Mud Creek Watershed Aquatic Ecosystem Restoration Feasibility Study

Task 5: Restoration Objectives for Mud Creek County Park

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1 Introduction

The purpose of this report (*Task 5- Technical Report on Restoration Objectives*) is to provide a narrative description of potential objectives for ecological restoration at Mud Creek County Park. The proposed objectives consider the opportunities and challenges associated with restoration based on field investigations and surveys of the stream morphology and aquatic habitats, terrestrial and wetland communities, topography, and man-made alterations, including dilapidated structures and debris. The restoration objectives proposed are purposefully broad so that agreement can be reached on the intended goals, targets, and benefits of ecological restoration prior to the development of various alternative concept plans and drawings to attain these accepted goals. Conceptual design plan alternatives shall be included in the *Task 6- Alternative Concept Plans for Mud Creek County Park* deliverable.

2 Restoration Objectives

Ecological restoration at Mud Creek County Park shall aim to 1) restore coastal plain stream and riparian habitat destroyed by historic duck farm operations, 2) provide high quality aquatic habitat for brook trout and native fish throughout the East Branch of Mud Creek, 3) provide diverse riparian and upland habitats for native plants and wildlife, 4) remove dilapidated structures, abandoned equipment, and debris to ensure the safety of future visitors to Mud Creek County Park, and 5) provide a recreational and educational amenity for the residents of Suffolk County. To accomplish these broad-based goals, the following objectives will guide the development of conceptual plans (to be prepared as part of *Task 6- Alternative Concept Plans for Mud Creek County Park*) and final restoration design plans and specifications (to be prepared as part of *Task 9- Plansheet Drawings, Specifications, and Opinion of Probable Cost*).

2.1 Restoration of Coastal Plain Stream Channel and Riparian Habitat

2.1.1 Create 1,700 Linear Feet of Coastal Plain Stream on the former Gallo Duck Farm

Restoring the East Branch of Mud Creek to a coastal plain stream system typical of eastern Long Island is a primary goal of the restoration project. The existing East Branch of Mud Creek extends approximately 3,600 feet from Gazzola Drive to Montauk Highway. Current conditions on the East Branch have been established from years of manipulating the stream and floodplain by human activity. The stream channel has been straightened, its location and alignment were altered when Montauk Highway was constructed, and multiple flow barriers and impoundments have been created. The goal of restoring the system to coastal plain stream conditions will require not only restoration of channel pattern, dimension and profile, but will also include reconnecting the channel to the riparian floodplain and wetlands.

Coastal plain streams are typically low-gradient meandering streams with densely forested floodplains well-connected to the river channel and ground water. Due to past human manipulation, the East Branch is no longer meandering and is no longer well-connected to the floodplain through much of its length. Restoring the East Branch to a meandering coastal plain system could result in the addition of more than 1,700 feet of stream channel for a total of

approximately 4,000 feet of stream on the East Branch of Mud Creek. Restoration designs will include developing a channel form, geometry and slope suitable for this particular coastal plain system. Using survey data, knowledge of the geomorphology and hydrology of the system, and hydraulic models, restoration designers will identify appropriate channel geometry that will allow regular inundation of the floodplains as well as the ability to mobilize fine-grain sediment to prevent excessive accumulation in the stream channel. The proposed channel slope in specific locations along the restored channel will depend on the local channel type and local conditions. The overall channel slope, however, is constrained by the existing elevations of the culverts at Montauk Highway and Gazzola Drive. If the Gazzola Drive culverts can be replaced as part of the restoration, the boundary conditions on the slope will change. Local slope will vary as pools and runs will maintain a lower slope than riffles.

An important component of the restoration of Mud Creek to a coastal plain stream is the reconnection to its floodplain. Portions of the East and West Branches are well-connected with their floodplains, while others are disconnected. The floodplain of Mud Creek should be a functional wetland that is inundated almost annually. This helps dissipate flood energy and provides for an exchange of nutrients, sediment, and wood between the channel and wetland that is important for both channel and floodplain development and for aquatic and terrestrial habitat quality. As discussed below in Section 2.2.2, a diversity in tree and wood structure is extremely important to the form and function of streams and their floodplains. Mature floodplains with a mix of canopy trees and understory provides good overbank roughness that slows the flow of floodwaters and traps sediment and organic debris, thereby replenishing the floodplain. Trees on the floodplain fall over and into the stream, altering the morphodynamics of the stream channel and creating a diversity and complexity of habitat. In stream systems where a mature forest is no longer available, these benefits can be reestablished through installation of large and small wood features and riparian plantings. Installation of log jams, logs and root wads on the channel banks, and wood throughout the floodplain (as described in Section 2.2.2), will provide beneficial roughness and complexity until the planted trees and shrubs have an opportunity to mature and in turn fall over and into the stream to continue the cycle.

