AMY S. GREENE
ENVIRONMENTAL
CONSULTANTS, INC.

Habitat Enhancement Master Plan

for the

Chatham Borough River Road Site
Chatham Borough, Morris County, New Jersey

***Prepared for*:**
Borough of Chatham Environmental Commission
Municipal Building
54 Fairmont Avenue
Chatham, NJ 07928

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November 2009

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1.0 INTRODUCTION

This open space plan describes the features of the Chatham Borough River Road site and provides recommendations to enhance and manage these features. In addition, recommendations are made to provide facilities for public access and for the removal of deposits of debris/waste. A conceptual plan is included that depicts the potential public access and recreation facilities. Field investigations of the site were performed by Amy S. Greene Environmental Consultants, Inc. (ASGECI) on July 21, 2009.

The River Road site is a 12.6 acre parcel located between River Road and the Passaic River, in Chatham Borough, Morris County, New Jersey (Figure 1 and Figure 2). The Conrail Erie Lackawanna railroad tracks also form a property boundary along the northwestern corner of the site. The property boundaries are identified on the Chatham Borough tax map as Block 137, Lot 1; Block 138, Lot 1; Block 139, Lot 1, and Block 140, Lot 1 (Figure 3). The site is considered undeveloped except for a deteriorated asphalt parking lot at the end of St. James Street, in the north-central portion of the site, and a Jersey Central Power and Light (JCP&L) easement that traverses the northern portion of the site. A chain link fence is found along a portion of the northern property boundary. Commercial and residential properties abut this boundary. One area of maintained lawn, which encroaches into the utility easement, is associated with the "backyard" of a commercial or residential property that is situated within Block 137; Lot 5. The utility easement is approximately 150 feet in width and includes two sets of supports and overhead electric transmission lines. The utility easement includes areas of early and late successional vegetation and several areas of emergent wetland. A forested riparian zone parallels the Passaic River within the site. The riparian zone includes both forested uplands and forested wetlands. The forested uplands and wetlands are occasionally flooded by the Passaic River (Figure 4). The Great Swamp National Wildlife Refuge is located nearby to the west/northwest of Chatham Borough.

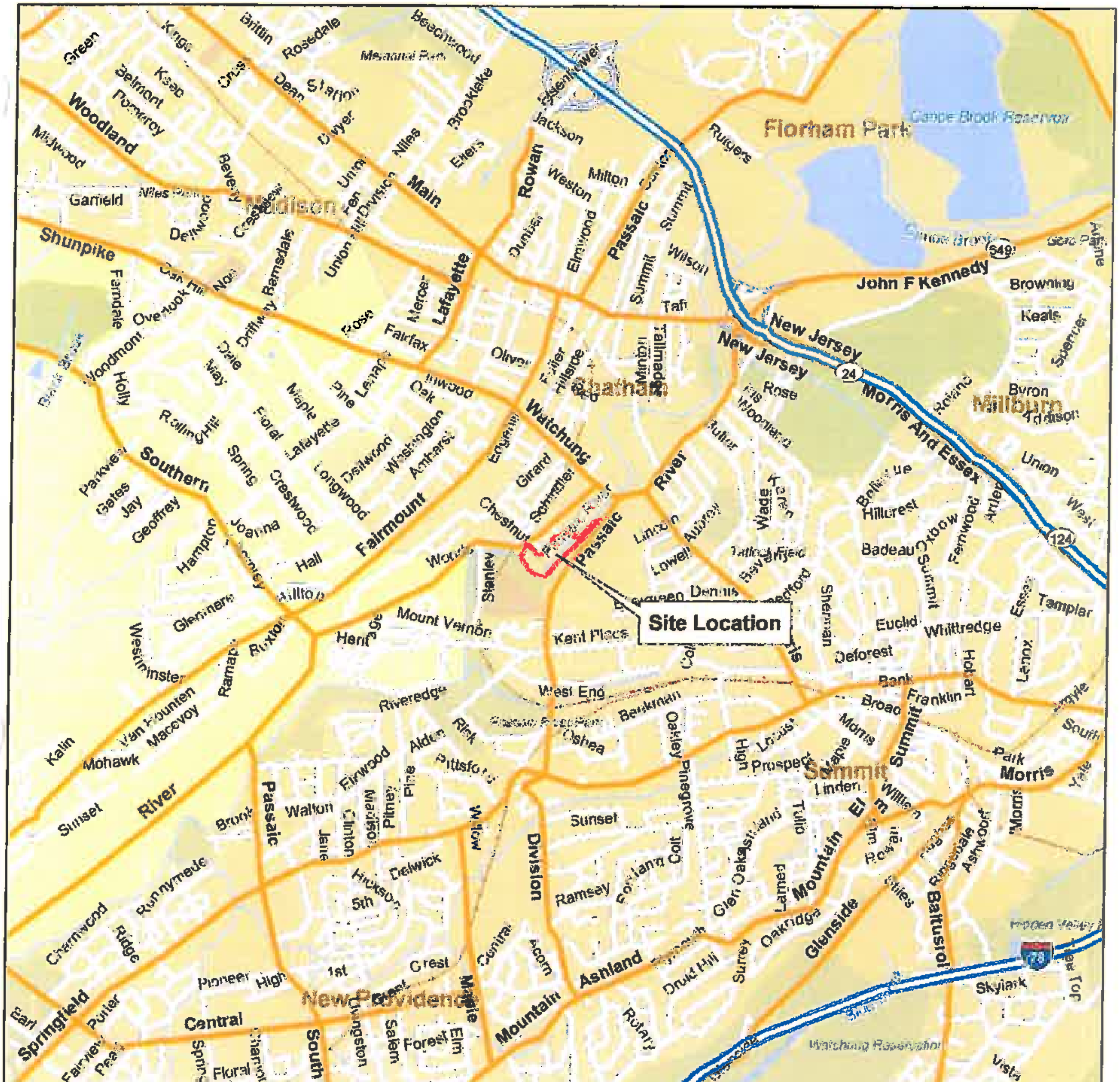
ASGECI has prepared a detailed description of the site's natural resources, including vegetation and wildlife, endangered and threatened species, the water quality and the Passaic River. An understanding of the site's resources is necessary in order to provide informed recommendations for possible human uses and habitat restoration within the site.

2.0 SITE DESCRIPTION AND MANAGEMENT CONCERNS

2.1 Topography and Surface Hydrology

The River Road site is within the Piedmont physiographic province. The geology of the Piedmont province is predominantly sedimentary and igneous rocks composed of red sandstone and shale.

Based on a review of the USGS topographic map (Figure 5), elevations at the site range from about 200+ feet at the parking area under the utility easement to about 190 feet along the banks of the Passaic River. The land gently slopes from the fenceline along the northwest property boundary to the southeast until it levels out at the forested floodplain along the Passaic River. The project site does not include any areas of steep slopes.



Legend

Site Location

Figure 1
Regional Location Map

River Road Open Space
Block 137; Lot 1, Block 138; Lot 1,
Block 139; Lot 1, and Block 140; Lot 1
Chatham Borough
Morris County, New Jersey

ASGECI Project # 3149

N W E S

3,000
Feet

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Source:
ESRI StreetMap USA, nationwide streets dataset in Smart Data Compression (SDC) containing
TIGER 2000-based streets dataset, enhanced by ESRI and TeleAtlas, published by ESRI, Redlands, California, 2005.

Legend

Site Location

Sources:
New Jersey 2007-2008 High Resolution Orthophotography - JPEG2000 5K Tiles, State of New Jersey - Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), Trenton, NJ, October 2008.
This (map/publication/report) was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

Figure 2
Aerial Photograph

River Road Open Space
Block 137; Lot 1, Block 138; Lot 1,
Block 139; Lot 1, and Block 140; Lot 1
Chatham Borough
Morris County, New Jersey

ASGECI Project # 3149

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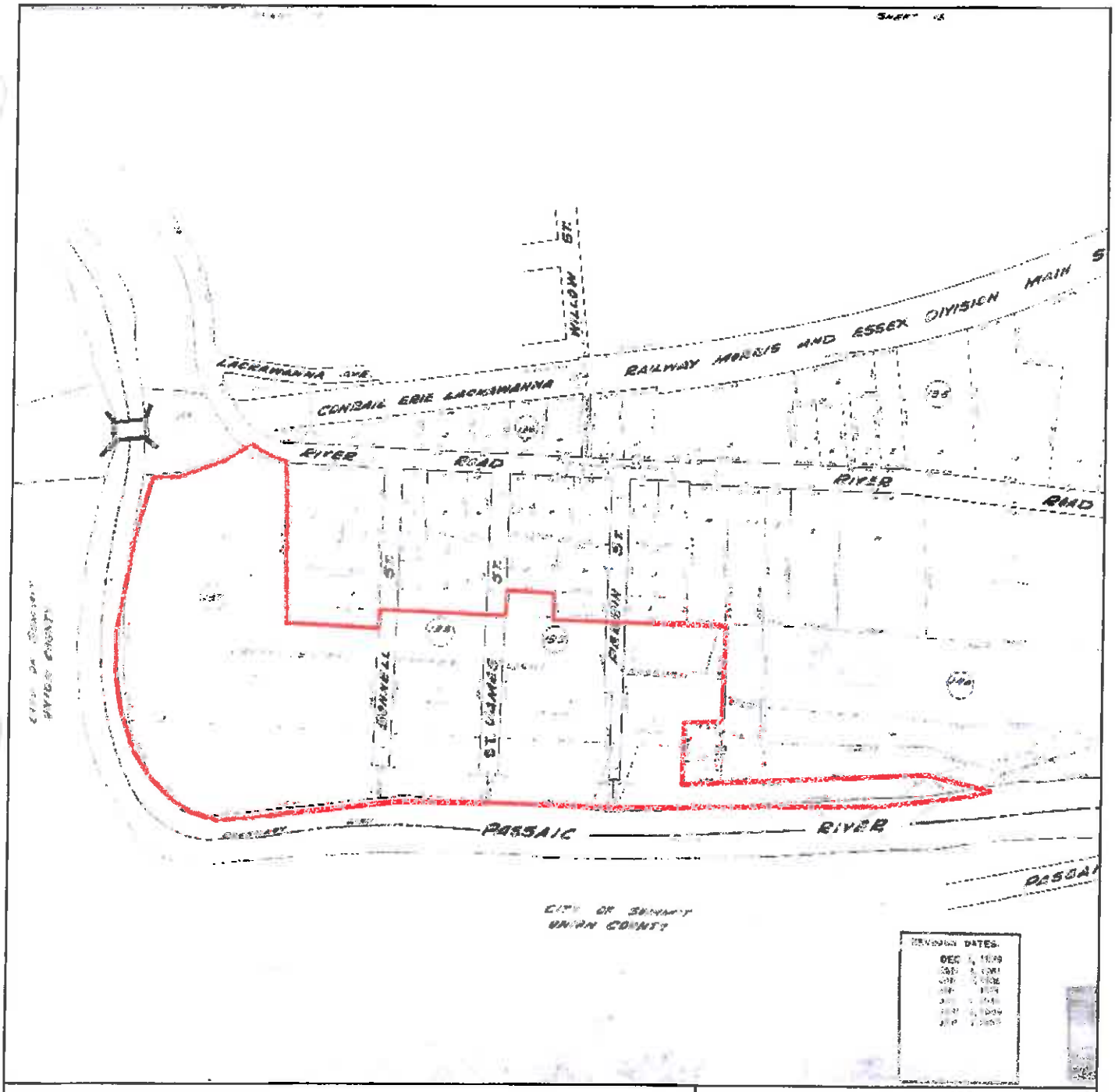

Legend

Site Location

Note: Map scale is approximate

Source:
Municipal Tax Map for Chatham Borough, Morris County, New Jersey, Sheet 22, prepared by AumHammer Associates Inc., Summit NJ, last revised January 1990.

Figure 3
Chatham Borough Tax Map

River Road Open Space
Block 137; Lot 1, Block 138; Lot 1, Block 139; Lot 1, and Block 140; Lot 1
Chatham Borough
Morris County, New Jersey

ASGECI Project # 3149

285
Feet

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Legend

- Site Location
- 100-year FEMA Floodplain

Sources:
Federal Emergency Management Agency Q3 Flood Data, Disc 16 -
New Jersey, Puerto Rico, Virgin Islands, National Flood Insurance Program, September 1996.
New Jersey 2007-2008 High Resolution Orthophotography - JPEG2000 5K Tiles, State of New Jersey - Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), Trenton, NJ, October 2008.
This (map/publication/report) was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

Figure 4
FEMA Floodplain Map

River Road Open Space
Block 137; Lot 1, Block 138; Lot 1,
Block 139; Lot 1, and Block 140; Lot 1
Chatham Borough
Morris County, New Jersey

ASGECI Project # 3149

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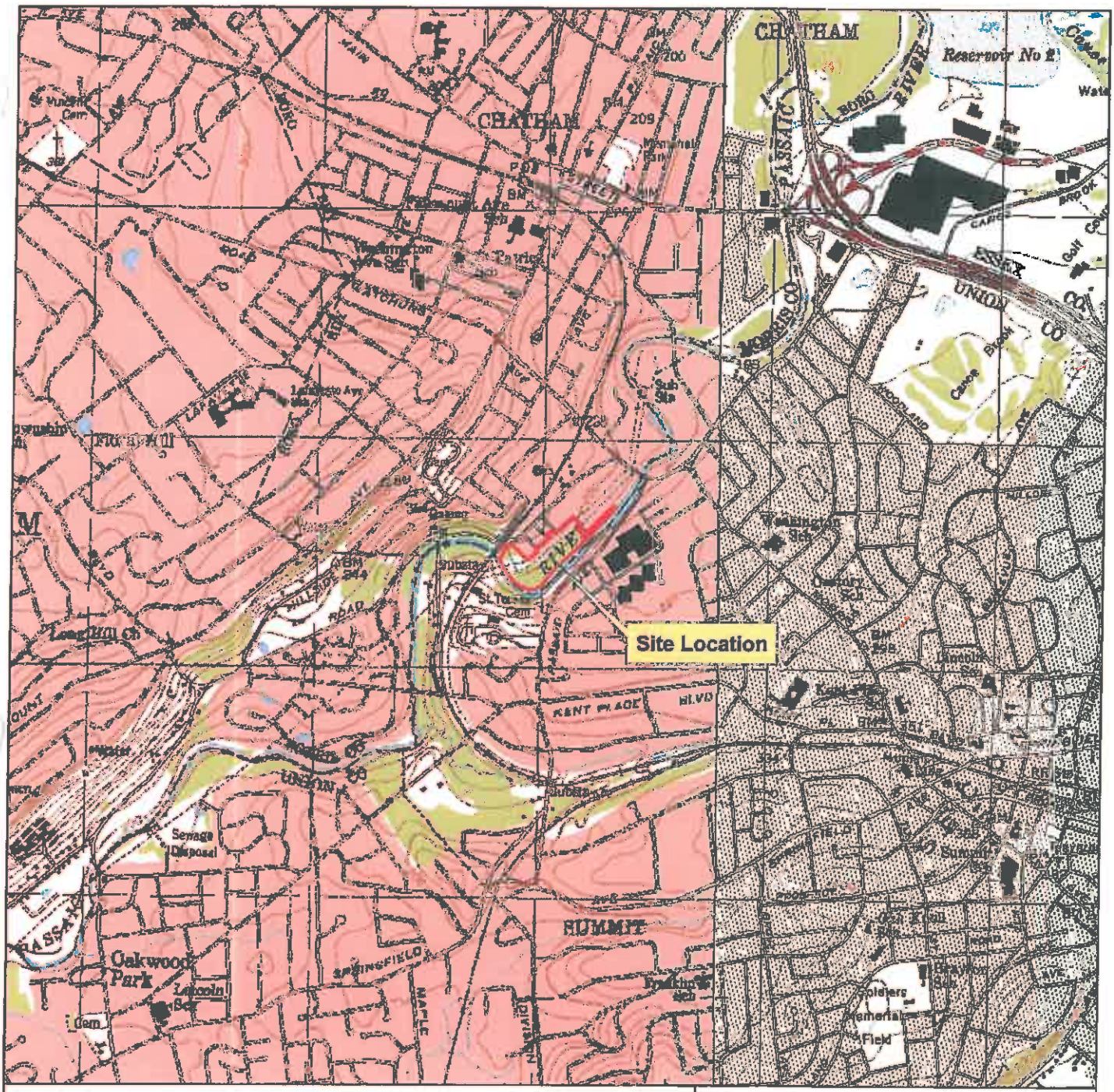

Legend

Site Location

New Jersey State Plane Coordinates
for the approximate center of site -
North: 689,317' // East: 524,229'

Latitude and Longitude Coordinates
for the approximate center of site -
N: 40° 43' 32.8" / W: 74° 23' 03.0"

Source:
Collarless / Seamless Bit-Mapped 7.5 Minute Color Topographic Images of New Jersey, United States Geological Survey (USGS), Digital Raster Graphic (DRG) Topographic Series Map, Roselle and Chatham NJ Quadrangles, USGS, Reston, Va., January 9, 1996, distributed by Digital Data Services, Inc., Lakewood, CO.

