion controls measures will take place prior to the commencement of earthwork activities.
2. Viable topsoil will be stripped within excavation area for re-use upon establishment of final grades.
3. Grading will likely commence in the southwestern areas and proceed in a north easterly direction to be determined (TBD) based upon prevailing field conditions. Track excavators and dozers will make the cuts and export the excess material to the fill placement areas via on-site truck transport. Stripped top soil will be regraded to achieve final elevations. Ditch plugs will be installed after achievement of final grades placement of stockpiled topsoil.
4. Stream restoration activities will likely be completed in phases corresponding with earthwork as it takes place within or proximate to that specific reach.
5. All areas subject to grading will be temporarily stabilized in accordance with the approved Erosion and Sediment Control plans, in sections as earthwork is completed.
6. Finish grades in all mitigation areas will be re-checked for before commencement of planting and seeding.
7. Surficial soil decompaction activities will be completed after achievement of final grades and prior to planting and seeding.
8. Perimeter deer fence will be installed concurrent with the completion of earthwork and will be completed prior to commencement of planting.
9. Woody debris, generated from on and offsite locations, such as root wads, branch packs, leaf pack and other woody debris will be added to select wetland areas upon completion of earthwork and after seed has been broadcast under the supervision of the project biologist.
10. Plant material will be installed once all grading/ soil decompaction is complete and the site has been fenced to prevent herbivory.

### **I. Maintenance Work Plan**

GreenVest, as the Sponsor, will maintain the MCMS from the completion of construction through closure. GV agrees to establish and maintain the mitigation site and ownership until the banking activity is terminated (bank closure) or a third party organization adopts the long-term site management/maintenance responsibilities. The Sponsor accepts full responsibility for any required maintenance activities that may be necessary related to achievement of performance standards.

The key to successful mitigation projects is diligent monitoring and swift implementation of maintenance measures as needed. Typical maintenance activities on mitigation sites like MCMS may include but are not limited to in-stream structure, fence repair, invasive species management, replanting/reseeding and erosion control. Fencing repair and invasive species management are by far the most frequent and required activities. During the first full year following the completion of construction it is not atypical for in-stream structure and/or soil bioengineering measures applied to stabilize stream banks to require minor adjustment or maintenance. All stabilized stream banks and in-stream structure will be monitored frequently during the first year following construction and following all major storm events. The deer exclusion fence will be monitored and maintained throughout the construction and monitoring periods, or until such time as woody vegetation has established to the point where its resistant to the deleterious effects of deer browse. If additional deer controls are needed, they will be developed and implemented in cooperation with appropriate wildlife control agencies including MD DNR.



The occurrence of non-native or invasive species on the MCMS is very low and we do not expect to have an invasive species problem post construction on this site. However, the Bank Operator will implement an invasive species eradication, control and proactive, management program on this site where control measures will be taken on an as needed basis. Any colonization or re-establishment of non-native or invasive species shall be the threshold for implementing specific control measures. An initial eradication consisting of aerial application of Rodeo was applied by an applicator licensed in the State of Maryland. The site will be inspected regularly following the completion of planting, with greatest emphasis on years 1 and 2. Long term, adaptive, management and control measures will vary based on the nature of any occurrence or re-occurrence and prevailing site conditions. These management measures may include, but are not necessarily limited to: mechanical removal/cutting, hand pulling, specific herbicide prescriptions suitable in aquatic environments either by mechanical means or by hand. The Sponsor will maintain this proactive adaptive management program throughout the life of the MCMS beginning with initial eradication efforts.

Any required long-term maintenance will be determined as per the Long-Term Management and Maintenance Plan (Section III. L).

**J. Performance Standards**

All nontidal wetland mitigation sites in Maryland are required to conform to the Performance Standards and Monitoring Protocol for Permittee Responsible Nontidal Wetland Mitigation Sites developed by the Interagency Review Team (IRT) hereafter referred to as the “IRT Standards”. The most recent version of the IRT Standards dated October 28, 2016 were provided by MDE and are included for reference as Appendix L. All performance standards and monitoring protocols detailed in the IRT Standards are applicable to the MCMS exclusive of the proposed rehabilitation areas unless otherwise determined by the IRT. We propose that the hydrology standards including groundwater monitoring do not apply within the existing, jurisdictional wetland areas slated for rehabilitation. These areas will be confirmed in an approved Jurisdictional Determination (JD) pending from the US Army Corps of Engineers, Baltimore District.

