U.S. Army Corps of Engineers
Philadelphia District

FINAL ENVIRONMENTAL ASSESSMENT

STREAMBANK STABILIZATION
MANASQUAN RIVER AT BERGERVILLE ROAD
HOWELL TOWNSHIP
MONMOUTH COUNTY, NEW JERSEY

November 2006

FINDING OF NO SIGNIFICANT IMPACT

Environmental Assessment
Streambank Stabilization
Manasquan River at Bergerville Road
Howell Township
Monmouth County, New Jersey

OVERVIEW

The United States Army Corps of Engineers has evaluated a range of bank stabilization and other measures to arrest encroachment of the Manasquan River into Bergerville Road in Howell Township, New Jersey.

PURPOSE

Bank erosion and flooding of the Manasquan River has undermined the stability of embankment supporting Bergerville Road, which is located approximately eight to twelve feet from the south bank of the river. Howell Township has conducted emergency repairs to shore up the road twice in the last three years. Underground utilities that are located along the road are also threatened by this problem. The embankment is approximately 26 feet high at this location and poses a safety issue to motorists traveling along this suburban connector. The goal of the project is to stabilize the embankment and prevent further bank erosion.

SPECIFICATIONS

The selected alternative includes stabilization of the embankment using a Cellular Confinement System (CCS) wall design to rebuild a stable slope and prevent further bank erosion. In this design, the toe of the CCS wall would be filled with concrete to protect the bank from erosion and flooding while the upper half of the CCS wall would be filled with soil and planted to reestablish vegetation on the bank. The foundation for this wall would extend out approximately 10 feet from the current bank, resulting in a slight shift in the stream centerline towards the north.

COORDINATION

The draft Environmental Assessment was submitted to the U.S. Environmental Protection Agency, Region II, the U.S. Fish and Wildlife Service, the New Jersey Department of Environmental Protection, and all other interested parties. In compliance with the National Environmental Policy Act of 1969 (NEPA) and the Clean Water Act of 1977 (CWA), the proposed project has been coordinated with other concerned resource agencies. Comments received in response to this coordination and other communications are included in Appendix A of this Environmental Assessment.

CRITICAL HABITAT IMPACT

The Environmental Assessment has determined that the proposed project is not likely to jeopardize the continued existence of any species or critical habitat of any fish, wildlife or plant that is designated as endangered or threatened pursuant to the Endangered Species Act of 1973, as amended by P.L. 96-159.

WATER QUALITY

The Environmental Assessment has concluded that the selected plan can be conducted in a manner that should not violate New Jersey's Water Quality Standards. Pursuant to Section 401 of the Clean Water Act, a 401 Water Quality Certificate will be requested from the New Jersey Department of Environment Protection. A consistency determination by the NJDEP has been requested. No work will begin before a water quality certificate determination is obtained from the New Jersey Department of Environmental Protection.

CULTURAL IMPACTS

There are no known properties listed on, or eligible for listing on, the National Register of Historic Places that would be affected by the proposed activity. The selected plan has been designed to avoid archaeologically sensitive areas, and is therefore not expected to impact any cultural resources.

RECOMMENDATION

Because the Environmental Assessment concludes that the proposed project is not a major Federal action significantly affecting the human environment, I have determined that an Environmental Impact Statement is not required.

17 NOV 06
Date

for P. Amelia Quinn MAJ, EN

Gwen E. Baker
Lieutenant Colonel
District Commander
U.S. Army Corps of Engineers

TABLE OF CONTENTS

Page

APPENDICES

1. PURPOSE OF AND NEED FOR ACTION

The project site is located along Bergerville Road (a.k.a. Casino Road) in Howell Township, Monmouth County, New Jersey. Approximately, 500 feet west of the project site, Casino Drive becomes Bergerville Road as it crosses into Freehold Township. The road is owned and maintained by Howell Township, who has requested the assistance of the U.S. Army Corps of Engineers (USACE) in alleviating damage to the road by flooding and erosion resulting from encroachment of the Manasquan River. Howell Township is the non-Federal sponsor of this activity.

At the project site, Bergerville Road is approximately eight to twelve feet from the south bank of the Manasquan River at a point where the river makes a U-shaped bend (Figure 1-1). The river is somewhat downcut at this location, with floodplain wetlands located inside the meander bend and residential properties located on a low terrace just outside the meander to the north (Figure 1-2). During high flow periods, water is directed into this bend at sufficient velocity to undercut the south bank. Further up the bank, above the area being undercut, additional erosion is resulting from bank slumping. Bergerville Road has been repaired twice in the last few years after being damaged by bank slumping. The bank in this area is approximately 26 feet high. Approximately 200 linear feet of stream bank requires some form of stabilization and erosion control to protect Bergerville Road.

2. PROPOSED ACTION AND ALTERNATIVES

The USACE undertook a multi-objective planning process for this project where economic, social, and environmental considerations were taken into account. During the formulation process, several alternative plans were developed to alleviate the identified problems at Bergerville Road in ways that were consistent with both Federal objectives and the desires of the community. The alternative plan that best met the environmental and technical criteria for this project site was selected as the proposed action. The full range of reasonable alternatives was considered during the National Environmental Policy Act (NEPA) process, resulting in the systematic elimination of alternatives that did not meet the purpose of and need for the action. The alternatives considered in detail in this Environmental Assessment (EA) include the No-Action Alternative, the Proposed Action, and two action alternatives (A and B).

2.1 No-Action Alternative

Analysis of the No-Action Alternative is prescribed by the regulations of the Council on Environmental Quality and serves as the benchmark against which the environmental and socioeconomic effects of the Proposed Action and other reasonable alternatives can be evaluated. At this location, existing conditions without corrective action will lead to continued streambank erosion that, within five years, would undermine the road bank, leading to road failure and damage to the underground gas and water lines, as well as utility poles along the road, and ultimately result in the abandonment of the existing road and a permanent traffic detour. Estimates by the Township Engineer indicate that a 2.0-mile detour would be needed if this major connector between various housing developments were not available to traffic. A permanent traffic detour would result in increased vehicle operating and opportunity costs to the

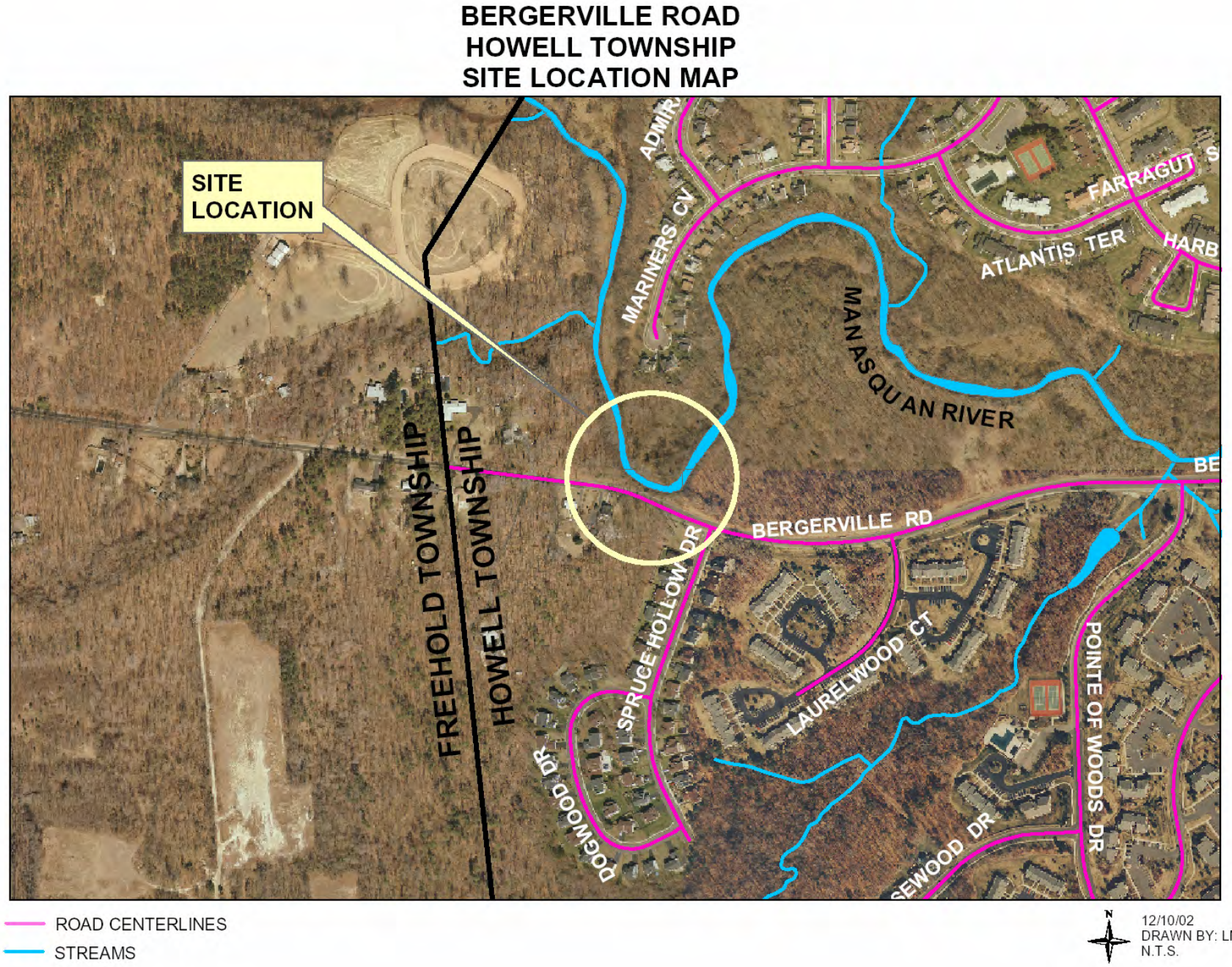

Figure 1-1 Aerial photograph showing the site location

Figure 1-2. Photographs of Manasquan River Stream Bank Stabilization project location

drivers and passengers due to the increased travel time. At an estimated annual cost of approximately $1,040,000, this without project condition is not considered cost effective. In addition, permanent road closure is contrary to the desires of Howell Township, which endeavors to keep this road from failing. Therefore, the No-Action alternative does not meet the purpose and need. As previously noted the road also connects to Freehold Township and would presumably be detrimental to that Township as well.

2.2 Development of and Elimination of Alternatives

A full range of alternatives was developed through coordination between Howell Township, USACE, the New Jersey Department of Environmental Protection (NJDEP), the U.S. Fish and Wildlife Service, and consultants. These alternatives fall into the following categories: bioengineering and other soft engineering techniques, engineered structures, stream relocation, road relocation combined with stream bank stabilization, and retaining walls (Table 2-1). Specific alternatives within each category are described in this section and their reasons for inclusion or exclusion from further consideration are discussed.

Table 2-1 List of Potential Alternatives for the Manasquan River Emergency Stream Bank Stabilization Project

Alternative	Advantages	Disadvantages
Bioengineering and Other Soft Engineering Techniques		
Bio Logs	Protect toe of slope and lower banks; low environmental impacts; aesthetically pleasing; inexpensive	Insufficient protection of upper banks; unstable due to high velocities in the vicinity of the project site; insufficient project life span
Mud Sill	Protect toe of slope and lower banks; low environmental impacts; aesthetically pleasing; inexpensive	Insufficient protection of upper banks; unstable due to high velocities in the vicinity of the project site; insufficient project life span
Bank Crib	Protect toe of slope and lower banks; low environmental impacts; aesthetically pleasing; provide instream habitat; inexpensive	Insufficient protection of upper banks; unstable due to high velocities in the vicinity of the project site; insufficient project life span
Root Wads	Protect toe of slope and lower banks; low environmental impacts; aesthetically pleasing; provide instream habitat; inexpensive	Insufficient protection of upper banks; unstable due to high velocities in the vicinity of the project site; insufficient project life span; insufficient room to anchor properly
Lunkers	Protect toe of slope and lower banks; low environmental impacts; aesthetically pleasing; provide instream habitat; inexpensive	Insufficient protection of upper banks; unstable due to high velocities in the vicinity of the project site; insufficient project life span
Deflectors	Protect toe of slope and lower banks; low environmental impacts; aesthetically pleasing; provide instream habitat; inexpensive	Insufficient protection of upper banks; unstable due to high velocities in the vicinity of the project site; insufficient project life span

Table 2-1. Continued		
Alternative	**Advantages**	**Disadvantages**
Engineered Structures		
Rock Vanes	Protect toe of slope and lower banks; provide instream habitat	Insufficient protection of upper banks; not aesthetically pleasing
Rip Rap	Protect toe of slope and lower banks; offer some habitat value	Restricts revegetation of the stream bank; not aesthetically pleasing; insufficient project life span
A-Jacks	Protect toe of slope and lower banks; offer some habitat value	Do not allow for revegetation of the stream bank; not aesthetically pleasing; more effective in wider streams
Concrete-lined Channel	Very effective in controlling bank erosion	Drastic reduction in habitat value; not aesthetically pleasing; increase flow velocities at project site
Articulated Concrete Mat	Very effective in controlling bank erosion	Drastic reduction in habitat value; not aesthetically pleasing; increase flow velocities at project site
Stream Relocation		
Stream Relocation	Remove encroachment threat to road	Substantial wetlands disturbance in new stream location; hydrology of stream altered and flow velocities increased; reduction in habitat value due to lining of new channel; localized flooding problems; land ownership issues
Road Relocation Combined with Stream Stabilization		
Road Relocation and Bank Stabilization	Remove encroachment threat to road; some habitat value depending on stabilization technique used	Temporary road closure; cost involved in moving utilities; land ownership issues
Retaining Walls		
Gabion Baskets	Relatively inexpensive	Insufficient project life span; poor aesthetics; limited vegetation regrowth
Modular Block Walls	Stabilize entire bank; somewhat aesthetically pleasing	Limited vegetation regrowth; substantial cost; drainage system and some excavation necessary
Sheet Piling	Stabilize entire bank; very long lasting	Very expensive; extensive use of heavy machinery; loss of most riparian vegetation with limited regrowth; not aesthetically pleasing; drainage system and some excavation necessary
CCS Walls	Stabilize entire bank; less expensive and more aesthetically pleasing than other retaining walls; revegetation possible; not necessary to move utilities; more natural stream substrates than other options	Substantial construction costs; need to shift streambed away from road; drainage system and some excavation necessary

2.1.1 Bioengineering and Other Soft Engineering Techniques

The first category of alternatives considered for use at the project site was bioengineering and other soft engineering techniques. Several different techniques were considered but all were ultimately eliminated as inadequate for achieving the purpose and need. Bio logs are generally used for protecting the toe of streambanks against fluctuating stage height and velocities, and as a natural planting medium for vegetation. They are made from coir fiber, are biodegradable, and last for 4 to 10 years. Mud sills and bank cribs are natural bank stabilization techniques that help prevent erosion near the waterline. Root wads are tree trunks with large masses of roots still

attached. The trunks are buried in the bank and anchored with large boulders such that the root masses abut along an outside bend of the stream. Root wads stabilize the outside bend of the stream during periods of high flow and provide cover and habitat for fish. Lunkers and deflectors are structures that serve the same purpose.

While these techniques have low environmental impacts and are relatively inexpensive to install, they are unstable given the high flow velocities in the vicinity of the project site. In the case of root wads, there is insufficient room to properly anchor the trunks without interfering with the road and utilities.

2.1.2 Engineered Structures

The second category of alternatives considered was engineered structures such as rock vanes, riprap, and A-jacks. All of these are in-stream structures constructed for the purpose of reducing shear stress on stream banks. These structures consist of rocks and other materials placed against the stream bank to reduce erosion and bank slumping. These techniques, while offering some habitat value, frequently have limited project life spans, can restrict vegetation along the stream bank, and are not aesthetically pleasing. For these reasons, they were determined not to meet the purpose and need, and eliminated from further consideration. In general, these techniques tend to work optimally on more gradual bends or in streams wider than the Manasquan River at the project location.

Another type of engineered structure is the channelization of the stream by using an articulated concrete mat or by lining the channel with concrete. Because the riverbank would be armored with concrete under this scenario, it would effectively control bank erosion at the project site and reduce erosional threats to the road. However, the smoothness of a concrete channel would also alter flow velocities where constructed, increasing flows and changing the hydrology (and erosion potential) downstream. In addition, concrete channels are not aesthetically pleasing and would drastically reduce the habitat value of the river at the project location. Therefore, articulated concrete mats or lining the channel with concrete were found not to meet the purpose and need, and were eliminated from further consideration.

2.1.3 Stream Relocation

The third category of alternatives considered was the relocation of the river. The meander bend at the project site could be cut off, moving the river further away from the road and towards the housing development to the north. This alternative would alleviate the need to move the road, but would create other environmental problems. Relocating the river to this location would cause substantial wetlands disturbance in the riparian area immediately adjacent to the river. Straightening the river would also increase its slope and change the hydrology of the stream by increasing flow velocities and shear stresses; this would ultimately lead to downstream adjustments to channel bed and banks and likely affect habitat below the project. To provide grade controls and prevent channel adjustments in the straightened reach, the new channel would have to be lined with concrete or rip-rapped, thereby significantly reducing the habitat value of this section of the river. This approach has the potential to create localized flooding problems and significant public concerns. The relocation of the stream would also involve land ownership

constraints because private landowners currently hold the land immediately adjacent to the river. Lastly, it would be costly to construct.

Although the stream relocation approach poses several environmental and cost problems, it would meet the purpose and need and, therefore, was retained for further consideration.

2.1.4 Road Relocation Combined With Bank Stabilization

The fourth category of alternatives considered involves the relocation of Bergerville Road further away from the riverbank. After the road has been moved and the slope of the stream bank decreased, a variety of bank stabilization techniques discussed in Section 2.2.1 could be employed to prevent further erosion problems.

For the stream bank slope to achieve a stable 2:1 ratio along the road, Bergerville Road would have to be shifted away from the river approximately 18 feet at the outside of the meander bend. In order to achieve this shift, the horizontal alignment of the road would have to be changed and utilities such as gas pipes, water mains, and utility poles would have to be relocated. This alternative would affect approximately 400 linear feet of roadway in the vicinity of the project site. Relocation of the road would affect at least two adjacent landowners, though no structures would be involved, and would require permits and permissions. Relocation alone is expected to have a 10-year project life at a cost of approximately $450,000. Once the roadway was shifted, bank stabilization could be implemented at an additional cost in a variety of forms, including riprap, gabions, a CCS wall, or an articulated concrete mat. Incorporating bank stabilization measures would likely extend the project life of the road relocation project.

Although the road relocation combined with bank stabilization would have substantial cost implications, it would meet the purpose and need and, therefore, was retained for further consideration.

2.1.5 Retaining Walls

The last category of alternatives considered was retaining walls to stabilize approximately 400 feet of streambank. Several techniques may be used to accomplish this alternative. Four techniques are discussed in further detail. Each of these techniques achieves the same approximate result; only the most promising was carried forward for further analysis. Gabion baskets, wire mesh cages filled with large rocks, were considered for the construction of a retaining wall. Recent experience with gabion baskets has shown that their longevity is much shorter than originally anticipated and of insufficient duration to satisfy the goals of this project.

A second technique is sheet piling, in which large sheets of steel are driven vertically into the toe of the stream and anchored in place on the stream bank. While this alternative is very sturdy and would have a project life span greater than 50 years, it has several drawbacks that make it unappealing for this case. First of all, a project of this magnitude requires extensive use of heavy machinery for installation, costing more than $1,000,000 and placing a prohibitive burden on the non-Federal sponsor. Most, if not all, vegetation would have to be removed from the riverbank in order to install the sheet piling (specifically those trees that are in the way of driving the sheet

pile) and, after installation, the pilings would limit the regrowth of vegetation on the riverbank. This lack of vegetation and the appearance of the sheet piling would not be aesthetically pleasing. Bergerville Road would also have to be closed during construction, leading to traffic problems in the immediate vicinity of the project site. The driving of the pilings, as well as placing the anchor system into the riverbank, could be a difficult and lengthy procedure that might require excavation of the streambed to anchor the base of the wall if there are large rocks on the stream bottom. Otherwise, the use of grouted soil anchors would eliminate the need for excavation of the streambed. Also, a drainage system would be required to release water buildup from behind the structure.

A third type of vertical retaining wall could be constructed using modular blocks. This system is similar to sheet piling, but is more visually attractive and considerably less expensive. It consists of interlocking concrete blocks that are anchored into the earth. The foundation for a modular block wall would need to be constructed in the streambed, shifting the centerline of the stream towards the inside of the meander bend approximately 10 feet. Although more economical than sheet piling, it has many of the same drawbacks: vegetation cannot be established on the front face of the wall, an anchor system has to be created in the riverbank, excavation of the riverbed is required, and a drainage system is required. Costs for this type of project could be substantial given the length of the riverbank affected.