2.1.2 Remove Barriers to Aquatic Organism Passage at Gazzola Drive

Several barriers on the East Branch of Mud Creek prevent or restrict the movement of aquatic organisms. These barriers include the following:

- Gazzola Drive Culvert
- Duck Pond Berm Culvert
- Culvert in Mowed Path Access Road at Downstream End of Duck Pond
- Concrete Rubble/Tire Impoundment
- Foot Path Culvert

Ecological restoration of Mud Creek will include the removal or modification of these barriers to allow daily and seasonal movement of aquatic organisms through the connected reaches of Mud Creek to ensure access to optimal feeding and spawning habitat. Gazzola Drive presents a critical barrier at the upstream end of the study site. The culverts under Gazzola Drive are completely blocked by sand at the upstream end. Water flows downstream by seeping through the sand and then through the culvert. While the channel conditions upstream of Gazzola Drive

may not be ideal for fish, this culvert is a complete barrier to other aquatic wildlife and macroinvertebrates. Currently, amphibians and reptiles must cross the road in order to pass up- or downstream and may be injured or killed by vehicle traffic. The clogged culvert at Gazzola Drive also does not allow for the natural flux of water and sediment to occur in this reach of stream. Water and sediment are impounded, resulting in changes to the channel type and geometry as well as the aquatic habitat upstream.

Culverts appropriately designed for fish and aquatic organism passage and proper water and sediment flow 1) are a minimum of 1.2 times the bankfull width of the stream, 2) contain natural substrate along the channel bed, and 3) hydraulically match upstream and downstream water depth and velocity for a range of flows. Replacing the Gazzola Drive crossing under these criteria would not only allow for fish passage, but would improve water quality by allowing free flowing conditions, lowering water temperatures, and increasing dissolved oxygen concentrations.

2.1.3 Excavation/Dredging of Organic Matter to Stream Channel with Coarse Substrate

Downstream of Gazzola Drive, the East Branch of Mud Creek contains four flow barriers that back up water and sediment (Figure 1). Three impoundments upstream of the dirt road on the former Gallo duck farm are created by earthen berms with culverts that allow water to flow downstream. The impoundment further downstream is created by an earthen berm and a spillway made of concrete, tires, and other debris. Fine sediment and organic matter have deposited within these impoundments since their construction. This type of deposition is known as 'legacy sediment' as it remains on the landscape from historic human manipulations. Legacy sediments contain contaminants and concentrated nutrients that contribute to the degradation of the water quality of the system. For example, the water surface within these impoundments is often coated with green algae and duckweed (*Lemna sp.*) during the summer and fall months due to the elevated nutrient levels (Figure 2). When the bottom sediments are disturbed, foul smells emerge from the pond bottom.

Sediments contaminated by metals, pesticides, PCBs, and volatile and semi-volatile organic compounds (VOCs, SVOCs) may result in chronic or acute toxicity to benthic and aquatic organisms. Suffolk County Planning Department and United States Army Corps of Engineers (USACE) collected sub-surface soil and sediment samples from the former Gallo Duck Farm property from December 12 – 19, 2006. The findings of this previous sediment and soil sampling are presented in USACE (2009). An elevated cadmium concentration (4.94 ppm) was observed in sediment at the upstream end of the large pond to the west of Gazzola Drive. Due to these cadmium levels, this sediment would be considered Class B under NYSDEC Technical & Operational Guidance Series (TOGS) 5.1.9, *In-Water and Riparian Management of Sediment and Dredged Material*, and would be considered to have chronic toxicity to aquatic life (NYSDEC, 2004). The USACE (2009) report stated that no detectable levels of other metals, PCBs, pesticides, VOCs, or SVOCs were observed. However, the report did not indicate the minimum detection limits of the analytical tests. Therefore, these previous investigations indicate that the sediment in some portions of the site is not an adequate substrate for aquatic life and will need to be removed from any proposed aquatic habitats or capped with clean material.

The existing sediment sampling data collected by Suffolk County Planning Department and USACE is not sufficient to obtain NYSDEC authorization for restoration actions at Mud Creek County Park. Therefore, after development and evaluation of conceptual site plans by Suffolk County (Task 6), additional sediment sampling and contaminant analysis will be conducted to evaluate potential disposal locations for dredged material and verify that the new exposed substrate in wetland and aquatic habitats is suitable to support healthy aquatic communities. Prior to implementation of this sediment sampling, a sampling plan will be submitted to and authorized by the NYSDEC Division of Materials Management.

An important aspect of this portion of the restoration is managing the impounded sediment and organic material. Like other dam and barrier removals, the management of impounded sediments can either be completed passively or actively. Passive sediment management involves the downstream release of the sediment to reincorporate sediment into the downstream system that has been starved of this sediment since dam construction. This type of sediment management is only possible when the impounded sediment is not contaminated, or is less contaminated than sediments further downstream, and when downstream release will not result in negative impacts to infrastructure or important aquatic habitat. Active sediment removal includes the mechanical removal of impounded sediments with excavators and dump trucks. This removed material can either be reused on another portion of the property if contaminant levels allow, or it can be removed off-site to be disposed in a landfill if contamination levels are too high. Impounded sediment and organic material along the East Branch of Mud Creek will likely need to be mechanically removed due to contamination levels and the integrity of downstream aquatic habitat.