Although the IRT Standards are accepted for the MCMS, GreenVest recognizes that there are limitations in the application of a single set of performance standard to all monitoring sites. We firmly believe that each site possesses its own unique constraints and opportunities. We also believe that the spirit and intent of any maintenance and monitoring program, including its attendant performance standards, is to ensure that: 1) the site achieves its stated purpose, intent and design objectives, 2) in the case of wetlands either maintains or develops the qualifying characteristics of a jurisdictional wetland (in this case) pursuant to the 1987 Federal Manual and the Atlantic and Gulf Coastal Plain Regional Supplement, 3) in the case of streams are stable within the dynamic limits set on a project specific basis and 4) is self-maintaining. **As such, only the creation (establishment) and restoration (re-establishment) elements will be monitored for hydrology standard satisfaction as the restoration (re-habilitation) and enhancement (H&H) elements were assumed to meet jurisdictional criteria per the completed delineation.**

While we understand the reasoning behind this requirement and method of review, we expect that site performance is evaluated against the criteria in the IRT Standards considering overall site performance where pass/fail is not determined based upon one small or isolated area of the site but rather achievement of targeted ecological uplift and overall performance function and value of the completed stream and wetland mitigation project. Additionally, GreenVest requests that any data collected in addition to the requirements of the IRT Standards is considered when evaluating site performance.

## **K. Monitoring Requirements**

A physical maintenance and monitoring plan for the Mattawoman Creek Site will be developed and implemented for a minimum of seven years following the completion of construction. A set of performance standards and maintenance and monitoring protocols will be implemented pursuant to the latest IRT Standards (Appendix L) and other applicable permit standards/special conditions. The approved maintenance and monitoring plan will be implemented, following the completion of construction, for the entire maintenance and monitoring period by GV, through bank closure. A construction completeness report will be prepared upon completion of the proposed mitigation project and submitted to the IRT, USACE and MDE in accordance with specific permit conditions. Subsequent monitoring reports will be submitted to the IRT annually following completion of the first growing season. The first monitoring visit will examine the initial vegetative response of the plants to their new environment and, although potentially not part of the monitoring program, will begin upon completion of planting. Subsequent seasonal and semi-annual monitoring visits will then provide a regular schedule for data gathering, maintenance and repair of the mitigation site, as required. Any corrective actions will be swiftly documented and submitted to the IRT for review and approval prior to implementation.

Annual Reports (electronic via email and paper copies) will be submitted, on odd years, prior to the end of each calendar year (December 31), documenting plant community conditions within the restoration areas; hydrologic/soil data within the restoration areas and reference plots; and annual credit value debits and balances. The Annual Report will also include a proposed plan of action for the following year, including maintenance activities and proposed or needed adaptive management measures. Monitoring will measure key biological and physical characteristics of the completed mitigation project where annual reports will include:

### **▪ General Information**

- Title page including permit name, tracking number, mitigation site name, monitoring year and preparer identification and contact information.
- Description of the location of the mitigation site including a description of the site perimeter (see below) and GIS coordinates (Lat/Long).
- Dates of inspections conducted.
- Description of the purpose of the mitigation, including total acreage used to create the mitigation as authorized under the approved Phase II proposal and plan.
- Dates that construction commenced and planting was completed.
- Brief description of the mitigation projects landscape position, adjacent water bodies and land uses.
- Statement regarding how the mitigation site is meeting or not meeting the mandated performance standards. This narrative will include a description of existing site conditions and how the mitigation site is generally performing.
- Dates and nature of any corrective actions taken plus recommendations for any corrective actions that need to be taken during the following growing season.
- Document any differences in narrative and/or plan form between the current conditions and the approved design drawings.
- List out all relevant performance standards and address how the site is meeting each or trending toward meeting each.
- Conclusion generally summarizing the condition of the mitigation site as it relates to meeting performance standards, trending toward meeting performance standards and any required corrective actions. If corrective actions are required a description of the requirement and a schedule for implementation should be included.