The most promising type of retaining wall considered for this project is a Cellular Containment System (CCS). A CCS wall consisting of a three-dimensional honeycomb structure made of polyethylene would be constructed along the steeply sloping bank. CCS walls are less expensive and more aesthetically pleasing than either sheet piling or modular block walls. While cells in the lower portions of the CCS wall would be filled with concrete to protect the lower banks, cells on the upper portions of the bank would be filled with soil and then vegetated. This vegetation could lead to improved riparian habitat on the riverbank. Construction impacts would be similar to those from sheet piling or modular block walls. Construction of the CCS wall would involve moving the centerline of the stream approximately 10 feet away from the existing right bank to provide a stable foundation and slope for the wall. The configuration would shift the river to an historical alignment that currently consists of a gravel point bar and riparian wetlands. This adjustment is expected to cause fewer environmental affects than other proposed alternatives; in addition, hydrologic modeling indicates that stage heights would be reduced because the modified channel would have greater capacity. Utilities would not have to be moved as in the road relocation alternative. Although construction impacts, the need to anchor the wall into the stream bottom, and the need for a drainage system are similar to the other types of retaining walls, the CCS wall allows for more natural stream substrates, bank slopes, riparian vegetation, and aesthetics. The project life span for the CCS wall is expected to be greater than 50 years. For these reasons, the CCS wall was selected from among the retaining wall options for further consideration.

2.3 Proposed Action – CCS Retaining Wall

As discussed in Section 2.2, the majority of potential alternatives were eliminated as not meeting the purpose and need.

The most promising alternative category is the construction of a retaining wall using CCS. Therefore, the construction of a CCS wall was selected as the Proposed Action. A CCS wall consisting of a honeycomb structure made of polyethylene would be constructed along the steeply sloping bank. This structure best mimics a natural streambank while affording protection to the streambank and road. It is also the most aesthetically pleasing alternative as it can be revegetated along the upper section of the wall.

2.4 Alternative A – Stream Relocation

As discussed in Section 2.2, this alternative was retained for detailed consideration in this EA. The meander bend of the river could be cut off, moving the river further away from the road and toward the housing development to the north.

2.5 Alternative B – Road Relocation Combined with Bank Stabilization

As discussed in Section 2.2, this alternative was retained for detailed consideration in this EA. This alternative involves the relocation of Bergerville Road further away from the riverbank. After the road has been moved and the slope of the stream bank decreased, a variety of bank stabilization techniques, including riprap, gabions, a CCS wall, or an articulated concrete mat could be employed to prevent further erosion problems.

3. AFFECTED ENVIRONMENT

3.1 Topography

Monmouth County's topography is dominated by hills extending across the county line from south to northeast. These hills become the Highlands of Navesink above Sandy Hook Bay, which is the highest point on the eastern coastline south of Maine at 269 ft above sea level. In contrast, the topography of Ocean County, which neighbors Monmouth County to the south is flat with few hills. Sand dunes line the coast to the east and the Pine Barrens lie to the west.

The study area is situated within the Manasquan River Basin, which is located in the Outer Coastal Plain of central New Jersey and encompasses a total drainage area of roughly 80 miles. Approximately 90 percent of the basin is in Monmouth County and the remaining 10 percent is in Ocean County. The basin includes parts of five townships in Monmouth County and two in Ocean County. The headwaters of the Manasquan River begin southwest of Freehold, NJ. The river is 24.5 miles in length and flows southeast, primarily through rural areas towards its outlet to the Atlantic Ocean near Point Pleasant, NJ. River flow is comprised of both surface runoff and groundwater discharge.

The study site is located on an upper portion of the Manasquan River and has a drainage area of approximately 20-square miles. The site is located on an outside bend in the river and consists of a narrow channel, with a steep, eroding cutbank on the south side of the channel. Figure 3-1 illustrates local topography in the project area.

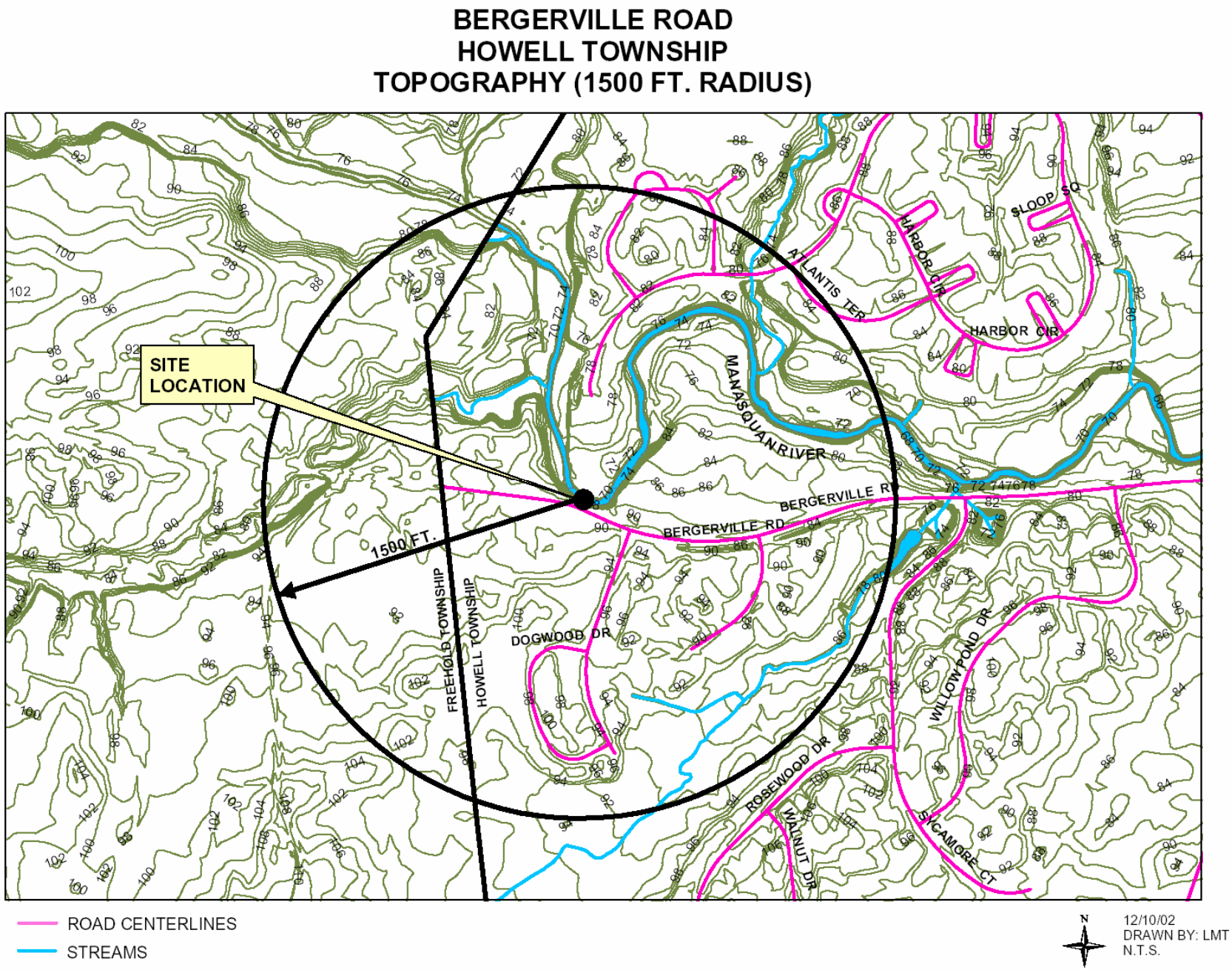

Figure 3-1 Topography (feet) in the vicinity of the project site

3.2 Geology and Soils

The Outer Coastal Plain physiographic province is unique among other provinces of New Jersey in terms of relief, rock properties, and origin. The low-lying, rolling hills in the region are developed on Cretaceous and Tertiary coastal plain sediments that underlie the area. The sediments are mainly of marine origin deposited during alternating periods of sea level encroachment and retreat. The coastal plain is composed of sand and clay layers that vary in extent and thickness. The sand and clay formations are characteristically loose and soft, and where they are cemented, the cementing agent is not hard.

Soils within the Manasquan Basin are potentially acidic. The principal cause of potential acidity is associated with the presence of iron pyrite (FeS_2) and marcasite (crystallized pyrite). Exposure of these mineral components to oxygen in the air or surface waters results in the production of sulfuric acid. Such exposure can result in environmental impacts by lowering the pH and increasing heavy metal solubility. Figure 3-2 and Table 3-1 identify soil types in the vicinity of the project area.

Table 3-1 Soil types found within the vicinity of the project site

Soil Type	Description
Ats	Atsion sand
EveB	Evesboro sand, 0 to 5 percent slopes
Eve D	Evesboro sand, 10 to 15 percent slopes
Frf B	Frehold sandy loam, 0 to 5 percent slopes
PegB	Pemberton loamy sand, 0 to 5 percent slopes
SUBT	Sulfaquents and Sulfihenmists, frequently flooded
ThgB	Tinton loamy sand, 0 to 5 percent slopes
the	Tinton loamy sand, 10 to 25 percent slopes

Soil borings in the project area and visual observations indicate that a loosely cemented layer was present at the base of the eroded cutbank. Soil borings also indicated that the site is underlain by sand and silty sand layers.

3.3 Land use

Bergerville Road borders the southern bank of the Manasquan River for approximately 150 feet. This two-lane township road serves as a major connector between various housing developments, and between Howell and Freehold Townships. Land use in the area is predominantly a mix of forested lands and low-to-medium density residential properties.

As shown in an aerial photograph of the project area (Figure 1-1), much of the area immediately adjacent to the river is forested. Two large-lot residential properties are located on uplands approximately 200 feet southwest Bergerville Road. In addition, two residential subdivisions are located nearby. One subdivision, located on Spruce Hollow Drive off Bergerville Road, is

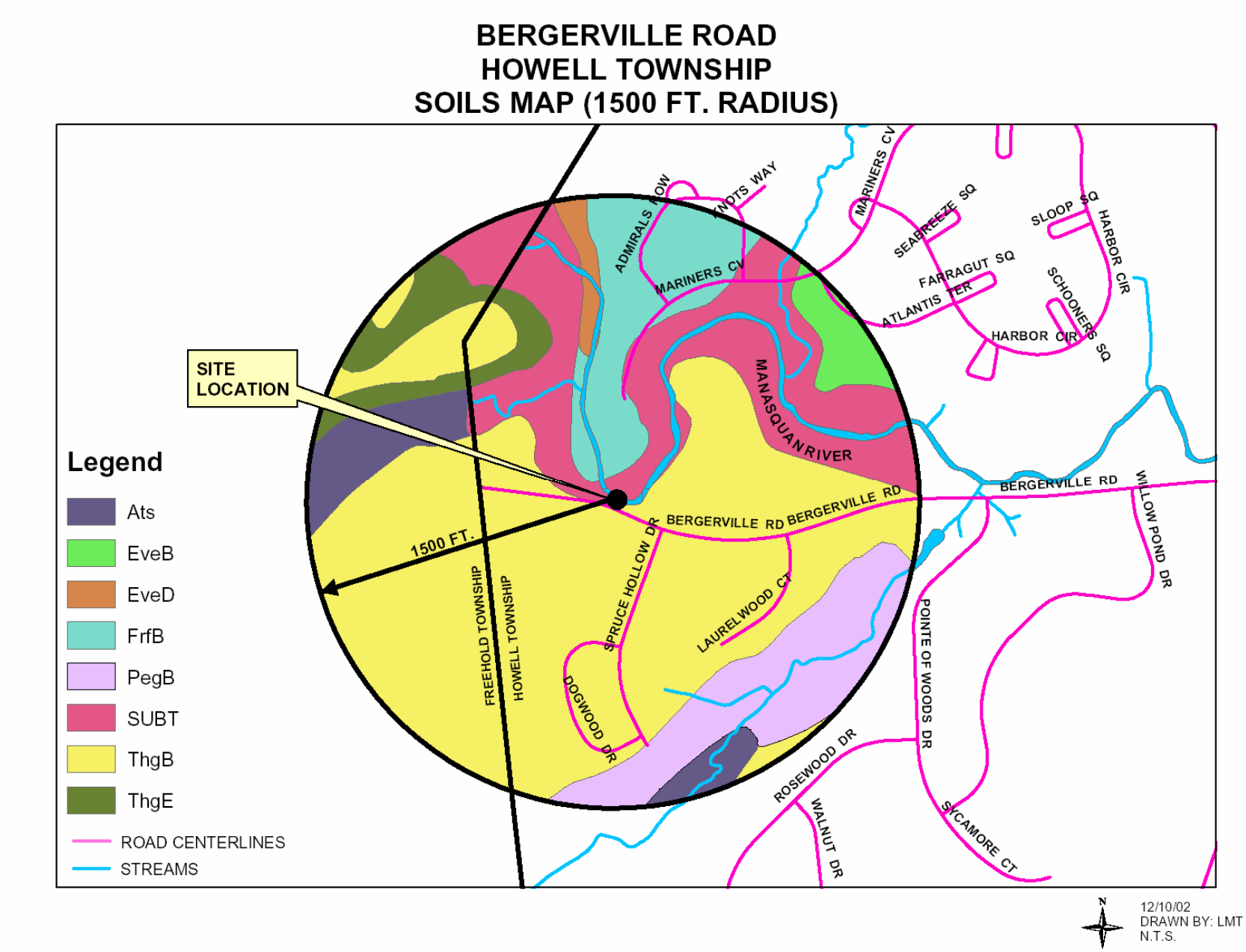

Figure 3-2 Soils in the vicinity of the project site

situated on uplands about 400 feet southeast of the project site. The second subdivision, on Mariners Cove, is located north of the project site, and extends down into the low-lying terrace formed by the Manasquan River in the meander bend.

3.4 Air Quality

There are currently 87 air monitoring stations located throughout New Jersey that actively monitor for carbon monoxide (CO), nitrogen dioxide (NO_2), ambient ozone (O_3), sulfur dioxide (SO_2), lead (Pb), or particulate matter (PM_{10}). There are two monitoring stations in Monmouth County. Ozone is monitored at Monmouth College and West Long Branch, and sulfur dioxide concentrations are monitored in Freehold.

The U.S. Environmental Protection Agency (USEPA) has reported that ozone levels within Monmouth County persistently exceed national air quality standards, causing the County to be classified as a non-attainment area for ozone. All other listed pollutants are in attainment status as of May 2002 (USEPA 2002).

3.5 Hydrology and Water Quality

The Manasquan River is classified as FW2-NT (Non-Trout) by the New Jersey DEP from its source, down through the project area, to the US Route 9 Bridge approximately 0.75 miles downstream of the project area. The FW2 class includes freshwater suitable for natural and established biota, recreation, water supply with appropriate treatment, and other reasonable uses. Below the US Route 9 Bridge, the classification changes to FW2-TM (Trout maintenance). Trout maintenance waters support trout throughout the year, or have the potential for such with some environmental modifications. Trout maintenance waters within the Manasquan River are annually stocked and heavily fished (NJDEP 1999).

Field observations indicate that significant trash accumulation and historical dumping may adversely affect water quality conditions. Prior to 1985, there were a number of point sources discharging directly to the Manasquan River or its tributaries. These discharges adversely affected stream water quality parameters including biological oxygen demand, suspended solids, fecal coliform, pH, and iron, and were sources of cyanide, algaecide, chlorinated hydrocarbons, surfactants, and thermal pollution. Removal of these point sources in 1985 has significantly improved the water quality of the River (USACE 1994). The NJ DEP has placed the Manasquan River on its 303(d) list of impaired waters; TMDLs for metals are anticipated by the end of 2002 (USEPA 2003).

Several agencies monitor water quality in the vicinity of the project site, including the NJDEP, the NJ Water Supply Authority, and the Monmouth County Department of Health. One site sampled by the County near the project site is located on Swankam Brook in Howell Township. This site showed exceedances of state environmental standards for fecal coliform in both spring and summer of 2002. Ammonia and phosphorus did not exceed State standards in 2002 (Monmouth County Department of Health 2002).

3.6 Wetlands

Wetland habitats in the Manasquan River Basin include saline, brackish, tidal freshwater, and non-tidal freshwater wetlands. Palustrine forested wetlands exist on the north side of the project site (Figure 3-3). These wetlands are densely vegetated with species common to outer coastal plain palustrine wetlands such as: red maple, green ash, and American beech. Other species include spicebush, southern arrowwood, and skunk cabbage.

Approximately 1 acre of freshwater wetlands exists within the proposed project boundaries. Wetlands in the vicinity of the project were all riparian (associated with the adjacent Manasquan River); many areas were densely forested with nearly complete canopy closure. Shading of the forest floor was often dense. Principal tree species in the forested wetlands included red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica* var. *subintegerrima*), and American beech (*Fagus grandifolia*). The shrub layer was occasionally dense in the wetland forest; principal species included spicebush (*Lindera benzoin*), sweet pepperbush (*Clethra alnifolia*), and southern arrowwood (*Viburnum dentatum*). Many of the trees present possessed diameters of 12 inches at breast height (dbh) or greater. The herbaceous layer was typically very sparse under the dense canopy, but included a mixture of cinnamon fern (*Osmunda cinnamomea*), jewelweed (*Impatiens duthicae*), skunk cabbage (*Symplocarpus foetidus*), and other species.

3.7 Aquatic Resources

The Manasquan River in the vicinity of the project site supports a variety of fish, herpetofauna, and benthic macroinvertebrate species. A trout fishery is located downstream of the project site. This area is stocked annually and provides for numerous man-hours of trout fishing every year. Other common freshwater fish species include black crappie, bluegill, brown bullhead, golden shiner, silvery minnow, white sucker, yellow perch, pumpkinseed, and tessellated darter. In addition, anadromous and catadromous species such as alewife, American eel, blueback herring, white perch, and sea lamprey may be found near the project site (USACE 1994).

Approximately 12 species of amphibians and 16 species of reptiles are known to occur in the vicinity of the Manasquan River Basin. These species include, but are not limited to wood frog, American toad, Fowler's toad, spotted salamander, common snapping turtle, stinkpot, Eastern box turtle, bog turtle, Easter garter snake, and northern black racer (USACE 1994).

Benthic macroinvertebrates are an important component of aquatic communities because they serve as a food source for many fish and other wildlife. The Monmouth County Department of Health runs a rapid bioassessment program in which a dip net is used to sample benthic organisms. The macroinvertebrates are then identified to the family taxonomic level and then scored based on the tolerance of the family to pollution. The final stream score is calculated using the variety of insects, the number of insect families present in the sample that are intolerant to pollution, the family with greatest number of individuals, and the family tolerance values. This score is then used to determine the level of impairment of the stream. A County monitoring site is located in the vicinity of the project area on the Manasquan River at Bergerville Road. During a sampling event on June 8, 2001, this site contained 79 individuals. The site was dominated by

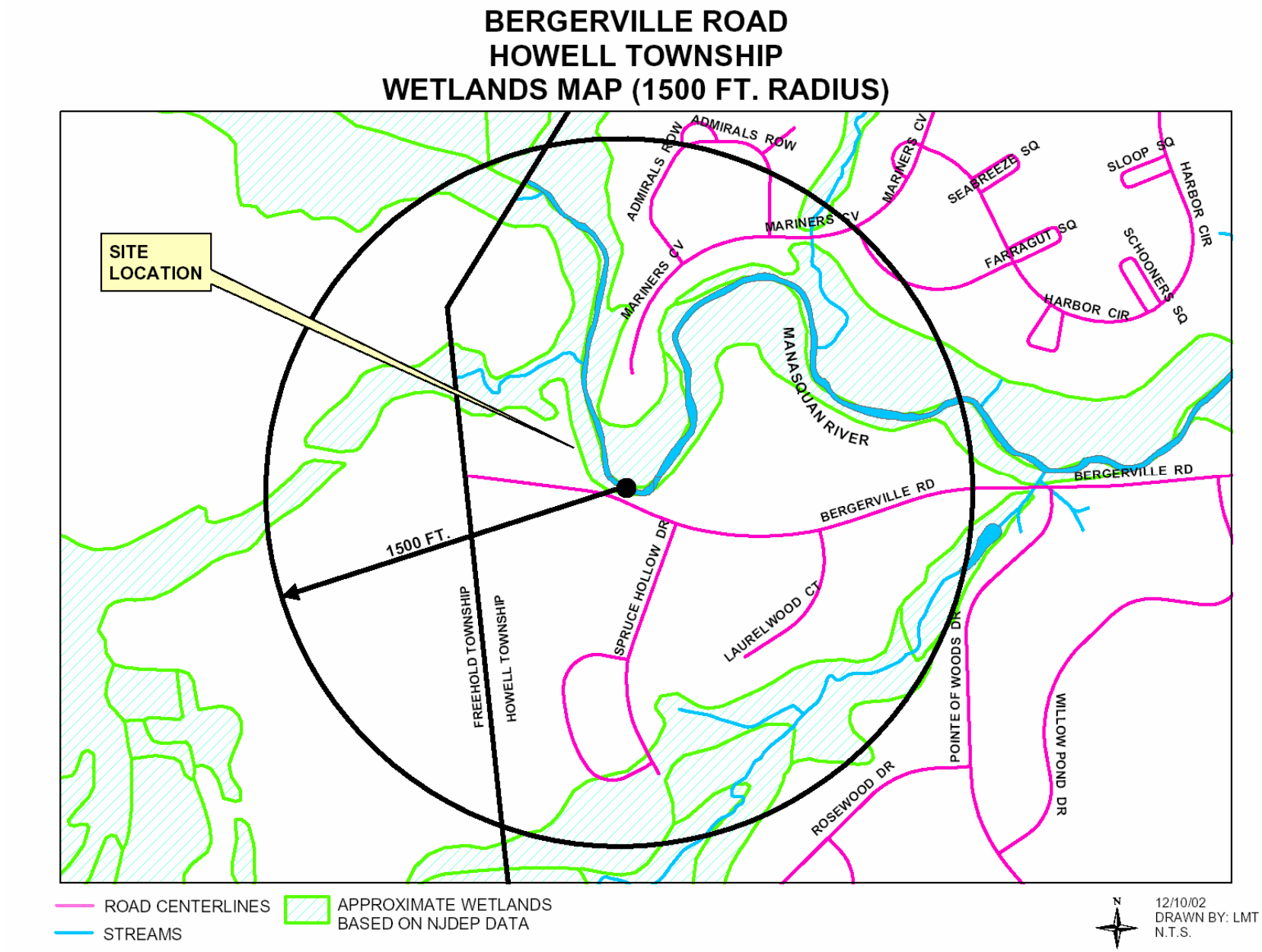

Figure 3-3 Wetlands in the vicinity of the project site

Chironomidae, a family group moderately tolerant of pollution. The final site score was 18, on a scale of 0-30. This score falls into the Moderately Impaired category, indicating that taxa richness is reduced, particularly among the more intolerant taxa (Monmouth County Department of Health 2001).