Disposal locations for organic sediments with observed contaminant concentrations will be determined by New York State regulatory standards and soil clean-up objectives (NYSDEC, 2006) and will be subject to review and approval by the NYSDEC Division of Materials Management. If sediment contaminant concentrations allow, on-site disposal of excavated sediments shall be prioritized to reduce transportation and disposal costs. The 0.7 acre aeration lagoon and nearby settling basins (0.4 acres total) may provide capacity for on-site disposal of significant quantities of excavated sediments. The location of the aeration lagoon and settling basins are provided in Figure 3. Organic sediments placed in the aeration lagoon or settling basins would be capped with clean material and planted with native trees to contribute to ecological restoration goals for Mud Creek County Park.

Another important component of removing impounded sediment is the exposure of coarser substrate underneath that was once part of the historic stream channel. These coarse substrates include coarse sand, gravel, and cobble, all materials common in the glacial geology typical of Long Island. Where coarse substrate is not present below the existing sediment deposits, replacing the sediments within the proposed channel alignment with imported coarse substrate will improve habitat conditions for spawning and benthic macroinvertebrates. Imported coarse substrate would be sized appropriately to maintain a stable channel bed that would be immobile during bankfull flow conditions. The coarse material, whether native or imported, provides a degree of substrate complexity that provides diverse habitat opportunities for aquatic organisms. The restored stream will likely contain a diversity of stream types as well, including riffles, pools, and runs, all of which add to the habitat diversity and complexity within Mud Creek.

2.1.4 Reduce Stormwater Discharge to East Branch of Mud Creek

Within the study area, there are two locations where stormwater from roadway surfaces discharges into the East Branch of Mud Creek (Figure 4). These include the stream crossings on:

- Gazzola Drive, approximately 500 feet north of Atlantic Avenue
- Montauk Highway, approximately 2,300 feet west of Gazzola Drive

At both locations, sediments and pollutants in stormwater from paved surfaces and developed sites is discharged into Mud Creek. On Gazzola Drive, there are four catch basins in the roadway that collect runoff from a 12.6 acre watershed in the immediate vicinity of Mud Creek. There are no catch basins in upland locations to allow for the collection of stormwater and discharge to the ground. As part of the restoration of Mud Creek, improvements in this area will include the installation of a series of drywells at upland locations on Gazzola Drive with an overflow into Mud Creek. Preliminary site data suggests that permeable soils exist in the project area that would promote the use of drywells. However, this would need to be confirmed with soil borings during the development of the concept plans. Drywells will remove sediment and reduce the quantity of stormwater runoff that enters Mud Creek.

In order to contain runoff from the 90% rainfall event of 1.2 inches (NYSDEC, 2010) for the entire contributing watershed (approximately 13,000 cubic feet of runoff), approximately 20 drywells (10 ft in diameter) would be required along Gazzola Drive between Atlantic Avenue and Patchogue-Yaphank Road. A hydrodynamic separator can also be utilized to remove pollutants contained in runoff from larger storms or to compensate for fewer drywells in the event it is not feasible to install 20 drywells in this area. A hydrodynamic separator is a pollutant removal device for storm water runoff. It is typically constructed of concrete and is installed on a drainage line similar to a catch basin or manhole. It removes debris, sediment and oil from storm water runoff through the use of a screen, baffles and by creating a vortex within the chamber as storm water flows through the structure.

On Montauk Highway, stormwater runoff is collected by a series of catch basins along Montauk Highway between Gazzola Drive and Mud Creek. These catch basins discharge untreated stormwater runoff into the side of the culvert that passes Mud Creek under Montauk Highway. The watershed for this drainage system is approximately 43.4 acres and includes commercial properties along Montauk Highway and residential properties along Gazzola Drive and Atlantic Avenue. The size and geometry of the watershed and quantity of stormwater runoff precludes the use of drywells to contain all runoff from the 90% rain event. However, a hydrodynamic separator can be installed on the existing drainage system to remove sediment and pollutants prior to discharge into Mud Creek.

Engineering designs for stormwater management structures for both Gazzola Drive and Montauk Highway prepared for this project shall be consistent with Town of Brookhaven and Suffolk County Department of Public Works design standards.

2.2 Restoration/Enhancement of Brook Trout Habitat

2.2.1 Conversion of Shallow Eutrophic Ponds to Groundwater Stream Habitat

Brook trout typically inhabit cold, swift, infertile headwaters of rivers and streams (Murdy et al, 2007). Due to historic construction of impoundments, the majority of the aquatic habitat at Mud Creek County Park consists of shallow eutrophic ponds (1.0 acres) and *Phragmites* marshes (5.3 acres) (Figure 5). Low water flow and warm water conditions in these shallow eutrophic ponds are not suitable habitat for brook trout. At water temperatures greater than 71.5°F (21.9°C), brook trout begin to avoid an area and disperse. Water temperatures greater than 75°F (23.8°C) are lethal to brook trout (Ficke et al, 2009). Water temperature data collected between June 2013 and November 2013 indicate that water temperatures in the East Branch of Mud Creek just downstream of the former duck farm were frequently greater than 71.5 ºF during the summer months and occasionally approached 80.0 ºF (Figure 6). Shallow eutrophic ponds on the former duck farm are warming the stream waters and making the downstream reaches of Mud Creel less habitable for brook trout. Accordingly, ecological restoration of Mud Creek County Park will incorporate removal of impoundments and shallow eutrophic ponds to provide cool, flowing stream conditions suitable for brook trout.