- **As-built Survey / Monitoring Plan, Construction Completion Report and Year 7 Close Out Monitoring Report.**
  - Plan view of entire project including topography at 1-foot contour intervals.
  - Location of Permanent Photograph, Monitoring/Sampling Stations, ditch plugs and/or other structures.
  
- **Photograph Documentation**
  - Permanent photograph stations will be established, surveyed, and located on the as-built survey.
  - Sedimentation patterns to indicate the presence of surface flow including drift lines, organic matter deposition, and effect on nearby vegetation will be documented. Standing water elevations will be documented in all confined depressions.
  - Success of scrub-shrub and forest vegetation and relative cover including native recruitment.
  - Wildlife habitat structure and usage.
  
- **Soils Documentation**
  - Soil profile descriptions to a depth of 18 inches in representative locations throughout the Mitigation Site. These will be compared to the pre-construction condition.
  - Document maintenance of or establishment/re-establishment of hydric soils including evidence of reduction within monitoring plots through soil borings including redoxymorphic features within each profile.
  - Location of all soil borings and profiles on the as-built survey/monitoring plan.
  
- **Vegetation Documentation**
  - Documentation that the Site has achieved 85% survival and/or 85% aerial cover of the mitigation plantings or target hydrophytes both planted and recruited.
  - Documentation of less than 10% cover of invasive/exotic species within all creation/restoration areas.
  - Documentation that all preferred plant species are healthy and thriving.
  - Documentation that the trees in all plant communities containing trees are a minimum of 5 feet at the completion of the monitoring period.
  
- **Hydrology Documentation**
  - Documentation demonstrating that the targeted hydrology/hydraulics have been successfully re-established in all wetland and stream areas.
  - Hydrology will be monitored via:
    - Observations and photos of surface flow, inundation, and saturation made during scheduled field visits and noted in the monitoring reports.
    - Ground water and surface water data will continue to be collected from permanent wells installed within the creation/restoration areas.

## **L. Long-Term Management and Maintenance Plan**

The purpose of the long-term management plan is to ensure that the Mattawoman Creek Mitigation Site is monitored and managed after the all credits have been sold, the bank has been closed and/or it has been transferred to the long-term steward. This management plan establishes objectives, priorities and tasks to monitor, manage, maintain and report on the wetlands and waters of the U.S plus other covered habitats on the Bank Site after all Performance Standards established for the Bank Site have been achieved. The long-term management plan will be an instrument implemented in accordance with the UMBI tied to the real estate





protection instrument (conservation easement or declaration of restrictions) covering the mitigation site property.

The real estate protection instrument details the roles and responsibilities of the long-term steward. GTA, the bank sponsor, will be responsible as the beneficiary of the easement to make certain all terms and conditions of the easement are complied with. An endowment for long term will be segregated and utilized to fund the costs associated with the long-term stewardship obligations. This will be accomplished by separate agreement.

The Long-Term Steward for the MCMS will be GTA, the bank sponsor and the eligible entity under the Cooperative Agreement with the United States Air Force and Joint Base Andrews. The Long-Term Steward, and subsequent Long-Term Stewards upon transfer, shall implement the approved long-term management plan, managing and monitoring the bank property to preserve its conservation values in accordance with the UMBI, site protection mechanism, and the long-term management plan. Long-term management tasks shall be funded through an endowment provided to the Long-Term Steward by the Bank Sponsor. The Long-Term Steward will maintain a copy of the UMBI, the Site-Specific Mitigation Plan for the MCMS (UMBI Addendum 1), and all addendums associated with the MCMS including all deed restrictions and easements. The Long-Term Steward shall be responsible for providing a letter report every two years to the IRT detailing management tasks and total amount expended over the course of the preceding year. Any subsequent grading, or alteration of the site's hydrology and/or topography by the Long-Term Steward or its representatives must be approved by the IRT and the necessary permits, such as a Section 404 permit and/or Maryland Nontidal Wetlands Permit, must be obtained if required.