3.8 Terrestrial Resources

Although portions of the Manasquan River lie within the New Jersey Pine Barrens, the majority of the riparian vegetation and surrounding forests are more characteristic of woodlands typical of Northern New Jersey. The dominant natural vegetation is a mixed-oak and pine-oak forest. Bergerville Road is adjacent to the southern bank of the project site, while the northern bank is dominated by a palustrine forested wetland. A residential subdivision along Mariners Cove is located beyond the palustrine forested wetland to the north.

The vegetation in the area supports a variety of wildlife species. Animals commonly found in the habitat near the study area include snapping turtles, box turtles, some snake species, opossums, moles, shrews, cottontails, squirrels, woodchucks, raccoons, skunks, and white-tailed deer. A number of bird species such as the common flicker, Eastern kingbird, veery, and song sparrow are also known to frequent forested areas in the vicinity of the project site (USACE 1994).

3.9 Threatened and Endangered Species

The U.S. Fish and Wildlife Service (USFWS), was contacted concerning the presence of Federally-listed rare, threatened, and endangered species in the vicinity of the project site. Based on correspondence dated January 12, 2003, the USFWS detected two Federally-listed species in the vicinity of the project site (Appendix A). The Federally threatened bald eagle currently nests at the Manasquan Reservoir 2.5 miles southeast of the project site. Eagles from the reservoir nest site may occasionally forage or roost in the vicinity of the project area. Upon evaluation of the habitat and proposed activities at the site, USFWS has determined that the proposed project is not likely to adversely affect the bald eagle due to the fact that eagles are attracted to open bodies of water and there is significant tree cover at the project site.

A second Federally-listed species known to occur in the vicinity of the project site is the Federally threatened bog turtle. One occurrence of the bog turtle is known within five miles downstream of the project site. Suitable habitat was documented approximately four miles downstream and USFWS records indicate that a habitat survey was conducted one mile upstream, but that the habitat was determined to be unsuitable for bog turtles. In accordance with a USFWS request for additional information concerning the habitat suitability for the bog turtle in the immediate vicinity of the project site, a Phase 1 bog turtle habitat survey was performed in April 2003 by a qualified wetlands scientist. Results of the survey determined that suitable bog turtle habitat was not present in the immediate vicinity of the project site (Appendix B). Findings of this survey have been forwarded to USFWS for review in order to confirm that project activities will not adversely affect bog turtles.

NJ Department of Environmental Protection, Natural Heritage Program, was contacted concerning the presence of State rare, threatened, and endangered species near the project site.

Based on correspondence dated January 2, 2003, the Natural Heritage Database does not have any records for rare plants or natural communities on the project site. The Landscape Project (Version 1.0) shows that suitable habitat patches of forest and forested wetland occur on the project site and has records for bird species of special concern, northern pine snake, and Pine Barrens treefrog in these habitat patches. A complete list of rare species and natural communities found in Monmouth County can be found in Appendix A

Correspondence received from both the USFWS and NJDEP, Natural Heritage Program, can be found in Appendix A.

3.10 Hazardous, Toxic, and Radioactive Wastes

A hazardous, toxic, and radioactive waste (HTRW) literature search was completed in 1994 for the majority of the Manasquan River Basin, as part of the NEPA process for the Manasquan Reservoir located approximately 2.5 miles downstream from the study area. Flood-prone areas along the River and its tributaries, as well as the project site, were reviewed. Seventy-three (73) possible HTRW sites located in the Manasquan River Basin were considered as potential risks to the reservoir project. A majority of the sites identified in this study were located in urbanized areas such as Freehold, Farmingdale, and Brielle. Sites on the National Priorities List (NPL), which are investigated and remediated under Federal "Superfund" legislation, are considered the most serious HTRW threats. Several sites currently on the NPL are located in Howell Township, including Bog Creek Farm and the Zschiegner Refining Company; however, both are located downstream of the project site.

A review of current HRTW information contained within EPA's Envirofacts database indicated that no Federally regulated sites of any kind were located within a 1-mile radius of the project site (USEPA 2003).

3.11 Cultural Resources

The NJ Department of Environmental Protection, Historic Preservation Office, was contacted concerning the identification of cultural resources in the vicinity of the project site. Based on correspondence dated January 8, 2003, there are no known properties of historical significance located near the site (Appendix A). There are several properties considered eligible for the National Register in Howell Township, but these are outside the project area. However, the Manasquan River is the principal waterway in this portion of New Jersey and sites from the major prehistoric periods have been found along the river above and below the project area. Therefore, this site may have been utilized by prehistoric peoples, but no physical evidence of their presence has been observed.

3.12 Recreational and Aesthetic Resources

Several New Jersey State Parks are located in the region around the project site. Island Beach State Park is located along the Atlantic shoreline and contains the State's largest osprey colony, as well as peregrine falcons and numerous species of waterfowl. The park also contains the largest expanse of beach heather in New Jersey. Also in Monmouth County are Allaire State

Park in Farmingdale downstream of the project site, and Monmouth Battlefield State Park, in Manalapan upstream of the project site.

Monmouth County also operates an extensive park system featuring 36 recreational facilities totaling more than 12,000 acres. Located in Howell Township 2.5 miles southeast of the project site, 720-acre Manasquan Reservoir features ice-skating, fishing, kayaking, and rowboats. The Reservoir is a source of drinking water for municipalities and utilities. It is part of a 1,200-acre park that includes woods and wetlands, a 5-mile perimeter hiking trail, and an environmental center. The Howell Park Golf Course, also operated by the County, is located adjacent to Manasquan Reservoir property. Manasquan River Linear Park, located along the river in Howell and Freehold Townships, is land area preserved by the County as open space, including canoe and kayak access to the Manasquan River.

3.13 Socio-Economic Conditions

3.13.1 Demographic Information

Howell Township, located in south-central Monmouth County, has a land area of 62.1 square miles, making it the largest municipality in the County. Residential development in this area began largely in the 1960s and has exploded in recent decades, as has commercial development. With access to Route 9, Route 195, and the Garden State Parkway, this centrally located municipality is one of the fastest growing townships in Monmouth County today.

According the Monmouth County Planning Board, 48,903 people lived in Howell Township in 2000 (MCPB 2002). An estimated 49,643 people will live there in 2001, and 57,354 people are expected to live in the Township by 2020. In the year 2000, 86% of the Township was white, 3% was black, 6% was Asian and Other, and 5% were of Hispanic origin. Fifty-eight percent of residents are of working age (20-64 years old). The projected median per capita and family income for 2000 was $27,372 and 84,238, respectively. The unemployment rate in Howell Township in the year 2000 was 3.4%.

As previously mentioned, Bergerville Road serves as a major traffic route between Howell and Freehold Townships. If the road were permanently closed, estimates by the Township Engineer indicate that a 2.0-mile detour would be needed. A permanent traffic detour would result in increased vehicle operating and opportunity costs to the drivers and passengers due to the increased travel time. At an estimated annual cost of approximately $1,000,000, this without project condition is not considered cost effective (USACE 2000).

3.13.2 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This Executive Order is designed to focus the attention of Federal agencies on the human health and environmental conditions in minority communities and low-income communities. It requires Federal agencies to adopt strategies to address environmental justice concerns within the context of agency operations. In an accompanying Presidential memorandum, the President emphasized

that existing laws, including NEPA, provide opportunities for Federal agencies to address environmental hazards in minority communities and low-income communities. In April of 1995, the EPA released the document titled *Environmental Justice Strategy: Executive Order 12898*. The document established Agency-wide goals and defined the approaches by which EPA will ensure that disproportionately high and adverse human health or environmental effects on minority communities and low-income communities are identified and addressed.

Also within the context of the NEPA process, effects of the action on children should be reviewed under environmental justice. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, directs Federal agencies to ensure that their policies, programs, activities, and standards address disproportionate risks to children that result from environmental health or safety risks. An estimated 49,643 people will live there in 2001, and 57,354 people are expected to live in the Township by 2020. In the year 2000, 86% of the Township was white, 3% was black, 6% was Asian and Other and 5% were of Hispanic origin. Fifty-eight percent of residents are of working age (20-64 years old). The projected median per capita and family income for 2000 was $27,372 and 84,238, respectively. The unemployment rate in Howell Township in the year 2000 was 3.4%.

Approximately 4.5% of County residents are below the poverty level. The distribution of minority and low-income residents is not greater in the project area than elsewhere in the county or Township.

4. ENVIRONMENTAL CONSEQUENCES

4.1 Topography

Under the No-Action Alternative, lateral bank erosion would continue, contributing to changes in bank slope and local topography as the river channel migrates laterally into the road in the vicinity of the project site.

The remaining alternatives – the Proposed Action (CCS wall) and Alternatives A (stream relocation) and B (road relocation and bank stabilization) – would all involve minor changes in local topography. The Proposed Action would make the topography more uniform, while stabilizing and reducing the slope of the bank. Alternative A would require the excavation of a new channel and backfilling the existing channel. The stream stabilization associated with moving the road in Alternative B would decrease the slope of the bank and decrease bank erosion.

4.2 Geology and Soils

The No-Action Alternative would result in continued bank erosion and soil loss in the vicinity of the project site.

The remaining alternatives, including the Proposed Action, would all result in minor construction impacts such as soil compaction and regrading. It is expected that Best Management Practices (BMPs) would be implemented during the construction phase of the project and efforts would be

made to reduce soil erosion and minimize long term effects on the soils in the vicinity of the project area.

4.3 Land Use

The permanent closing and abandonment of Bergerville Road would be the eventual result of the No-Action Alternative. This would lead to the re-routing of traffic through suburban residential areas and increased inconvenience and opportunity costs for the residents of Howell Township and the surrounding area.

Alternative A, the relocation of the stream, is expected to result in minor to moderate land use impacts. A new stream channel would be created in the wetlands area north of the current channel and wetlands could be created in the backfilled channel. Changes in hydrologic and sediment transport regimes could lead to increased downstream flooding, channel adjustments, and habitat loss.

Alternative B, the relocation of the road and subsequent stream stabilization would result in the conversion of a small strip of adjacent residential land use to road.

No adverse land use effects are anticipated if the Proposed Action is implemented.

4.4 Air Quality

Road closure and subsequent traffic detours associated with the No-Action Alternative are expected to increase driving distances and travel times. The resulting increased motor vehicle use could pose minor threats to local air quality in the vicinity of the project site.

The remaining alternatives, including the Proposed Action, would have short-term, localized construction impacts resulting from emissions from construction vehicles. No long-term impacts to air quality are expected to occur.

A General Conformity Review and Emission Inventory was performed to ensure that the Proposed Action conforms to the nonattainment area's State Implementation Plan (SIP), thus not adversely impacting the area's progress toward attaining the National Ambient Air Quality Standards (NAAQS) (see Appendix C).

Based on the conformity analysis in the subject report, it was determined that the proposed action conforms to the applicable State Implementation Plan (SIP). The total estimated emissions that would result from construction of the Manasquan River at Bergerville Road Howell Township Monmouth County, New Jersey Streambank Stabilization Project are 0.75 tons of NO_x and 0.15 tons of VOCs. These emissions are below the General Conformity trigger levels of 25 tons per year for each pollutant. General Conformity under the Clean Air Act, Section 176 has been evaluated for the project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project because the total direct and indirect emissions from the project are below the conformity threshold values established at 40 CFR

93.153 (b) for ozone (NO_x and VOCs) in a Severe Nonattainment Area (25 tons of each pollutant per year). The project is not considered regionally significant under 40 CFR 93.153 (i).

4.5 Hydrology and Water Quality

The No-Action Alternative is expected to result in increased bank erosion, causing downstream channel adjustments, possibly affecting the downstream trout fishery on the Manasquan River. Increased erosion would also lead to an increased sediment load in the river, increasing turbidity and reducing water quality in the vicinity of the project site.

Alternative A is expected to dramatically increase water velocities in the vicinity of the project site, leading to possible adverse downstream effects resulting from increased stream power and sediment transport. Temporary construction impacts resulting from the implementation of this alternative would result when trees were cut down or moved. This would decrease shading and increase water temperature in the river, as well as increasing sediment load and turbidity due to increased soil erosion. Once trees were replanted or allowed to grow back, this impact would be alleviated.

Because the current planform alignment of the channel would be maintained with Alternative B, only minimal impacts to water quality are anticipated. These impacts would be limited to short term construction impacts associated with regrading the south bank of the river. Perhaps the most significant impact would be the loss of shade provided by the mature trees along the south bank, which would result in localized increases in water temperature. Stabilization of the eroding right bank is anticipated to outweigh short-term construction impacts and localized temperature increases that would occur until mature vegetation re-establishes at the site.

Minor hydrologic changes are anticipated with the Proposed Action as the channel centerline is shifted north approximately one half channel width (approximately 10 feet). This planform adjustment would result in minor increase in flow velocities as channel slope is increased. Increased flow velocities would help flush accumulated sediment from the existing pools along the outside bend, thereby improving habitat quality and diversity in the river. Designs for the CCS wall call for additional channel capacity that would alleviate flooding by reducing stage height compared to the No-Action Alternative. Stabilization of the eroding right bank is anticipated to outweigh short-term construction impacts and localized temperature increases that would occur until mature vegetation re-establishes at the site.

4.6 Wetlands

Both the No-Action Alternative and Alternative B are not anticipated to have any expected impact on wetlands in the vicinity of the project site.

Alternative A, stream relocation, is expected to result in major impacts to wetlands as a new stream channel is constructed across the forested wetlands on the meander bend. These wetland impacts could be mitigated somewhat by creating wetlands in the existing stream channel after it is backfilled. Wetland soils and vegetation could be transferred from the new channel to the backfilled channel to preserve the wetland soils, seed bank, and plant diversity.

The Proposed Action will impact approximately 0.36-acre of existing wetlands and State open waters; it will shift the stream channel approximately 10 feet toward the inside of the meander bend, into the gravel point bar and wetlands along the river's left bank. This shift will return the channel to a preexisting channel configuration. Adverse impacts to the riparian wetlands that have established along the gradually expanding point bar and adjacent floodplain over time are expected to be minor, and limited to the project area. Wetland vegetation will be restored and replanted to pre-construction condition. For a detailed description of the proposed wetland restoration plan, see the report in Appendix E entitled: *Final Habitat Assessment and Recommendations for Restoration for Manasquan River Streambank Stabilization and Channel Realignment Project, Howell Township, New Jersey.*

4.7 Aquatic Resources

Under the No-Action Alternative, increased sedimentation due to continued bank erosion could have adverse impacts on the fish, benthic macroinvertebrates, and other aquatic wildlife in the vicinity of the project site. Additionally, aquatic wildlife, especially in the trout waters downstream of the project site may be impacted by sedimentation under this alternative.

Alternative A, stream relocation, would require the stream to be blocked or diverted during the construction phase of the project. Recolonization of the new stream channel could take some time and affect the diversity of organisms in the stream. Because the new stream channel would have to be lined with concrete or riprap, habitat diversity would decrease significantly. Construction impacts, such as a temporary increase in sedimentation and the removal of trees causing a decrease in shading may occur, but would decrease over time once the construction phase of the project was completed.

Both the Proposed Action and Alternative B would have similar impacts on aquatic resources in the area. Under the Proposed Action, the hardened lower portion of the CCS wall would slightly reduce habitat diversity of the stream bottom, potentially impacting the local benthic community slightly. The impacts to aquatic resources under Alternative B would depend significantly upon the type of bank stabilization technique used. The proposed action would result in some portions of wetted channel being converted from deep-water habitat to a shallow-water habitat due to grading into the existing left bank. Certain techniques could add to the habitat diversity of the area, while techniques such as riprap and gabions would decrease the diversity of habitat available to aquatic wildlife. The project design should include all existing pools in the new channel (approximately 3,000 cubic feet) to replace aquatic habitat. Temporary construction impacts similar to those listed under Alternative A would also occur, but would also decrease over time.

4.8 Terrestrial Resources

As increased bank slumping and lateral bank erosion occurs under the No-Action Alternative, trees and other riparian vegetation will fall into the stream causing further soil erosion and impacting the hydrology of the stream itself.

Impacts resulting from both Alternatives A and B, as well as the Proposed Action, are similar. Short-term construction impacts will harm the riparian vegetation in the vicinity of the project site for all of these alternatives. For each alternative, replanting after the construction phase will help alleviate the impacts to terrestrial resources. Mature trees along the right streambank will be stabilized prior to initial construction activities to minimize loss of shade habitat due to sloughing of the right bank. If trees are removed, a planting plan for the left bank will be incorporated to include native species. Concurrent with left bank excavation and planting, the herbaceous understory of Japanese stiltgrass shall be removed. This is a non-native and invasive species that poses a threat to habitat quality and difficult to control.

4.9 Threatened and Endangered Species

Because there are no known State- or Federally-listed threatened or endangered species in the vicinity of the project site, there are no anticipated effects on threatened or endangered species under any of the listed alternatives.

4.10 Hazardous, Toxic, and Radioactive Wastes

Because there are no known hazardous, toxic, or radioactive waste sites in the vicinity of the project site, impacts associated with these types of sites are not anticipated under any of the listed alternatives. As previously indicated in Section 3.9, a Phase 1 bog turtle habitat survey was performed on and adjacent to the Manasquan site in April 2003 by a qualified wetlands scientist. Results of the survey determined that suitable bog turtle habitat was not present in the immediate vicinity of the project site (Appendix B). Findings of this survey have been forwarded to USFWS for review in order to confirm that project activities will not adversely affect bog turtles.

4.11 Cultural Resources

Because there are no known cultural resources near the project site, impacts to cultural resources under any of the listed alternatives are not anticipated.

4.12 Recreational and Aesthetic Resources

Under the No-Action Alternative, increased sedimentation due to bank erosion may adversely affect the trout fishery downstream of the project site. If this occurs, the recreational value of the downstream trout fishery is likely to be reduced.

The remaining alternatives may also have temporary impacts to the downstream trout fishery due to increased sedimentation during the construction phase of the project. In addition, during construction, the presence of construction equipment will temporarily lower local aesthetic quality. Once the project is completed, site-related stresses on downstream water quality and habitat condition are expected to be greatly reduced. Under each of these Alternatives, impacts to State or Township park properties are not anticipated.

4.13 Socio-Economic Conditions

Under the No-Action Alternative, Bergerville Road would be permanently closed and traffic would have to be re-routed for two miles through suburban areas, causing increased traffic and safety concerns in those areas. A permanent traffic detour would result in increased opportunity costs to drivers due to increased travel time. The estimated annual cost of this alternative is approximately $1,040,000.

Under the remaining alternatives, Bergerville Road would be closed periodically during construction activities and fully reopened once construction has been completed. Also, under Alternative B, the relocation of the road would involve moving several utility poles and pipelines, increasing the cost of this Alternative significantly.

None of the listed alternatives is expected to have disproportionate, adverse environmental or human health impacts on minority or low-income populations. Also, none of the proposed alternatives is expected to have disproportionate impacts on children. Therefore, the Proposed Action or its alternatives would have no adverse impacts on environmental justice.

4.14 Cumulative Effects

Because of the relatively small scale of this project and the lack of other stream altering projects in the surrounding area, any cumulative effects associated with this stream bank restoration project are expected to be minimal.