2.2.2 Creation of In-Stream Habitat for Brook Trout and Aquatic Diversity

In-stream habitat for brook trout and other aquatic organisms in coastal plain streams includes substrate complexity, diversity in channel morphology, bank and canopy cover, and large woody debris (LWD). Diversity in channel morphology, such as riffle-pool or run sequences, is also important as fast and slow, shallow and deep waters provide preferred habitat conditions for different aquatic organisms. Bank cover from overhanging vegetation or undercut banks and canopy cover from trees provide important protection against the warming effects of the sun during summer months and against predation from birds and other animals.

Large and small wood and boulders in stream channels helps create much of the complexity and habitat diversity. Table 1 summarizes the habitat diversity and complexity created by woody debris in streams.

Table 1: Benefits of Woody Debris for Habitat Complexity in Streams

LWD complex jams	• Increase macroinvertebrate habitat • Create flow refugia • Provide overhead cover for adult trout • Create juvenile habitat	• Stable substrate for macroinvertebrates • Local scour maintains coarse substrates for macroinvertebrates • Creates low-velocity niches during floods for refugia • Creates low-velocity and shallow depth habitat niches for juveniles • Provides overhead cover in pools for adult trout

Small wood and brush creates high-quality micro-habitat structure; large wood in streams and on floodplains may control channel location, channel morphology, flood flow water velocity, and

habitat quality throughout the riparian corridor. The purpose of LWD is to mimic old-growth forest conditions where LWD was an important component of brook trout habitat including: creating overhead cover, maintaining scour pools for adults and shallow water habitat for juveniles, and providing flow refugia. Given that the forests in the Mud Creek watershed are second growth, the current density and size of LWD pieces is relatively low compared with old growth forests. Mature second growth forests typically have 50-59% of the LWD abundance of old growth forests (Bilby and Ward, 1991). In many places along the East Branch of Mud Creek, fewer than five large wood structures provide minimal habitat per 100 feet. An effective restoration technique to improve geomorphic and habitat complexity is to strategically install large wood throughout the channel and floodplain. Large wood installations can be in the form of whole trees including branches, trunks of trees, and trunks with root wads attached. The root wads are extremely valuable as they help maintain scour pools and provide great cover and habitat opportunities.

In natural stream systems, trees that fall into flowing water will move downstream depending on the size of the tree relative to the stream width as well as the stream flow velocity. Large trees may never move beyond their initial location providing long-term channel and habitat complexity. Smaller trees or portions of trees may be stable for a period of time and then move downstream during flood flows, creating new habitat downstream. Often, these mobile wood pieces will deposit together in the form of log jams, creating new habitat. Depending on restoration goals and site limitations, large and small wood placed during restoration may or may not need to be anchored in place to limit movement. At Mud Creek County Park, measures will need to be taken during design and restoration to limit the likelihood of wood floating downstream and blocking the Montauk Highway culvert.

Installation of large wood structures may include a few pieces overlapping along the channel bank or larger log jams at strategic locations (Figures 7 and 8). These log jams and wood installations would be placed in a variety of configurations designed to mimic natural LWD jams, improve habitat conditions, and remain stable through flood events. Long-term stability of the logs will be provided by soil ballast, existing trees, or log piles. Soil ballast will be provided by excavating trenches into the stream banks, placing log(s) in the trench, and backfilling with native material. Additional logs may be cabled to the soil-ballasted logs depending on the length of the buried log and the amount of soil on top. Logs can be placed strategically around existing trees so they do not float downstream during floods, but help to maintain and build aquatic and floodplain habitat complexity. Logs placed vertically into the floodplain and channel banks, called log piles, replicate tree trunks of natural floodplains by providing floodplain roughness to slow flood waters and by providing an anchor to large and small wood moving downstream during floods. These log piles also provide valuable anchors to the other installed wood nearby.

2.3 Restoration of Native Ecological Communities

2.3.1 Eradication of Common Reed (Phragmites australis)

There are 5.2 acres of *Phragmites*-dominated marshes at Mud Creek County Park (Figure 5). The dense monospecific stands of *Phragmites australis* are up to 14 feet tall and have several adverse impacts on ecological conditions, including exclusion of nearly all native wetland

vegetation through shading and competition for aboveground and belowground space, perturbation of wetland hydrology, and alteration of wildlife habitat (Figure 9). Invasive forms of *Phragmites australis* were introduced to North America from Europe, likely in ballast material, in the late 1700s or early 1800s. There is a subspecies of *Phragmites* that is native to North America, *Phragmites australis* subsp. *americanus*; however, the native form does not form dense monocultures with adverse ecological effects. Restoration actions at Mud Creek County Park will aim to eradicate *Phragmites* and replace these stands with wetland or upland habitats that are dominated by native plants. Eradication of *Phragmites* is challenging and wetland restoration at Mud Creek County Park will likely require use of targeted herbicides along with grubbing and excavation of organic sediments and *Phragmites* rhizomes.