The Bank Sponsor, easement holder, or Long-Term Steward shall provide the Corps and MDE with 60 day advance notice before any action is proposed to be taken to modify the site protection instrument, management plan, or long-term protection mechanism, including the transfer of title to or establishment of any other legal claims over, the Bank Site. The site protection instrument may not be altered, modified, amended, vacated, or terminated in whole or in part in any way without the express written approval of the Corps and MDE, in coordination with the IRT.

Pursuant to recent discussions with MDE and USACE, attempting to determine a restoration site's long-term maintenance requirements prior to commencing construction, or even shortly after construction, is an effort in gross speculation. This Bank Site will be monitored for a period of 7 years following the completion of construction. During that time, the site's overall development and its trajectory toward achieving self-maintenance will be closely monitored and evaluated. Assuming the site is meeting, or has met, its performance standards in year 5, one can assume that it will also meet those same standards in year 7. This would be evidenced by securing release letters from both USACE and MDE. Therefore, long-term maintenance requirements could be more accurately determined at some time during or after monitoring year 5. Both the MDE and USACE will have review and approval authority over these issues where approving the long-term management plan and its associated endowment is a prerequisite to securing final regulatory release.

Furthermore, it is unlikely that the restoration efforts on this Bank Site will require any long-term maintenance if the features constructed exhibit permanent stability and self-maintenance over the life of the 7-year maintenance and monitoring period. Woody plant material should be well established and thriving assuming that the maintenance and monitoring period has closed and the project has met those applicable performance standards. All in stream structure and in and near stream vegetation will also be stable. Thus, long-term stewardship will likely be comprised of conducting annual or biennial site visits by the Long-Term Steward to



evaluate existing conditions and the need for any active maintenance. The most likely maintenance or stewardship activity may include spot treatments for any recurrence of invasive/exotic species of vegetation.

### **M. Adaptive Management Plan**

An adaptive management plan will be employed whereby minor modifications to the design plans may be required during the construction process to address unforeseen or prevailing site conditions. Any adaptive management measures will be implemented under the direction of the project biologist and/or engineer. Adaptive management principles will also be applied to the maintenance and management of the site, post-construction and throughout the monitoring period. The project biologist/engineer will develop all aspects of the post-construction adaptive management plan, including any modifications from the approved mitigation plans. GV will advise IRT in writing of any material changes to the approved mitigation plan and provide adequate justification. Any such changes will be shown on the as-built construction drawings and documented in the Construction Completion Report (CCR).

Adaptive management will also be employed during the maintenance and monitoring period as well. Any site issues beyond normal maintenance found through the implementation of the Long-term Management Plan will be noted and brought to the attention of the IRT for consultation and determination of any remedial action, if deemed necessary. Any corrective actions implemented during the growing season will be formally documented in the corresponding annual monitoring report.

### **N. Financial Assurances**

Given that the Sponsor is developing this bank on behalf of Joint Base Andrews and the Department of Defense, government agencies, it is our understanding that financial assurances will not be required. However, if necessary, GreenVest will provide financial assurances for the construction as well as maintenance and monitoring of the MCMS. The amount and type of the financial assurances posted, if any, will be based on final MDE/USACE direction/approval. The financial assurances, if required, will be posted prior to commencement and following completion of construction respectively and maintained until all performance standards and related permit requirements have been fully satisfied and approved by the MDE/USACE pursuant to the approved MBI.