5. COORDINATION AND PERMITS

As described earlier, letters were submitted to and comments received from USFWS and NJ DEP, Natural Heritage Program, and NJ Historic Preservation Office, addressing potential environmental impacts from the proposed project. After negative findings in the Phase 1 Bog Turtle Survey, the USFWS is expected to find that no adverse effects on listed species are expected. No potential impacts on state listed species or cultural resources were identified by NJ DEP, Natural Heritage Program, and NJ Historic Preservation Office, respectively.

In addition to agency coordination, this EA has supported the development of applications for the following permits:

- Section 401 Water Quality Certificate - New Jersey Department of Environmental Protection, Land Use Regulation Program, *New Jersey Surface Water Quality Standards, NJSA 58: 10A-1*

- Freshwater Wetlands Permit - New Jersey Department of Environmental Protection, Land Use Regulation Program, *Freshwater Wetlands Protection Act Rules, NJAC 7:7A* as amended March 16, 1999

- Stream Encroachment Permit - New Jersey Department of Environmental Protection, Land Use Regulation Program, *Stream Encroachment, NJAC 7:13-4-1*

- Soil Erosion Sediment Control Permit - New Jersey Soil Erosion and Sediment Control Act of New Jersey, Chapter 251; *P.L. 1975*

The EA also includes an evaluation of the Proposed Action using the "*Guidelines for Specification of Disposal Sites for Dredged or Fill Material*" (40 CFR Part 230) by the United States Environmental Protection Agency.

6. CONCLUSIONS

The Proposed Action involves arresting encroachment of the Manasquan River into Bergerville Road using a CCS wall design to stabilize the embankment. This Proposed Action meets the project objectives by providing long-term (>50 year) protection of Bergerville Road at a reasonable cost for the non-Federal sponsor, while minimizing associated environmental consequences. While the CCS wall design will require shifting the river channel approximately 10 feet toward the inside of the meander bend, the design will return the river to a historical planform alignment, provide additional channel capacity, and reduce or eliminate the project site's harmful influences on downstream habitat and water quality. The other alternatives considered under this assessment could meet some or all of these objectives, but at greater environmental, economic, or opportunity cost.

7. LIST OF PREPARERS

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B.S. Zoology, M.S. Biology (Ecology)
EA Preparation

Barbara Conlin
Ecologist
B.A.A.S. Biology; M.S. Ecology
EA finalization

8. REFERENCES

Monmouth County Department of Health, 2002. Ambient Surface Water Monitoring Results, Squankam Brook, Howell Township. http://www.visitmonmouth.com/health/environmental/water/ambients/index.asp (March 2003).

Monmouth County Department of Health, 2001. Rapid Bioassessment Program Results, Manasquan River, Bergerville Road. http://www.visitmonmouth.com/health/labpages/rbasites.asp (March 2003).

New Jersey Department of Environmental Protection (NJDEP), 1999. Initial Surface Water Quality and Characterization Report (based on DEP Data) for Watershed Management Area 12. http://www.state.nj.us/dep/dsr/watershed/area12-toc.htm#1.0 (January 2003).

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US Environmental Protection Agency (USEPA), 2003. USEPA Total Maximum Daily Loads, Listed Water Information, Cycle: 1998. http://oaspub.epa.gov/waters/enviro.control?p_list_id=NJ-02040301-002, (March 2003).

APPENDIX A

AGENCY CORRESPONDENCE – USFWS, NJDEP, NJHPO

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609/646 9310
Fax: 609/646 0352
http://www.fws.gov/northeast/njfieldoffice

In Reply Refer To:
07-FA0196a

JUN 05 2007

Minas M. Arabatzis, Chief
Planning Division, U.S. Army Corps of Engineers
Wanamaker Building
100 Penn Square East
Philadelphia, Pennsylvania 19107-3390
ATTN: Ms. Barbara Conlin

Dear Mr. Arabatzis:

The U.S. Fish and Wildlife Service (Service), New Jersey Field Office has received and reviewed the engineering plans for the proposed streambank stabilization of the Manasquan River along Bergerville Road, Howell Township, Monmouth County, New Jersey. The Service acknowledges that the engineering plans have not significantly changed since our last review dated June 27, 2003 (Service control number PL-NJ-03/300), pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq.*) (FWCA). Therefore, all coordination requirements between the U.S. Army Corps of Engineers and the Service pursuant to the FWCA are satisfied.

Please contact Carlo Popolizio of my staff at (609) 646-9310, extension 32, if you have any questions or require further assistance regarding federally listed threatened or endangered species.

Sincerely,

John C. Staples
Assistant Supervisor

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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http://www.fws.gov/northeast/njfieldoffice

IN REPLY REFER TO:
07-FA0196

MAY 2 9 2007

Minas M. Arabatzis, Chief
Planning Division, U.S. Army Corps of Engineers
Wanamaker Building
100 Penn Square East
Philadelphia, Pennsylvania 19107-3390
Fax Number: (215) 656-6543
ATTN: Ms. Barbara Conlin

Reference: Streambank Stabilization along the Manasquan River along Bergerville Road, Howell Township, Monmouth County, New Jersey

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed project pursuant to Section 7 of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) (ESA) to ensure the protection of federally listed endangered and threatened species. The following comments do not address all Service concerns for fish and wildlife resources and do not preclude separate review and comment by the Service as afforded by other applicable environmental legislation.

Except for an occasional transient bald eagle (*Haliaeetus leucocephalus*), no other federally listed or proposed threatened or endangered flora or fauna under Service jurisdiction are known to occur within the proposed project's impact area. Therefore, no further consultation pursuant to Section 7 of the ESA is required between the federal action agency and the Service. If additional information on federally listed species becomes available, or if project plans change, this determination may be reconsidered.

Please refer to this office's web site at http://www.fws.gov/northeast/njfieldoffice/Endangered/ for current information regarding federally listed and candidate species in New Jersey, and procedures for requesting Section 7 consultation. Our web site lists species occurrence by municipality, and specifies the information that must be submitted to expedite Service review of proposed projects. The web site also includes contacts for obtaining information from the New Jersey Natural Heritage and Endangered and Nongame Species Programs regarding State-listed and other species of concern.

Reviewing Biologist: _____

Authorizing Supervisor: _____

Versar INC.
ESM Operations

HPO-A2003-35
03-0651-1 DF

December 10, 2002

Ms. Dorothy Guzzo
Historic Preservation Office, 4th Floor
Division of Parks and Forestry
Department of Environmental Protection
501 East State Street
P.O. Box 404
Trenton, NJ 08625

RE: Historical Properties Review

Dear Ms. Guzzo:

On behalf of the U.S. Army Corps of Engineers, Philadelphia District (USACE), Versar, Inc., would like to request a review of the proposed project area on the Manasquan River, adjacent to Bergerville Road, in Howell Township, Monmouth County, New Jersey, to identify significant cultural resources in the immediate area (Figure 1).

Howell Township has requested help from the USACE to stabilize the streambank along Bergerville Road, where the Manasquan River is severely eroding the outside (right) bank as it passes through a tight meander bend. To meet the USACE's requirements under the National Environmental Policy Act, Versar is preparing an Environmental Assessment for this project. The proposed action involves reinforcement of approximately 200 linear feet of streambank and road embankment with a cellular confinement system (CCS) wall. The CCS wall will extend approximately half way (about eight feet) into the existing channel and to compensate, the left bank will be excavated and the centerline of the channel will be moved slightly. The results of the review performed by your office will be used in our assessment of the environmental consequences associated with the proposed action and alternatives being considered.

Thank you for your assistance in this matter. We also welcome any additional comments or concerns that you may have regarding potential impacts of the project. Your comments would be most helpful if received on or before January 15, 2003. Should you have any questions, please contact me via telephone at 410/740-6092 or e-mail at perotmor@versar.com.

Sincerely,

A. Morris Perot, Jr.
Environmental Scientist

AMP:amp/sg
Enclosure
I:\DEPT_74\PHILA01\Manasquan\13232-L2.doc

cc: File: 110392-0034-012

I concur with your finding that there are no historic properties affected within the project's area of potential effects. Consequently, pursuant to 36 CFR 800.4(d)(1), no further Section 106 consultation is required unless additional resources are discovered during project implementation pursuant to 36 CFR 800.13.

Dorothy P. Guzzo 1/8/03
Dorothy P. Guzzo — Date
Deputy State Historic Preservation Officer

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HISTORIC PRESERVATION OFFICE

9200 RUMSEY ROAD • COLUMBIA, MARYLAND 21045-1934 • TELEPHONE: (410) 964-9200 • FAX: (410) 964-5156

c.c. Frank Cianfrani, USACE

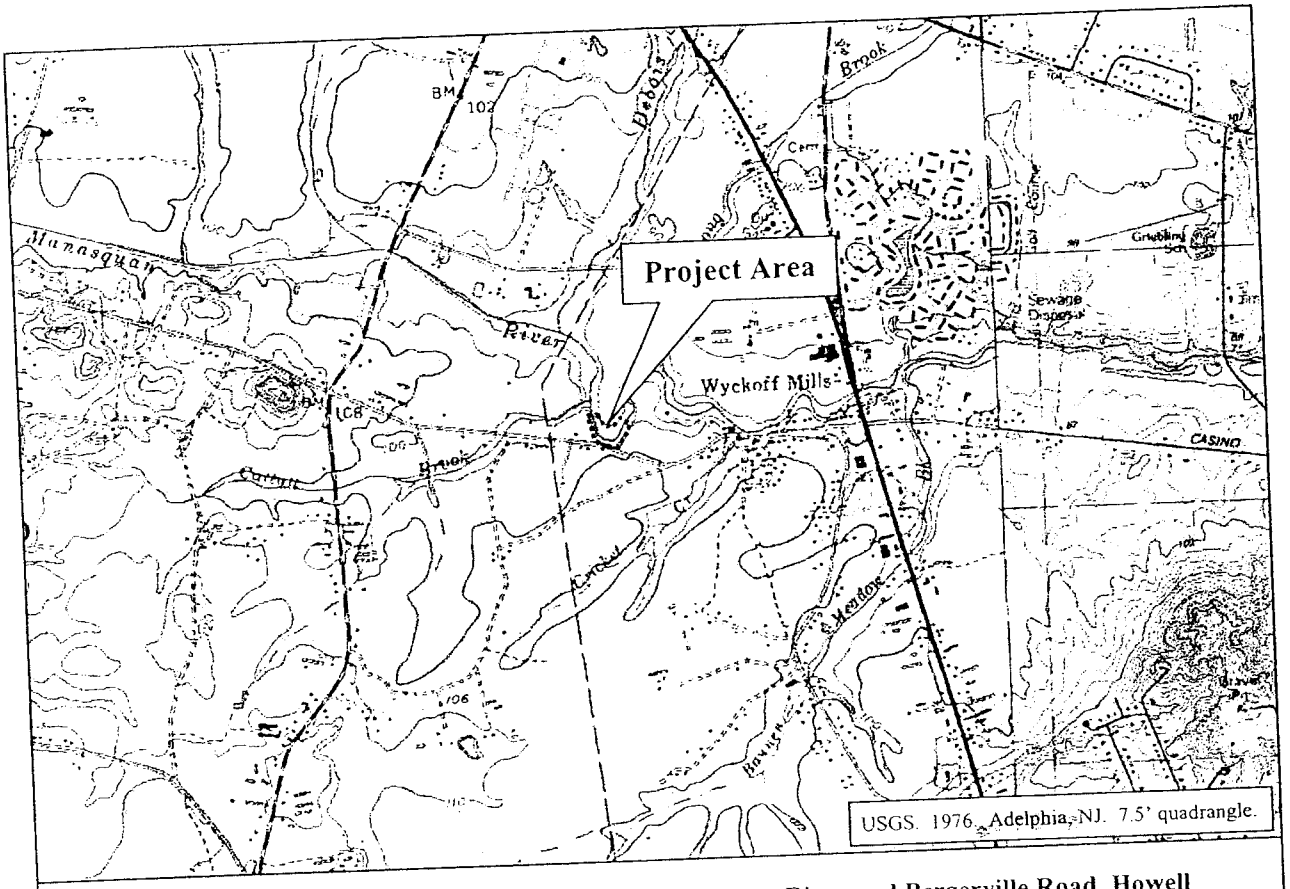

Figure 1: Streambank Stabilization Project Area, Manasquan River and Bergerville Road, Howell Township, Monmouth County, New Jersey

State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection
Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
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Bradley M. Campbell
Commissioner

January 2, 2003

A. Morris Perot, Jr.
Versar Inc.
9200 Rumsey Road
Columbia, MD 21045

Re: Bergerville Road, Howell Township - Environmental Review

Dear Mr. Perot:

Thank you for your data request regarding rare species information for the above referenced project site in Howell Township, Monmouth County.

The Natural Heritage Data Base does not have any records for rare plants or natural communities on the site.

The Landscape Project (Version 1.0) shows that suitable habitat patches of forest and forested wetland occur on the project site, and has records for bird species of special concern, northern pine snake, and pine barrens treefrog in habitat patches that are on the project site. The attached list provides more information about those records that are also in the Natural Heritage Data Base.

Attached is a list of rare species and natural communities that have been documented from Monmouth County. This county list can be used as a master species list for directing further inventory work. If suitable habitat is present at the project site, these species have potential to be present. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend you contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

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: Thomas F. Breden
Lawrence Niles
NHP File No. 03-4007423

CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program to map critical habitat for rare animal species. Some of the rare species data in the Landscape Project is in the Natural Heritage Database, while other records were obtained from other sources. Natural Heritage Database response letters will list all species (if any) found during a search of the Landscape Project. However, any reports that are included with the response letter will only reference specific records if they are in the Natural Heritage Database. This office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.

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

On Project Site
Rare Species and Natural Communities Presently Recorded in the Landscape Project

Project: Bergerville Road, Howell Township - Environmental Review
Habitats: forest and forested wetland

Landscape and Heritage Species
bird species of special concern
northern pine snake
pine barrens treefrog

Linked Natural Heritage Database Records

Latin Name	Common Name	Federal Status	State Status	Grank	Srank	Date Observed	Ident.
Pituophis m. melanoleucus	northern pine snake		T	G4T4	S3	1982-07-05	Y
Pituophis m. melanoleucus	northern pine snake		T	G4T4	S3	1986-08-??	Y
Pituophis m. melanoleucus	northern pine snake		T	G4T4	S3	1990-06-??	Y
Pituophis m. melanoleucus	northern pine snake		T	G4T4	S3	1987-07-??	Y
Pituophis m. melanoleucus	northern pine snake		T	G4T4	S3	1988-07-??	Y
Hyla andersonii	pine barrens treefrog		E	G4	S3	2001-05-22	Y
Hyla andersonii	pine barrens treefrog		E	G4	S3	2001-05-22	Y

EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

LE	Taxa formally listed as endangered.
LT	Taxa formally listed as threatened.
PE	Taxa already proposed to be formally listed as endangered.
PT	Taxa already proposed to be formally listed as threatened.
C	Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.
S/A	Similarity of appearance species.

STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (NSSA 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

D	Declining species-a species which has exhibited a continued decline in population numbers over the years.
E	Endangered species-an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors - a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
EX	Extirpated species-a species that formerly occurred in New Jersey, but is not now known to exist within the state.
I	Introduced species-a species not native to New Jersey that could not have established itself here without the assistance of man.
INC	Increasing species-a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.
T	Threatened species-a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.
P	Peripheral species-a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
S	Stable species-a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
U	Undetermined species-a species about which there is not enough information available to determine the status.

Status for animals separated by a slash(/) indicate a duel status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

S2 Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.

S3 Rare in state with 21 to 100 occurrences (plant species in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.

S4 Apparently secure in state, with many occurrences.

S5 Demonstrably secure in state and essentially ineradicable under present conditions.

SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.

SE Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).

SH Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.

SP Element has potential to occur in New Jersey, but no occurrences have been reported.

SR Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.

SRF Elements erroneously reported from New Jersey, but this error persists in the literature.

SU Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.

SX Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.

SXC Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.

SZ Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined.

Typically, the SZ rank applies to a non-breeding population (N) in the state - for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration.

JUN 2002

MONMOUTH COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
** Vertebrates						
ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5	S3B,S4N
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1B
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B
CLEMMYS INSCULPTA	WOOD TURTLE		T		G4	S3
CLEMMYS MUHLENBERGII	BOG TURTLE	LT	E		G3	S2
CROTALUS HORRIDUS HORRIDUS	TIMBER RATTLESNAKE		E		G4T4	S2
DOLICHONYX ORYZIVORUS	BOBOLINK		T/T		G5	S2B
FALCO SPARVERIUS	AMERICAN KESTREL		INC/S		G5	S3B,S?N
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	LT	E		G4	S1B,S2N
HYLA ANDERSONII	PINE BARRENS TREEFROG		E		G4	S3
IXOBRYCHUS EXILIS	LEAST BITTERN		D/S		G5	S3B
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5	S2B,S2N
NYCTANASSA VIOLACEA	YELLOW-CROWNED NIGHT-HERON		T/T		G5	S2B
PANDION HALIAETUS	OSPREY		T/T		G5	S2B
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2B,S4N
PITUOPHIS MELANOLEUCUS	NORTHERN PINE SNAKE		T		G4T4	S3
MELANOLEUCUS						
PODILYMBUS PODICEPS	PIED-BILLED GREBE		E/S		G5	S1B,S3N
POOECETES GRAMINEUS	VESPER SPARROW		E		G5	S1B,S2N
RYNCHOPS NIGER	BLACK SKIMMER		E		G5	S1B
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B
STRIX VARIA	BARRED OWL		T/T		G5	S3B
*** Ecosystems						
COASTAL DUNE WOODLAND	COASTAL DUNE WOODLAND				G2G3	S1
FLOODPLAIN FOREST	FLOODPLAIN FOREST				G4	S3?
MARITIME FOREST	MARITIME FOREST				G3?	S1
*** Invertebrates						

MONMOUTH COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
ASCLEPIAS VARIEGATA	WHITE MILKWEED				G5	S2
ASTER RADULA	LOW ROUGH ASTER		E		G5	S1
CACALIA ATRIPLICIFOLIA	PALE INDIAN PLANTAIN		E		G4G5	S1
CALAMAGROSTIS PICKERINGII	PICKERING'S REED GRASS		E		G4	S1
CALAMOVILFA BREVIPILIS	PINE BARREN REEDGRASS			LP	G4	S4
CAREX BARRATTII	BARRATT'S SEDGE			LP	G4	S4
CAREX CUMULATA	CLUSTERED SEDGE		E		G4?	SH
CAREX POLYMORPHA	VARIABLE SEDGE		E		G3	S1
CERATOPHYLLUM ECHINATUM	SPINY COONTAIL		E		G4?	S1
CRATAEGUS CALPODENDRON	PEAR HAWTHORN		E		G5	S1
CRATAEGUS SUCCULENTA	FLESHY HAWTHORN		E		G5	S1
CYPERUS LANCASTRIENSIS	LANCASTER FLAT SEDGE		E		G5	S1
CYPERUS POLYSTACHYOS	COAST FLAT SEDGE		E		G5T5	S1
DESMODIUM HUMIFUSUM	TRAILING TICK-TREFOIL		E		G1G2Q	SH
DESMODIUM PAUCIFLORUM	FEW-FLOWER TICK-TREFOIL		E		G5	S1
DIODIA VIRGINIANA	LARGER BUTTONWEED		E		G5T5	S1
DIRCA PALUSTRIS	LEATHERWOOD				G4	S2
DOELLINGERIA INFIRMA	CORNEL-LEAF ASTER				G5	S2
ERIOCAULON PARKERI	PARKER'S PIPEWORT				G3	S2
FRAXINUS PROFUNDA	PUMPKIN ASH		E		G4	S1
GENTIANA AUTUMNALIS	PINE BARREN GENTIAN			LP	G3	S3
GLAUX MARITIMA	SEA-MILKWORT		E		G5	SX.1
HELONIAS BULLATA	SWAMP-PINK	LT	E	LP	G3	S3
HYDROCOTYLE VERTICILLATA VAR VERTICILLATA	WHORLED MARSH-PENNYWORT				G5T5	S2
JUNCUS CAESARIENSIS	NEW JERSEY RUSH		E	LP	G2	S2
LIATRIS SCARIOSA VAR NOVAE-ANGLIAE	NORTHERN BLAZING-STAR		E		G5?T3	SH
LIMOSELLA SUBULATA	AWL-LEAF MUDWORT		E		G4G5	S1
LINUM INTERCURSUM	SANDPLAIN FLAX		E		G4	S1

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609/646 9310
Fax: 609/646 0352
http://njfieldoffice.fws.gov

In Reply Refer to:

ES-02/885

JAN 15 2003

A. Morris Perot, Jr., Environmental Scientist
Versar Incorporated
9200 Rumsey Road
Columbia, Maryland 21045-1934

Dear Mr. Perot:

As requested in your December 9, 2002 letter, the U.S. Fish and Wildlife Service (Service) has reviewed a proposal for streambank stabilization along the Manasquan River at Bergeville Road, Howell Township, Ocean County, New Jersey. The project was proposed by Howell Township and the U.S. Army Corps of Engineers, Philadelphia District. The Service understands that the Manasquan River is severely scouring the road bank at an oxbow and that you are seeking preliminary comments to prepare an Environmental Assessment (EA) for the proposed project. The Service was informed at the December 11, 2002 Joint Permit Processing (JPP) meeting in Trenton, New Jersey, that the New Jersey Department of Environmental Protection will require an individual permit application for the proposed activities.