2.3.2 Restoration of Native Forest Communities

Prior to human settlement, historical ecological communities in upland portions of Mud Creek County Park were likely coastal oak-heath forests and/or oak-pine forests, similar to the forests observed to the northeast of the former Gallo duck farm. Historical aerial photographs indicate that forested lands surrounded the former duck farm in 1962 (Figure 10). Currently, there are 11.1 acres of successional fields and 2.1 acres of dilapidated buildings at Mud Creek County Park (Figure 5). Invasive herbaceous plants, shrubs, and small trees dominate most of these areas and there is little natural recruitment of the historically dominant native oaks and pitch pine.

Restoration of Mud Creek County Park will include native tree planting in the successional fields and footprints of dilapidated buildings to initiate succession towards native oak-pine forests. The establishment of native forests on the site will connect forested wetlands and uplands located upstream and downstream of the former Gallo Duck Farm, thereby creating a continuous riparian corridor for wildlife from the headwaters of the East Branch to Montauk Highway. In addition, establishment of forested riparian habitats surrounding Mud Creek will provide long-term benefits to aquatic habitats of the East Branch of Mud Creek by increasing shade and decreasing water temperature.

An alternative to restoration of forested habitats in the successional old fields of the former Gallo Duck Farm could be restoration of grassland habitats. Grasslands are imperiled on Long Island and throughout eastern North America due to development and forest re-growth. As a result, the populations of many grassland-dependent birds are in decline throughout New York State (New York Breeding Bird Atlas, 2000). Many of the imperiled grassland birds in New York State, such as short-eared owl, northern harrier, upland sandpiper, grasshopper sparrow, and vesper sparrow, require large grassland areas for breeding and foraging. However, studies of grassland bird abundance have indicated that grassland patches should be a minimum of 125 acres and ideally should be greater than 500 acres to support grassland birds (Vickery et al, 1994); any grassland patches created on the former Gallo Duck Farm would be too small to provide adequate foraging areas and breeding territories for grassland birds. Therefore, restoration of grassland patches at Mud Creek County Park should not be undertaken as 1) forested communities, not grasslands, are typical of pre-disturbance conditions, 2) restored grassland patches would be too small to provide the habitat benefits for grassland birds, and 3) grasslands require more long-term maintenance than forest habitats including periodic mowing or prescribed fire to prevent encroachment of woody shrubs and trees.

2.3.3 Eradication of Mugwort in Old Field Habitats

Successional old fields at Mud Creek County Park are largely located on sites that were historically duck feedlots and are dominated by mugwort (*Artemesia vulgaris*) (Figure 11). Mugwort is an introduced, invasive plant that can be commonly found along roadsides, in waste places, and in fields of non-containerized nursery stock, agricultural crops, and turfgrass (Barney and DiTommaso, 2003). Mugwort infestation in these old fields has resulted in significantly degraded ecological structure and function, as it is present in dense, monospecific stands that exclude nearly all other plant species (including other invasive plants) and provides poor habitat for wildlife. Mugwort tends to exclude other plant species through production of dense aboveground stands of leaves and shoots (up to 2 m in height), formation of dense underground rhizome networks, and production of allelopathic chemicals that inhibit the growth of competing plant species (Barney and DiTommaso, 2003). Due to its adverse ecological impacts, mugwort eradication is considered a high priority for restoration at Mud Creek County Park.

Mugwort is difficult to control and eradicate, as repeated mowing is not effective (Bing, 1983) and few herbicides provide long-term control with plants often re-sprouting after application (Henderson and Weller, 1985). Accordingly, mugwort eradication will require use of both chemical and mechanical methods over multiple growing seasons. Grubbing of mugwort-infested fields will likely be necessary to remove rhizome networks, seed banks, and allelopathic chemicals from the upper soil horizons. Effective herbicides for mugwort control are dichlobenil and glyphosate (Senesac and Eshenaur, 2013). It will not be feasible to control mugwort at Mud Creek County Park without the use of chemical herbicides.

2.3.4 Preservation of Native Trees in Wetland and Upland Habitats

Forested wetlands and uplands were dominant in Mud Creek's watershed prior to European settlement, with red maple-hardwood swamps present in bottomlands and riparian zones and coastal oak-heath and/or oak-pine forests present in upland areas. Due to cost considerations, forest restorations typically use large quantities of small tree saplings to simulate the early phases of forest regeneration, rather than larger caliper tree plantings. As a result, forest restorations take many decades to provide the ecological benefits and structural characteristics of mature forests. In order to accelerate forest restoration at Mud Creek County Park, existing native trees in wetland and upland habitats will be preserved and incorporated into restoration designs. During Task 4d, all trees greater than 4 inches in diameter were mapped within the potential restoration area to facilitate preservation of existing native trees in restoration plans for Mud Creek County Park. Furthermore, the preservation of existing mature trees will also provide a seed source for restored wetland and upland habitats. In addition, many of the dominant invasive plants at Mud Creek County Park, such as *Phragmites* and mugwort, are not shade tolerant. Therefore, preservation of mature trees decreases light levels in restoration areas and will serve to reduce the proliferation of these invasive plants.