Figure 5
USGS Topographic Map

River Road Open Space
Block 137; Lot 1, Block 138; Lot 1,
Block 139; Lot 1, and Block 140; Lot 1
Chatham Borough
Morris County, New Jersey

ASGECI Project # 3149

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2.1.1 Surface Water Quality

The project area is within the Upper Passaic Watershed, which is classified as an FW2 non-trout stream by the New Jersey Department of Environmental Protection (NJDEP) (N.J.A.C. 7:9B). According to these rules, the designated uses for FW-2 waters are:

1. Maintenance, migration and propagation of the natural and established biota;
2. Primary and secondary contact recreation;
3. Industrial and agricultural water supply;
4. Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation, and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection; and
5. Any other reasonable uses.

The relationship between the designated uses, as described above and the results of an assessment of actual water quality are provided in semi-annual reports prepared by the NJDEP. According to the 2008 Draft New Jersey Integrated Water Quality Monitoring and Assessment Report, the Passaic River adjacent to the project site was in non-attainment (below standard) of Surface Water Quality Standards for New Jersey Waters for aquatic life (general), primary contact recreation, and for drinking water and industrial water supply. The waters were in attainment (within standard) for certain individual uses of agricultural water supply. Insufficient data exist to designate attainment status for the Passaic River adjacent to the project site for fish consumption. According to the report, the pollutants that impair aquatic life and drinking water supply are identified as arsenic and cyanide. However, arsenic tends to occur naturally at levels above the surface water quality standards and so most NJ rivers exceed this criteria. In addition, the Passaic River adjacent to the site suffers from dissolved oxygen deficits and exceedences of total suspended solids.

The surface water quality for the Passaic River adjacent to the site has also been evaluated using a protocol termed the Ambient Biological Monitoring Network (AMNET). The AMNET methodology assesses the benthic macroinvertebrate populations for pollution tolerant and intolerant aquatic life forms including insects and insect larvae, mollusks, and crustaceans. Ratings of the stream condition are based on the level of pollution tolerance of the families collected, the ratio of pollution tolerant to pollution intolerant families, and the biodiversity of the system.

Two (2) AMNET stations are established along the Passaic near the site, one approximately 4,200 feet downstream and a second approximately 1,200 feet upstream. The AMNET sampling generally indicates "moderate" impairment for aquatic life for the surface waters of the Passaic River adjacent to the site. Moderately impaired waterways have a fewer number of macroinvertebrate species compared to less impaired waterways. Moderately impaired waterways also have fewer pollution intolerant species than pollution tolerant species. In addition, the physical attributes of the habitat adjacent to the two sites were evaluated. The habitat adjacent to the two AMNET sites was designated to be "sub-optimal." The biological impairment of surface waters adjacent to the project site is likely due to nonpoint source

pollution (stormwater), point source pollution and/or a lack of stream corridor (riparian) buffers. The AMNET Assessment Methodology is outlined in the AMNET executive summary at http://www.nj.gov/dep/wms//bfbm/GenExecSum.html.

As mentioned above, the Passaic River along the project site is described as freshwater non-trout, which by default, identifies it as a warm water fish resource. According to an electro fishing survey performed by the NJDEP in the vicinity of the site (100 yards downstream of the old Rt. 24 Bridge), the following fish species were identified:

Common Name	**Scientific Name**
pumpkinseed sunfish	(*Lepomis gibbosis*)
bluegill	(*Lepomis gibbosus*)
redbreast sunfish	(*Lepomis auritis*)
largemouth bass	(*Micropterus salmoides*)
tesselated darter	(*Etheostoma olmstedi*)
brown bullhead	(*Ameiurus nebulosus*)
white sucker	(*Catostomous commersoni*)
banded killifish	(*Fundulus diaphanous*)
blacknose dace	(*Micropterus salmoides*)
spotted shiner	(*Erimystax x- punctatus*)
satinfin shiner	(*Notropis analostranus*)
golden shiner	(*Notemigonus crysoleucas*)
American eel	(*Anguilla rostrata*)
black crappie	(*Pomoxis alularis*)

This sample represents a moderately degraded fish resource and is typical of streams and rivers located within urban environs.

The southeastern boundary of the project site borders the Passaic River. Emergent and forested wetlands, forested uplands and a small tributary to the Passaic River are found within this portion of the site. The small tributary to the Passaic River is located near the northeastern end of the site. This tributary begins at a culvert beneath an unpaved road that accesses the electric utility easement. This tributary is not shown on either the USDA Soil Survey or the USGS topographic quadrangle mapping and does not appear to be a natural stream. It may only discharge stormwater in response to rainfall. The banks of the Passaic River within the project site are only 1-2 ft in height relative to the surface water elevation at base flow. Trees and shrubs were noted to be well established along the immediate river banks. The plant root systems reinforce the bank and the plant stems create "roughness" which reduces water velocity during flood stages. As a result, the banks appear to be stable and exhibit little erosion or slumping.

The Passaic River and wetlands are actively used by wildlife. A review of the NJDEP Freshwater wetlands quarterquad mapping for the project area indicate mapped palustrine (non-tidal) forested wetland within the site adjacent to the Passaic River (Figure 6).

2.2 Soils

The Morris County Soil Survey (Eby, 1976) mapped the soils within the project site as Parsippany silt loam, sandy loam substratum, 0 to 3 percent slopes (Pk) (Aeric Endoaqualfs) (Figure 7). The Parsippany silt loam, sandy loam substratum (Pk) mapping unit is considered a hydric soil by the USDA Natural Resource Conservation Service (USDA, 2009). This is a poorly drained, frequently flooded soil and has a seasonal high water table at 0 to 12 inches most of the year (Eby, 1976). The Parsippany silt loam, sandy loam substratum is typically mapped within active floodplains.

2.3 Biotic Communities

Vegetative communities were identified based on field reconnaissance by Amy S. Greene Environmental Consultants, Inc (ASGECI) on July 21, 2009. General wetland areas, surface waters (Passaic River bank), tree lines, invasive species clusters, debris piles and other pertinent landscape features were located and mapped (Figure 8) using GPS (Trimble 4000). Summaries of invasive and native plants observed on the site by ASGECI staff are included in Appendices A and B. A summary of animals observed on the site by ASGECI staff during field visits is included in Appendix C.

The majority of plants observed in the River Road project area were native species. However, many invasive species were noted, in particular, tree-of-heaven (*Ailanthus altissima*), common mugwort (*Artemesia vulgaris*), stiltgrass (*Microstegium vimineum*), Japanese knotweed (*Polygonum cuspidatum*), Japanese honeysuckle (*Lonicera japonica*) and common reed (*Phragmites australis*).

The biotic communities have been separated into recognizable areas based on plant stage of succession; species composition and landscape position in order to simplify their descriptions. Biotic communities include Early and Late Successional field; Hardwood Forest; Forested Riparian Floodplain, Wetland Forest; Emergent Wetlands; and Open Water.

Early and Late Successional Field

Early successional fields are generally dominated by herbaceous annuals and perennials that quickly occupy disturbed sites. These communities provide habitat for many wildlife species capable of adapting to disturbed habitats. Late successional communities typically replace (succeed) the early successional communities, represent less disturbance, and generally include both herbaceous and woody species of shrubs and tree saplings. A mixture of early and late successional vegetation was found within the utility easement. The vegetation within the utility easement is regularly mowed to maintain an open corridor for the overhead electrical transmission lines. The regular mowing tends to "reset" succession. Herbaceous vegetation identified within this area included an extensive monoculture of common mugwort, and several discrete stands of common reed, and Japanese knotweed, all considered invasive species. Additional invasive herbaceous species noted included curly dock (*Rumex crispus*), field bindweed (*Convolvulus arvensis*), orchardgrass (*Dactylis glomerata*), tatarian honeysuckle (*Lonicera tatarica*), common mullein (*Verbascum thapsus*), wineberry (*Rubus phoenicolasius*) and bull thistle (*Cirsium vulgare*). Non-invasive herbaceous species noted included daisy

Legend

- Site Location
- NJDEP Freshwater Wetlands
- NJDEP Linear Wetlands

WETLAND CLASSIFICATIONS:
PFO1A - Palustrine, Forested, Broad-leaved Deciduous, Temporarily Flooded
PFO1C - Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded

Sources:
New Jersey 2007-2008 High Resolution Orthophotography - JPEG2000 5K Tiles, State of New Jersey - Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), Trenton, NJ, October 2008.
This (map/publication/report) was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.
NJDEP Wetlands of Morris and Union Counties, New Jersey 1986, NJ Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis, NJDEP, Trenton, November 1999.
NJDEP Linear Non-Tidal Wetlands of Morris and Union Counties, NJ 1986, NJ Department of Environmental Protection (NJDEP), Office of Information Resource Management, Bureau of Geographic Information and Analysis, NJDEP, Trenton, November 1998.

Figure 6
NJDEP Freshwater Wetlands Map

River Road Open Space
Block 137; Lot 1, Block 138; Lot 1, Block 139; Lot 1, and Block 140; Lot 1
Chatham Borough
Morris County, New Jersey

ASGECI Project # 3149

N W E S
500
Feet

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Legend

Site Location

SOILS LIST:
PbphAt - Parsippany silt loam, sandy loam substratum, 0 to 3 percent slopes, frequently flooded
USHALB - Urban land-Haledon complex, 3 to 8 percent slopes

Sources:
Soil Survey Geographic (SSURGO) Database for Morris County, New Jersey,
USDA, Natural Resources Conservation Service, Fort Worth, Texas, December 2004.
New Jersey 2007-2008 High Resolution Orthophotography - JPEG2000 5K Tiles, State of New Jersey - Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), Trenton, NJ, October 2008.
This (map/publication/report) was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

Figure 7
SSURGO Soils Map

River Road Open Space
Block 137; Lot 1, Block 138; Lot 1,
Block 139; Lot 1, and Block 140; Lot 1
Chatham Borough
Morris County, New Jersey

ASGECI Project # 3149

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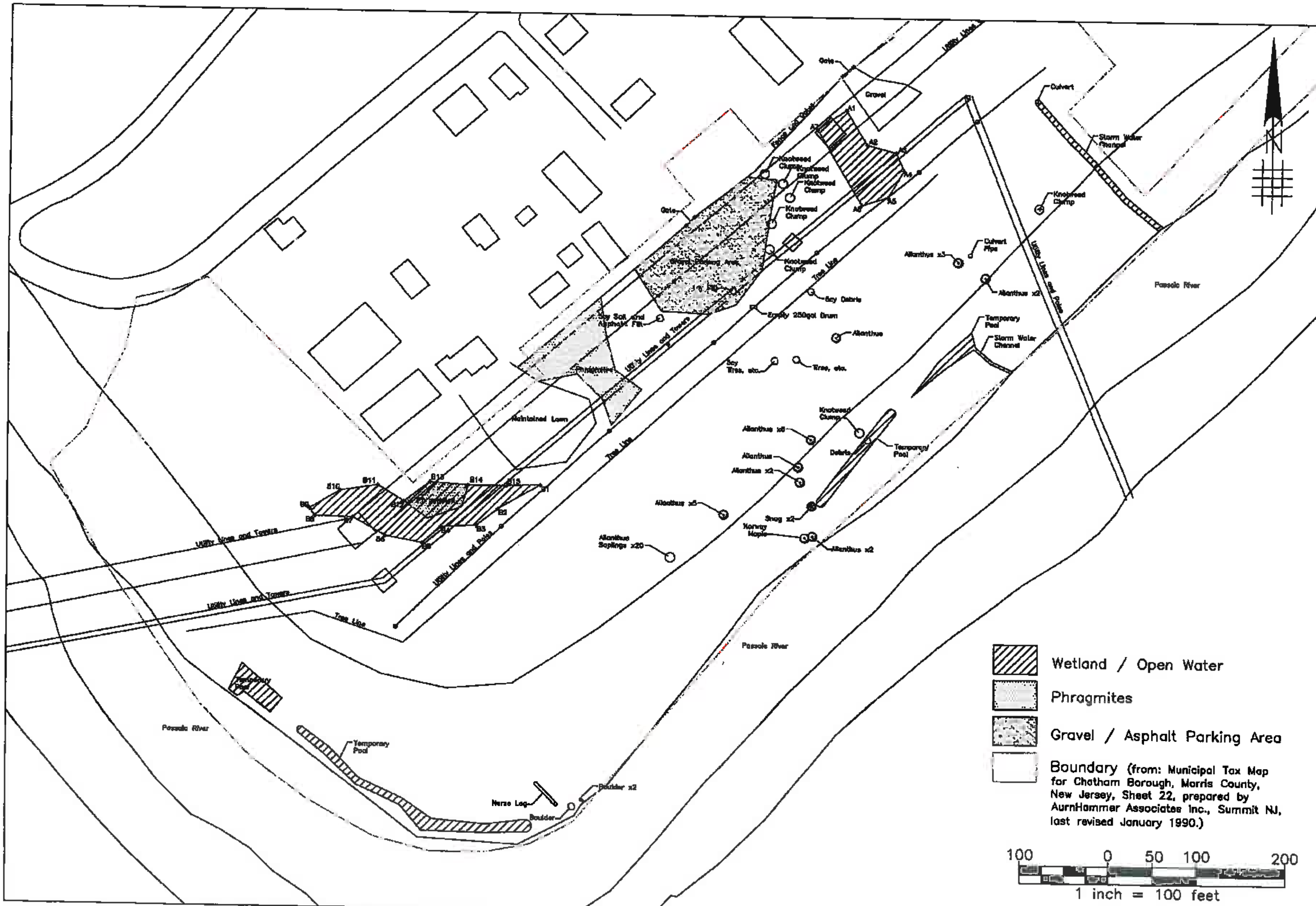

Figure 8

GPS Project Area Map

River Road Open Space
Block 137, Lot1; Block 138, Lot1;
Block 139, Lot 1 and Block 140, Lot 1
Chatham Borough
Morris County, New Jersey

0 1"

Date: Oct. 8, 2009
Project: 3149
Figure: #8

Date	Chk'd	Revision		
Dsgn	Dr	Chk'd	App	
SJR	SJR	C. Helm	XXX	

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fleabane (*Erigeron annuus*), bush clover (*Lespedeza capitata*), Queen Anne's lace (*Daucus carota*), wild bergamot (*Monarda fistulosa*), pokeweed (*Phytolacca americana*) and several species of goldenrod (*Solidago* spp.). Invasive shrubs and trees identified in this area included multiflora rose (*Rosa multiflora*), Chinese privet (*Ligustrum sinense*), autumn olive (*Elaeagnus umbellata*) and tree-of-heaven tree saplings. Non-invasive tree species noted included a few hickory (*Carya* spp.) and northern red oak (*Quercus rubra*).