AUTHORITY

This response is pursuant to Section 7 of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of federally listed endangered and threatened species. These comments do not preclude separate review and comments by the Service as afforded by the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq.*), if any permits are required from the U.S. Army Corps of Engineers pursuant to the Clean Water Act of 1977 (33 U.S.C. 1344 *et seq.*) nor do they preclude comments on any forthcoming environmental documents pursuant to the National Environmental Policy Act of 1969 as amended (83 Stat. 852; 42 U.S.C. 4321 *et seq.*).

FEDERALLY LISTED SPECIES

Bald Eagle

The federally listed (threatened) bald eagle (*Haliaeetus leucocephalus*) currently nests at the Manasquan Reservoir downstream of the proposed project site. Eagles are often attracted to a

determine if further consultation pursuant to Section 7(a)(2) of the ESA is necessary. Please include the survey method used and the qualifications of the surveyor along with project specifications and details. The Service must be contacted for further consultation to ensure that project activities will not adversely affect the bog turtle.

Endangered Species Act

Pursuant to Section 7 of the ESA and in consultation with the Service, a federal agency is required to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally listed species or result in the destruction or adverse modification of critical habitat. In accordance with Section 7(a)(2) of the ESA, an assessment of potential direct, indirect, and cumulative impacts is required for all federal actions that may affect listed species. In addition, Section 9 of the ESA includes prohibitions on unauthorized taking of listed species, which also applies to non-federal activities. Section 9 of the ESA prohibits any person from harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting listed wildlife species; attempting to engage in such conduct; or, soliciting or causing such acts to be committed. Section 3 of the ESA defines "person" to mean "an individual, corporation, partnership, trust, association, or any other private entity; or any officer, employee, agent, department, or instrumentality of the federal government, of any State, municipality, or political subdivision of a State; or any other entity subject to the jurisdiction of the United States."

Regulations implementing the ESA (50 CFR 17.3) further define "harm" to include significant habitat modification or degradation that results in the killing or injury of wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. "Harass" means an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include but are not limited to, breeding, feeding, or sheltering.

CONCLUSIONS

The Service has not been provided with sufficient information on this project to determine whether the federally listed (threatened) bog turtle may be adversely affected. By copy of this letter, the Service requests that the Corps conduct a bog turtle habitat survey, conducted by a qualified herpetologist. We also request the survey method used and the qualifications of the surveyor along with project specifications and details. Results of the bog turtle habitat survey may also be presented in the EA, which is currently in preparation. The Service must be contacted for further consultation to ensure that project activities will not adversely affect listed species.

RECOGNIZED QUALIFIED BOG TURTLE SURVEYORS

The following list includes individuals experienced in field herpetology that the U.S. Fish and Wildlife Service, New Jersey Field Office, and the New Jersey Endangered and Nongame Species Program currently recognize as qualified to identify bog turtle habitat and survey for the presence of bog turtles. This list may not include all individuals qualified to survey for this species. This list will be updated periodically. Inclusion of names on this list does not constitute endorsement by the Service or any other U.S. Government agency or State agency.

Scott Angus
Amy S. Greene Environmental Consultants, Inc.
18 Commerce Street Plaza
Flemington, New Jersey 08822-1743
Work: (908) 788-9676

Dr. Rudolf Arndt
The Richard Stockton College
Jimmy Leeds Road
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Bryon DuBois
Trident Environmental Consultants
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Toms River, New Jersey 08755
Work: (732) 818-8699

Tim Hoen
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Jarretsville, Maryland 21084
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Work: (973) 366-9500

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322 Amblewood Way
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Home: (814) 237-2313
email: gxr124@psu.edu

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Glen Arm, Maryland 21057
Home: (410) 592-6122
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(Aberdeen Proving Ground)

William H. Smejkal
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18 Commerce Street Plaza
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Andrea M. Teti
150 Commissioners Road
Woodstown, New Jersey 08098
Home: (856) 769-4796
Cell: (609) 457-1370
email: sierra@nothinbut.net

Anthony Wisnieski
Reptile House - Baltimore Zoo
Druid Hill Park
Baltimore, Maryland 21217
Work: (410) 396-0441
Work: (410) 462-4398

Robert Zappalorti
Herpetological Associates, Inc.
575 Tom's River Road
Jackson, New Jersey 08527
Work: (732) 833-8600

October 2001

- Surveys can be performed any month of the year (except when significant snow cover is present). This flexibility in conducting Phase 1 surveys allows efforts during the Phase 2 survey window to be spent on wetlands most likely to support bog turtles (i.e., those that meet the criteria below).

- Potential bog turtle habitat is recognized by three criteria *(not all of which may occur in the same portion of a particular wetland)*:

1. **Suitable hydrology**. Bog turtle wetlands are typically spring-fed with shallow surface water or saturated soils present year-round, although in summer the wet area(s) may be restricted to near spring head(s). Typically these wetlands are interspersed with dry and wet pockets. There is often subsurface flow. In addition, shallow rivulets (less than 10 cm deep) or pseudo-rivulets are often present.

2. **Suitable soils**. Usually - a bottom substrate of soft muck or mucky-like soils (this does not refer to a technical soil type); you will usually sink to your ankles or deeper in muck, although in summers of dry years this may be limited to areas near spring heads. In some portions of the species' range, the soft substrate consists of scattered pockets of peat (6+ inches deep) instead of muck. Suitable soils are the critical criterion.

3. **Suitable vegetation**. Dominant vegetation of low grasses and sedges (emergent wetland), often with a scrub-shrub wetland component. Common emergent vegetation includes: tussock sedge (*Carex stricta*), soft rush (*Juncus effusus*), rice cut grass (*Leersia oryzoides*), sensitive fern (*Onoclea sensibilis*), tearthumbs (*Polygonum* spp.), jewelweeds (*Impatiens* spp.), arrowheads (*Sagittaria* spp.), skunk cabbage (*Symplocarpus foetidus*), panic grasses (*Panicum* spp.), other sedges (*Carex* spp.), spike rushes (*Eleocharis* spp.), grass-of-Parnassus (*Parnassia glauca*), sweet-flag (*Acorus calamus*), and in disturbed sites, reed canary grass (*Phalaris arundinacea*) or purple loosestrife (*Lythrum salicaria*). Common scrub-shrub and tree species include alder (*Alnus spp.*), red maple (*Acer rubrum*), willow (*Salix spp.*), shrubby cinquefoil (*Potentilla fruticosa*), tamarack (*Larix laricina*), and in disturbed sites, multiflora rose (*Rosa multiflora*).

- Suitable hydrology, soils and vegetation are necessary to provide the critical wintering sites (soft muck, peat, burrows, root systems of woody vegetation) and nesting habitats (open areas with tussocky or hummocky vegetation) for this species. It is very important to note, however, that one or more of these criteria may be absent from portions of a wetland or wetland complex supporting bog turtles. Absence of one or more criteria does not preclude bog turtle use of these areas to meet important life functions, including foraging, shelter and dispersal.

- If these criteria (suitable soils, vegetation and hydrology) are present in the *wetland*, then the *wetland* is considered to be potential bog turtle habitat, regardless of whether or not that portion of the wetland occurring within the project boundaries contains all three criteria. If the *wetland* is determined to be potential habitat and the project will directly or indirectly impact *any portion* of the wetland, then either:

  - Completely avoid all direct and indirect effects to the wetland, in consultation with the Service and appropriate State wildlife agency, OR

conducted on four successive days in late April due to possible late spring emergence, or during periods of extreme weather because turtles may be buried in mud and difficult to find. If bog turtles are found on the first, second or third visit, the site does not need to be revisited. Because this is solely a presence/absence survey, survey efforts at a particular wetland may cease once a bog turtle has been found.

7. Survey time should be three (3) to six (6) person-hours per acre of wetland per visit. Both random opportunistic searching and transect surveys should be used at each wetland.

8. Walk quietly through the wetland. Bog turtles will bask on sedge tussocks and mossy hummocks, or be half-buried in shallow water or rivulets. Walking noisily through the wetland will often cause the turtles to submerge before they can be observed. Be sure to search areas where turtles may not be visible, including shallow pools, underground springs, open mud areas, vole runways and under tussocks. Do not step on the tops of tussocks or hummocks because turtle nests, eggs and nesting microhabitat may be destroyed.

9. Photo-documentation of each bog turtle located will be required; a macro lens is highly recommended. The photos should be in color and of sufficient detail and clarity to identify the bog turtle to species and individual. Therefore, photographs of the carapace, plastron, and face/neck markings should be taken of each individual turtle. Do not harass the turtle in an attempt to get photos of the face/neck markings; if gently placed on the ground, most turtles will slowly extend their necks if not harassed. If shell notching is conducted, do the photo-documentation after the notching is done.

10. The following information should be collected for each bog turtle: sex, carapace length-straight line, carapace width, weight, and details about scars/injuries. Plastron length-straight line information should also be collected to differentiate juveniles from adults (>70 mm; Ernst 1977) as well as to obtain additional information on recruitment, growth, and demography.

11. Each bog turtle should be marked (e.g., notched, PIT tagged) in a manner consistent with the requirements of the appropriate State agency and/or Service. Contact the appropriate State agency prior to conducting the survey to determine what type of marking system, if any, should be used.

12. All bog turtles must be returned to the point of capture as soon as possible on the same day as capture. They should only be held long enough to identify, measure, weigh, and photograph them, during which time their exposure to high temperatures must be avoided. No bog turtles may be removed from the wetland without permission from the Service and appropriate State agency.

13. The Fish and Wildlife Service and appropriate State agency should be sent a copy of survey results for review and concurrence, including the following: dates of site visits; time spent per wetland per visit; names of surveyors; a site map; a description of the wetlands within the project area (e.g., acreage, vegetation, soils, hydrology); an explanation of which wetlands or portions of wetlands were or were not surveyed, and why; survey methodology; weather per visit at beginning and end of survey (air temperature, water temperature, percent cloud cover,

Attachment 1

CONTACT AGENCIES - BY STATE

(Revised May 2001)

STATE	FISH AND WILDLIFE SERVICE	STATE AGENCY
Connecticut	U.S. Fish and Wildlife Service New England Field Office 22 Bridge Street, Unit #1 Concord, NH 03301	Department of Environmental Protection Env. & Geographic Information Center 79 Elm Street, Store Floor, Hartford, CT 06106 *(info about presence of bog turtles in or near a project area)* Department of Environmental Protection Wildlife Division, Sixth Floor 79 Elm Street, Store Floor, Hartford, CT 06106 *(to get a Scientific Collectors Permit or determine what type of marking system to use)*
Delaware	U.S. Fish and Wildlife Service Chesapeake Bay Field Office 177 Admiral Cochrane Drive Annapolis, MD 21401	Nongame & Endangered Species Program Delaware Division of Fish and Wildlife 4876 Hay Point Landing Road Smyrna, DE 19977
Maryland	U.S. Fish and Wildlife Service Chesapeake Bay Field Office 177 Admiral Cochrane Drive Annapolis, MD 21401	Maryland Department of Natural Resources Wildlife & Heritage Division PO Box 68, Main Street Wye Mills, MD 21679
Massachusetts	U.S. Fish and Wildlife Service New England Field Office 22 Bridge Street, Unit #1 Concord, NH 03301	Division of Fisheries and Wildlife Dept. Fisheries, Wildlife and Env Law Enforcement Rt. 135 Westboro, MA 01581
New Jersey	U.S. Fish and Wildlife Service New Jersey Field Office 927 North Main Street, Bldg. D-1 Pleasantville, NJ 08232	Endangered & Nongame Species Program Division of Fish, Game & Wildlife Northern Region Office 26 Route 173W, Hampton, NJ 08827
New York	U.S. Fish and Wildlife Service 3817 Luker Road Cortland, NY 13045	New York Natural Heritage Program Department of Environmental Conservation 700 Troy-Schenectady Road Latham, NY 12110-2400 *(info about presence of bog turtles in or near a project area)* NY Department of Environmental Conservation Special Licenses Unit 50 Wolf Road, Albany, NY 12233 *(for endangered species permit applications)*

James E. McGreevey
Governor

State of New Jersey
Department of Environmental Protection

Bradley M. Campbell
Commissioner

Land Use Regulation Program
P. O. Box 439, Trenton, NJ 08625-0439
Fax # (609) 777-3656
www.state.nj.us/dep/landuse

November 24, 2003

Minas M. Arabatzis
Chief, Planning Division
Dept. of the Army
Phila. District Corps of Engineers
Wanamaker Building, 100 Penn Square East
Philadelphia, PA 19107-3391

RE: Water Quality Certificate
Streambank stabilization
Manasquan River at Bergerville Road
Howell Township, Monmouth County

R# 570CAF

Dear Sir:

Your recently submitted WQC Permit application is returned herewith. It was not acceptable for filing due to a lack of items below. Please resubmit the entire application when the deficiencies are corrected. Appropriate forms and instructions are enclosed, if necessary. When resubmitting your application, YOU MUST REFERENCE THE R# OF YOUR REJECTION LETTER.

1. Statement of Compliance with the "Rules on Coastal Zone Management" (N.J.A.C. 7:7E-1.1 et seq.)
2. Appropriate Plans

REMARKS: Please submit hard copies of plans, compliance statement, etc. Feel free to contact me at (609) 777-0456 should you have any questions.

Sincerely,

Mark Fedorowycz, Supervisor
Application Support Unit

mv
Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Habitat Conservation Division
James J. Howard Marine
Sciences Laboratory
74 Magruder Rd.
Highlands, NJ 07732

December 4, 2003

Minas M. Arabatzis
Chief, Planning Division
Department of the Army
Philadelphia District, Corps of Engineers
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107-3391

ATTN: Ms. Barbara Conlin

Dear Mr. Arabatzis:

We have reviewed the draft report, "Environmental Assessment, Streambank Stabilization, Manasquan River at Bergerville Road, Howell Township, Monmouth County, New Jersey". We offer the following comments.

The selected alternative includes stabilization of the embankment using a Cellular Confinement System (CCS) wall design to rebuild a stable slope and to prevent further bank erosion. The toe of the CCS wall would be filled with concrete to protect the bank from erosion and flooding while the upper half of the CCS wall would be filled with soil and planted to re-establish vegetation on the bank. The project was presented by the Philadelphia District, US Army Corps of Engineers at the New Jersey joint permit processing meeting on December 11, 2002.

With the exception of occasional transients, no endangered or threatened marine species under the jurisdiction of the National Marine Fisheries Service (NMFS) are present in the project vicinity. Further consultation with NMFS under Section 7 of the Endangered Species Act will not be necessary. However, should project plans change or should new information become available that modifies the basis for this determination, then consultation should be reinitiated.

Although the Manasquan River provides habitat for anadromous fishes, the Manasquan reservoir, which is downstream of the project, prevents these fishes from passing further upstream to the project area; and therefore no anadromous fish protective measures are recommended.

We concur with the finding of no significant impact for this project.

If you wish to discuss this matter further, please contact Anita Riportella at (732) 872-3116.

Sincerely,

Stanley W. Gorski
Field Offices Supervisor

ar/manasquan river streambank stabilization

cf: EPA, Region II
USFWS, Pleasantville
NJDEP, Land Use Regulation
NJDEP, Fish and Wildlife

05 JAN 2004

Environmental Resources Branch

Mark Mauriello
Land Use Regulation Program
New Jersey Department of Environmental Protection
CN 404
501 E. State Street
Trenton, New Jersey 08625

Dear Mr. Mauriello:

This is in response to a letter dated November 24, 2003 from Mark Fedorowycz of your Application Support Unit. In this letter Mr. Fedorowycz requests a statement of compliance with the "Rules on Coastal Zone Management" and Plans for the proposed Streambank Stabilization project, Manasquan River at Bergerville Road, Howell Township, Monmouth County. A Statement of Compliance was previously submitted in our October 17, 2003 letter providing the draft Environmental Assessment on CD to your office. Enclosed please find a summary table of each of the regulations in support of our Coastal Zone Consistency Statement. Also enclosed are the previously submitted draft Environmental Assessment for this project, in accordance with Section 102 of the National Environmental Policy Act of 1969, as amended, in both CD format and hardcopy. These documents and plans are enclosed for your review and comment.

Bergerville Road is a two-lane township road that serves as a major connector between various housing developments, and between Howell and Freehold Townships. Bergerville Road borders the southern bank of the Manasquan River for approximately 200 feet. In the proposed project area, the road is approximately 8 to 12 feet from the south bank of the Manasquan River at a point where the river makes a U-shaped bend. There are floodplain wetlands on the inside meander bend and residential properties on a low terrace just outside the meander to the north. During high flow periods, water is directed into this bend at sufficient velocity to undercut the south bank. In addition, erosion is occurring due to bank slumping. Bergerville Road has undergone emergency repairs twice by the township in the last three years, after being damaged by bank slumping. The bank is approximately 26 feet high.

The USACE evaluated a full range of bioengineering, engineered structures and stream and/or road relocation alternatives. The selected plan is a Cellular Containment System (CCS wall) consisting of a three-dimensional honeycomb structure made of polyethylene, constructed along approximately 200 feet of steeply sloping bank. The structure best mimics a natural streambank

while affording protection to the streambank and road. It is also the most aesthetically pleasing alternative as it can be revegetated along the upper section of the wall. Construction of the CCS wall would involve moving the centerline of the stream approximately 10 feet away from the existing right bank to provide a stable foundation and slope for the wall. The configuration would shift the river to an historical alignment that currently consists of a gravel point bar and riparian wetlands. This adjustment is anticipated to cause fewer environmental affects than other proposed alternatives. In addition, hydrologic modeling indicates that stage heights would be reduced because the modified channel would have greater capacity. Utilities would not have to be moved nor would private property be acquired.

A consistency review was preformed by this office based on recommendations provided by staff of the Land Use Regulation Program and rules established in the document: *Rules on Coastal Zone Management N.J.A.C. 7:7E as amended February 3, 2003.* After a detailed review of all-applicable regulations and policies associated with the construction design for the aforementioned project, it is our finding that the proposed activity complies with New Jersey's approved coastal zone management program and will be conducted in a manner consistent with the program. The proposed action would be conducted in a manner that would not violate New Jersey Surface Water Quality Standards.

Please review the enclosed draft report and provide Section 401 Water Quality Certification and your concurrence with our determination of Coastal Zone Consistency by February 19, 2004. If you have any questions regarding the Environmental Assessment, please contact Ms. Barbara Conlin of the Environmental Resources Branch at (215) 656-6557.

Sincerely,

Minas M. Arabatzis
Chief, Planning Division

Enclosure

James E. McGreevey
Governor

State of New Jersey
Department of Environmental Protection

Bradley M. Campbell
Commissioner

Office of Permit Coordination and Environmental Review
PO Box 418
Trenton, NJ 08625-0418
Phone 609-292-2662
Fax 609-292-4608
Ken.koschek@dep.state.nj.us

January 14, 2004

Mr. Minas M. Arabatzis
Chief, Planning Division
Philadelphia District
Corps of Engineers
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107-3391

RE: **Manasquan River at Bergerville Road**
Streambank Stabilization
Howell Township, Monmouth County

Dear Mr. Arabatzis:

The Office of Permit Coordination and Environmental Review of the New Jersey Department of Environmental Protection (NJDEP) has completed its review of the Environmental Assessment (EA) for the proposed Streambank Stabilization of the Manasquan River at Bergerville Road in Howell Township, Monmouth County. We offer the following comments and recommendations for your consideration.

Regulatory Requirements

A freshwater wetlands permit and a stream encroachment permit will be required for the project from our Department's Land Use Regulation Program (LURP).

Natural Resources

The NJDEP's Division of Fish and Wildlife (DFW) has the following comments and concerns regarding the selected alternative relative to fish and wildlife resources. The proposed action is the construction of a Cellular

Containment System or CCS retaining wall as well as a slight realignment of the road eroding meander in the Manasquan River at Bergerville Road.

While the DFW agrees that the proposed solution is the least environmentally damaging alternative that fulfills the objectives, they also note that the EA does not discuss the issue of stream restoration following the proposed realignment. The criteria of a Stream Encroachment Permit at N.J.A.C. 7:13-2.9 (c) and 7:13-3.6 (c), (f) will require the replacement of instream habitat characteristics such as substrate type, pool/riffle ratio, width/depth/velocity characteristics, cross channel configuration (i.e. low flow channel), bank vegetation/overhead canopy, etc. Design of a functional and stable channel following realignment may require the aid of a professional stream geomorphologist; a rip-rap lined trough in the realignment reach would be unacceptable to the DFW and would not meet the requirements in the existing stream encroachment regulations. Since the resulting design on stream restoration can alter the acceptability of the project and the DFW's position on the environmental impacts, the NJDEP recommends that the details of the stream restoration be provided to the review agencies. A commitment and details on stream restoration should be provided prior to a Finding of No Significant Impact (FONSI).