## O. Credit Release Schedule

### Credit Release Milestones & Schedule – Wetlands

Mitigation Category	Ratio	Acres	Credits	Initial Credit Release*	Completion of Construction	Yr 1	Yr 2	Yr 3***	Yr 4***	Yr 5***	Yr 7	Total
<b>Release Schedule</b>		<b>Total</b>		<b>15%</b>	<b>25%</b>	<b>20%</b>	<b>10%</b>	<b>10%</b>	<b>10%</b>	<b>5%</b>	<b>5%</b>	<b>100%</b>
Wetland Creation	1:1	9.40	<b>9.400</b>	1.41	2.35	1.880	0.94	0.94	0.94	0.470	0.470	<b>9.400</b>
Wetland Restoration (Re-establishment)	1:1	12.10	<b>12.100</b>	1.815	3.025	2.420	1.21	1.210	1.210	0.605	0.605	<b>12.100</b>
Wetland Restoration (Rehabilitation)	1.5:1	24.71	<b>16.473</b>	2.471	4.118	3.295	1.647	1.647	1.647	0.824	0.824	<b>16.473</b>
Wetland Enhancement (H&H)	10:1	0.51	<b>0.051</b>	0.008	0.013	0.010	0.005	0.005	0.005	0.003	0.003	<b>0.051</b>
Nontidal Wetland Buffer - Enhancement	15:1	4.45	<b>0.297</b>	0.045	0.074	0.059	0.030	0.030	0.030	0.015	0.015	<b>0.297</b>
Nontidal Wetland Buffer - Preservation	20:1	5.66	<b>0.283</b>	0.042	0.071	0.057	0.028	0.028	0.028	0.014	0.014	<b>0.283</b>
Upland Restoration	15:1	4.41	<b>0.294</b>	0.044	0.074	0.059	0.029	0.029	0.029	0.015	0.015	<b>0.294</b>
Wetland Preservation	10:1	14.32	<b>1.432</b>	1.432	0	0	0	0	0	0	0	<b>1.432</b>
**5% Additional Credit for Cons. Group Easement	NA	NA	<b>2.017</b>	0.302	0.504	0.403	0.202	0.202	0.202	0.101	0.101	<b>2.017</b>
<b>Total</b>		<b>75.56</b>	<b>42.347</b>	<b>7.569</b>	<b>10.229</b>	<b>8.183</b>	<b>4.091</b>	<b>4.091</b>	<b>4.091</b>	<b>2.046</b>	<b>2.046</b>	<b>42.347</b>
Cumulative Credits Released				7.569	17.798	25.981	30.072	34.164	38.255	40.301	42.347	<b>42.347</b>

\*The initial credit release includes 100% of the bank credits generated from preservation and 10% of the bank credits for other mitigation categories. Subsequent credit releases are a percentage of the total bank credits less the preservation credits.

\*\* Per MDE Comment 14 on the Draft Prospectus.

\*\*\*All remaining credits are proposed for release upon meeting all applicable performance standards for two consecutive monitoring years.

**Initial Credit Release:** 15% of the total anticipated wetland credits upon MBI execution by the Bank Sponsor, the Corps, MDE, and other IRT agencies who choose to execute the MBI; approval of the final mitigation plan; implementation of the financial assurances; recordation of the approved restrictive covenant or other approved site protection mechanism; and approval of the long-term management plan.

**Completion of Construction:** 25% of the total anticipated credits upon successful completion of all required physical and biological wetland and stream mitigation work in accordance with the MBI and approved mitigation plan. Successful completion of all proposed wetland work shall be documented in the as-built survey and Construction Completion Report A site visit may be performed by the IRT to confirm the status of the Bank and written approval will be provided by the Corps and MDE.

**End of Year 1:** 20% of the total as-built wetland credits upon attainment of the performance standards in year one. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.

**End of Year 2:** 20% of the total as-built wetland credits upon attainment of the performance standards in year two. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.

**End of Year 3:** 20% of the total as-built wetland credits upon attainment of the performance standards in year three. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.



End of Year 4: 20% of the total as-built wetland credits upon attainment of the performance standards in year four. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.

End of Year 5: 5% of the total as-built wetland credits upon attainment of the performance standards in year five. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.

End of Year 7: 5% of the total as-built wetland credits upon attainment of the performance standards in year seven. Prepare and submit required annual monitoring reports including any corrective actions implemented during the previous year.

Monitoring may be terminated or the extent of monitoring may be reduced over part or the entire site at the petitioning of the bank sponsor and at the discretion of the IRT based on overall site performance. Conversely, the IRT may extend the original monitoring period upon a determination that performance standards have not been met or the bank is not on track to meet them.