The invasive species need to be managed to enhance this area. Suggested methods of management are described in Section 3.0 and Appendix D.

Hardwood Forest

An intermediate-aged mixed hardwood forest community is located between the utility easement and the Passaic River. Dominant canopy and sapling species considered invasive include tree-of-heaven and Norway maple (*Acer platinoides*). Dominant canopy and sapling species native to the region include red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), sugar maple (*Acer saccharum*), box elder (*Acer negundo*), white ash (*Fraxinus americana*), green ash (*Fraxinus pensylvanica*), black cherry (*Prunus serotina*), persimmon (*Diospyros virginiana*), tulip poplar (*Liriodendron tulipifera*), black walnut (*Juglans nigra*), American elm (*Ulmus americana*), shagbark hickory (*Carya ovata*), pin oak (*Quercus palustris*), northern red oak, sassafras (*Sassafras albidum*), ironwood (*Carpinus caroliniana*) and flowering dogwood (*Cornus florida*). Invasive shrubs within the hardwood forest include multiflora rose, tatarian honeysuckle (*Lonicera tatarica*), Japanese barberry (*Berberis thunbergii*) and wineberry (*Rubus phoenicolasius*). Native shrubs within the hardwood forest included black haw viburnum (*Viburnum prunifolium*), blackberry (*Rubus allegheniensis*) and a few American bladdernut (*Staphylea trifolia*). Japanese honeysuckle was a common invasive vine. Native vines included common greenbrier (*Smilax rotundifolia*), poison ivy (*Rhus radicans*), Virginia creeper (*Parthenocissus quinquefolia*) and fox grape (*Vitus labrusca*). Invasive herbaceous species common in the understory include stiltgrass, garlic mustard (*Alliaria petiolata*), curly dock, goldenrod and reed canary grass (*Phalaris arundinaceae*). Native herbaceous species common in the understory include white snakeroot (*Ageratina altissima*), deer tongue (*Dichanthelium clandestinum*), Virginia knotweed/jumpseed (*Polygonum virginianum*), Japanese knotweed, stout wood reed (*Cinna arundinaceae*), New York fern (*Thelypteris noveboracensis*), bracken fern (*Pteridium aquilinum*), Christmas fern (*Polystichium acrostichoides*), jack-in-the-pulpit (*Arisaema triphyllum*), white avens (*Geum canadense*), deptford pink (*Dianthus armeria*), Gray's sedge (*Carex grayi*), and additional unidentified sedge species (*Carex* spp.)

It was noted during the field investigation that only a limited number of standing dead or partially dead trees, or "snags," were present within the site. Snags provide valuable habitat for wildlife. In particular, snags offer potential roosting opportunities for bats and nesting and foraging for a number of species of birds. Bird species richness is directly correlated to the quality and quantity of available snags.

The forest understory has been heavily browsed by white tailed deer (*Odocoileus virginiana*). Non-native plants are generally not palatable/less palatable to white-tailed deer. The selective herbivory focuses feeding pressure on the native plants, which favors the proliferation of non-

native species, ultimately reducing plant diversity. As a result, many of the plants that currently inhabit the forest understory are non – native, invasive species.

"Invasive species" refers to species that become established in a new ecosystem in which they have not co-evolved. These plants proliferate, spread and persist and cause or are likely to cause detrimental impact to the economy, environment or to human health. These plants tend to:

- Produce large numbers of new plants each season
- Tolerate many soil types and weather conditions
- Spread easily and efficiently, usually by wind, water, or animals
- Grow rapidly, allowing them to displace slower growing plants
- Spread rampantly when they are free of the natural checks and balances found in their native range
- Negatively impact native wildlife by reducing habitat variability

Suggested methods for management of invasives are described in Section 3.0 and Appendix D.

Wildlife observed in the forest during the field visit included opossum (*Didelphis virginiana*), red-bellied woodpecker (*Melanerpes carolinus*), downy woodpecker (*Picoides pubescens*), American robin (*Turdus migratorius*), catbird (*Dumetella caroliniensis*), northern flicker (*Colaptes auratus*) and white-tailed deer.

Forested Riparian Floodplain

Forested riparian floodplain habitat is located in the level areas adjacent to the banks of the Passaic River. These areas receive overflow from the Passaic River during periods of high water. Dominant canopy and sapling species within the forested floodplain include American sycamore (*Platanus occidentalis*), silver maple, red maple, American elm, bladdernut, persimmon, box elder, river birch (*Betula nigra*), black cherry, northern red oak, sassafras, and ironwood. Herbaceous species identified include arrowhead (*Sagittaria latifolia*), skunk cabbage (*Symplocarpus foetidus*), blue flag (*Iris versicolor*), umbrella sedge (*Carex umbellata*), fringed sedge (*Carex crinita*) and stout wood reed.

Forested Wetlands

Temporary forested pools are located within the riparian floodplain areas of the forest (Appendix E-Photo 10). Hydrology for these pools is derived primarily from overbank flow associated with the Passaic River. These pools are sparsely vegetated depressions that generally parallel the Passaic River. They have formed behind the slightly elevated berms that naturally develop paralleling surface waters. These berms form slowly over time as the heavier sediment(s) from floodwaters is deposited parallel to the river bank. These wetlands exhibit ponding, saturated soils and water stained leaves. Vegetation identified growing around and within these wetlands included fowl manna grass (*Glyceria striata*), sensitive fern (*Onoclea sensibilis*), soft rush (*Juncus effusus*), Pennsylvania smartweed (*Polygonum cuspidatum*), and dark green bulrush (*Scirpus atrovirens*).

No wildlife was noted; however, amphibians that may occur in the area and are known to occupy and breed in temporary pools include spring peeper (*Pseudacris crucifer*), blue-spotted

salamander (*Ambystoma laterale*), southern leopard frog (*Rana sphenocephola*), green frog (*Rana clamitans*) and wood frog (*Rana sylvatica*).

Emergent Wetlands

Emergent wetland plants are generally water dependent herbaceous perennials. Two emergent wetlands were identified within the utility easement area (Appendix E-Photos 4 and 17). Hydrology for these wetland areas appears to be derived primarily from surface water runoff. The soils within these wetlands are likely to be compacted as a result of construction activities within the utility easement, which will limit infiltration. Common vegetation in the emergent wetlands included swamp milkweed (*Asclepias incarnata*), wool grass (*Scirpus cyperinus*), soft rush, broad-leaved cattail (*Typha latifolia*), jewelweed (*Impatiens capensis*), sensitive fern, common reed, purple loosestrife (an invasive species), and sedges (*Carex* spp.).

Open Water

Open water consists of the Passaic River, which serves as the southeastern boundary of the project area. A tributary flows through the forest and into the Passaic River at the northeastern end of the project area. The source of this tributary is a large diameter culvert that discharges from beneath an unpaved road that accesses the electric utility easement. The Passaic River is a meandering river approximately 50 feet wide along the project area. The Passaic River originates near Mendham, New Jersey and flows for approximately 90 miles until its confluence with Newark Bay.

Wildlife observed along the river during the field visit included several great blue herons (*Ardea herodias*) and a kingfisher (*Ceryle alcyon*). The great blue heron is a species of special concern as a breeding population in New Jersey. This means that further population declines will result in a State listing as a threatened species. The great blue heron nests communally in rookeries and constructs large stick nests in tree canopies. No great blue heron rookeries or nests were noted during our field investigations.

2.4 Wildlife/Endangered and Threatened Species

The NJDEP Natural Heritage Program (NJNHP) was contacted to determine if any records of endangered or threatened species have been recorded for the project site. A letter from the NJ NHP dated August 7, 2009, (Appendix F) identifies only the fowler's toad (*Bufo woodhousii fowleri*), great blue heron, and spotted turtle (*Clemmys guttata*). These three species are identified as species of special concern, and none of these species are state or federally listed as endangered or threatened. The NJNHP also provides a list of additional species within one-mile of the site. Species identified within one mile include barred owl (*Strix varia*), red shouldered hawk (*Buteo lineatus*), blue spotted salamander (*Ambystoma laterale*), wood turtle (*Glyptemys insculpta*) and the northern spring salamander (*Gyrinophilus p. porphyriticus*). Except for the northern spring salamander, each of these species is listed as endangered or threatened. The NJNHP does not identify any rare plants or natural communities within one mile of the site.

The NJDEP Landscape Project mapping for the site was also reviewed (Figure 9). The NJDEP Endangered and Non-Game Species Program (ENSP) developed the landscape project maps in order to identify critical rare species habitats based on land use classifications, documented rare

species locations and habitat models linked to each of the rare, threatened or endangered species. The habitat patches are then assigned a Rank based on the status of the species that inhabit the habitat patches, such as Federal/State Endangered or Threatened and Priority Species. This mapping provides a basis for planning and management guidelines for rare species protection. Our review of the landscape project mapping confirms the results of the NJDEP Natural Heritage Program record search as described above.

Wildlife observed during the field visit include American robin, northern flicker, great blue heron, king fisher, several species of woodpecker, catbird, opossum and white-tailed deer. A number of wildlife species are known to occupy habitats in the nearby Great Swamp National Wildlife Refuge (Appendix G). Many of these species have the potential to occupy habitats found on the River Road site. A brief description of several sensitive species that are known to occur within the project vicinity is provided below.

Wood turtle
The wood turtle is never found very far from water. In the winter they inhabit deep pools with overhanging roots or logs along the stream bank. Breeding usually takes place in the water in the spring or fall. During warmer months, the wood turtle can typically be found foraging and basking in forests with openings in the canopy. The wood turtle, a Threatened species in New Jersey, is known to occupy the Passaic River. Riparian areas and lands adjacent to riparian areas in the project area may provide potentially suitable wintering, breeding, basking, and foraging habitats for the wood turtle.

Indiana Bat
In the summer months, the Indiana bat occupies large trees with peeling bark, dead trees or structures with crevices to hide in. The Indiana bat forages in riparian and forested floodplain areas located along the banks of streams or lakes. Winter hibernacula for these bats include secluded caves or mines. Hibernia Mine, located in Rockaway, New Jersey approximately 20 miles away, is an important hibernacula site for the Indiana bat. The Indiana bat is listed as Federally Endangered and State Endangered in New Jersey. This bat was discovered in the nearby Great Swamp National Wildlife Refuge in 2006 and has the potential to occupy the forest area in the River Road site.

Red Shouldered Hawk
The red shouldered hawk has a dual status. The breeding population of the red-shouldered hawk is State-listed as Endangered and the winter/migratory population is State-listed as Threatened. Red-shouldered hawks prefer mature forested wetlands and riparian forests, but will use upland forest, particularly for feeding and roosting. The upland areas they typically utilize are near water bodies with associated wetlands. Nesting occurs in deciduous, coniferous, and mixed woodlands, often containing standing water. They most commonly nest in large deciduous trees of various species, usually in forests of mixed conifer and deciduous species, and most commonly in wetlands. Red-shouldered hawks prefer large wilderness areas and tend to avoid areas of human habitation. The red shouldered hawk is an area-sensitive species that typically nests away from residences, roads, and development. Although the project site is relatively secluded within the Boro of Chatham, the forest is fragmented and isolated from surrounding

large forest tracts. It is unlikely that the red shouldered hawk would utilize the project site for breeding, although it could be used occasionally as foraging habitat.

Barred Owl

The barred owl has a dual status. The breeding population of the barred owl is State-listed as Threatened and the winter/migratory population is also State-listed as Threatened. The barred owl requires large tracts of undisturbed forest dominated by mature and old growth stands and high canopy cover. The large tree habitat is necessary to provide large old cavity trees for nest sites as well as open flyway space below the canopy for hunting. Wetlands are typically used significantly more by barred owls than by other sympatric nesting owls. The reason for this is likely due to the fact that wetland complexes often represent the last remaining large area refuges for forest species. Barred owl territories are very large (mean = 676 acres) and are usually located a considerable distance (mean = 2,204 feet) from houses and other buildings (Bosakowski and Smith 1997) showing a significant avoidance of human disturbance and habitat alteration. The barred owl is a large owl that resides in forests and demonstrates long-term site fidelity in areas that remained undisturbed. The project site forest is relatively small in size and isolated by development from surrounding large forest tracts. It is unlikely that the barred owl would utilize the project site for breeding; however it would be expected to forage within the riparian zones along the Passaic River.

2.5 Debris Piles and Disturbed Areas

Several areas of debris were identified and these are identified on the GPS Project Area Map (Figure 8). An empty 250 gallon tank is located within the utility easement along the edge of the forest and former parking area. Tarps, bubble wrap bundles, several tires and an old deteriorated concrete culvert were found in the forest. Electrical components and asphalt tailings were found along the border between the utility easement and the forest. Removal of the asphalt tailings, oil tank and deteriorated concrete culvert will require heavy equipment. Other debris can be collected manually. Debris should be removed during winter months when visibility will be improved. Asphalt tailings, if relatively "clean" and not mixed with soil or other debris, can usually be recycled. It is estimated that approximately 20 cubic yards of debris may be onsite.

3.0 ENHANCEMENT CONSIDERATIONS AND RECOMMENDATIONS

3.1 Management Objectives

Management efforts will be directed toward reducing the abundance of invasive plant species and enhancing the existing habitats and native species identified on the site. Other objectives include providing and maintaining habitats that are potentially suitable for threatened and endangered species known to occur in the vicinity and providing passive recreational use for the public. A small parking area is proposed within the same location as the existing deteriorated parking lot. A trail and small dock have been included in the conceptual design in order to provide an access point for kayaks/canoes to the Passaic River. Community gardens, a native plant display garden, and/or a butterfly garden would be appropriate for developing within the utility easement since there is abundant sunlight. Any work within the utility easement must be coordinated with the easement holder; and in accordance with the NJDEP Freshwater Wetlands

Legend

Site Location

Landscape Project v2.1

Forested Wetland Habitat

Priority Species (2)

Forest Habitat

Priority Species (2)

Sources:
NJDEP Forest and Forested Wetland Critical Habitat, Edition: Version 2.1, 200607, New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered Non-Game Species Program, vector digital data, NJ Division of Fish and Wildlife, Trenton, NJ, November 2007.
New Jersey 2007-2008 High Resolution Orthophotography - JPEG2000 5K Tiles, State of New Jersey - Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), Trenton, NJ, October 2008.
This (map/publication/report) was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

Figure 9
NJDEP Landscape Project Mapping

River Road Open Space
Block 137; Lot 1, Block 138; Lot 1,
Block 139; Lot 1, and Block 140; Lot 1
Chatham Borough
Morris County, New Jersey

ASGECI Project # 3149

N
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500
Feet

James S. Greene Environmental Consultants

Protection Act Rules (N.J.A.C. 7-7A), and the Flood Hazard Area Control Act Rules (N.J.A.C. 7:13).

3.2 Rules and Regulations

The project site includes several areas of freshwater wetlands and the Passaic River. The freshwater wetlands and their associated transition areas will be regulated in accordance with NJAC 7:7A Freshwater Wetlands Protection Act rules. The flood plains and riparian zone associated with the Passaic River will be regulated in accordance with the Flood Hazard Area Control Act rules at NJAC 7:13. A discussion of the rules and potentially regulated and non regulated activities is provided below under 3.2.1 and 3.2.2. The recommendation to construct a trail/pedestrian path and a non-commercial boat dock within the site will require that design avoid and minimize impacts to the extent possible. NJDEP permits would be required depending on the final selected design. We recommend that a pre-application conference with the NJDEP be requested to evaluate the projects that may impact regulated areas.