2.3.5 Removal of Large Bittersweet (Celastrus orbiculatus) Vines from Native Trees

Asiatic bittersweet *(Celastrus orbiculatus)* is an invasive vine that vigorously climbs on and over native vegetation, resulting in the suppression or death of native plants due to shading or breakage. Excess weights of bittersweet vines in tree canopies can cause limb loss or tip-overs

during high winds or snow storms. Asiatic bittersweet is present throughout Mud Creek County Park; however, there is a particularly severe infestation that merits specific restoration actions. A 1,400 square foot infestation is located on the southern portion of Mud Creek County Park in the vicinity of the slaughterhouse building (Figure 12). In this area, large bittersweet vines (up to 8 inches in diameter, Figure 13) are growing in the canopy of several large oak trees. In order to prevent damage or mortality of these large trees, restoration plans for Mud Creek County Park will include control of these bittersweet infestations. Recommended methods of bittersweet management include cutting vine stems close to the ground and applying herbicides (typically glyphosate or triclopyr) to the cut stems (Dreyer, 1988; Hutchinson, 1992).

2.3.6 Preservation of Sandy Patches for Box Turtle Nesting Habitat

Studies have documented that habitat fragmentation has resulted in population declines of eastern box turtle in the eastern United States (Hall et al, 1999; Nazdrowicz et al, 2008). Box turtles nest in open canopy areas with exposed sand or gravel with well-drained soils. There are several small patches of exposed sandy substrate with sparse ground cover and an open tree canopy at Mud Creek County Park that likely serve as nesting habitat for box turtles (Figure 14). Restoration actions will seek to maintain or improve these sites for nesting box turtles following recommendations put forth by the Massachusetts Division of Fisheries and Wildlife (Massachusetts Division of Fisheries and Wildlife, 2009).

2.4 Providing a Safe Amenity for Residents of Suffolk County

2.4.1 Demolition of All Dilapidated Buildings

It is likely that all buildings within the Potential Gallo Duck Farm Restoration Area will be deemed structurally unsound by a licensed professional engineer or registered architect during the development of construction plans (*Task 9- Final Environmental Restoration Design*). Restoration of Mud Creek County Park shall therefore include razing of all dilapidated buildings within the Project Study under controlled demolition. Many of the buildings have asbestos containing materials (ACM) present that would have to be removed prior to their being demolished (see Section 2.4.5).

During field investigations, buildings were located that are outside of the Potential Gallo Duck Farm Restoration Area. These buildings are associated with the turkey farm operation on the east side of Gazzola Drive and are shown on Figure 15. Guidance from Suffolk County Department of Economic Development and Planning and Suffolk County Department of Parks, Recreation, and Conservation is requested to confirm whether these turkey farm buildings should be included in restoration plans for Mud Creek County Park.

2.4.2 Removal of Out-of-Service Cesspools

Four out-of-service cesspools were identified during completion of Task 4. Three cesspools were identified between Buildings F and G in the northern portion of the site, and one cesspool was identified off the southwest side of the Slaughterhouse in the southern portion of the site. Bottom sediments from all four cesspools were sampled and analyzed for standard Suffolk

County Department of Health Services (SCDHS) parameters including VOCs, SVOCs, and metals. Because VOCs, SVOCs and metals were either non-detectable or present at concentrations well below the SCDHS action levels in all four cesspools, remedial actions will not be required. These cesspools shall be removed or abandoned in place in accordance with applicable SCDHS regulations (Article 12 – SOP No. 9-95, Pumpout and Soil Cleanup Criteria).

2.4.3 Removal of Pipe Access Vaults and Abandoning of Sub-Surface Pipes

Numerous pipe access vaults were located during field investigations. It is apparent that an extensive network of sub-surface pipes is present at Mud Creek County Park. Excavation and removal of the sub-surface pipes terminating at these access vaults is not necessary to provide a safe recreational amenity for Suffolk County residents. However, the removal of pipe access vaults shall be included in restoration plans for Mud Creek County Park. It is expected that pipe access vaults shall be removed, the pipe ends capped, and the vault filled and graded with clean material.