### Credit Release Milestones & Schedule - Streams

Mitigation Category	Ratio	Linear Feet	Credits	Initial Credit Release*	Completion of Construction	Yr 1	Yr 2	Yr 3***	Yr 4***	Yr 5	Total
<b>Release Schedule</b>		<b>Total</b>		<b>15%</b>	<b>25%</b>	<b>20%</b>	<b>10%</b>	<b>15%</b>	<b>10%</b>	<b>5%</b>	<b>100%</b>
Stream Restoration	2:1	3,798.00	<b>1899.000</b>	284.850	474.750	379.800	189.900	284.850	189.900	94.950	<b>1899.000</b>
**5% Additional Credit for Cons. Group Easement	NA	NA	<b>94.950</b>	9.495	28.485	18.990	9.495	9.495	9.495	4.748	<b>90.203</b>
<b>Total</b>		<b>3,798.00</b>	<b>1993.950</b>	<b>294.345</b>	<b>503.235</b>	<b>398.79</b>	<b>199.395</b>	<b>294.345</b>	<b>199.395</b>	<b>99.6975</b>	<b>1989.203</b>
Cumulative Credits Released				294.345	797.580	1196.370	1395.765	1690.110	1889.505	1989.203	1989.203

\*The initial credit release includes 100% of the bank credits generated from preservation and 10% of the bank credits for other mitigation categories. Subsequent credit releases are a percentage of the total bank credits less the preservation credits.

\*\* Per MDE Comment 14 on the Draft Prospectus.

\*\*\*All remaining credits are proposed for release upon meeting all applicable performance standards for two consecutive monitoring years.

Initial Credit Release: 15% of the total anticipated stream credits upon MBI execution by the Bank Sponsor, the Corps, MDE, and other IRT agencies who choose to execute the MBI; approval of the final mitigation plan; implementation of the financial assurances; recordation of the approved restrictive covenant or other approved site protection mechanism; and approval of the long-term management plan.

Completion of Construction: 25% of the total anticipated credits upon successful completion of all required physical and biological stream mitigation work in accordance with the MBI and approved mitigation plan. Successful completion of all proposed wetland and stream work shall be documented in the as-built survey and Construction Completion Report A site visit may be performed by the IRT to confirm the status of the Bank and written approval will be provided by the Corps and MDE.

End of Year 1: 20% of the total as-built stream credits upon attainment of the performance standards in year one. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.

End of Year 2: 20% of the total as-built stream credits upon attainment of the performance standards in year two. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.