A soil erosion and sediment control plan would be required if the project activities exceed 5000 square feet of total disturbance.

3.2.1 Freshwater Wetlands Protection Act rules

The freshwater wetlands protection act (FWPA) rules at NJAC 7:7A include a number of provisions that protect existing wetlands and wetland transition areas. Note that ASGECI has preliminarily identified the wetland boundaries onsite and these approximate boundaries are provided on Figure 8, the GPS Project Area Map. Based on our best professional judgment the onsite wetlands would likely be classified as intermediate resource value wetlands and would include a standard 50 foot width wetland transition area. Performance of an onsite, detailed wetland delineation and field survey of the wetland delineation, along with locating of the top of bank of the Passaic River, would more accurately establish the location of regulatory boundaries within the project site. The NJDEP is the ultimate arbiter with regard to state open water/wetland boundaries and the width of the wetland transition area. A summary of the types of activities that are either regulated or authorized (not-regulated) under the FWPA rules is provided in Appendix H.

The construction of a trail that will disturb wetlands or wetland transition areas will require authorization under the FWPA rules. A General Permit #17 can be obtained to authorize trails and boardwalks that cross wetlands or wetland transition areas. A General Permit #19 may also be obtained to construct a public dock or pier that disturbs wetland/wetland transition areas along the Passaic River.

The NJDEP regulates "the destruction of plant life which would alter the character of a freshwater wetland including killing vegetation by applying herbicides or by other means..." A General Permit #16 for Habitat Creation and Enhancement may need to be obtained to authorize enhancement of existing wetlands. Limited management of vegetation and planting of gardens (2,500 sq ft or less) within wetland transition areas is not a regulated activity.

3.2.2 Flood Hazard Areas Control Act rules

The Flood Hazard Area Control Act (FHACA) rules at N.J.A.C. 7:13 include a number of provisions that protect existing flood hazard areas (flood fringe and floodway) and the adjacent riparian zone. A regulated flood hazard area exists along all waters with a drainage area of 50 acres or more. In addition, a riparian zone exists along every regulated water. The Passaic River within the project area will include both a regulated flood hazard area and riparian zone. The approximate extent of the flood hazard area is provided on Figure 4, the FEMA Floodplain Map. This limit was obtained from FEMA mapping that includes the project site. More detailed mapping is available through the NJDEP; however its value is limited unless and until a topographic survey is obtained for the site. Based on our best professional judgment, the riparian zone that parallels the Passaic River will be 50 feet in width for the length of the project site. A summary of the types of activities that are either regulated or authorized (not-regulated) under the FHACA rules is provided in Appendix H.

The construction of a pedestrian trail within 50 feet of the top of bank of the Passaic River will require an FHACA Individual Permit. This permit will allow up to 1000 sq feet of disturbance within the 50 foot riparian zone; however, all disturbances would have to be compensated for at a 2:1 ratio; meaning that twice the area of disturbance would have to be replanted, also within 50 feet of the top of bank. Based on the Proposed open space plan (back pocket) we have shown the pedestrian path at a distance of greater than 50 feet from the top of bank of the Passaic River in order to avoid disturbing the riparian zone. It is recommended that the trail be maintained at a minimum distance of 50 feet from the top of bank of the Passaic River.

In accordance with N.J.A.C. 7:13-7.2(a)2, the construction of a trail at grade within a flood hazard area is authorized under Permits-by-Rule, as long as "no vegetation is cleared cut or disturbed within the riparian zone" and no disturbance occurs within 25 feet of the top of bank. Prior written notice to the NJDEP is required for activities under NJAC 7:13-7.2(a)2.

In accordance with NJAC 7:13-7.2(a)6, the construction of a boat launching ramp of no more than 1000 sq ft in size is also authorized under the Permits by Rule. Prior written notice to the NJDEP is required for activities under NJAC 7:13-7.2(a)6.

A pre-application conference should be scheduled with the NJDEP prior to developing any final plans that include potential projects that may require NJDEP permits, such as the construction of trails/boardwalks; the construction of a public recreation dock; or the removal of invasive species or replanting of native species within wetlands, wetland transition areas, flood hazard areas or the riparian zone.

3.3 Human Use

The site is currently underutilized as open space. The implementation of this open space management plan is intended to increase human use to include walking, bird watching, fishing, kayaking/canoeing, and possibly gardening. Camping, picnicking, off-road vehicles, horse-back riding and bicycles should not be permitted within the site. The following recommendations are

provided as potential opportunities for public utilization of the project site. The Proposed Open Space Plan in the back pocket depicts these recommendations.

Considerations and Recommendations:

1. Remove deteriorated asphalt and debris and install gravel parking area

There is currently a deteriorated asphalt parking area within the north-central part of the site. This is unsuitable for parking cars in its present condition. An area large enough to accommodate 10 cars (10 spaces and 1 barrier free space) is included in the conceptual design for the site. The current condition of the asphalt is not suitable for reuse. The entire asphalt lot should be removed and the area should be restored as a gravel parking lot. This would allow for safe access to the site. Reducing the area of asphalt and replacing this with a smaller gravel lot will reduce stormwater runoff. Debris including a 250 gallon tank, tarps, bubble wrap, old tires, concrete chunks, electrical components and asphalt tailings should also be removed to help with the aesthetic appeal of the site.

Cost Estimate
Preliminary costs for the replacement of the parking lot and debris removal are included in the cost estimate (Appendix I). The cost for the removing the existing deteriorated asphalt and replacement with clean gravel is included under Initial Planning ($10,000), Site Preparation ($9,180), Site Access ($40,240) and Earthwork ($19,700). The cost for the debris removal, estimated to be 20 cubic yards, is included under Earthwork ($2,000).

2. Construct a pedestrian path through the forest and early successional field

Access for hiking on the site is currently not available. A trail should be constructed beginning at the proposed parking area and continuing as a loop through the forest and early successional fields. The trail can also be constructed to access the proposed kayak/canoe launch (See Proposed Open Space Plan in the back pocket). The forest understory is open enough to allow a trail to be constructed with minimal disturbance to vegetation and no tree removal. The trail can be constructed of aggregate or wood chips. Wood chips will require annual replacement. Except for the access to the canoe launch, and due to environmental constraints, the trail should remain a minimum of 50 feet from the top of bank of the Passaic River. Interpretive signage can be added along the trail providing information on the habitats and wildlife known from the area. Native plantings or deer exclosures could be concentrated along the trail.

As discussed above in Section 3.2 (Rules and Regulations), the FWPA and FHACA rules must be addressed to construct a pedestrian trail within wetlands, wetland transition areas and the flood hazard area. As currently designed the trail will avoid the riparian zone of the Passaic River. A FWPA General Permit #17 can be obtained to authorize trails and boardwalks that cross wetlands or wetland transition areas. In accordance with N.J.A.C. 7:13-7.2(a)2, the construction of a trail at grade within a flood hazard area can be authorized under Permits-by-Rule. Prior written notice to the NJDEP is required for activities under NJAC 7:13-7.2(a)2.

Cost Estimate

A preliminary cost estimate for the pedestrian trail is included in the cost estimate (Appendix I) under Pedestrian Trail ($37,500). A wetland delineation must be performed and environmental permitting will be required to authorize the trail construction. These additional costs are included in the cost estimate under Initial Planning ($11,000).

3. Develop a kayak/canoe launch

A kayak/canoe launching area can be installed along the bank of the Passaic River, just off of the main pedestrian path. A location in the immediate vicinity of several large boulders and a large fallen log has been tentatively selected. This location is further from the parking area than other locations down river; however it was selected due to its aesthetic qualities. The launch would include a small floating dock that would be capable of resisting flooding.

As discussed above in Section 3.2 (Rules and Regulations), the FWPA and FHACA rules must be addressed. A FWPA General Permit #19 will authorize the construction of a public dock or pier that disturbs wetland/wetland transition areas along the Passaic River. In accordance with the FHACA rules (N.J.A.C. 7:13-7.2(a)6), the construction of a boat launching ramp of no more than 1000 sq ft in size may be authorized under the Permits by Rule. Prior written notice to the NJDEP is required for activities under NJAC 7:13-7.2(a)6.

Cost Estimate

A preliminary cost estimate for the kayak/canoe launch is included in the cost estimate (Appendix I) under Boat Launch ($6,500). A wetland delineation must be performed and environmental permitting will be required to authorize the kayak/canoe launch construction. These additional costs are included in the cost estimate under Initial Planning ($11,000).

4. Develop various gardens within the utility easement

The utility easement area is currently overgrown with invasive species, primarily mugwort along with patches of common reed and Japanese knotweed. This open area should be transformed to create a functional use of public space. Several types of gardens can be developed within this part of the site. Community vegetable gardens, a butterfly garden, a native plant display garden and a rain garden are potential options. The rain garden would capture and treat any runoff from the gravel parking area. Areas that are not dedicated to gardens can be seeded with native species of warm season grasses and forbs, once the invasive species are eliminated through herbicide treatment. This is discussed in greater detail below under Section 3.4.1 Field Habitat. The owner/operator of the utility easement should be contacted to confirm all site development proposals and the location of a dedicated access road. Invasive species would need to be managed, deteriorating asphalt would need to be removed, soils would need to be decompacted, and compost or topsoil would need to be brought in to restore the substrate within potential garden areas. The area could be seeded with a warm season grass and wildflower mix once the invasive species have been eliminated and the substrate has been prepared. Restoration activities and gardens would have to be designed to avoid wetlands; however, these activities may occur within wetland transition areas without requiring a permit.

Cost Estimate
Preliminary costs for the various gardens are included in the cost estimate (Appendix I). The cost for the community garden is included under Community Gardens ($55,700) and Utility Systems ($33,500). The costs for the butterfly garden and the rain garden are included under Landscaping ($30,400). The costs for herbicide application and warm season grass seeding are identified under Section 3.4.1 below.

3.4 Habitat Enhancement and Maintenance

The forested area paralleling the Passaic River and the early successional field beneath the utility easement include a number of invasive plant species. These areas are suitable for enhancement through the removal of invasive species followed by replanting with native plants. Some additional opportunities to enhance usage by wildlife can be implemented by creating "snags," installing deer exclosures, and the installation of nest and bat boxes.

3.4.1 Field Habitat

Considerations and Recommendations:

1. Control invasive plant species in the fields and replant with warm season grasses

Common invasive species within the field include common mugwort, common reed, Japanese knotweed, privet, bindweed, orchard grass (naturalized), tatarian honeysuckle, common mullein (naturalized), wineberry, and bull thistle (naturalized). The field can be managed to introduce warm season grasses and forbs. The preferred method for eliminating the invasive species that dominate the site would be through the use of herbicides. There is no other practicable method that is suitable for eliminating invasive species within such a large area. Once established, warm season grasses and forbs can be maintained through annual mowing to a height of 5 inches. It is preferable that mowing be conducted in the late fall (after the growing season) or early spring; however, mowing should be restricted from April 15 through September 15, with a focus on May 1 through July 31, which is a critical nesting and brood rearing period for grassland birds. Description and control methods for mugwort, common reed and knotweed are provided in Appendix D.

Cost Estimate
Preliminary costs for the herbicide treatment and warm season grass seeding are included in the cost estimate (Appendix I) under Landscaping ($7,500).

3.4.2 Forest Habitat

Considerations and Recommendations:

1. Control invasive plant species in the forest and replant with native species

Common invasives displacing native species within the forest include tree-of-heaven, Norway maple (only one found), multiflora rose, Japanese barberry, Japanese honeysuckle, and stiltgrass. Invasive plant species should be reduced or removed through either herbicide application or manual removal where practicable within the site. Invasive trees and shrubs to be removed would need to be identified and flagged by a restoration specialist prior to treatment/removal by the contractor. A discussion of control methods for the most common species is provided in Appendix D. Areas subject to invasive species removal should be replanted with native species to help prevent recolonization. All replanting with native species should be performed only within areas protected by deer exclusion fencing.

Cost Estimate

Preliminary costs for the habitat enhancement are included in the cost estimate (Appendix I). The preliminary cost for herbicide application, manual invasives removal, snag creation, nest boxes, deer exclosure fencing and native plantings are included under Landscaping ($14,500). Manual invasives removal does not include a cost for a restoration specialist and is based on two men for one day. The cost for native plantings is based on planting 100 shrubs (#2 container) at 8' on-center and 425 forbs (2"plugs) at 4' on-center within a 6,800 sq ft area. This 6,800 sq ft area is the area that would be surrounded by 330 linear feet of deer exclosure fencing.

2. Preserve existing and create additional dead standing trees within the forest to benefit wildlife.

Tree snags, tree cavities, decaying logs and brush piles provide cover and food for a variety of wildlife including bats, birds, amphibians, reptiles, small mammals, and insects. Decaying logs and trees retain moisture and nutrients that aid in new plant growth. Young plants often sprout from decaying trees and limbs known as nurse logs (Appendix E-Photo 14). Dead and dying trees in the forest (Appendix E-Photo 15) should be left undisturbed for wildlife habitat and food. Retaining a variety of sizes and types of downed wood is usually the best strategy to establish habitat for wildlife. Creating additional dead standing trees or "snags" is recommended. Approximately 3-4 snags per acre are required to maintain suitable breeding and roosting habitat for the common cavity nesting species, such as red bellied woodpecker and downy woodpecker. Standard silvicultural (forestry) practices can be employed to create snags through selection of trees that can be girdled. Trees to be girdled should be those that occur in the intermediate canopy or subcanopy and would otherwise die or be crowded out in the near term. This allows growth to be focused on certain superior trees. Superior trees would be those within the dominant canopy that provide "mast," such as oaks and hickories.

Cost Estimate

Preliminary costs for the development of additional snags are included in the cost estimate (Appendix I) under Landscaping ($2000). Potential snags would need to be identified and flagged by a NJ State Approved forester prior to treatment by the contractor.

3. Plant native species to increase the diversity of the vegetative community and provide food and cover for wildlife.

Animals directly or indirectly rely on plants for food. The diversity of animals in a habitat is closely linked to the diversity of the plant community in that habitat (Rosenzweig, 1995). A goal of this open space plan is to benefit wildlife through habitat improvement. Planting deer resistant native plant species is one method for increasing plant diversity within the site. Planted trees should be a minimum of 6-7 feet in height, to be above the "browse line," and should be protected by trunk wrap or tree tubes to prevent "buck rub." Alternatively, plantings can be installed within deer exclosures (see below). Suggested deer resistant tree species include American beech (*Fagus grandifolia*), sweetgum (*Liquidambar styraciflua*), birch (*Betula* spp.) and shadbush (*Amelanchier arborea*). Deer resistant shrubs include nannyberry (*Viburnum lentago*), southern arrow-wood (*Viburnum dentatum*), red-osier dogwood (*Cornus amomum*), Maple-leaf viburnum (*Viburnum acerifolium*), witch hazel (*Hamamelis virginiana*), spicebush (*Lindera benzoin*), Virginia sweetspire (*Itea virginica*), and sweet pepperbush (*Clethra alnifolia*). Herbaceous species might include various ferns, cardinal flower (*Lobelia cardinalis*), and lizard's tail (*Saururus cernuus*). The latter two plants prefer sunny, moist locations. Although these plants are considered deer "resistant," they may nonetheless be subject to herbivory depending on deer pressure/population.