2.4.4 Debris Removal

Two debris stockpiles were noted in the western portions of the site. Stockpile No. 1 is located off the southwest side of Building 6 and consists of wood, vegetation, metal chicken wire, concrete fragments and pipe fragments. Stockpile No. 2 is located off the south side of Building B, between Buildings A and E, and consists of soil and gravel. In addition, there were various abandoned vehicles and old equipment located throughout the site, including: a rowboat, boat motor, lawn mower and wood splitter inside Building A; an automobile, boat and personal watercraft located outside the Slaughterhouse; the top to a pickup truck outside Building C; a pickup truck outside Building I; a truck trailer located south of Building B; a refrigerated truck trailer and gas cylinders of indeterminable size north of Building 11; a bulldozer located northwest of the aeration basins; a payloader located in the northeastern portion of the site; and miscellaneous vehicle parts located east of the trailer in the northwest portion of the site. Various debris and debris stockpiles shall be removed and transported for off-site disposal at a permitted facility and in accordance with applicable local, state and federal regulations. Debris disposal shall include location, collection, and removal of all small debris including fence posts, sections of fence, tires, bricks, and miscellaneous garbage and trash. The larger pieces of equipment such as the payloader, bulldozer, and truck trailers can be legally disposed at a vehicle recycling facility or potentially a scrap metal facility.

In addition to the above noted debris, several containers of potentially hazardous materials were identified, including: approximately two dozen 1-gallon paint cans, four 5-gallon buckets filled with an aqueous solution, one 5-gallon bucket filled with an oil-like substance, two 1-gallon cans of paint thinner. There were also several empty 55-gallon drums and three 5-gallon propane tanks inside Building A. Waste characterization analyses of the unknown aqueous solutions indicated they are not hazardous wastes. Nevertheless, these materials must all be disposed of at a licensed waste disposal facility.

2.4.5 Asbestos Abatement

An asbestos survey conducted as part of Task 4 identified asbestos containing materials (ACM) in the Slaughterhouse, Buildings A, B, C, D, and F, in the structures east of Gazzola Drive. The majority of the ACM was in the form of transite board, but also included flashing, floor tiles, wallboard and transite pipe. New York State regulations (12 NYCRR Part 56) require that all ACM be abated (i.e., removed) prior to a building or structure being demolished. However, the poor and dilapidated condition of the site buildings may severely restrict or prohibit a normal asbestos abatement. 12 NYCRR Part 56-11.5 allows for controlled demolition with asbestos in place, provided the building or structure is ruled structurally unsafe by a licensed professional.

2.4.6 Removal of Out of Service Utility Poles

Numerous utility poles and overhead wires are present at Mud Creek County Park, as shown in Figure 16. Utility poles and overhead wires within potential ecological habitat restoration areas shall be removed. Existing electrical infrastructure may be maintained adjacent to the northern access road (Patchogue Avenue) and the existing asphalt driveway to allow for electrical service for proposed or future amenities such as parking area lighting, restroom facilities, or an educational center.

2.5 Providing a Recreational Amenity for Residents of Suffolk County

2.5.1 Nature Trail

A nature trail with educational signage will be the principal public amenity provided at Mud Creek County Park. Task 6 shall provide alternative configurations and dimensions for the proposed natural trail along with construction materials. Our team anticipates that the proposed nature trail will be a maximum of 4,500 feet (0.85 miles) in length. The nature trail shall provide a recreational amenity for various user groups including walkers, joggers, and nature enthusiasts. It is expected that the nature trail shall include the following features:

- Shall be located on both sides of Gazzola Drive and a pedestrian crosswalk(s) shall be provided for park users to safely access both parts of the park.
- Shall be located within the Potential Gallo Duck Farm Restoration Area and shall not extend into Suffolk County lands located to the northeast of the former duck farm or Suffolk County lands surrounding the west branch of Mud Creek
- Shall be preferentially located in existing stands of mugwort and other upland invasive species.
- Shall be preferentially located on existing informal access roads and paths to minimize clearing needed to construct nature trail.
- Shall be located in upland areas to avoid impacts to existing or restored wetland and stream habitats
- Shall provide several wetland or stream overlook points

- Shall be located to provide suitable locations for interpretive signage with views of ecological resources and locations of former duck farm features
- Shall be located to provide a potential connection to the conceptual location for a future interpretive center (design of nature center is not included in this contract)

2.5.2 Providing Park Visitors with Sense of Historical Duck Farm Without Its Buildings

Duck farming has an important place in the economic history of Long Island. As stated previously, educational signage along the nature trail will describe the duck farming on Long Island and the duck farm operation at Mud Creek County Park. All of the buildings at Mud Creek County Park are likely to be classified as structurally unsound and none of the buildings are considered to have historical value. While it is proper and necessary that all buildings will be demolished and removed, a drawback is that visitors will have little spatial sense of the layout of the former duck farm. Historical photographs and aerial images of the duck farm provided on educational signage will provide historical information and context. Many of the trees at Mud Creek County Park provide an interesting opportunity to give park visitors a sense of the location and scale of the farm buildings, particularly the duck houses, after their demolition.

Many large trees are found growing adjacent to the outer walls of the buildings, the result of wind-dispersed seeds (such as Norway maple) collected at the bottom of the walls or as bird-dispersed seeds (such as black cherry or white mulberry) deposited by birds perched atop the eaves of buildings. If these large trees are preserved during building demolition, they will mark the perimeter of many of the elongated duck houses. The nature trail could run within the footprint of the duck house buildings and be bordered by the large trees or the nature trail could be oriented perpendicular to the long axis of duck house buildings and allow visitors to look through the rows of trees. In either case, these trees can be used to provide a sense of the location, scale, and dimensions of the duck farm buildings after their demolition.