Thank you for providing the NJDEP the opportunity to comment on the EA.

Sincerely,

Kenneth C. Koschek

Kenneth C. Koschek
Supervising Environmental Specialist
Office of Permit Coordination
& Environmental Review

C: Andrew Didun, NJDEP

JUL 0 1 2004

Mr. Mark Mauriello
Land Use Regulation Program
New Jersey Department of Environmental Protection
CN 404
501 E. State Street
Trenton, New Jersey 08625

Dear Mr. Mauriello:

This is in reference to the Corps' Manasquan River at Bergerville Road, Streambank Stabilization Project, Howell Township, Monmouth County, NJ, NDJEP File No.1319-040003.1. Based on coordination with Mr. Eric Virostek of your office, we understand that the review period for this project is scheduled to end 5 July 2004.

We received a letter from Mr. Kenneth Koschek of the New Jersey Department of Environmental Protection's (NJDEP) Office of Permit Coordination and Environmental Review, dated 14 January 2004 regarding this project. Mr. Koscheck indicated that both a freshwater wetlands permit and a stream encroachment permit would be required. We are currently in the process of preparing these two permit applications. The letter also indicated NJDEP's Division of Fish and Wildlife agreed with our Environmental Assessment that the selected plan is the least environmentally impacting alternative that fulfills the objectives, but indicated that more information regarding stream restoration is needed for the permit review process to proceed. We are currently coordinating with a private consulting firm to develop a detailed plan containing the necessary information on stream restoration that we will propose in conjunction with the selected design.

We request a 30-day extension to 3 August 2004 so that we may complete the design requirements, as specified by the NJDEP's Office of Permit Coordination and Environmental Review. Mr. Virostek also indicated that a site visit would be helpful in understanding this project. Ms. Barbara Conlin of my staff will be contacting Mr. Virostek to arrange this meeting. If you have any questions prior to that time, Ms. Conlin can be reached at 215-656-6557. Thank you for your assistance.

Sincerely,

Minas A. Arabatzis
Chief, Planning Division

MAR 3 0 2005

Environmental Resources Branch

Mr. Mark Fedorowycz, Supervisor
Application Support Unit
Land Use Regulation Program
Department of Environmental Protection
P.O. Box 39
Trenton, New Jersey 08625-0439

Dear Mr. Fedorowycz:

This letter is in reference to the *Manasquan River Streambank Stabilization project at Bergerville Road, Howell Township, Monmouth County, New Jersey*. Enclosed please find a habitat assessment for restoration report and in response to your request, applications for both a freshwater wetlands permit and a stream encroachment permit. Additional copies of the Environmental Assessment and our CZM review and Statement of Compliance are also enclosed for your review.

A section of the Manasquan River that runs through Howell Township is experiencing erosion on the right streambank along Bergerville Road. The bank erosion has degraded the stability of the embankment along Bergerville Road, which is located approximately 8 to 12 feet from the south bank of the river. Currently, the embankment is approximately 26 feet high and poses a safety issue to motorists traveling along the suburban connector road. Approximately 450 linear feet of the right streambank requires stabilization to protect and alleviate damage to Bergerville Road from erosion that results from the encroachment of the Manasquan River. The preferred plan will stabilize the embankment using a Cellular Confinement System (CCS) wall design in conjunction with shifting the channel centerline to the north to stabilize the embankment and prevent further bank erosion. The upper half of the CCS wall would be filled with soil and planted to reestablish vegetation on the bank. The foundation for this wall would extend approximately 10 feet from the current bank, resulting in a slight shift in the stream centerline towards the north. The excavated north bank will be revegetated with grasses and willows. The final channel design will contain equal proportions of riffles/runs as exists now. The radius of curvature of the CCS wall will match as closely as what exists in the stream now. A minimal number of trees will be removed during construction and replaced.

In summary, an Environmental Assessment (EA) for the proposed project was sent to you in October 2003 in accordance with Section 102 of the National Environmental Policy Act of 1969. In response, your Office of Permit Coordination and Environmental Review (January 2004) indicated that a freshwater wetlands permit and a stream encroachment permit were required for

this project. The NJDEP Division of Fish and Wildlife (DFW) commented that they were in agreement that our proposed plan (CCS wall) was the least environmentally damaging alternative that fulfills the objectives. However, DFW indicated that the EA did not adequately discuss the issue of stream restoration. At your department's request, we withdrew our application until the additional information could be provided to your office and we received a rejection letter dated November 24, 2003 (R#570CAF). This letter serves to resubmit our application.

In order to address the issue of replacing instream habitat characteristics such as substrate type, pool/riffle ratio, width/depth, velocity characteristics, cross channel configuration (i.e. low flow channel), bank vegetation/overhead canopy, etc. we contracted EA Engineering, Inc. to design a functional and stable channel incorporating the necessary habitat replacement parameters compatible with our preferred plan. EA's final report is enclosed for your review. EA conducted a full stream assessment including a description of the key physical and geomorphic features of the study area, the existing riparian and adjacent habitat, and biological indicators present within the reach, including benthic macroinvertebrates. A hydraulic model was completed to generate water surface profiles (river depths, areas, flows, and velocities) at specified cross-sections for steady, gradually-varied flow during low flow scenarios for use in a fish passage assessment. The hydraulic model was completed for the existing conditions as well as a with-project scenario.

A consistency review was performed by this office based on recommendations provided by your staff and rules established in the document: Rules on Coastal Zone Management N.J.A.C. 7:7E as amended February 3, 2003. After a detailed review of all applicable regulations and policies associated with the construction design for the aforementioned project, it is our finding that the proposed activity complies with New Jersey's approved coastal zone management program and will be conducted in a manner consistent with the program. The proposed action would not be conducted in a manner that would violate New Jersey Surface Water Quality Standards.

Please review the enclosed information and provide freshwater wetlands and stream encroachment permits, Water Quality Certification, and your concurrence with our determination

of Coastal Zone Consistency by May 18, 2005. If you have any questions regarding this proposed project, please contact Ms. Barbara Conlin of our Environmental Resources Branch at (215) 656-6557.

Sincerely,

Minas M. Arabatzis
Chief, Planning Division

Enclosures

:hard J. Codey
Acting Governor

D t of Environmental ction

Br y M. Campbell
Commissioner

Land Use Regulation Program
P.O. Box 439, Trenton, New Jersey 08625
FAX # (609) 777-3656
Web Site:www.state.nj.us/dep/landuse

April 14, 2005

Mr. Brian Mulvenna
Planning Division
Army Corps of Engineers
100 Penn Square East
Philadelphia, Pennsylvania 19106

RE: Stream Encroachment and Freshwater Wetlands Permit Rejection
R#0071
1319-05-0010.1
Applicant/Project Name: Manasquan River
Howell Township, Monmouth County

Dear Mr. Mulvenna;

This letter is in response to your request of March 30 2005 for a Stream Encroachment and Freshwater Wetlands Permit. The Application Support Section has reviewed and is returning the above referenced application due to the following administrative deficiencies:

1. Page 2 of the LURP-1 form was not submitted.

2. On the submitted stream cross-section please label the pre-existing (ie pre- erosion) elevations. The proposed retaining wall must be located outside of the pre existing stream channel.

3. Since the retaining wall is greater than 4 feet in height a stability analysis for overturning and sliding must be submitted.

4. On the submitted plans, please label the open water/Freshwater Wetlands to be destrobed.

5. Please identify the property owners within 200 feet of the proposed project. Proof of certified local notices must be submitted.

The Application Support Section of the Land Use Regulation program functions to improve the time period and quality of application review. In general it is our policy to

return incomplete applications when administrative deficiencies exist. Consequently, since your application is administratively deficient as indicated above, your application is being returned for revisions. If you delay resubmission, please be sure to include evidence of new local public notices. You should also include a copy of this rejection letter with your resubmission.

In accordance with internal controls your check has been automatically deposited. When resubmitting your application, you MUST REFERENCE THE R NO. OF YOUR REJECTION LETTER. Should you decide not to resubmit your application, kindly return the attached refund form for processing of your refund.

Also, be advised that after the application has been accepted for administrative review, it may be necessary for the project manager or review engineer to request additional information or technical revisions. If this situation occurs, you will be contacted directly by the project manager or review engineer.

Should you have any questions or comments, please contact me at the above address or phone (609) 777-0456.

Sincerely,

Dennis Contois
Application Support Unit

Enclosure-LURP-1 form
Cc: Steve Hurriott, Versar
RB

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
WANAMAKER BUILDING, 100 PENN SQUARE EAST
PHILADELPHIA, PENNSYLVANIA 19107-3391

November 4, 2005

Mr. Dennis Contois
New Jersey Department of Environmental Protection
501 East State Street
P.O. Box 439
Trenton, New Jersey 08625

Re: Stream Encroachment and Freshwater Wetlands
Permit Rejection R#0071
1319-05-0010.1

Dear Mr. Contois:

Enclosed please find the resubmission of the above referenced application. The U.S. Army Corps of Engineers Philadelphia District is planning to provide emergency bank stabilization assistance to Howell Township for Bergerville Road/Casino Drive along the Manasquan River. This permit application addresses the rules on stream encroachment under the Stream Encroachment regulations and the requirements of the Freshwater Wetlands Protection Act. Included within this resubmission package are the following:

1. Form LURP-1
2. Revised cross-section drawing depicting pre-erosion elevations
3. Retaining wall stability analysis
4. Revised plan drawing depicting open water/freshwater wetland area of disturbance
5. List of property owners within 200 feet and the Required Notices
6. Environmental Assessment
7. Copy of the affidavits from the ad in the newspapers.
8. Habitat Assessment and Recommendations

If you have any questions or need additional information regarding this submission, please contact the undersigned at 215-656-6599.

Sincerely,

Brian J. Mulvenna, P.E.
Project Manager

Land Use Regulation Program
P.O. Box 439, Trenton, New Jersey 08625
FAX # (609) 777-3656
Web Site:www.state.nj.us/dep/landuse

November 28, 2005

Mr. Brian Mulsenna
Planning Division
Army Corps of Engineers
100 Penn Square East
Philadelphia, Pennsylvania 19106

RE: Stream Encroachment and Freshwater Wetlands Permit Rejection
R# 0071
1319-05-0010.1
Applicant/Project Name: Mauasguan River
Howell Township, Moumouth County

Dear Mr. Mulsenna:

This letter is in response to your request of November 10, 2005 for a Stream Encroachment Permit. The Application Support Section has reviewed and is returning the above referenced applications due to the following administrative deficiencies:

1. The submitted stream cross-sections indicate the wall is proposed within the pre-erosion limits. Since this is fill within the floodway which is a prohibited use the submitted plans must be revised. Also cross-sections along the entire length of the wall should be provided.

2. The submitted plan must have a title block and should be signed and sealed by a professional engineer. Also, the stability analysis should be signed and sealed by a professional engineer.

3. Five (5) copies of all plans must be provided.

If you have specific questions, please contact Michael Alemzadeh at (609) 292-8262.

The Application Support Section of the Land Use Regulation program functions to improve the time period and quality of application review. In general it is our policy to return incomplete applications when administrative deficiencies exist. Consequently, since your application is administratively deficient as indicated above, your application is being returned for revisions. If you delay resubmission, please be sure to include evidence of new local public notices. You should also include a copy of this rejection letter with your resubmission.

In accordance with internal controls your check has been automatically deposited. When resubmitting your application, you MUST REFERENCE THE R NO. OF YOUR REJECTION LETTER. Should you decide not to resubmit your application, kindly return the attached refund form for processing of your refund.

Also, be advised that after the application has been accepted for administrative review, it may be necessary for the project manager or review engineer to request additional information or technical revisions. If this situation occurs, you will be contacted directly by the project manager or review engineer.

Should you have any questions or comments, please contact me at the above address or phone (609) 777-0456.

Sincerely,

Dennis Contois

Dennis Contois
Application Support Unit

RB

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
WANAMAKER BUILDING, 100 PENN SQUARE EAST
PHILADELPHIA, PENNSYLVANIA 19107-3391

August 8, 2006

Mr. Dennis Contois
New Jersey Department of Environmental Protection
501 East State Street
P.O. Box 439
Trenton, New Jersey 08625

Re: Stream Encroachment and Freshwater Wetlands
Permit Rejection R#0071
1319-05-0010.1
Bergerville Road at Manasquan River
Howell Township, Monmouth County

Dear Mr. Contois:

Enclosed please find the resubmission of the above referenced application. The U.S. Army Corps of Engineers, Philadelphia District is planning to provide emergency bank stabilization assistance to Howell Township for Bergerville Road/Casino Drive along the Manasquan River. The revised plans included in this permit application address the administrative deficiencies noted in your November 28, 2005 letter and our subsequent meeting with Mr. Michael Alemzadeh on January 12, 2006. Included within this resubmission package are the following:

1. Form LURP-1
2. Revised cross-section drawing (5 copies)
3. Retaining wall stability analysis
4. Revised plan drawing with U.S. Army Corps of Engineers signature and title block (5 copies)
5. List of property owners within 200 feet and the Required Notices
6. Environmental Assessment
7. Copy of the affidavits from the ad in the newspapers.
8. Habitat Assessment and Recommendations

If you have any questions or need additional information regarding this latest resubmission, please contact the undersigned at 215-656-6599.

Sincerely,

Brian J. Mulvenna, P.E.
Project Manager

NOTICE TO PUBLIC OFFICIALS AND NEWSPAPER NOTICES

MUNICIPAL AGENCIES

Howell Township

Environmental Commission
251 Preventorium Road
P.O. Box 580
Howell, NJ 07731

Mr. Mark Corzine
Planning Board
251 Preventorium Road
P.O. Box 580
Howell, NJ 07731

Construction Official
251 Preventorium Road
P.O. Box 580
Howell, NJ 07731

COUNTY AGENCIES

Monmouth County Planning Board
Hall of Records Annex
1 East Main Street
Freehold NJ 07748

Monmouth County Mosquito Commission
PO Box 162
Eatontown, NJ 07724

Monmouth County Health Department
3435 Hwy. 9
Freehold, NJ 07728

NEWSPAPERS

1) Local

News Transcript
Greater Media Newspapers
PO 5001
Freehold, NJ 0

2) Regional

The Asbury Park Press
3601 Highway 66, PO Box 1550,
Neptune, NJ 07754
732.922.6000

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Land Use Regulation
P.O. Box 439, Trenton, New Jersey 08625
FAX # (609) 777-3656
Web Site: www.state.nj.us/dep/landuse

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

August 22, 2006

Mr. Brain J. Mulvenna P.E
Planning Division
Army Corps of Engineers
100 Penn Square East
Philadelphia, Pennsylvania, 19106

RE: Stream Encroachment and Freshwater Wetlands Permit Rejection
R# 0071
Applicant/Project Name: Mauasguan River
Block(s) Lot(s)
Howell Township, Monmouth County

Dear Mr. Mulvenna:

This letter is in response to your request of August 11,2006 for a Stream Encroachment Permit. The Application Support Section has reviewed and is returning the above referenced application due to the following administrative deficiencies:

1. Please submit the hydraulic analysis input and output data.

2. Please submit the soil erosion and stabilization calculations for the stream bank located opposite the retaining wall.

3. If work is proposed outside of the township right of way permission from properties owner will be required.

4. All submitted plans and the stability analysis for the proposed retaining wall must be signed and sealed by a professional engineer.

The Application Support Section of the Land Use Regulation program functions to improve the time period and quality of application review. In general it is our policy to return incomplete applications when administrative deficiencies exist. Consequently,

since your application is administratively deficient as indicated above, your application is being returned for revisions. If you delay resubmission, please be sure to include evidence of new local public notices. You should also include a copy of this rejection letter with your resubmission.

In accordance with internal controls your check has been automatically deposited. When resubmitting your application, you MUST REFERENCE THE R NO. OF YOUR REJECTION LETTER. Should you decide not to resubmit your application, kindly return the attached refund form for processing of your refund.

Also, be advised that after the application has been accepted for administrative review, it may be necessary for the project manager or review engineer to request additional information or technical revisions. If this situation occurs, you will be contacted directly by the project manager or review engineer.

Should you have any questions or comments, please contact me at the above address or phone (609) 777-0456.

Sincerely,

Dennis Contois
Application Support Unit

CC:
RB

APPENDIX B

PHASE 1 BOG TURTLE SURVEY RESULTS

Bog Turtle Habitat Survey
Manasquan River Shoreline Enhancement Project
Bergerville Road, Howell Township,
Monmouth County, New Jersey

Background

The U.S. Fish and Wildlife Service (USFWS) requested the USACE Philadelphia District to conduct a survey for bog turtle (*Clemmys muhlenbergii*) habitat in the vicinity of the proposed Manasquan River shoreline enhancement project (herein called "proposed project"). The USFWS indicated by letter that there was one known occurrence of this federally listed (threatened) species within 5 miles downstream of the proposed project site. In addition, USFWS stated that suitable habitat was documented approximately 4 miles downstream, but another survey indicated that no habitat was present at a site about 1 mile upstream from the proposed project site. Subsequent telephone conversations and email correspondences between USFWS and Versar indicated that the habitat survey should be conducted over a minimum river reach of 500 feet upstream and downstream of the proposed project.

General information on bog turtles provided by the USFWS indicates that bog turtles typically inhabit a variety of habitat types, including sphagnum bogs, open wet meadows, swamps, and spring-fed fens, with standing or slow-moving water over a mucky substrate. In addition, bog turtles prefer intermediate successional-stage wetlands (i.e., open wetlands with less than about 60 percent shrubs and trees). Bog turtles typically use pedestal vegetation, such as tussock sedge (*Carex stricta*) and sphagnum mosses (*Sphagnum* spp.), for nesting and basking. Adult bog turtles mate in May and June. Female bog turtles deposit between two and six eggs in sphagnum mosses or tussock sedges in June or July; hatchlings emerge in August or early September. In winter, bog turtles bury themselves deep in mud that is flooded with water.

Bog turtle habitats often comprise a mosaic of dry pockets, saturated areas, and shaded areas. Habitat becomes unsuitable for bog turtles, however, as the tree canopy closes in a young forest. According to USFWS, bog turtles most often prefer habitats with good sunlight, high evaporation rates, high humidity in the near-ground microclimate, and perennial substrate saturation.

Methods

The bog turtle habitat survey was conducted between about 12:00 p.m. and 4:00 p.m. on 30 April 2003 by Steve Harriott, a biologist and Professional Wetland Scientist with 15 years of experience (see attached resume), and Martin Berlett, a field biology assistant with Versar. The survey was conducted per guidelines for bog turtle habitat surveys, as specified by USFWS (USFWS 2001). All areas within approximately 1,200 feet upstream and 1,200 feet downstream of the proposed project were evaluated for hydrology, vegetation, and soils conditions appropriate for bog turtle habitat. All areas along both the left and right banks of the Manasquan River were slowly and carefully walked over the 1,200 feet above and below the proposed project. Weather on the day of the survey was clear and warm, at about 75° to 80° Fahrenheit.

Results

Wetlands in the vicinity of the project were all riparian (associated with the adjacent Manasquan River); many areas were densely forested with nearly complete canopy closure. Shading of the forest floor was often dense. Principal tree species in the forested wetlands included red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica* var. *subintegerrima*), and American beech (*Fagus grandifolia*). The shrub layer was occasionally dense in the wetland forest; principal species included spicebush (*Lindera benzoin*), sweet pepperbush (*Clethra alnifolia*), and southern arrowwood (*Viburnum dentatum*). Many of the trees present possessed diameters of 12 inches at breast height (dbh) or greater. The herbaceous layer was typically very sparse under the dense canopy, but included a mixture of cinnamon fern (*Osmunda cinnamomea*), jewelweed (*Impatiens duthicae*), skunk cabbage (*Symplocarpus foetidus*), and other species.

Several small herbaceous-dominated areas also existed within the survey area. These parcels were primarily dominated by reed canary grass (*Phalaris arundinacea*), an invasive species that does not form tussocks. Reed canary grass often grows in dense, relatively monotypic stands in suitable, moist soils. Several other herbaceous species occurred in scattered populations at the edges of these areas, including jewelweed (*Impatiens duthicae*), skunk cabbage (*Symplocarpus foetidus*), and cinnamon fern (*Osmunda cinnamomea*). One very small area approximately 1,000 feet south of the proposed project possessed a few widely-spaced individual tussock sedge (*Carex stricta*) plants. No sphagnum mosses were observed within the survey area.

The type and nature of the existing substrate was also noted during the bog turtle survey. Most places within the survey area possessed sandy silts (washed in by the river and its small tributaries), underlain by a dense clay sub-layer; these soils were generally tight-packed. A few very small areas possessed a thin layer (two inches) of muddy soil over the dense clay sub-layer. No areas of deep organic or muddy soils were present.