Cost Estimate

Preliminary costs for the additional deer resistant plantings are included in the cost estimate (Appendix I) under Landscaping ($2,600). The cost for deer resistant plantings is based on planting 20 trees (#5 container/ 6-7 ft. hgt.), 20 shrubs (#3 container) and 50 forbs (2" plugs).

4. Install deer exclosures to allow native plants to recover and naturally increase plant species diversity

The forest understory has been severely impacted by herbivory from white tailed deer (*Odocoilus virginiaus*). Deer browsing results in a reduction in species richness and reduces or eliminates forest regeneration. Overabundance of deer also affects other wildlife by reducing food and cover. The number of deer ticks (*Ixodes scapularis*), the species that carries Lyme disease, also increases along with increasing deer population. It has also been shown that when deer densities are reduced to approximately 20 per sq mi, the native forest vegetation can recover and vegetation species diversity will increase. It may require years to reverse the damage caused by high deer densities.

The NJDEP identifies deer exclosure fencing as an effective method to control deer. Various types of deer fencing are available such as wire fencing, polypropylene fencing, high tensile electric fencing and electrical deterrent tape. ASGECI recommends the use of 8' height heavy duty polypropylene fencing along with metal or pressure treated wood posts. The fencing must be properly staked down to the ground to prevent deer from lifting the bottom edge. Fencing may reduce deer impacts in a particular area, but in the absence of an effective deer management program, deer damage will increase beyond the fenced exclosures.

A maintenance plan will be required. The deer fencing is subject to potential problems, from falling limbs or breaching by deer, either through or under the fencing. It will be critical to regularly inspect the fencing in order to maintain its integrity. It will also be important to

manage invasive species, since their continued growth within exclosures will compete with planted natives and also prevent the reemergence of the native seed bank.

Cost Estimate
The preliminary cost for installing the deer exclosure fencing is included in the cost estimate (Appendix I) under Landscaping ($2,000). This cost is based on installing a single 330 ft length roll with posts at 10 ft on center spacing. A 330 ft roll would enclose a 7000 to 8000 sq ft area, depending on shape.

5. Implement a deer management program to allow native plants to recover and naturally increase plant species diversity

A deer control program within the River Road site is recommended to complement the deer exclosures and promote regeneration of native species. The publication "Evaluation of Deer Management Options" prepared by the Northeast Deer Technical Committee (April 2008) suggests that deer hunting is the most effective tool, proving to be the most efficient and least expensive technique for managing deer at a desired level. A long-term deer hunting program is the only method that will ultimately provide for the restoration of the River Road site at the landscape level. If a low level of deer herbivory can be achieved, the deer exclosures can be expected to provide a source for the effective dispersal of native plants to adjacent areas throughout the site. No cost is associated with implementing this program

6. Install nest boxes and bat boxes

A variety of nest boxes could be installed. Bluebird/Eastern tree swallow boxes would be appropriate for installation with the early successional field setting along the utility easement. Boxes for screech owl/American kestrel and black capped chickadee/tufted titmouse/house wren would be appropriate for the forested setting. Additional information on building bird houses is available at http://www.wild-bird-watching.com/Building_Bird_Houses.html. Bat boxes can also be installed along the forest/early successional field interface. The website http://www.batcon.org/ provides information on bat boxes

Cost Estimate
The preliminary cost for installing nest or bat boxes is included in the cost estimate (Appendix I) under Landscaping ($1,000). The cost is based on installing 10 nest/bat structures.

3.4.3 Wetlands

The project site includes two distinct emergent wetlands within the utility easement and several areas identified as "temporary pools" within the forest, paralleling the Passaic River. The southernmost emergent wetland within the utility easement includes an area dominated by common reed. This invasive plant should be eradicated and the area replanted with native wetland plants. The northernmost emergent wetland included primarily native plants and does not require management. The temporary pools are largely void of emergent wetland vegetation and provide limited habitat for amphibians. These pools can be enhanced by increasing the

amount of structure, which will provide refuge for amphibians. Some shade tolerant wetland plants, such as ferns, might also be planted to provide additional vegetative cover.

Considerations and Recommendations:

1. Introduce large woody debris and native plants into temporary pools to provide habitat for amphibians

The temporary pools can be enhanced through introducing large wood debris and through planting. Plants that are deer resistant, such as sensitive fern, cinnamon fern, royal fern, sweet flag, lizard tail and button bush could be planted within the temporary pools. This would provide cover and refuge for a variety of amphibians.

Cost Estimate
The preliminary cost for improving the temporary pool habitat includes only additional deer resistant planting which is included in the cost estimate (Appendix I) under Landscaping ($2,600). It is assumed that woody debris can be placed in the temporary pools by volunteers. The cost for deer resistant plantings is based on planting 20 trees (#5 container/ 6-7 ft. hgt.), 20 shrubs (#3 container) and 50 forbs (2" plugs). Plantings within or along the fringes of the temporary pools would not require trees.

2. Restore emergent wetland within ROW

The southernmost emergent wetland includes an area that has been overgrown with the invasive species common reed. The common reed should be eradicated. Typical treatment includes a herbicide treatment in the fall (Sept/Oct) with a follow up treatment in the spring. The area could be replanted with native shrubs once the common reed has been eradicated. The area would require monitoring to ensure that the common reed does not become reestablished. Because the area is relatively small, an alternative method to eliminate the common reed, such as mowing and smothering with black plastic sheeting might be implemented.

As discussed above under Section 3.2 (Rules and Regulations), the NJDEP regulates "the destruction of plant life which would alter the character of a freshwater wetland including killing vegetation by applying herbicides or by other means...". A General Permit #16 for Habitat Creation and Enhancement may need to be obtained to authorize this work. We recommend that a pre-application conference be convened to discuss the need for this permit.

Cost Estimate
Preliminary costs to restore the emergent wetlands would require herbicide application and native plantings, which are included in the cost estimate (Appendix I) under Landscaping ($7,500). Deer exclosure fencing would also be required to protect the native plantings. A wetland delineation and environmental permitting would be required, which are included under Initial Planning ($8,000).

4.0 SUMMARY

The resource information provided in this report was acquired from existing secondary sources supplemented by a one-day qualitative field inventory and assessment, and the recommendations provided have considered current NJDEP environmental regulations.

The River Road project site includes a variety of habitats including early successional fields within the utility easement, forested riparian areas paralleling the Passaic River, and emergent and forested wetlands. The Passaic River borders the project site and provides a significant focal point. The site includes a wide range of native plants and wildlife habitats within both the early successional and forested communities; however, non-native, invasive species of plants have become established throughout all vegetated communities. Invasive species entirely dominate some areas, such as the monoculture of mugwort within the utility easement, whereas other areas include only scattered invasive plants. Selective herbivory by white tailed deer has contributed to the establishment of the invasive species. A deteriorated parking area is located near the site center and debris and piles of waste are scattered within various locations throughout the site.

ASGECI has provided a variety of recommendations for both ecological restoration and for public use and access. Opportunities to improve the habitat could include eradicating invasive species; installing native plantings such as warm season grasses and forbs; planting species beneficial to butterflies; girdling trees to create "snags", creating brush piles, installing deer exclosures, and installing bird/bat boxes. Public access and recreation opportunities might include a small 10 space gravel parking area, a walking trail with educational signage; constructing community vegetable garden; planting a native plant display garden and butterfly garden; and installing a small kayak/canoe launch. The installation of a community garden should include a reliable source for water and a structure for tools and bins for composting. The deteriorating asphalt parking area and the debris and waste piles identified during our field investigation should be removed as an initial step in the site restoration.

A preliminary cost estimate (Appendix I) has been developed for the various recommended habitat enhancement activities and the proposed park improvements. The costs are based on our best professional judgment and are for guidance purposes only.

We recommend that a pre application meeting with the NJDEP be scheduled once the extent of the public access, recreation opportunities and habitat enhancement has been determined.

5.0 REFERENCES

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Appendix A

List of Invasive Plant Species Observed at the Chatham Borough River Road Site

Common name	Scientific Name
autumn olive	*Elaeagnus umbellata*
bindweed	*Calystegia* sp.
bull thistle	*Cirsium vulgare*
common mugwort*	*Artemisia vulgaris*
common mullein	*Verbascum thapsus*
common reed*	*Phragmites australis*
curly dock	*Rumex crispus*
garlic mustard	*Alliaria petiolata*
Japanese barberry	*Berberis thunbergii*
Japanese honeysuckle	*Lonicera japonica*
Japanese knotweed	*Polygonum cuspidatum*
Japanese stiltgrass	*Microstegium vimineum*
multiflora rose	*Rosa multiflora*
Norway maple	*Acer platanoides*
orchardgrass	*Dactylis glomerata*
Chinese privet	*Ligustrum sinense*
purple loosestrife	*Lythrum salicaria*
reed canary grass	*Phalaris arundinacea*
Tartarian honeysuckle	*Lonicera tatarica*
tree of heaven*	*Ailanthus altissima*
wineberry	*Rhus phoenicolasius*
field bindweed	*Convolvulus arvensis*

*abundant species

Appendix B

List of Native Plant Species Observed at the Chatham Borough River Road Site

Common Name	Scientific Name
American elm	*Ulmus americana*
American sycamore	*Platanus occidentalis*
black cherry	*Prunus serotina*
black haw	*Viburnum prunifolium*
black walnut	*Juglans nigra*
blackberry	*Rubus allegheniensis*
bladdernut	*Staphylea trifolia*
blue flag	*Iris versicolor*
boxelder	*Acer negundo*
bracken fern	*Pteridium aquilinum*
bush clover	*Lespedeza capitata*
broad-leaved cattail	*Typha latifolia*
Christmas fern	*Polystichum acrostichoides*
common arrowhead	*Sagittaria latifolia*
common greenbrier	*Smilax rotundifolia*
daisy fleabane	*Erigeron annuus*
dark green bulrush	*Scirpus atrovirens*
deer tongue	*Dichanthelium clandestinum*
deptford pink	*Dianthus armeria*
flowering dogwood	*Cornus florida*
fowl manna-grass	*Glyceria striata*
fringed sedge	*Carex crinita*
goldenrod	*Solidago* sp.
fox grape	*Vitus labrusca*
Gray's sedge	*Carex grayi*
green ash	*Fraxinus pennsylvanica*
hickory	*Carya* sp.
ironwood	*Carpinus caroliniana*
jack in the pulpit	*Arisaema triphyllum*
New York fern	*Thelypteris noveboracensis*
northern red oak	*Quercus rubra*
Pennsylvania smartweed	*Polygonum pennsylvanicum*
persimmon	*Diospyros virginiana*
pin oak	*Quercus palustris*
poison ivy	*Toxicodendron radicans*
pokeweed	*Phytolacca americana*
Queen Anne's lace	*Daucus carota*
red maple	*Acer rubrum*

Common Name	Scientific Name
river birch	*Betula nigra*
sassafras	*Sassafras albidum*
sedge	*Carex* sp.
sensitive fern	*Onoclea sensibilis*
shagbark hickory	*Carya ovata*
silver maple	*Acer saccharinum*
skunk cabbage	*Symplocarpus foetidus*
soft rush	*Juncus effusus*
stout wood reed	*Cinna arundinaceae*
sugar maple	*Acer saccharum*
swamp milkweed	*Asclepias incarnata*
touch-me-not	*Impatiens* sp.
tulip poplar	*Liriodendron tulipifera*
umbrella sedge	*Cyperus* sp.
Virginia creeper	*Parthenocissus quinquefolia*
Virginia knotweed/jumpseed	*Polygonum virginianum*
white ash	*Fraxinus americana*
white avens	*Geum canadense*
white snakeroot	*Eupatorium rugosum*
wild bergamot	*Monarda fistulosa*
woolgrass	*Scirpus cyperinus*

Appendix C

List of Animals Observed at the Chatham Borough River Road Site

Common name	**Scientific Name**
opossum	(*Didelphis virginiana*)
white-tailed deer	(*Odocoileus virginiana*)
red-bellied woodpecker	(*Melanerpes carolinus*)
downy woodpecker	(*Picoides pubescens*)
American robin	(*Turdus migratorius*)
catbird	(*Dumetella caroliniensis*)
northern flicker	(*Colaptes auratus*)
great blue heron	(*Ardea herodias*)
kingfisher	(*Ceryle alcyon*)

Appendix D

Invasive Species Descriptions and Recommendations for Control for the Chatham Borough River Road Site

Utility Easement/Early Successional Field

Mugwort (*Artemisia vulgaris*)
This plant was introduced by European settlers in the mid 1800's largely for medicinal uses. It grows along roads, meadows and agricultural fields and prefers open sunny locations. The plant grows from an underground root network. The seeds are reported not to be viable in the northern parts of the U.S. The plant forms dense stands that restrict the growth of natives, reducing plant diversity. Mugwort was found occupying a large percentage of the herbaceous community within the utility easement.

Management:
Small infestations can be dugout however any root fragments will reroot. Repeated monthly mowing can control the spread and reduce populations. The most effective control is the application of Glyphosate or clopyralid. Several repeated applications may be required to provide good control.

Japanese Knotweed (*Polygonum cuspidatum*)
Japanese knotweed was introduced in the 1800's as an ornamental and for erosion control. This plant tolerates a wide range of soil, shade, moistures and temperature conditions. It is most commonly found in riparian areas along streams and in floodplains. Once established it is extremely persistent. This perennial grows to about 10 feet in height during summer and dies back to below ground rhizomes during winter. Japanese knotweed spreads via the stout rhizomes which can extend 45 to 60 feet from the plant, or via seed. It prefers full sun but tolerates shade. Japanese knotweed was found in a number of discrete locations within the site.

Management:
Repeated pulling of stems, 3 or more times a growing season, will exhaust the rhizome, but this may take up to ten years. Cutting and spraying the resprouts in late summer/early fall provides effective control.

Common Reed (*Phragmites australis*)
Both native and non-native (Haplotype M) forms of common reed occur in the U.S. The native plant is considered rare by some researchers. The plant typically colonizes wetlands, marshes, floodplains, wet meadows and ditches and can tolerate brackish water. It can grow to 15 feet in height and forms dense monocultures that eliminate plant diversity and inhibit wildlife. Stands of common reed pose a fire hazard. The seeds have a very low germination rate. Spread is often via plant parts (stem or root tissue) or the aggressive rhizomes that will grow overland 30 feet or more in a single growing season. It is found in all 48 lower States. The plant does provide excellent water quality treatment. Common reed occurs within the site in two particular locations within the utility easement.

Management:
Common reed can be difficult to control. Small stands can be repeatedly mowed and disked. Larger areas require mowing followed by spraying with herbicides. Spraying is most effective when performed during the late summer/early fall season. Animals can be fenced to graze areas and will substantially reduce the plant vigor and population.

Forested Riparian Zone/Intermediate Aged Forest

Tree-of-Heaven (*Ailanthus altissima*)
Tree-of-heaven, native to China, is a fast growing tree that can attain heights of 80 feet and with a girth of several feet in diameter. Male and female trees are separate. A single female tree can produce up to 300,000 winged seeds in late summer, and the seeds have a good rate of germination. It tolerates a wide range of soils and thrives in disturbed soils. It is not very shade tolerant. The tree releases allelopathic compounds from the roots that prevent the growth of other nearby plants. This tree will take over sites, forming thickets and replace native vegetation. Thickets of tree-of-heaven and individual trees or small groups of trees were identified in the forest (Figure 8).