2.5.3 Parking

Restoration plans for Mud Creek County Park will include a parking area with driveway access from Gazzola Drive. The parking area should provide sufficient space for school buses as well as passenger cars. To minimize clearing, the existing driveway on Gazzola Drive should be maintained. The size and location of the parking lot will be partly dictated by the location of the nature trail and site educational amenities. Drainage for the parking lot could be provided by drywells or horizontal leaching chambers, pending the results of the soil borings. Depending upon the location of the parking lot and depth to groundwater, porous pavement could also potentially be utilized to construct the pavement, which would eliminate the need for drywells or horizontal leaching chambers.

2.5.4 Educational Amenities

Restoration of native wetland and upland habitats and construction of a recreational path shall provide educational opportunities for students and the public about Long Island's natural resources and duck farming history. Conceptual plans for the site's recreational path shall include locations for wetland and stream overlook points and locations for interpretive signage

with views of ecological resources and locations of former duck farm features. Ten locations for interpretive storyboards shall be provided on the recreational path. These storyboard locations shall emphasize the ecological resources of Mud Creek County Park, the implementation of ecological restoration at Mud Creek, and the duck farming history of Mud Creek and Long Island.

2.6 Challenges to Restoration

2.6.1 Partial Ownership of Lower East Branch by Suffolk County

A 2.25 foot impoundment composed of concrete rubble and debris (such as tires and shopping carts) is located on the lower East Branch approximately 800 feet downstream of the grass road dam. This impoundment creates a shallow pond (approximately 1.0 – 2.0 ft deep) upstream and influences surface water elevation and stream flow approximately 650 feet upstream of the impoundment. Due to low flow rates upstream of the impoundment, organic matter settles from the stream water and is deposited upstream of the impoundment. Up to 2 feet of accumulated organic matter and fine sediments are present in the ponded waters upstream of the concrete rubble impoundment. This impoundment and the oxygen-depleted waters upstream of the impoundment are a barrier to the upstream movement of brook trout in Mud Creek. Therefore, restoration of this barrier would be necessary to allow brook trout to migrate upstream into restored habitats on the former Gallo Duck Farm. As shown in Figure 17, this impoundment is located on a strip of County property. However, the pond created by this impoundment and the accumulated organic matter extend onto private property to the east; private property is also located west of this lot. Partial County ownership of the lower East Branch may 1) prevent access to the County parcel and the impoundment, 2) limit the efficacy of restoration actions by preventing complete removal of accumulated organic matter in the stream channel and 3) may eliminate consideration of alternatives for lower East Branch restoration, such as creation of a new stream channel to bypass the impoundment and accumulated sediments, due to private land ownership east and west of the impoundment. Accordingly, Suffolk County should investigate the feasibility of obtaining permission to conduct stream restoration actions on the three privately owned properties on the lower East Branch (SCTM #'s 200-977.8-1-3, 200-977.8-1-5.1, and 200-977.8-1-1).

2.6.2 Former Gallo Duck Farm Out Parcel

An out parcel (Suffolk County Tax Map #: 200-975.7-1-9) is located within the former Gallo Duck Farm located to the west of Gazzola Drive and to the north of the freshwater wetland areas (Figure 18). No restoration actions shall be planned for this parcel other than removal of debris, unless Suffolk County obtains this parcel or an access agreement with the property owner.

2.6.3 Atlantic Avenue Access to Buildings I and J

Historical access to Building I (Slaughterhouse) and Building J was from the western terminus of Atlantic Avenue. At the present time, the western terminus of Atlantic Avenue is privately held and has been consolidated with parcel 200-975.7-2-25.5 (Figure 19). A large metal bar gate is located on the paved road at the border between these private properties and paper street

easement (Bridgeport Avenue). Without owner authorization to access Buildings I and J through Atlantic Avenue, a temporary access road will need to be constructed to transport demolition debris from these buildings through the successional fields and woodlands of the restoration site and to a temporary staging area adjacent to Gazzola Drive (Figure 19). This will increase the costs and ecological disturbance of building demolition. Accordingly, Suffolk County should investigate obtaining permission to utilize Atlantic Avenue for the purposes of demolition of Buildings I and J.

2.6.4 ATV and Other Unauthorized Uses of Mud Creek County Park

Illegal use of ATVs occurs on Suffolk County lands to the northeast of the former duck farm in the vicinity of Kane and Patchogue Avenues. A bicycle motocross track is located on privately owned lands (SCTM# 200-975.7-1-20, # 200-975.7-1-21) to the east of the large parcel owned by Suffolk County Department of Public Works containing the West Branch of Mud Creek. Restoration plans for Mud Creek County Park shall include appropriate barriers to minimize potential illegal ATV and BMX damage to nature trails and restored habitats. Physical barriers and materials that may be included in restoration plans include overlapping split rail fences, downed trees, metal or wooden-post bollards, and post and beam wooden fences. In addition, dense plantings of native shrubs and trees along the east and west sides of Gazzola Drive can also serve as a deterrent to ATV access to the restored habitats.

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