It should also be noted that a large amount of junk and debris was observed in and adjacent to the Manasquan River along the entire reach of the survey area. Most of the river within the survey area appeared to possess relatively poor water quality. Several small old dumps (primarily containing bottles) were observed along the floodplain of the river to the south of the proposed project. The dumps appeared to coincide with part of an old unpaved road adjacent to the river in this area.

Conclusions

It is unlikely that appropriate bog turtle habitat is currently present within approximately 1,200 feet above and 1,200 feet below the proposed Manasquan River shoreline enhancement project. Specifically, the tree canopy is likely too dense throughout most of these wetlands to be suitable habitat for bog turtles. Almost no pedestal vegetation, such as tussock sedges or sphagnum mosses (*Sphagnum* spp.) is available for nesting and basking bog turtles. Further, no deep, muddy or organic substrates are present for wintering turtles within the survey area. Based on the observed evidence, we conclude that the proposed project would have no effects on bog turtles, as there are likely none present.

APPENDIX C

GENERAL CONFORMITY REVIEW AND EMISSION INVENTORY

CLEAN AIR ACT STATEMENT OF CONFORMITY

CLEAN AIR ACT
STATEMENT OF CONFORMITY

MANASQUAN RIVER AT BERGERVILLE ROAD, HOWELL TOWNSHIP
MONMOUTH COUNTY, NEW JERSEY
STREAMBANK STABILIZATION

The total estimated emissions that would result from construction of the Manasquan River at Bergerville Road Howell Township Monmouth County, New Jersey Streambank Stabilization Project are 0.75 tons of NOx and 0.15 tons of VOCs. These emissions are below the General Conformity trigger levels of 25 tons per year for each pollutant. General Conformity under the Clean Air Act, Section 176 has been evaluated for the project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project because the total direct and indirect emissions from the project are below the conformity threshold values established at 40 CFR 93.153 (b) for ozone (NOx and VOCs) in a Severe Nonattainment Area (25 tons of each pollutant per year). The project is not considered regionally significant under 40 CFR 93.153 (i).

Based on the conformity analysis in the subject report, I have determined that the proposed action conforms to the applicable State Implementation Plan (SIP). The Environmental Protection Agency had no adverse comments under their Clean Air Act authority. No air quality comments from the New Jersey Department of Environmental Protection were received during coordination of the draft feasibility report and integrated environmental impact statement. The proposed project would comply with Section 176 (c)(1) of the Clean Air Act Amendments of 1990.

17 NOV 06

Date

for P Gwen Gwen MAJ, EN

Gwen E. Baker
Lieutenant Colonel
District Commander
Corps of Engineers

General Conformity Review and Emission Inventory
Manasquan River at Bergerville Road
Howell Township Monmouth County, New Jersey
Streambank Stabilization Project

The 1990 Clean Air Act Amendments include the provision of Federal Conformity, which is a regulation that ensures that Federal Actions conform to a nonattainment area's State Implementation Plan (SIP) thus not adversely impacting the area's progress toward attaining the National Ambient Air Quality Standards (NAAQS). In the case of the Manasquan River at Bergerville Road Streambank Stabilization Project, the Federal Action is to stabilize an eroding streambank through construction of a cellular containment system wall. The U.S. Army Corps of Engineers, Philadelphia District would be responsible for construction. Monmouth County, New Jersey within which the Federal Action will take place is classified as severe nonattainment for ozone (oxides of nitrogen [NOx] and volatile organic compounds [VOCs]). Monmouth County, New Jersey is within the New York-New Jersey-Long Island Nonattainment Area (NYNJLINA).

There are two types of Federal Conformity: Transportation Conformity and General Conformity (GC). Transportation Conformity does not apply to this project because the project would not be funded with Federal Highway Administration money and it does not impact the on-road transportation system. GC however is applicable. Therefore, the total direct and indirect emissions associated with the Manasquan River at Bergerville Road Streambank Stabilization Project must be compared to the GC trigger levels presented below.

	Pollutant	General Conformity Trigger Levels (tons per year)
9.	**NOX**	**25**
	VOCs	25

To conduct a general conformity review and emission inventory for the project, a list of equipment necessary for construction was identified. Pertinent pieces of equipment include: dozers, loaders, a grader, rollers, a hydro seeder, pumps, and various trucks. Table 1 lists these pieces of equipment along with the number of engines, engine size (hp), and duration of operation. A Load Factor (LF) was also selected for each engine, which represents the average percentage of rated horsepower used during a source's operational profile. Load factors were taken from the General Conformity Review and Emission Inventory for the Delaware River Main Channel Deepening Project. The load factor for dozers was taken from the General Conformity Review and Emission Inventory for the Orchard Beach Renourishment Project The Bronx, New York.

Table 1 shows the estimated hp-hr required for each equipment/engine category. Hp-hr was calculated using the following equation:

9.1 hp-hr = # of engines*hp*LF*hrs of operation

The second calculation is to derive the total amount of emissions generated from each equipment/engine category by multiplying the power demand (hp-hr) by an emission factor (g/hp-hr). The following equations were used:

emissions (g) = power demand (hp-hr) * emission factor (g/hp-hr)

emissions (tons) = emissions (g) * (1 ton/907200 g)

Tables 2 and 3 provide the NO_x and VOC emission factors selected for each equipment/engine category. These factors were taken from the General Conformity Review and Emission Inventory for the Delaware River Main Channel Deepening Project. Tables 2 and 3 present the emission estimates for NO_x and VOCs, respectively. The tables present the emissions from each individual equipment/engine category and the combined total.

In addition to the construction equipment, vehicles used to transport the workers to and from the worksite were also taken into account (Table 4). This analysis assumed 10 construction workers and a 6-month construction period. Other assumptions included a 5-day work week, each worker drives their own vehicle, and on average each worker drives 50 miles round-trip each day. Table 4 presents an estimate of the total NO_x and VOCs attributed to worker transportation.

The total estimated emissions that would result from construction of the Manasquan River at Bergerville Road Howell Township Monmouth County, New Jersey Streambank Stabilization Project are 0.75 tons of NO_x and 0.15 tons of VOCs. These emissions are below the General Conformity trigger levels of 25 tons per year for each pollutant. General Conformity under the Clean Air Act, Section 176 has been evaluated for the project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project because the total direct and indirect emissions from the project are below the conformity threshold values established at 40 CFR 93.153 (b) for ozone (NO_x and VOCs) in a Severe Nonattainment Area (25 tons of each pollutant per year). The project is not considered regionally significant under 40 CFR 93.153 (i).

Table 1. Project Emission Sources and Estimated Power

hp-hr = # of engines*hp*LF*hrs of operation

Load Factor (LF) represents the average percentage of rated horsepower used during a source's operational profile.

Equipment/Engine Category	# of engines	hp	LF	hrs of operation	hp-hr
Roller, VIB, DD, SP 6.0 T	1	130	0.70	4	364
Roller, VIB, DD, SP 12.0 T	1	300	0.70	1	210
Dewatering Pump 12" Diesel	1	32	0.74	11	260.48
Dewatering Pump 12" Diesel	1	32	0.74	11	260
Dozer, Crawler	1	100	0.64	16	1024
Dozer, Crawler	1	135	0.64	83	7171
Dozer, Crawler	1	340	0.64	1	218
Hydroseeder, 3000 Gal, Truck Mt	1	100	0.70	1	70
Grader Motor Artic Cat 12-H	1	135	0.64	1	86
TRK Flatbed, 8'x12'	1	330	0.57	1	188
TRK Rear Dump Body, 12 CY	1	240	0.57	175	23940
LDR, BH, WH 1.25CY FE Bkt	1	86	0.55	18	851
LDR, BH, WH 1.75CY FE Bkt	1	105	0.55	1	57.75
TRK, HWY 8,800GVW 4x4 3/4T-PKUP	1	137	0.57	1	78
TRK, HWY 21,000GVW 4x2 2 axle	1	175	0.57	1	100
TRK, HWY 50,000GVW 6x4 3 axle	1	330	0.57	175	32918
TRK,WTR,OF-HY, 5000 Gal W/CAT613-C	1	175	0.57	1	100

Load Factors taken from the General Conformity Review and Emission Inventory for the Delaware River Main Channel Deepening Project. (May 2003). Prepared for the U.S. Army Corps of Engineers, Philadelphia District by Moffatt & Nichol Engineers.

Table 2. Emission Estimates (NOx)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

NO_x Emissions Factor for Off-Road Construction Equipment is 9.20 g/hp-hr

Equipment/Engine Category	hp-hr	EF (G/hp-hr)	Emissions (tons)
Roller, VIB, DD, SP 6.0 T	364	9.20	0.0037
Roller, VIB, DD, SP 12.0 T	210	9.20	0.0021
Dewatering Pump 12" Diesel	260	9.20	0.0026
Dewatering Pump 12" Diesel	260	9.20	0.0026
Dozer, Crawler	1024	9.20	0.0104
Dozer, Crawler	7171	9.20	0.0727
Dozer, Crawler	218	9.20	0.0022
Hydroseeder, 3000 Gal, Truck Mt	70	9.20	0.0007
Grader Motor Artic Cat 12-H	86	9.20	0.0009
TRK Flatbed, 8'x12'	188	9.20	0.0019
TRK Rear Dump Body, 12 CY	23940	9.20	0.2428
LDR, BH, WH 1.25CY FE Bkt	851	9.20	0.0086
LDR, BH, WH 1.75CY FE Bkt	58	9.20	0.0006
TRK, HWY 8,800GVW 4x4 3/4T-PKUP	78	9.20	0.0008
TRK, HWY 21,000GVW 4x2 2 axle	100	9.20	0.0010
TRK, HWY 50,000GVW 6x4 3 axle	32918	9.20	0.3338
TRK,WTR,OF-HY, 5000 Gal W/CAT613-C	100	9.20	0.0010
		Total NOx Project Emissions (tons) =	0.6885

Table 3. Emission Estimates (VOCs)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

VOC Emissions Factor for Off-Road Construction Equipment is 1.30 g/hp-hr

Equipment/Engine Category	hp-hr	EF (g/hp-hr)	Emissions (tons)
Roller, VIB, DD, SP 6.0 T	364	1.30	0.0005
Roller, VIB, DD, SP 12.0 T	210	1.30	0.0003
Dewatering Pump 12" Diesel	260.48	1.30	0.0004
Dewatering Pump 12" Diesel	260	1.30	0.0004
Dozer, Crawler	1024	1.30	0.0015
Dozer, Crawler	7171	1.30	0.0103
Dozer, Crawler	218	1.30	0.0003
Hydroseeder, 3000 Gal, Truck Mt	70	1.30	0.0001
Grader Motor Artic Cat 12-H	86	1.30	0.0001
TRK Flatbed, 8'x12'	188	1.30	0.0003
TRK Rear Dump Body, 12 CY	23940	1.30	0.0343
LDR, BH, WH 1.25CY FE Bkt	851	1.30	0.0012
LDR, BH, WH 1.75CY FE Bkt	58	1.30	0.0001
TRK, HWY 8,800GVW 4x4 3/4T-PKUP	78	1.30	0.0001
TRK, HWY 21,000GVW 4x2 2 axle	100	1.30	0.0001
TRK, HWY 50,000GVW 6x4 3 axle	32918	1.30	0.0472
TRK,WTR,OF-HY, 5000 Gal W/CAT613-C	100	1.30	0.0001

Total VOCs Project Emissions (tons) = 0.0973

Table 4. Pollutant Emissions from Employee Vehicles

Assumptions:

Average trip distance (1 way) is 25 miles.
Average NOx vehicle emission factor is 0.96 g/mile.
Average VOC vehicle emission factor is 0.84 g/mile.
Work crew comprised of 10 people
Every member of the work crew drives their own vehicle.
Project construction period is 6 months.
Project construction occurs 5 days per week.
There are 10 holidays in a calendar year.
There are 30 weather days (no work) in a year.

Actual work days = 365 days - 104 weekend days off - 10 holidays off - 30 weather days off.

Actual work days in 1 year = 221 days Actual work days in 6 months = 111 days

NOx Calculation: 10 workers * 2 trips/work day * 111 work days * 25 miles/trip * 0.96 g of NOx/mile

Total NOx resulting from employee vehicles = 0.06 tons.

VOC Calculation: 10 workers * 2 trips/work day * 111 work days * 25 miles/trip * 0.84 g of VOC/mile

Total VOCs resulting from employee vehicles = 0.05 tons.

Pollutant emissions associated with employee vehicles derived from data found in: Marine and Land-Based Mobile Source Emission Estimates for 50-Foot Deepening Project. January 2002. Prepared for The Port Authority of New York and New Jersey by Killam Associates and Starcrest Consulting Group, LLC.

Table 1. Project Emission Sources and Estimated Power

hp-hr = # of engines*hp*LF*hrs of operation

Load Factor (LF) represents the average percentage of rated horsepower used during a source's operational profile.

Equipment/Engine Category	# of engines	hp	LF	hrs of operation	hp-hr
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Grader Motor Artic Cat 12-H	1	135	0.64	1	86
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TRK, HWY 50,000GVW 6x4 3 axle	1	330	0.57	175	32918
TRK,WTR,OF-HY, 5000 Gal W/CAT613-C	1	175	0.57	1	100

Load Factors taken from the General Conformity Review and Emission Inventory for the Delaware River Main Channel Deepening Project. (May 2003). Prepared for the U.S. Army Corps of Engineers, Philadelphia District by Moffatt & Nichol Engineers.

Table 2. Emission Estimates (NOx)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

NO_x Emissions Factor for Off-Road Construction Equipment is 9.20 g/hp-hr

Equipment/Engine Category	**hp-hr**	**EF (G/hp-hr)**	**Emissions (tons)**
Roller, VIB, DD, SP 6.0 T	364	9.20	0.0037
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Hydroseeder, 3000 Gal, Truck Mt	70	9.20	0.0007
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TRK Rear Dump Body, 12 CY	23940	9.20	0.2428
LDR, BH, WH 1.25CY FE Bkt	851	9.20	0.0086
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TRK, HWY 8,800GVW 4x4 3/4T-PKUP	78	9.20	0.0008
TRK, HWY 21,000GVW 4x2 2 axle	100	9.20	0.0010
TRK, HWY 50,000GVW 6x4 3 axle	32918	9.20	0.3338
TRK,WTR,OF-HY, 5000 Gal W/CAT613-C	100	9.20	0.0010
		Total NOx Project Emissions (tons) =	0.6885

Table 3. Emission Estimates (VOCs)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

VOC Emissions Factor for Off-Road Construction Equipment is 1.30 g/hp-hr

Equipment/Engine Category	hp-hr	EF (g/hp-hr)	Emissions (tons)
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Grader Motor Artic Cat 12-H	86	1.30	0.0001
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LDR, BH, WH 1.25CY FE Bkt	851	1.30	0.0012
LDR, BH, WH 1.75CY FE Bkt	58	1.30	0.0001
TRK, HWY 8,800GVW 4x4 3/4T-PKUP	78	1.30	0.0001
TRK, HWY 21,000GVW 4x2 2 axle	100	1.30	0.0001
TRK, HWY 50,000GVW 6x4 3 axle	32918	1.30	0.0472
TRK,WTR,OF-HY, 5000 Gal W/CAT613-C	100	1.30	0.0001
		Total VOCs Project Emissions (tons) =	0.0973

Table 4. Pollutant Emissions from Employee Vehicles

Assumptions:

Average trip distance (1 way) is 25 miles.
Average NOx vehicle emission factor is 0.96 g/mile.
Average VOC vehicle emission factor is 0.84 g/mile.
Work crew comprised of 10 people
Every member of the work crew drives their own vehicle.
Project construction period is 6 months.
Project construction occurs 5 days per week.
There are 10 holidays in a calendar year.
There are 30 weather days (no work) in a year.

Actual work days = 365 days - 104 weekend days off - 10 holidays off - 30 weather days off.

Actual work days in 1 year = 221 days Actual work days in 6 months = 111 days

NOx Calculation: 10 workers * 2 trips/work day * 111 work days * 25 miles/trip * 0.96 g of NOx/mile

Total NOx resulting from employee vehicles = 0.06 tons.

VOC Calculation: 10 workers * 2 trips/work day * 111 work days * 25 miles/trip * 0.84 g of VOC/mile

Total VOCs resulting from employee vehicles = 0.05 tons.

Pollutant emissions associated with employee vehicles derived from data found in: Marine and Land-Based Mobile Source Emission Estimates for 50-Foot Deepening Project. January 2002. Prepared for The Port Authority of New York and New Jersey by Killam Associates and Starcrest Consulting Group, LLC.

APPENDIX D

CLEAN WATER ACT
SECTION 404(b) (1) EVALUATION

Clean Water Act Section 404(b)(1) Evaluation

I. Project Description

a. Location

The project site is located along Bergerville Road (a.k.a. Casino Road) in Howell Township, Monmouth County, New Jersey. Approximately, 500 feet west of the project site, Casino Drive becomes Bergerville Road as it crosses into Freehold Township. The road is owned and maintained by Howell Township, who has requested the assistance of the U.S. Army Corps of Engineers (USACE) in alleviating damage to the road by flooding and erosion resulting from encroachment of the Manasquan River. Howell Township is the non-Federal sponsor of this activity.

b. General Description

At the project site, Bergerville Road is approximately eight to twelve feet from the south bank of the Manasquan River at a point where the river makes a U-shaped bend. The river is somewhat downcut at this location, with floodplain wetlands located inside the meander bend and residential properties located on a low terrace just outside the meander to the north. During high flow periods, water is directed into this bend at sufficient velocity to undercut the south bank. Further up the bank, above the area being undercut, additional erosion is resulting from bank slumping. Bergerville Road has been repaired twice in the last few years after being damaged by bank slumping. The bank in this area is approximately 26 feet high. Approximately 200 linear feet of stream bank requires some form of stabilization and erosion control to protect Bergerville Road.

A full range of alternatives was developed through coordination between Howell Township, USACE, the New Jersey Department of Environmental Protection (NJDEP), the U.S. Fish and Wildlife Service, and consultants. These alternatives fall into the following categories: bioengineering and other soft engineering techniques, engineered structures, stream relocation, road relocation combined with stream bank stabilization, and retaining walls. Specific alternatives within each category are described in this section and their reasons for inclusion or exclusion from further consideration are discussed.

The USACE undertook a multi-objective planning process for this project where economic, social, and environmental considerations were taken into account. During the formulation process, several of the alternatives were selected that alleviated the identified problems at Bergerville Road in ways that were consistent with both Federal objectives and the desires of the community. The full range of reasonable alternatives was considered during the National Environmental Policy Act (NEPA) process, resulting in the systematic elimination of alternatives that did not meet the purpose of and need for the action. The alternative plan that best met the environmental and technical criteria for this project site was selected as the proposed action.

The proposed action for this project is a Cellular Containment System (CCS). A CCS wall consisting of a three-dimensional honeycomb structure made of polyethylene would be constructed along the steeply sloping bank. CCS walls are less expensive and more aesthetically pleasing than the other alternatives considered. While cells in the lower portions of the CCS wall would be filled with concrete to protect the lower banks, cells on the upper portions of the bank would be filled with soil and then vegetated. This vegetation could lead to improved riparian habitat on the riverbank. Construction impacts would be similar to those from sheet piling or modular block walls. Construction of the CCS wall would involve moving the centerline of the stream approximately 10 feet away from the existing right bank to provide a stable foundation and slope for the wall. The configuration would shift the river to an historical alignment that currently consists of a gravel point bar and riparian wetlands. This adjustment is expected to cause fewer environmental affects than other proposed alternatives; in addition, hydrologic modeling indicates that stage heights would be reduced because the modified channel would have greater capacity. Utilities would not have to be moved as in the road relocation alternative. Although construction impacts will occur to approximately 0.36 acre of wetland, the project design calls for replacement of the loss wetland adjacent to the realignment. The need to anchor the wall into the stream bottom, and the need for a drainage system are similar to the other types of retaining walls, and the CCS wall allows for more natural stream substrates, bank slopes, riparian vegetation, and aesthetics. The project life span for the CCS wall is expected to be greater than 50 years.

c. Authority and Purpose

The study is authorized under Section 14 of the 1946 Flood Control Act, as amended. In a letter dated 6 April 1988, Howell Township, New Jersey requested that the Emergency Stream Bank Erosion study be conducted and agreed to serve as the project sponsor.

d. General Description of the Discharge Material

(1) Characteristics of Fill Material
The CCS wall would be composed primarily of polyethylene. The cells in the lower portions of the CCS wall would be filled with concrete to protect the lower banks; cells on the upper portions of the bank would be filled with soil and then vegetated.