Management:
Cutting this species encourages the development of root and stump sprouts and trunks left on the ground in contact with soil can resprout. A weed wrench can be used when the soil is moist to remove this species and small trees can be removed by hand. Root fragments left behind can result in sprouts. The most effective method of control is with the use of an herbicide (i.e. Roundup, Rodeo, Garlon) applied to the leaves, green stems, sprouts and suckers. If trees are too large for foliar spraying, the trees may be cut and an herbicide applied immediately to the cut stump or the herbicide can be applied to notches hacked with an ax into the trunk. Follow up spraying will be needed to control stump sprouts and root suckers that may emerge. Girdling may also be used on larger trees if cutting is not possible. This may kill the upper parts of the tree but spraying will still be needed for sprouts and stems. Manual removal and spot spraying can be used to manage stiltgrass, multiflora rose, Japanese barberry, and Japanese honeysuckle. One Norway maple located near the Passaic River can be girdled or cut.

Multiflora Rose (*Rosa multiflora*)
Multiflora rose was introduced to the Eastern U.S. in 1866 as rootstock for ornamental roses. In the 1930's the U.S. Soil Conservation Service promoted it for use in erosion control and as a living fence. It is tolerant of a wide range of soil moisture and light conditions and can invade many types of habitats. This plant grows aggressively and produces numerous fruits that are dispersed by birds. A single plant can produce up to a million seeds that will survive in the soil seed bank for 20 years. The arching tips of shoots will also root into the ground. Dense thickets of shrubs exclude most other plants although they do provide nest sites for birds. Multiflora rose was identified as individual plants or groups of plants throughout all portions of the site.

Management:
Individual plants can be cut or pulled out with a weed wrench. One effective method for working on multiflora rose is to have one person hold the arching canes back with a pitch fork while another person cuts the base of the plant. The plant base can then be grubbed out or treated with an herbicide. Glyphosate (Roundup™) is extremely effective if it is applied to the foliage after the plant flowers in the early spring. Rose rosette disease, a disease native to the Western U.S., has spread east and is affecting multiflora rose. The disease is spread by mites. Unfortunately, this disease will also affect all native roses as well.

Japanese Barberry (*Berberis thunbergii*)
Japanese barberry was introduced to the US as an ornamental in 1875, and remains commercially available. It can form dense stands in closed canopy forests, meadows, pastures and wetlands. It is highly shade tolerant. The branches include sharp spines. It spreads vegetatively and by seeds that are eaten by birds. Japanese barberry was noted scattered throughout the forest understory.

Management:
Individual plants can be cut or pulled out with a weed wrench. This is best done when the soil is moist which allow roots to be removed more efficiently. Make certain to wear heavy gloves due to the sharp spines. Treatment with the herbicides Glyphosate (Roundup™) and triclopyr are effective.

Japanese Honeysuckle (*Lonicera japonica*)
Japanese honeysuckle is a perennial vine that was introduced from Asia during the 1800's as an ornamental and erosion control. It is extremely widespread. This climbing, twining vine will girdle shrubs and small trees. The plant spreads by seeds, underground rhizomes and above ground runners, which can grow 30 feet in a year. In our area, the leaves tend to remain green until about mid-winter when they will drop. It prefers road sides, fields, woods edges, and disturbed forest openings. It can form dense thickets of vines in sunny locations and outcompete most plants both above and below ground. Birds feed on the (black) fruits and rabbits and deer eat the leaves.

Management:
Individual plants can be pulled out when the soil is moist, but some root fragments may remain behind and resprout. The plant can be treated with the herbicide Glyphosate (Roundup™) relatively late in the season when the leaves are still green but other plants have senesced.

Japanese Stiltgrass (*Microstegium vimineum*)
Japanese stiltgrass was introduced in Tennessee in 1919 and was spread through its use as a packing material. Japanese stiltgrass is capable of colonizing a wide range of soils and grows in full sun to dense shade. It readily colonizes disturbed sites and easily outcompetes native herbaceous plants. It spreads vegetativley by rooting at stems and from seed. One plant can produce 100 to 1000 seeds which remain viable for up to 3 years. The seeds are dispersed by surface water runoff and on the feet of animals and humans.

Management:
The plant has shallow roots and small infestations can be hand pulled, weed whacked or mowed. Make certain to do this prior to seed set which is mid to late September in our area. Large infestations can be treated with contact herbicides. Infestations will have to be treated for a number of years in order to exhaust the seed bank.

Appendix E

Photographs of Habitats, Important Natural Features and Disturbed Areas at the Chatham Borough River Road Site

PHOTO 1: Looking southwest at early successional field covered with the invasive mugwort (*Artemisia vulgaris*) and a deteriorating asphalt parking area along northwest boundary of the property

PHOTO 2: A stand of the invasive Japanese knotweed (*Polygonum cuspidatum)* located in the early successional field under the utility easement.

PHOTO 3: A discarded 250 gallon oil tank within the utility easement along the edge of the forest.

PHOTO 4: Looking south at an emergent wetland located within the utility easement at the north end of the site. A small amount of debris is located in the foreground of the photo along the edge of the wetland.

PHOTO 5: The invasive bull thistle (*Cirsium vulgare*) located in the early successional field within the utility easement.

PHOTO 6: The invasive purple loosestrife (*Lythurm salicaria*) located in the wetland area within the utility easement at the northeast end of the site.

PHOTO 7: Gate and fenceline at northwest end of the site adjacent to emergent wetland in utility easement.

PHOTO 8: Powerline right of way/late successional field at northeast end of the site.

PHOTO 9: Looking southeast across the Passaic River at the east end of the site.

PHOTO 10: Looking west at a temporary pool located in the Passaic River floodplain.

PHOTO 11: Debris (bubblewrap) in temporary forested pool.

PHOTO 12: Dead tree snag with peeling bark, suitable foraging habitat for birds and roosting habitat for bats.

PHOTO 13: River bank and boulders at the end of the proposed trail and which is a potential location for kayak/canoe launch. Trees include red maple (*Acer rubrum*), American elm (*Ulmus americana*), and northern red oak (*Quercus rubra*).

PHOTO 14: Nurse log provides substrate for plants and wildlife habitat. Log is located near the proposed canoe/kayak launch.

PHOTO 15: Dead tree (snag) in forest provides important habitat for cavity nesting birds and mammals.

PHOTO 16: Stand of the invasive tree-of-heaven (*Ailanthus altissima*) with an understory dominated by the invasive stiltgrass (*Microstegium vimineum*).

PHOTO 17: Wetland area under utility easement at southwest end of the site. A dense monoculture of the invasive common reed (*Phragmites australis*) is located within the central portion of this wetland.

PHOTO 18: Looking northeast at early successional field located at the southwest end of the site.

Appendix F

New Jersey Department of Environmental Protection (NJDEP)
Natural Heritage Program Correspondence

JON S. CORZINE
Governor

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

MARK N. MAURIELLO
Acting Commissioner

August 7, 2009

John Pabish
Amy S. Greene Environmental Consultants, Inc.
4 Walter E. Foran Boulevard, Suite 209
Flemington, NJ 08822

Re: River Road Open Space Restoration Project - ASGECI # 3149

Dear Mr. Pabish:

Thank you for your data request regarding rare species information for the above referenced project site in Chatham Borough, Morris County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3 in the highlands region, Version 2.1 elsewhere) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
Fowler's toad	*Bufo woodhousii fowleri*		SC	G5	S3
great blue heron	*Ardea herodias*		SC/S	G5	S3B,S4N
spotted turtle	*Clemmys guttata*		SC	G5	S3

We have also checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat within one mile of the referenced site. Please see Table 2 for species list and conservation status. This table excludes any species listed in Table 1.

Table 2 (additional species within one mile of referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
barred owl	*Strix varia*		T/T	G5	S2B,S2N
blue-spotted salamander	*Ambystoma laterale*		E	G5	S1
northern spring salamander	*Gyrinophilus p. porphyriticus*		D	G5T5	S3
red-shouldered hawk	*Buteo lineatus*		E/T	G5	S1B,S2N
wood turtle	*Glyptemys insculpta*		T	G4	S2

We have also checked the Natural Heritage Database for occurrences of rare plant species or ecological communities. The Natural Heritage Database does not have any records for rare plants or ecological communities on the site or for rare plant species covered by the Flood Hazard Area Control Act rule within one mile of the site.

The Natural Heritage Database has records for occurrences of rare plant species and ecological communities that may be present on the Roselle and Chatham USGS quadrangles. The attached lists provide additional information about these occurrences. A list of rare plant species and ecological communities that have been documented from Morris County can be

downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2008.pdf.

In order to red flag the general locations of occurrences of rare and endangered plant species and ecological communities, we have prepared computer generated Natural Heritage Index Maps. Enclosed please find these maps for the Roselle and Chatham USGS quadrangles. If individual projects are to be located in the areas of these maps that contain letter codes, the Natural Heritage Program can be contacted for additional information.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, http://www.state.nj.us/dep/gis/depsplash.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292 9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Robert J. Cartica
NHP File No. 09-4007464-2984

Chatham USGS Quadrangle
Rare Plant Species and Ecological Communities Presently Recorded In The New Jersey Natural Heritage Database

Scientific Name	Common Name	Federal Status	State Status	Regional Status	G Rank	S Rank	Date Observed	Ident
Terrestrial Community - Other Classification								
Traprock glade/rock outcrop community	Traprock Glade/rock Outcrop Community				G2	S1	1986-??-??	
Vascular Plant								
Asclepias verticillata	Whorled Milkweed			HL	G5	S2	1915-08-29	Y
Castilleja coccinea	Scarlet Indian-paintbrush			HL	G5	S2	1936-05-16	Y
Cynoglossum virginianum var. virginianum	Wild Comfrey			HL	G5T5	S2	1982-05-20	Y
Cynoglossum virginianum var. virginianum	Wild Comfrey			HL	G5T5	S2	1934-06-04	Y
Cynoglossum virginianum var. virginianum	Wild Comfrey			HL	G5T5	S2	2005-04-22	Y
Hottonia inflata	Featherfoil		E	LP, HL	G4	S1	1947-07-06	Y
Melanthium virginicum	Virginia Bunchflower		E	LP, HL	G5	S1	1916-08-26	Y
Mimulus alatus	Winged Monkey-flower			HL	G5	S3	1997-08-20	Y
Muhlenbergia capillaris	Long-awn Smoke Grass		E	LP, HL	G5T5?	S1	1985-09-??	Y
Muhlenbergia capillaris	Long-awn Smoke Grass		E	LP, HL	G5T5?	S1	1918-09-29	Y
Muhlenbergia glomerata	Eastern Smoke Grass			HL	G5	S2	1919-09-14	Y
Obolaria virginica	Virginia Pennywort			HL	G5	S2	1941-05-24	Y
Panax quinquefolius	American Ginseng			HL	G3G4	S2	1918-07-28	Y
Phlox pilosa	Downy Phlox		E	LP, HL	G5T5	SH	1918-05-19	Y
Populus heterophylla	Swamp Cottonwood			HL	G5	S2	1916-09-23	Y
Sagittaria australis	Southern Arrowhead		E	LP, HL	G5	S1	1916-09-23	Y
Sanicula trifoliata	Large-fruit Black-snakeroot		E	LP, HL	G4	S1	198?-??-??	Y
Sanicula trifoliata	Large-fruit Black-snakeroot		E	LP, HL	G4	S1	1918-07-28	Y
Scirpus atrocinctus	Black-girdle Woolgrass			HL	G5	S1	1951-06-	Y
Selaginella rupestris	Rock Spike-moss			HL	G5	S2	1992-08-14	Y
Stachys tenuifolia	Smooth Hedge-nettle			HL	G5	S3	1941-09-07	Y
Triosteum augustifolium	Narrow-leaf Horse-gentian		E	LP, HL	G5	SH	1925-06-10	Y
Viola canadensis	Canadian Violet		E	LP, HL	G5T5	S1	1918-05-22	?
Viola rostrata	Long-spur Violet				G5	S3	2005-04-22	Y

25 Records Selected

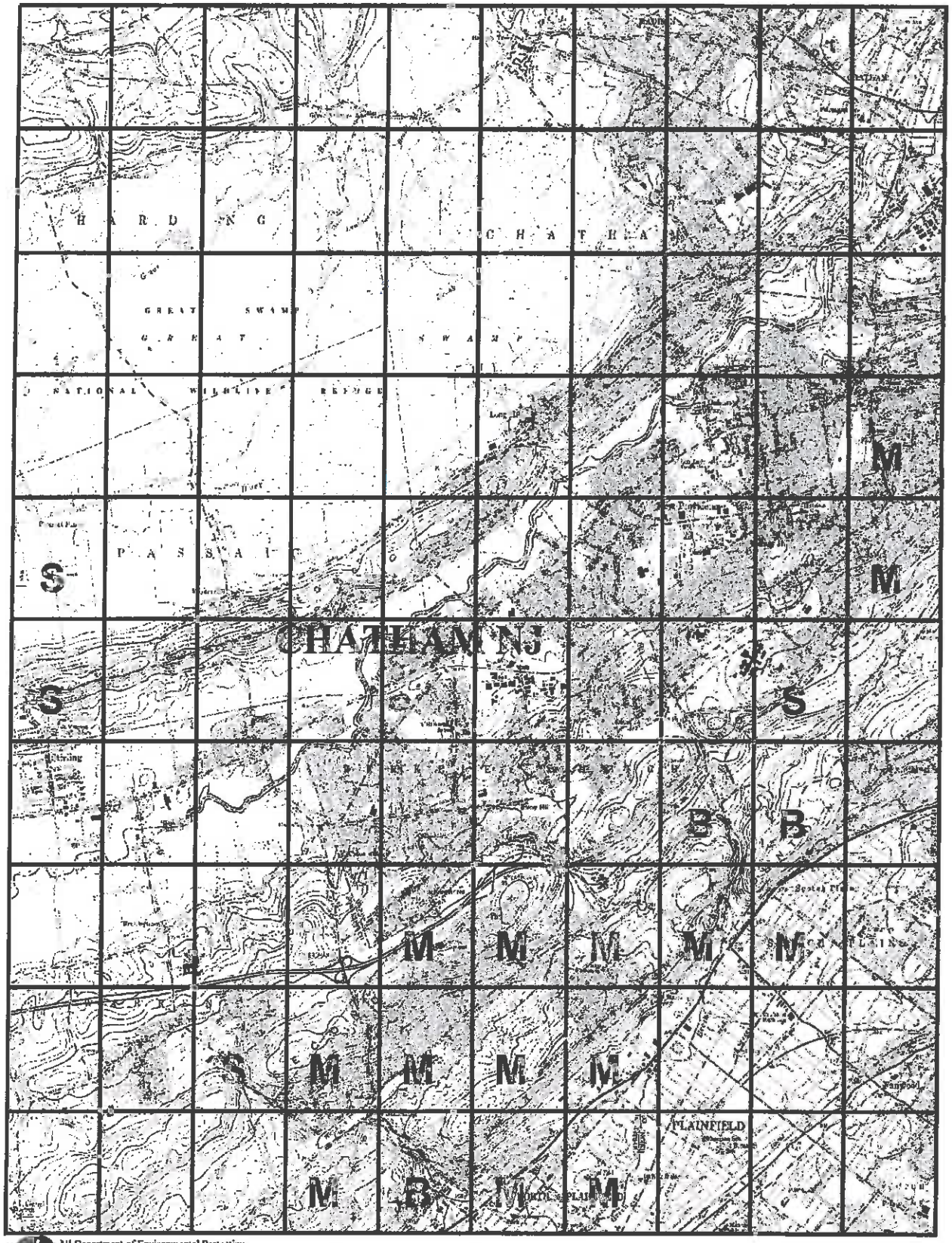
Natural Heritage Grid Map

Rare Plant Species and Natural Communities

S - Documented Location Known Precisely

M - Documented Location Known Within 1.5 Miles

B - Both 'M' and 'S' occurrences



NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management

0.5 0 0.5 1 Miles

February 2004

Appendix G

Summary of Wildlife Species Known from the Great Swamp National Wildlife Refuge

VERTEBRATE SPECIES DOCUMENTED AT GREAT SWAMP NWR					
Species[1]	Seasons on the Great Swamp National Wildlife Refuge (Birds)[2]				
	Spring	Summer	Fall	Winter	Nesting
BIRDS					
Loons, Grebes and Cormorants					
Red-throated loon					
Common loon					
American Coot					
Horned grebe			r		
Double-crested cormorant					
Pied-billed grebe	u	r	o	r	
Herons and Ibis					
Least bittern	u	u	u		Y
American Bittern					Y
Little blue heron	o	o	o		
Black-crowned night heron					
Yellow-crowned night heron	r	r			
Green Heron					
Glossy Ibis					
White Ibis	Accidental				
Cattle Egret					
Snowy egret	r	r	r		
Coots and Rails					
American coot					
King rail					
Virginia rail	c	c	c	r	Y
Sandhill Crane	Accidental				
Sora	u	u	u	r	Y
Gulls					
Herring gull	o	o	o	u	
Ring-billed gull	u		u	c	
Laughing gull					
Greater black-backed gull					
Lesser black-backed gull	Accidental				
Black-tern	Accidental				
Ducks and Geese					
American black duck	c	u	c	u	Y
American widgeon	u	r	c	o	
Atlantic brant	Accidental				
Atlantic Canada goose (migrant)				c	
Atlantic Canada goose	c	c	c	c	Y
Blue-winged teal	u	u	u		Y
Bufflehead	r		r	r	
Canvasback	r		r	r	
Common goldeneye			r	r	
Common merganser	r			r	