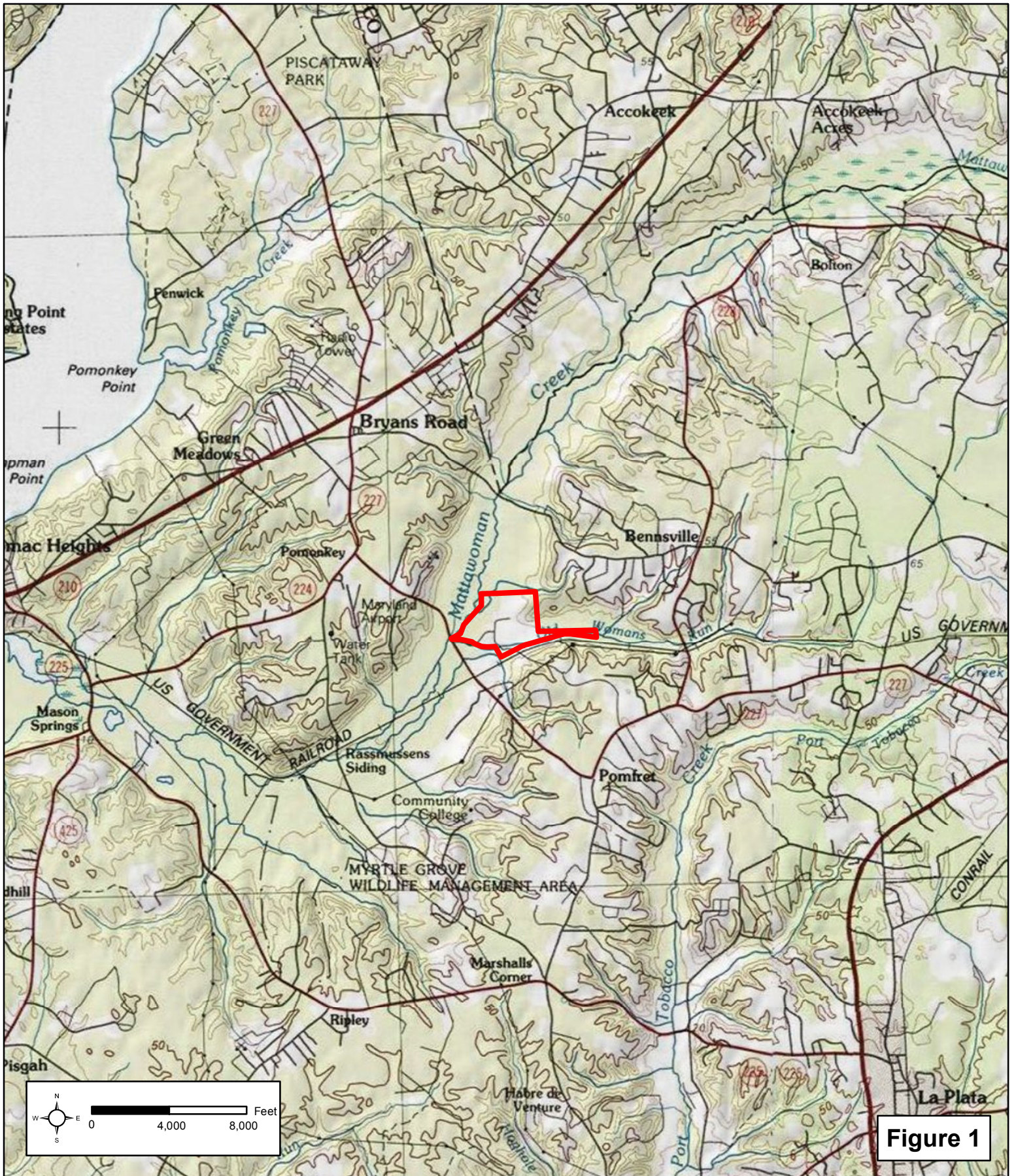


End of Year 3: 20% of the total as-built stream credits upon attainment of the performance standards in year three. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.

End of Year 4: 20% of the total as-built stream credits upon attainment of the performance standards in year four. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.

End of Year 5 (End of Stream Maintenance and Monitoring Period): 5% of the total as-built stream credits upon attainment of the performance standards in year five. Prepare and submit required annual monitoring reports including any corrective actions implemented and/or planned for the following year.

Monitoring may be terminated or the extent of monitoring may be reduced over part or the entire site at the petitioning of the bank sponsor and at the discretion of the IRT based on overall site performance. Conversely, the IRT may extend the original monitoring period upon a determination that performance standards have not been met or the bank is not on track to meet them.