Gadwall	u	r	u	o	
Greater White-fronted goose	Accidental				
Green –winged teal	c	r	c	u	Y
Hooded merganser	u	u	u	o	Y
Lesser scaup	Accidental				
Mallard	a	a	a	a	Y
Mute swan (e)					
Northern pintail	u	r	c	u	
Northern shoveler	o	r	o	r	
Red-breasted merganser				r	
Ring-necked duck	c			o	
Ruddy duck			r	r	
Snow goose	r		o	o	
Tundra swan	Accidental				
Wood duck	a	a	a	u	Y
Wrens/Nuthatches					
House wren	c	a	c		Y
Marsh wren	c	c	c	r	Y
Carolina wren	c	c	c	u	Y
Common grackle	a	c	a	o	Y
Red–breasted nuthatch	o	o	u	o	
Cedar waxwing	c	u	c	u	Y
Downy woodpecker	c	c	c	c	Y
Eastern meadowlark	u	u	u	o	Y
Brown Creeper	u	u	u	u	Y
White-breasted nuthatch	c	c	c	c	Y
Winter wren	u		u	u	
Woodpeckers					
Pileated woodpecker	o	o	o	o	Y
Northern flicker	c	c	c	u	Y
Hairy woodpecker	u	u	u	u	Y
Red-headed woodpecker	o	o	o	u	Y
Red-bellied woodpecker	c	c	c	c	Y
Horned lark		r	r	r	
Yellow-bellied sapsucker	u		u	r	
Shrikes and Vireos					
White-eyed vireo	u	u	u		Y
Northern shrike	r		r	r	
Yellow-throated vireo	u	u	u		Y
Philadelphia vireo			o		
Red-eyed vireo	c	c	c		Y
Warbling vireo	c	u	r		Y
Loggerhead shrike	Accidental				
Owls					
Eastern screech-owl	u	u	u	u	Y
Barred owl	u	u	u	u	Y
Barn owl	o	o	o	o	
Northern saw-whet owl	r		r	r	
Long-eared owl	o		o	o	
Short-eared owl	r			r	
Great horned owl	c	c	c	c	Y
Swallows, Swifts and Nightjars					

Cliff swallow	u				
Bank swallow	u	u	u		
Chimney swift	c	c	c		Y
Common nighthawk	u	u	c		
Purple martin	u	u			Y
Tree swallow	a	a	a	r	Y
Chuck-will's widow	Accidental				
Tanagers, Grosbeaks and Buntings					
Evening grosbeak	o		o	r	
Indigo bunting	u	o	u		Y
Snow bunting			r	r	
Rose-breasted grosbeak	c	c	c		Y
Orchard oriole	u	u			Y
Summer tanager	Accidental				
Scarlet tanager	c	c	c		Y
Cardinal, Finches and Old World Finches					
American goldfinch	a	a	c	c	Y
Purple Finch	u		u	u	
Baltimore oriole	c	c	c		Y
House finch	c	c	c	c	Y
Northern cardinal	c	c	c	c	Y
White-winged crossbill			r	r	
Red crossbill			r	r	
Pine siskin	o		o	o	
Gallanaceous Birds					
Ring-necked pheasant (e)	Accidental				
Wild turkey	c	c	c	c	Y
Crows and Jays					
American crow	a	a	a	a	Y
Fish crow	u	o	u	o	Y
Doves and Cuckoos					
Black-billed cuckoo	u	u	o		Y
Mourning dove	a	a	a	a	Y
Yellow-billed cuckoo	u	u	o		Y
Rock dove	c	c	c	c	Y
Sanpipers and Plovers					
American woodcock	a	c	a	o	Y
Common snipe	a	r	c	o	Y
Dunlin	r				
Greater yellowlegs	u	u	u		
Killdeer	c	c	c	o	Y
Least sandpiper	c	u	o		
Lesser yellowlegs	u	o	u		
Pectoral sandpiper	u	u	u		
Ruff	Accidental				
Semipalmated sandpiper	o	o	o		
Short-billed dowitcher	r	r			
Solitary sandpiper	c	u	u		
Spotted sandpiper	c	u	u		Y
Upland sandpiper	r				
Flycatchers					
Acadian flycatcher	o	o			Y

American pipit	u		u		
American robin	a	a	a	u	Y
Eastern kingbird	c	c	c		Y
Eastern phoebe	c	c	c	r	Y
Eastern wood pewee	c	c	c		Y
Great-crested flycatcher	c	c	c		Y
Least flycatcher	u	o	o		Y
Olive-sided flycatcher	o	r	o		
Yellow-bellied flycatcher	o	r	o		
Willow flycatcher	c	c	c		Y
Hawks, Eagles, Falcons, Osprey					
American kestrel	c	u	c	u	Y
Bald eagle	o	o	o	o	
Cooper's hawk	u	u	u	u	Y
Golden eagle			r	r	
Merlin	o		o	r	
Northern harrier	c	r	c	c	
Osprey	u		u		
Peregrine falcon			r		
Red-shouldered hawk	u	u	u	o	Y
Red-tailed hawk	c	u	c	c	Y
Rough-legged hawk	r		r	o	
Sharp-shinned hawk	u		c	u	
New World Vultures					
Turkey vulture	c	c	c	c	
Black vulture	u	u	u	u	Y
Thrushes and Mimics					
Brown thrasher	c	c	c	r	Y
Eastern bluebird	c	c	c	c	Y
Gray catbird	a	a	a	r	Y
Gray-cheeked thrush	u		o		
Hermit thrush	c		c	o	
Northern mockingbird	c	c	c	c	Y
Swainson's thrush	u		u		
Veery	c	c	c		Y
Varied thrush	Accidental				
Wood thrush	c	c	c		Y
Chickadees and Titmice					
Tufted titmouse	a	a	a	a	Y
Golden-crowned kinglet	c		c	u	
Ruby-crowned kinglet	c		c	o	
Black -capped chickadee					
Warblers					
American redstart	c	c	c		Y
Black-and-white warbler	c	c	c		Y
Blackburnian warbler	u	o	u		
Blackpoll warbler	c	o	c		
Black-throated blue warbler	c	o	c		
Black-throated green warbler	c	o	c		
Blue-winged warbler	c	c	c		Y
Canada warbler	c	r	c		
Cerulean warbler	o	o			

Common yellowthroat	a	a	a	r	Y
Connecticut warbler			o		
Golden-winged warbler	o				
Hooded warbler	o		o		
Blue-gray gnatcatcher					
Kentucky warbler	o	r			
Louisiana waterthrush	u	o	o		Y
Magnolia warbler	c	o	c		
Mourning warbler	u	o	o		
Nashville warbler	u		u		
Northern parula	c	o	c		
Northern waterthrush	c	u	u		Y
Ovenbird	c	c	c		Y
Palm warbler	c		u		
Pine warbler	u		o		
Prairie warbler	o				
Prothonotary warbler	o	r	r		Y
Tennessee warbler	u	o	u		
Wilson's warbler	u		u		
Worm-eating warbler	u	o			
Yellow warbler	a	a	u		Y
Yellow-breasted chat	o	o	o		Y
Yellow-rumped warbler	a		c		
Yellow-throated warbler	r				
Sparrows, Towhees, Juncos					
Chipping sparrow	c	c	c	r	Y
Eastern towhee	a	a	a	r	Y
Dark-eyed junco	c		c	c	
Field sparrow	c	c	c	u	Y
Fox sparrow	u		u	o	
Grasshopper sparrow	r		r		
Savannah sparrow	u		u	r	
Lincoln's sparrow	o		u		
White-throated sparrow	c		c	c	
Swamp sparrow	a	a	a	u	Y
Vesper sparrow	o	r	o	r	
American tree sparrow	c		c	c	
Common redpoll	r		r	r	
Le Conte's Sparrow	Accidental				
Sharp-tailed Sparrow (Nelson's)	Accidental				
White-crowned sparrow	o		o		
Song sparrow	a	a	a	c	Y
Blackbirds and Orioles					
Red winged blackbird	a	a	a	u	Y
Rusty blackbird	c		c	u	
bobolink					
Ruby-throated hummingbird	u	o	u		Y
Brown headed cowbird	c	c	c	o	Y
Yellow-headed blackbird	Accidental				
Monk Parakeet (e)	Accidental				
MAMMALS					
Beaver					

Big brown bat					
black bear					
Coyote					
Eastern chipmunk					
Eastern cottontail					
Eastern pipistrelle					
Eastern red bat					
Eastern small-footed bat					
Gray fox					
Gray squirrel					
Hoary bat					
house mouse					
Indiana myotis					
Little brown bat					
Longtail weasel					
Masked shrew					
Meadow jumping mouse					
Meadow vole					
Mink					
Muskrat					
Opossum					
raccoon					
Red fox					
Red squirrel					
River otter					
Short-tailed shrew					
Silver-haired bat					
Smoky shrew					
Southern flying squirrel					
Southern red-backed vole					
Starnose mole					
Striped skunk					
White-footed mouse					
Whitetail deer					
Woodchuck					
Woodland jumping mouse					
Woodland vole					
AMPHIBIANS					
Blue-spotted salamander					
Red-spotted newt					
Northern dusky salamander					
Redback salamander					
Northern slimy salamander					
Four –toed salamander					
Northern red salamander					
Upland chorus frog					
Spring peeper					
Northern cricket frog					
Northern gray treefrog					
Bullfrog					
Green frog					
Wood frog					

Pickerel frog					
Northern leopard frog					
Southern leopard frog					
American toad					
Fowler's toad					
REPTILES					
Eastern mud turtle					
Black rat snake					
Bog turtle					
Common musk turtle					
Common snapping turtle					
Eastern box turtle					
Eastern garter snake					
Eastern hognose snake					
Eastern milk snake					
Eastern ribbon snake					
Eastern smooth earth snake					
Eastern worm snake					
Five-lined skink					
Northern black racer					
Northern brown snake					
Northern ringneck snake					
Northern water snake					
Painted turtle					
Redbelly turtle					
Red-eared slider					
Smooth green snake					
Spotted turtle					
Wood turtle					
FISH					
American Brook Lamprey					
Banded Killifish					
Banded Sunfish					
Black Crappie					
Blacknose Dace					
Bluegill					
Bluespotted sunfish					
Bridle Shiner					
Brook Trout					
Brown trout					
Brown Bullhead					
Chain Pickerel					
Common Carp					
Common Shiner					
Creek Chub					
Creek Chubsucker					
Eastern Mudminnow					
Eastern Silvery Minnow					
Fallfish					
Golden Shiner					
Grass Pickerel					
Green Sunfish					

Inland Silverside					
Johnny Darter					
Largemouth Bass					
Mud Sunfish					
Pumpkinseed					
Redbreast Sunfish					
Redfin Pickerel					
Satinfin Shiner					
Smallmouth Bass					
Spotfin Shiner					
Spottail Shiner					
Tessellated Darter					
White Crappie					
White Sucker					
Yellow Bullhead					
Yellow Perch					
NOTES					

1 Species List compiled from Great Swamp NWR Inventory Lists and NJDEP Bureau of Freshwater Fisheries (2009)

2 Seasonal occurrence is based upon the likelihood of viewing a species while birding at the refuge (a = abundant, c = common, u = uncommon, o = occasional, r = rare), as indicated in the US Fish and Wildlife Service Great Swamp National Wildlife Refuge Bird List (http://www.fws.gov/northeast/greatswamp/).

INVERTEBRATE SPECIES DOCUMENTED AT GREAT SWAMP NWR				
Class or Subclass	**Order/Suborder**	**Family/Subfamily**	**Genius/Species**	**Common Name**
Butterflies				
Insecta	Lepidoptera	Pieridae	*Colias philodice*	Clouded sulphur
Insecta	Lepidoptera	Pieridae	*Colias eurytheme*	Orange sulfur
Insecta	Lepidoptera	Pieridae	*Phoebis sennae*	Cloudless sulphur
Insecta	Lepidoptera	Pieridae	*Pieris rapae*	Cabbage white
Insecta	Lepidoptera	Papilionidae	*Battus philenor*	Pipevine swallowtail
Insecta	Lepidoptera	Papilionidae	*Papilio glaucus*	Eastern tiger swallowtail
Insecta	Lepidoptera	Papilionidae	*Papilio troilus*	Spicebush swallowtail
Insecta	Lepidoptera	Lycaenidae	*Feniseca tarquinius*	Harvester
Insecta	Lepidoptera	Lycaenidae	*Lycaena philaeas*	American copper
Insecta	Lepidoptera	Lycaenidae	*Satryium titus*	Coral hairstreak
Insecta	Lepidoptera	Lycaenidae	*Satryium calanus*	Banded hairstreak
Insecta	Lepidoptera	Lycaenidae	*Satryium liparops*	Striped hairstreak
Insecta	Lepidoptera	Lycaenidae	*Parrhasius m-album*	White M hairstreak
Insecta	Lepidoptera	Lycaenidae	*Satyrium favonius*	Southern hairstreak
Insecta	Lepidoptera	Lycaenidae	*Strymon melinus*	Gray hairstreak
Insecta	Lepidoptera	Lycaenidae	*Everes comyntas*	Eastern tailed blue
Insecta	Lepidoptera	Lycaenidae	*Celastrina ladon*	Spring azure
Insecta	Lepidoptera	Lycaenidae	*Celastrina neglecta*	Summer Azure
Insecta	Lepidoptera	Lycaenidae	*Callophrys augustinus*	brown elfin
Insecta	Lepidoptera	Nymphalidae	*Speyeria cybele*	Great spangled fritillary
Insecta	Lepidoptera	Nymphalidae	*Phyciodes tharos*	Pearl crescent
Insecta	Lepidoptera	Nymphalidae	*Euphydryas phaeton*	Baltimore checkerspot
Insecta	Lepidoptera	Nymphalidae	*Polygonia interrogationis*	Question mark
Insecta	Lepidoptera	Nymphalidae	*Polygonia comma*	Eastern comma
Insecta	Lepidoptera	Nymphalidae	*Nymphalis vau-album*	Compton tortoiseshell
Insecta	Lepidoptera	Nymphalidae	*Nymphalis antiopa*	Mourning cloak
Insecta	Lepidoptera	Nymphalidae	*Vanessa virginensis*	American lady
Insecta	Lepidoptera	Nymphalidae	*Vanessa cardui*	Painted lady
Insecta	Lepidoptera	Nymphalidae	*Vanessa atalanta*	Red admiral
Insecta	Lepidoptera	Nymphalidae	*Junonia coenia*	Common buckeye
Insecta	Lepidoptera	Nymphalidae	*Limenitis arthemis astynax*	Red-spotted purple
Insecta	Lepidoptera	Nymphalidae	*Limenitis archippus*	Viceroy
Insecta	Lepidoptera	Nymphalidae/Satyrinae	*Enodia anthedon*	Northern pearly-eye

Insecta	Lepidoptera	Nymphalidae/Satyrinae	*Satyrodes eurydice*	Eyed brown
Insecta	Lepidoptera	Nymphalidae/Satyrinae	*Satyrodes appalachia*	Appalachian brown
Insecta	Lepidoptera	Nymphalidae/Satyrinae	*Megisto cymela*	Little wood-satyr
Insecta	Lepidoptera	Nymphalidae/Satyrinae	*Cercyonis pegala*	Common wood-nymph
Insecta	Lepidoptera	Nymphalidae/Danainae	*Danaus plexippus*	Monarch
Insecta	Lepidoptera	Hesperiidae	*Epargyreus clarus*	Silver -spotted skipper
Insecta	Lepidoptera	Hesperiidae	*Achalarus lyciades*	Hoary edge
Insecta	Lepidoptera	Hesperiidae	*Thorybes bathyllus*	Southern cloudywing
Insecta	Lepidoptera	Hesperiidae	*Erynnis horatius*	Horace's duskywing
Insecta	Lepidoptera	Hesperiidae	*Erynnis juvenalis*	Juvenal's duskywing
Insecta	Lepidoptera	Hesperiidae	*Erynnis baptisiae*	Wild indigo duskywing
Insecta	Lepidoptera	Hesperiidae	*Nastra lherminier*	Swarthy skipper
Insecta	Lepidoptera	Hesperiidae	*Ancyloxypha numitor*	Least skipper
Insecta	Lepidoptera	Hesperiidae	*Thymelicus lineola*	European skipper
Insecta	Lepidoptera	Hesperiidae	*Hyephila phyleus*	Fiery skipper
Insecta	Lepidoptera	Hesperiidae	*Polites themistocles*	Tawny-edged skipper
Insecta	Lepidoptera	Hesperiidae	*Polites peckius*	Peck's skipper
Insecta	Lepidoptera	Hesperiidae	*Polites origenes*	Crossline skipper
Insecta	Lepidoptera	Hesperiidae	*Wallengrenia egeremet*	Northern broken-dash
Insecta	Lepidoptera	Hesperiidae	*Pompeius verna*	Little glassywing
Insecta	Lepidoptera	Hesperiidae	*Atalopedes campestris*	Sachem
Insecta	Lepidoptera	Hesperiidae	*Anatrytone logan*	Delaware skipper
Insecta	Lepidoptera	Hesperiidae	*Poanes massasoit*	Mulberry wing
Insecta	Lepidoptera	Hesperiidae	*Poanes hobomok*	Hobomok skipper
Insecta	Lepidoptera	Hesperiidae	*Poanes zabulon*	Zabulon skipper
Insecta	Lepidoptera	Hesperiidae	*Poanes viator*	Broad-wing skipper
Insecta	Lepidoptera	Hesperiidae	*Euphyes dion*	Dion skipper
Insecta	Lepidoptera	Hesperiidae	*Euphyes conspicua*	Black dash
Insecta	Lepidoptera	Hesperiidae	*Euphyes vestris*	Dun skipper
Insecta	Lepidoptera	Hesperiidae	*Panoquina ocola*	Ocola skipper

APPENDIX H

Summary of Wetland Rules & Regulations
&
Flood Hazard Area Control Act Rules

The following types of activities are "regulated" within wetlands:

1. The removal, excavation, disturbance or dredging of soil, sand, gravel, or aggregate material of any kind;
2. The drainage or disturbance of the water level or water table so as to alter the existing elevation of groundwater or surface water, regardless of the duration of such alteration
3. The dumping, discharging or filling with any materials;
4. The driving of pilings;
5. The placing of obstructions, including depositing, constructing, installing or otherwise situating any obstacle which will affect the values or functions of a freshwater wetland; and
6. The destruction of plant life which would alter the character of a freshwater wetland, including killing vegetation by applying herbicides or by other means, the physical removal of wetland vegetation, and/or the cutting of trees.

The following activities are authorized (not regulated) in wetlands:

1. Surveying or wetlands investigation activities, for the purpose of establishing or reestablishing a boundary line or points, which use only hand held equipment and do not involve the use of motorized vehicles;
2. The placement of temporary structures (such as observation blinds, waterfowl blinds, artificial nesting structures, or sign posts) for observing, managing, or harvesting fish or wildlife
3. Placement of one or more small guy anchors that screw into the ground to secure a guy wire supporting a utility pole;
4. Hand trimming of trees or other vegetation, provided the trimming does not alter the character of the freshwater wetland; and
5. The driving of one or more pilings in a State open water, if the pilings are not regulated by the ACOE under the Federal 404 program.

The following types of activities are "regulated" within wetland transition areas:

1. Removal, excavation, or disturbance of the soil;
2. Dumping or filling with any materials;
3. Erection of structures;
4. Placement of pavements; and
5. Destruction of plant life which would alter the existing pattern of vegetation.

The following activities are authorized (not regulated) in wetland transition areas:

1. Mowing of existing lawns. The conversion of a field to a lawn by planting, seeding, frequent mowing or any other means requires a transition area waiver;
2. Maintenance of existing fields;
3. Pruning of trees and shrubs;
4. Selective cutting of trees;
5. Replacement of existing non-native plants with either native or non-native species that will not significantly change the character of the existing vegetational community of the transition area; and,
6. Limited supplemental planting of non-native plant species that will not significantly change the character of the existing vegetational community of the transition area. The creation of a lawn is not considered supplemental planting;
7. Planting of native species, that is, plants naturally occurring in transition areas in the local region, (the county agricultural agent may be consulted to obtain information regarding these species);
8. Continued cultivation of existing gardens; and the development of new gardens provided that the new garden is:
(A) No larger than 2,500 square feet in size;
(B) Located in a non-forested transition area; and
(C) Located in a transition area not subject to a conservation restriction or easement; and
9. Maintenance of artificial features including the repair, rehabilitation, replacement, maintenance or reconstruction of any previously authorized, currently serviceable structure, lawfully existing prior to July 1, 1989.

<u>The following types of activities are "regulated" within the flood hazard area and riparian zone:</u>

1. The alteration of topography through excavation, grading and/or placement of fill;
2. The clearing, cutting and/or removal of vegetation in a riparian zone;
3. The creation of impervious surface;
4. The storage of unsecured material;
5. The construction, reconstruction and/or enlargement of a structure; and
6. The conversion of a building into a private residence or a public building.

The FHACA rules at NJAC 7:13-7.2(b)1 allow the disturbance of vegetation in a riparian zone for "normal property maintenance," including:

1. Pruning;
2. Selective tree cutting;
3. Planting indigenous, non-invasive vegetation;
4. Maintaining a field, lawn, park and/or easement that was lawfully established prior to October 2, 2006, and that has been maintained (such as through periodic mowing) since that date;
5. The removal of trash, debris and dead vegetation by hand; and
6. Maintaining a garden that was lawfully established prior to October 2, 2006.

Normal property maintenance does not include:

1. Mowing an area that was not lawfully mowed prior to October 2, 2006, or which was lawfully mowed prior to this date but has since been allowed to revert to its natural vegetative state;
2. Removing vegetation to create a new lawn, garden, field or park;
3. Burning vegetation;
4. Applying herbicide;
5. Grading and other changes in topography; and,
6. Constructing structures, or placing fill or impervious surfaces.

PRELIMINARY COST ESTIMATE
CONSTRUCTION OF SITEWORK
AT
RIVER ROAD SITE
BOROUGH OF CHATHAM
MORRIS COUNTY, NEW JERSEY

INITIAL PLANNING	Units	Quantity	Unit Cost	Item Cost
Survey of Site	Lump Sum		$10,000.00	$10,000.00
Environmental Permitting				
Wetland Delineation	Lump Sum		$4,000.00	$4,000.00
Path/Trail Construction and Wetland Restoration	Lump Sum		$7,000.00	$7,000.00
Wetland Restoration	Lump Sum		$4,000.00	$4,000.00
Boat Launch Construction	Lump Sum		$7,000.00	$7,000.00
			SUBTOTAL	$32,000.00

SITE PREPARATION	Units	Quantity	Unit Cost	Item Cost
Security barriers, signage and construction fencing	Lump Sum		$1,500.00	$1,500.00
Construction Layout by Surveyor	Lump Sum		$3,000.00	$3,000.00
Soil erosion and sedimentation controls Wheel cleaning blanket	Lump Sum		$2,100.00	$2,100.00
Silt fence	LF	300	$4.00	$1,200.00
Tree Protection	LF	230	$6.00	$1,380.00
			SUBTOTAL	$9,180.00

EARTHWORK	Units	Quantity	Unit Cost	Item Cost
Tree clearing	Lump Sum		$8,500.00	$8,500.00
Topsoil stripping and stockpiling	CY	200	$5.00	$1,000.00
Bulk excavation	CY	600	$5.00	$3,000.00
Surface grading	CY	250	$6.00	$1,500.00
Earth removal (stone contaminated)	CY	300	$6.00	$1,800.00
Topsoiling and finished grading	CY	650	$6.00	$3,900.00
Debris removal	Lump Sum	20	$2,000.00	$2,000.00
			SUBTOTAL	$21,700.00

SITE ACCESS	Units	Quantity	Unit Cost	Item Cost
Driveway pavements	SY	560	$45.00	$25,200.00
Driveway curbs	LF	120	22	$2,640.00
Fencing and entry gate	LF	260	$40.00	$10,400.00
Roadway repair (St. James Street)	Lump Sum		$2,000.00	$2,000.00
			SUBTOTAL	$40,240.00

COMMUNITY GARDENS	Units	Quantity	Unit Cost	Item Cost
Garden concrete entry	SF	560	$15.00	$8,400.00
Garden curbing	LF	1,900	$12.00	$22,800.00
Garden shelter	Lump Sum		$18,000.00	$18,000.00
Shelter slab	SF	650	$10.00	$6,500.00
			SUBTOTAL	$55,700.00
PEDESTRIAN TRAIL	**Units**	**Quantity**	**Unit Cost**	**Item Cost**
Pathway construction	SY	2,500	$15.00	$37,500.00
			SUBTOTAL	$37,500.00
BOAT LAUNCH	**Units**	**Quantity**	**Unit Cost**	**Item Cost**
Boat launch structure	Lump Sum		$4,500.00	$4,500.00
Miscellaneous	Lump Sum		$2,000.00	$2,000.00
			SUBTOTAL	$6,500.00
UTILITY SYSTEMS	**Units**	**Quantity**	**Unit Cost**	**Item Cost**
Electric service entry	Lump Sum		$3,000.00	$3,000.00
Site lighting	Location	3	$3,500.00	$10,500.00
Potable Water Service and Wet Tap	Lump Sum		$2,500.00	$2,500.00
Meter pit and valving	Lump Sum		$13,500.00	$13,500.00
Supply main	LF	100	$40.00	$4,000.00
			SUBTOTAL	$33,500.00
LANDSCAPING	**Units**	**Quantity**	**Unit Cost**	**Item Cost**
Landscape plantings				
Native Plants for exclusion area	Lump Sum		$4,500.00	$4,500.00
Deer resistant trees, shrubs, plugs	Lump Sum		$2,600.00	$2,600.00
Warm season grass seeding	Per Acre	1	$4,500.00	$4,500.00
Rain garden	Lump Sum		$4,500.00	$4,500.00
Garden construction - butterfly garden	Lump Sum		$4,500.00	$4,500.00
Herbicide applications	Per Day			$3,000.00
Additional invasive species control (manual removal)	Lump Sum		$2,000.00	$2,000.00
Nest boxes	Lump Sum		$1,000.00	$1,000.00
Snag creation (marking & implement)	Lump Sum		$2,000.00	$2,000.00
Site furnishing (benches, tables)	Lump Sum		$6,000.00	$6,000.00
Environmental signage	Lump Sum		$3,200.00	$3,200.00
Exclusion fence with installation	Lump Sum	1 roll (330 ft)	$2,000.00	$2,000.00
Miscellaneous	Lump Sum		$5,000.00	$5,000.00
Lawn area marginal finishing	SY	2,600	$2.00	$5,200.00
			SUBTOTAL	$50,000.00
			ESTIMATED GRAND TOTAL	**$286,320.00**

PRELIMINARY COST CHART
CONSTRUCTION OF SITEWORK AT RIVER ROAD SITE-continued

		Human Use				Field	Forest							Wetlands	
		Remove asphalt & debris; install gravel parking area	Pedestrian path	Kayak/canoe launch	Gardens utility easement	Control invasive plant species; replant with grasses	Control invasive plant species; replant with natives	Preserve and create dead standing trees	Plant native species	Deer exclosures	Deer management program	Nest and bat boxes	LWD and native plants in temporary pools	Restore emergent wetland within ROW
Community Gardens	Garden concrete entry				X									
	Garden curbing				X									
	Garden shelter				X									
	Shelter slab				X									
Pedestrian Trail	Pathway construction		X											
Boat Launch	Boat launch structure			X										
	Miscellaneous			X										
Utility Systems	Electric service entry				X									
	Site lighting				X									
	Potable Water Service and Wet Tap				X									
	Meter pit and valving				X									
	Supply main				X									
Landscaping	Native Plants for exclusion area						X							X
	Deer resistant trees, shrubs, plugs								X				X	
	Warm season grass seeding				X	X								
	Rain garden				X									
	Garden construction - butterfly garden				X									
	Herbicide applications				X	X	X							X
	Add. invasive spp. control (manual removal)				X		X							
	Nest boxes						X					X		
	Snag creation (marking & implement)						X	X						
	Site furnishing (benches, tables)				X									
	Environmental signage				X									
	Exclusion fence with installation						X			X				X
	Miscellaneous				X									
	Lawn area marginal finishing				X									

PRELIMINARY COST CHART
CONSTRUCTION OF SITEWORK AT RIVER ROAD SITE

		Human Use				Field	Forest							Wetlands	
Enhancement Recommendations		Remove asphalt & debris; install gravel parking area	Pedestrian path	Kayak/canoe launch	Gardens utility easement	Control invasive plant species; replant with grasses	Control invasive plant species; replant with natives	Preserve and create dead standing trees	Plant native species	Deer exclosures	Deer management program	Nest and bat boxes	LWD and native plants in temporary pools	Restore emergent wetland within ROW
Intitial Planning	Survey of Site	X			X									
	Wetland Delineation		X	X										X
	Path/Trail Construction-Wetland Restoration		X											
	Wetland Restoration													X
	Boat Launch Construction			X										
Site Preparation	Security barriers, signage, construction fence	X												
	Construction Layout by Surveyor	X												
	Soil erosion and sedimentation controls	X												
	Wheel cleaning blanket	X												
	Silt fence	X												
	Tree Protection	X												
Earthwork	Tree clearing	X												
	Topsoil stripping and stockpiling	X												
	Bulk excavation	X												
	Surface grading	X												
	Earth removal (stone contaminated)	X												
	Topsoiling and finished grading	X												
	Debris removal	X												
Site Access	Driveway pavements	X												
	Driveway curbs	X												
	Fencing and entry gate	X												
	Roadway repair (St. James Street)	X												