**Figure 1**

 Morgan Property Boundary

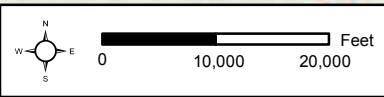
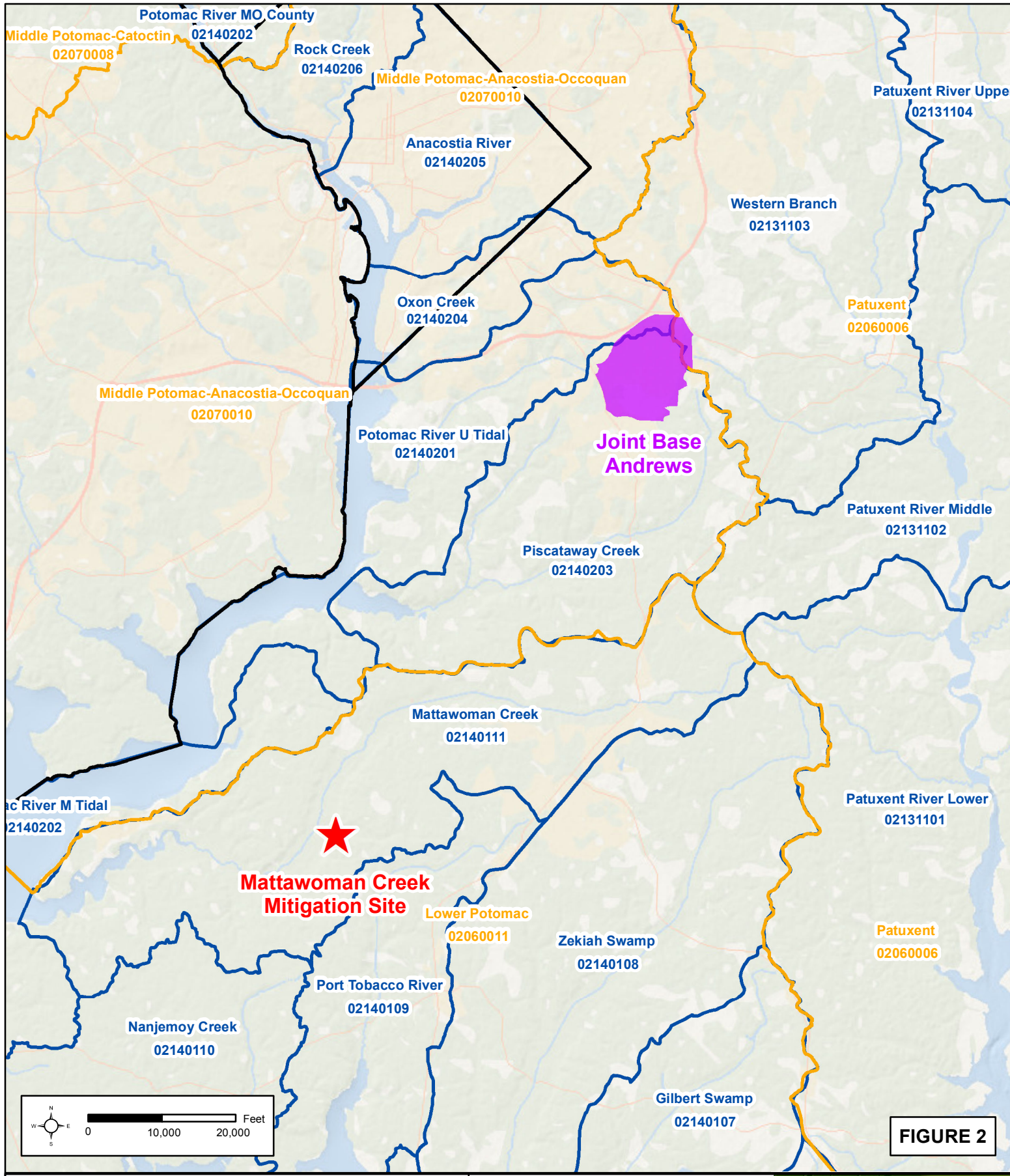
**SITE LOCATION MAP**

Mattawoman Creek Mitigation Site  
 4250 Foxburrow Place  
 Pomfret, Charles County, Maryland

**GreenVest**  
 VISION • PERFORMANCE • RESULTS

<b>MARYLAND</b> 210 Najoles Road, Suite 202 Millersville, MD 21108 410.987.5500 (p)	<b>NEW JERSEY</b> 91 Fieldcrest Ave. Raritan Plaza II, A-1 Edison, NJ 08837 732.902.6644 (p)	<b>NORTH CAROLINA</b> 4405 Dewees Court Raleigh, NC 27612 919.349.2224 (p)
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1 in = 8,000 ft @ 8.5 x 11 Date: 12/8/2016



**FIGURE 2**

- Federal HUC-8 Boundaries
- MD 8-Digit Watershed Boundaries

**WATERSHED BOUNDARIES  
MAP**

Mattawoman Creek Mitigation Site  
4250 Foxburrow Place  
Pomfret, Charles County, Maryland



MARYLAND	NEW JERSEY	NORTH CAROLINA
210 Najoles Road, Suite 202 Millsville, MD 21108 410.987.5500 (p)	91 Fieldcrest Ave. Raritan Plaza II, A-1 Edison, NJ 08837 732.902.6644 (p)	4405 Dewees Court Raleigh, NC 27612 919.349.2224 (p)

1 inch = 20,000 ft @ 8.5x11 Date: 12/8/2016

Data Sources: GreenVest, MD Map, ESRI, USDA, Prince George's County