(2) Fill materials
The footprint of the proposed project would cover an area of approximately 0.36-acre. The proposed project would involve the addition of a small amount (approximately 0.10-acre) of impervious surface to the riverbed. The upper part of the CCS wall would be earth-filled, and pervious. The 3,000 cubic feet of existing pools would be replaced within the new realigned channel.

e. Description of Proposed Discharged Site

The discharge site is an approximately 420-foot reach of the Manasquan River, along Bergerville Road (a.k.a. Casino Road) in Howell Township, Monmouth County, New

Jersey. The total project footprint would encompass approximately 0.36-acre of open water, steep upland riverbank, and riparian wetlands.

f. Description of Disposal Method

Materials would be placed at the site by mechanical means. Equipment would be standard earth-moving machinery.

II. Factual Determination

a. Physical Substrate Determination

The substrate used for the upper portions of the CCS wall will consist of clean, upland soils, originating from off-site.

b. Water Circulation, Fluctuation, and Salinity Determinations

Water chemistry, clarity, color, odor, taste, dissolved gas levels, nutrients, eutrophication, and other physical water quality factors would not be affected by the proposed project. Salinity determinations are not applicable to the proposed project.

c. Suspended Particulate/Turbidity Determination

The proposed action is expected to only temporarily increase suspended sediments and turbidity locally in the Manasquan River during construction of the project. No noticeable impacts to dissolved oxygen levels, toxic metals, organics, or pathogens would be anticipated. Impacts to photosynthetic, filter feeder, and sight feeders are expected to be minimal to nonexistent. Sediment loading and its effects would likely decrease long-term, as the project would halt the severe erosion of the right bank of the river.

d. Contaminant Determinations

Materials for construction of the project would be chemically stable and non-contaminating. Construction would take place in areas where the soil is not considered likely to be contaminated. Neither the fill or its placement would cause relocation or increases of contaminants in the aquatic ecosystem. Certification of the project under Section 401 is being requested from the New Jersey Department of Environmental Protection, and all requirements would be met prior to construction.

e. Aquatic Ecosystem and Organism Determinations

The proposed action should have no significant effects on the aquatic ecosystem. No significant impacts to benthos, plankton, or nekton are anticipated. No federally listed threatened or endangered species are known to exist in the vicinity of the proposed project. It has been determined, therefore, that there would be no impacts to federal listed species as a result of the project.

f. Proposed Disposal Site Determinations

No violations of water quality standards are likely to occur as a result of the proposed project. The proposed action would have no adverse effect on municipal or private water supplies, recreational or commercial fisheries, water-related recreation, aesthetics, parks, national historic monuments, or similar preserves. The project would likely enhance

water quality locally, as it would check the current severe erosion on the right bank of the river.

g. Determination of Cumulative Effects on the Aquatic Ecosystem

Because of the restorative nature of the proposed project, it is not anticipated to act in concert with other typical area construction activities in adversely impacting local aquatic or terrestrial ecosystems.

h. Determination of Secondary Effects on the Aquatic Ecosystem

No significant detrimental secondary effects are anticipated as a result of the proposed action.

III. Actions Taken to Minimize Adverse Impacts

1. Access through existing vegetated wetlands will be minimized wherever possible in the construction of this project. Wherever temporary impacts to existing vegetated wetlands are unavoidable, these areas will be stabilized immediately after construction. These areas will be restored and re-planted to their previous condition as soon as practicable after construction.

2. Access through existing forested upland areas adjacent to the project shall be limited to the minimum width necessary for deployment of the construction equipment. Clearing of forest vegetation, particularly mature trees, shall be kept to the minimum necessary for completion of the project. All upland areas cleared for construction shall be restored and re-planted to their previous condition as soon as practicable after construction.

IV. Finding of Compliance

1. No adaptations of the Section 404(b)(1) guidelines made relative to this evaluation.

2. The alternative of no federal action was not feasible because it would allow the catastrophic failure of Bergerville Road.

3. Certification under Section 401will be applied for from the State of New Jersey. Certification will be obtained prior to construction.

4. The project would not introduce toxic substances into the Manasquan River or result in appreciable increases in existing levels of toxic substances.

5. No significant impacts to federal or state listed threatened and endangered species would result from the project.

6. No municipal or private water supplies would be affected by the proposed project. Recreational values would remain the same. No sensitive or critical

habitats would be affected, and no long-term adverse impacts would occur. Local water quality could be somewhat enhanced by the project.

7. Project construction materials would be chemically and physically stable.

8. The preferred alternative has been reviewed for environmental impacts in an Environmental Assessment. The EA supports the determination that the proposed action would lead to a Finding of No Significant Impact, pending public review and comment.

9. When compared to the other alternatives, the preferred alternative was determined to the least environmentally damaging alternative that still meets the project purposes.

10. The proposed actions would not significantly affect water quality or the aquatic ecosystem, and are found to be in compliance with the requirements of guidelines for Sections 404(b)(1) of the Clean Water Act, as amended.

APPENDIX E

Final Habitat Assessment and Recommendations For Restoration

Manasquan River Streambank Stabilization And Channel Realignment Project Howell Township, New Jersey

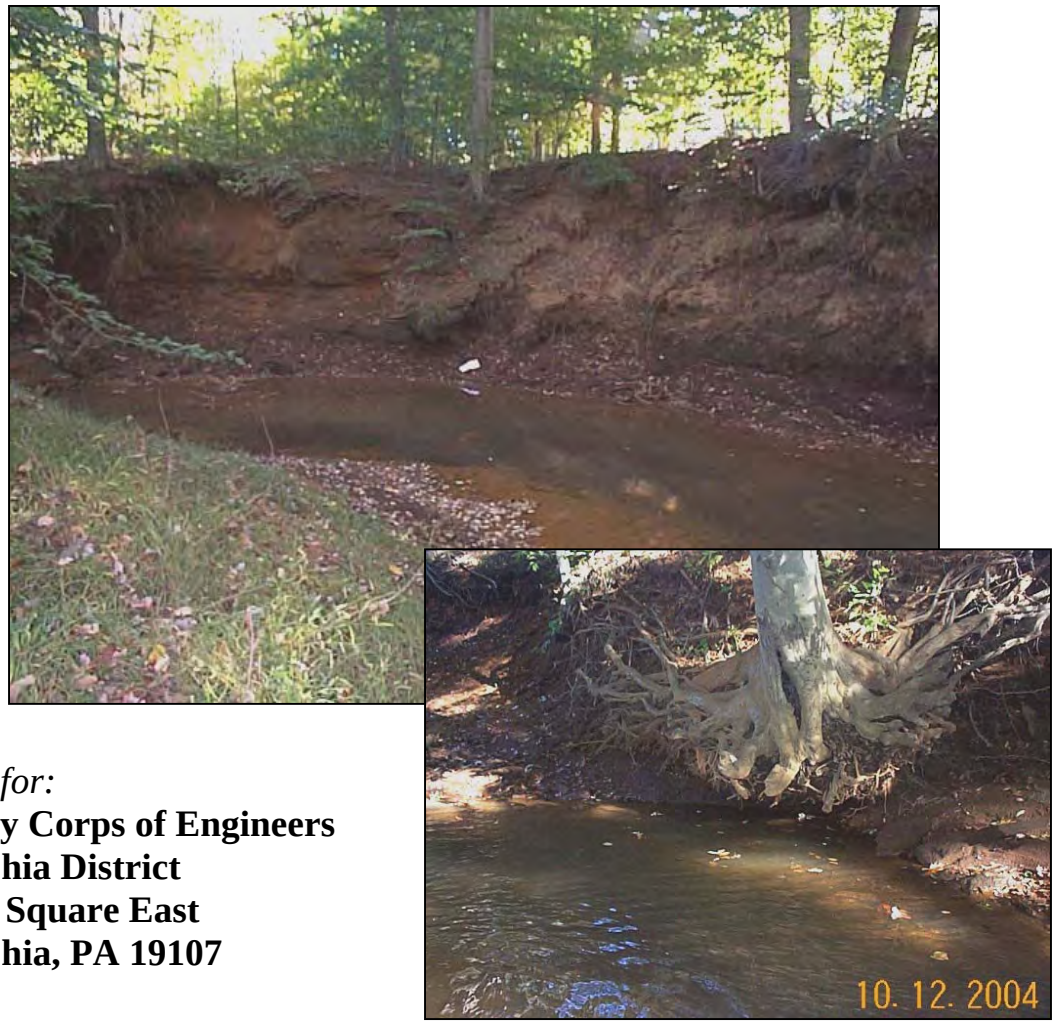
February 2005

FINAL HABITAT ASSESSMENT AND RECOMMENDATIONS FOR RESTORATION

FOR

MANASQUAN RIVER STREAMBANK STABILIZATION AND CHANNEL REALIGNMENT PROJECT

HOWELL TOWNSHIP, NEW JERSEY



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February 2005

EXECUTIVE SUMMARY

A section of the Manasquan River in Monmouth County, New Jersey (NJ) is experiencing active incision on the right streambank along Bergerville Road. The study reach is located along Bergerville Road, or Casino Road in Howell Township, NJ, approximately 500 feet from Freehold Township. This bank erosion and flooding of the Manasquan River has degraded the stability of the embankment along Bergerville Road, which is located approximately eight to twelve feet from the south bank of the river and is owned and maintained by Howell Township. Currently, the embankment is approximately 26 feet high and poses a safety issue to motorists traveling along the suburban connector road (USACE 2003). Approximately 200 linear feet of the right streambank requires stabilization to protect and reduce damage to Bergerville Road from flooding and erosion that result from the encroachment of the Manasquan River. The United States Army Corps of Engineers (USACE) – Philadelphia District evaluated a range of bank stabilization and other measures as required by the National Environmental Policy Act (NEPA) of 1969 in an Environmental Assessment (EA) published in 2003 to prevent the further encroachment of the Manasquan River into Bergerville Road. The selected alternative from the EA includes stabilization of the embankment using a Cellular Confinement System (CCS) wall design to rebuild a stable slope and a subsequent relocation of the existing stream channel.

Because channel relocation is proposed as part of this project, a Stream Encroachment Permit is required. The USACE submitted an application to the New Jersey Department of Environmental Protection (NJDEP), Office of Permit Coordination and Environmental Review in October 2003 (Appendix A). The NJDEP reviewed the permit package and the Division of Fish and Wildlife (DFW) responded with the concern that the EA did not discuss the issue of stream restoration following the proposed realignment, as specified in the New Jersey Administrative Code (NJAC), sections 7:13-2.9c and 7:13-3.6c,f. Specifically, DFW is concerned with the loss of existing in-stream habitat and fish passage during low flow conditions. This study was therefore conducted in response to concerns by the DFW.

Section 1.0 of this report discusses the purpose and objectives of this study. Section 2.0 presents the methods of data collection, including a review of existing information and a stream assessment of the stream reach in the project area. The stream assessment included a description of the key physical and geomorphic features of the study area, the existing riparian and adjacent habitat, and biological indicators present within the reach, including benthic macroinvertebrates. In Section 3.0, previous hydraulic models are discussed and a new hydraulic model was completed to generate water surface profiles (river depths, areas, flows, and velocities) at specified cross-sections for steady, gradually-varied flow during low flow scenarios for use in a biological assessment for a fish passage analysis included at the end of this section. The

hydraulic model was completed for the existing conditions as well as a with-project scenario. Following the hydraulic models discussion, Section 4.0 includes an evaluation of the channel design prepared by the USACE to determine the extent to which the modified channel duplicates the pre-construction character of the channel. The streambank stabilization restoration plans are currently at 30% design and do not yet show the level of detail to determine compliance with NJAC 7:13-2.9c and 7:13-3.6c and f. As a result, this section discusses details that the 100% design plans should include for compliance with NJAC. Requirements for the restoration design plans were divided into the following four categories for discussion: 1) scheduling, construction, and logistical details, 2) in-stream and channel details, 3) riparian and adjacent vegetation details, and 4) biological requisites. Finally, a discussion and conclusion is presented in Section 6.0 that includes recommendations for the project and 100% design plans.

TABLE OF CONTENTS

List of Figures:

List of Tables:

List of Appendices:

1.0 Purpose and Objectives of Study

A section of the Manasquan River that runs through Howell Township in Monmouth County, New Jersey (NJ) is experiencing active incision on the right streambank along Bergerville Road. This bank erosion and flooding of the Manasquan River has degraded the stability of the embankment along Bergerville Road, which is located approximately eight to twelve feet from the south bank of the river (Figure 1-1). Currently, the embankment is approximately 26 feet high and poses a safety issue to motorists traveling along the suburban connector road (USACE 2003). Approximately 200 linear feet of the right streambank requires stabilization to protect and alleviate damage to Bergerville Road from flooding and erosion that result from the encroachment of the Manasquan River.

As a result of the erosion and flooding issues, the USACE Philadelphia District has prepared streambank stabilization design drawings, flood elevation calculations, and a draft Environmental Assessment (EA) for the stabilization of the embankment using a Cellular Confinement System (CCS) wall design (200 linear feet) in conjunction with relocating the channel centerline to the north to stabilize the embankment and prevent further bank erosion. In the proposed design, construction of the CCS wall includes the temporary excavation of approximately 3.5 ft below the existing bottom elevation of the stream channel to anchor the wall into the stream bottom with an articulating concrete block scour apron that is the leveling layer and a maximum of 6 inches thick. The upper half of the CCS wall would be filled with soil and planted to reestablish vegetation on the bank (USACE 2003). A drainage system is also proposed behind the CCS wall to provide adequate drainage along the right streambank. The foundation for this wall would extend out approximately 10 feet from the current bank, resulting in a slight shift in the stream centerline towards the north. The cost of construction is estimated at approximately $445,000 (USACE 2003).

Because channel relocation is proposed, a Stream Encroachment Permit for the project is required. The USACE submitted an application to the New Jersey Department of Environmental Protection (NJDEP), Office of Permit Coordination and Environmental Review in October 2003 (Appendix A). The NJDEP reviewed the permit package and provided the following comments from the Division of Fish and Wildlife (DFW):

“While the DFW agrees that the proposed solution is the least environmentally damaging alternative that fulfills the objectives, they also note that the EA does not discuss the issue of stream restoration following the proposed realignment. The criteria of a Stream Encroachment Permit at New Jersey Administrative Code (NJAC) 7:13-2.9 c and 7:13-3.6c and f will require

the replacement of instream habitat characteristics, cross channel configuration (i.e., low flow channel), bank vegetation/overhead canopy, etc." (Appendix A).

This study was conducted in response to the DFW statement detailed in the previous paragraph. The objectives of this study were: 1.) to characterize the current conditions in the stream channel with respect to the cited sections of the NJAC and 2.) to assess if the proposed design replaces the existing stream habitat adequately, as specified in the regulations. The habitat features that were defined for the channel to document the existing conditions include percent meandering, bottom substrate type, pool/riffle ratio, stream width, depth and gradient, and any habitat enhancement devices currently located within the watercourse. These features should be replaced in the final design plans as specified by DFW for compliance with the NJAC.

Source: USACE 2003, drawing not to scale

Figure 1-1. General Location Map of Surveyed Stream Reach on Manasquan River, October 2004

2.0 Methods and Collected Data

This section presents the methods of data collection, including a review of existing information and the NJAC and a stream assessment of the stream reach in the project area. The stream assessment includes a description of the key physical and geomorphic features of the study area, the existing riparian and adjacent habitat, and biological indicators present within the reach, including benthic macroinvertebrates. A hydraulic model was then completed to generate water surface profiles (river depths, areas, flows, and velocities) at specified cross-sections for steady, gradually-varied flow during low flow scenarios for use in a biological assessment for a fish passage analysis.

2.1 Review of Existing Information

2.1.1 Data Reports and Studies

Existing project information reviewed prior to the site visit included the *Draft Environmental Assessment* (USACE 2003), the existing topography map of the project area (Appendix B, Drawing 1), the proposed streambank stabilization and channel relocation design plans (Appendix B, Drawings 2 and 3), the hydrologic and hydraulic studies (HEC-2 analysis), the Stream Encroachment Permit package and DFW statement (Appendix A), and documentation of coordination efforts of the project between agencies.

The New Jersey Department of Environmental Protection (NJDEP), Bureau of Freshwater and Biological Monitoring, uses U.S. Environmental Protection Agency's (USEPA) *Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers* (Barbour et. al. 1999). Agency personnel at NJDEP were contacted to acquire existing biological, habitat, and water quality data from the Manasquan River upstream and downstream of the study reach.

2.1.2 New Jersey Administrative Code (NJAC)

The DFW requires stream restoration so that no net loss in habitat results at the channel realignment site. The NJAC 7:13-2.9c and 7:13-3.6c and f specifies criteria for Stream Encroachment. This may “require the replacement of instream habitat characteristics, cross channel configuration (i.e., low flow channel), bank vegetation/overhead canopy, etc” (Appendix A, DFW letter dated 14 January 2004). The following sections describe the requirements of the cited sections of the NJAC from the New Jersey Department of State, New Jersey Department of Archives and Records Management (2004) followed by an explanation of each section.

NJAC 7:13-2.9 Channel modification, c):

"(c) Environmental standards for channel modification are as follows: 1. Reconstruction of aquatic habitat damaged or destroyed during channelization is required (NJAC 7:13-3.4) whether or not the watercourse is trout-associated. This includes, but is not limited to, replication of aquatic characteristics such as percent meandering, bottom substrate type, pool/riffle ratio, stream width, depth and gradient, and the placement of habitat enhancement devices within the watercourse. Provision for Fish Passage (NJAC 7:13-3.6(c)) is required, as is vegetative bank stabilization to reestablish any near-watercourse habitats damaged or destroyed as a result of the construction of the project."

Section (c) therefore states that the existing in-stream habitat at the site is required to be returned to similar quality and quantity of pre-construction conditions following the construction of the proposed project, even though this portion of the Manasquan River is not categorized as supporting trout species.

NJAC 7:13-3.6 Projects affecting other fish resources, c) and f):

"(c) Channel modifications at bridges and culverts (including their upstream and downstream transition zones), channelization projects, watercourse cleaning projects, and other channel modifications (excluding dams) shall comply with the following fish passage requirements:

1. Any new or modified channel of a watercourse shall be designed and constructed so that, during low-flow conditions, the water depth is at least as deep as in the pre-construction channel unless the Department allows an exception to this requirement pursuant to (c)2 below.
2. No exception to (c)1 above shall be allowed by any delegated agency. The Department will allow an exception to (c)1 above if:
    i. The pre-construction channel does not allow for the upstream passage of fish during low-flow conditions;
    ii. Conditions upstream or downstream of the channel modification are unfavorable to fish passage; or
    iii. The Department determines that other circumstances such as public need for the project or exceptional and undue hardship for the applicant warrant such an exception."

"(f) The new or modified channel of a watercourse shall be designed and constructed in such a manner as to duplicate or preserve the pre-construction character of the channel including proportion of shading, pools, flats, riffles and cascades and areas for fish cover and shelter."

Section (c) therefore states that if the stream reach is passable to fish during current low flow conditions, then the completed project must also be passable to fish at the same depths as pre-construction. The proposed project includes channel relocation and is therefore considered channel modification. Section (f) states that the in-stream habitat at the site is returned to similar quality and quantity for fish habitat of pre-construction conditions following the construction of the proposed project.

2.2 Stream Assessment

EA conducted a field reconnaissance survey of the study area on 12 October 2004. The field team was comprised of three scientists with expertise in benthic biota, fisheries, botany, and stream restoration. Approximately 480 feet were surveyed including the entire area within the "Contractor Limit of Work" as detailed in the streambank stabilization design (Appendix B, Drawing 2). The field reconnaissance included a description of the key physical and geomorphic features of the study area, the existing riparian and adjacent habitat, and biological indicators present within the reach, including benthic macroinvertebrates. These characteristics are described in full detail in the following sections to profile the existing conditions prior to construction at the site. All field datasheets are included in Appendix C of this report. The physical characterization section includes a description of the existing features and the current substrates of the surveyed stream reach. The habitat assessment section includes a discussion of the existing riparian, adjacent, and in-stream habitat at the surveyed stream reach. The biological indicators section describes the benthic macroinvertebrate, fish, nearby terrestrial wildlife community observed within the survey stream reach, and the water quality parameters recorded at the reach. A site map of the study area was completed that depicts the major features observed during the stream assessment. The map was scaled to show the entire reach surveyed and included features within the surveyed reach, or the designated limit of disturbance and is detailed in design Drawing 4, included in Appendix B of this report. Photographic documentation of the stream assessment is included in Appendix D of this report.

2.2.1 Physical Characterization

2.2.1.1 Existing Features

The prominent existing physical features were mapped and measured within the surveyed stream reach. The features recorded included pools, riffles, and runs/glides. The current conditions that

describe the physical features that require replacement as specified in the regulations and are described in this section include radius of curvature (meandering), pool/riffle ratio, stream width, depth, and gradient are defined for the existing channel. A short description of each of the features observed is included in the paragraphs below. There were no cascades, plunge or step pools observed in the reach.

Definition of Physical Features

The **channel gradient** (measured in ft/ft) is the amount by which the grade increases or decreases in a unit of horizontal distance (USDA 1989). The average **stream width** and the channel gradient were determined using an existing topographic survey of the site (Appendix B, Drawing 1). **Stream depths** were recorded for each physical feature. The maximum stream depth was measured at all pools and riffles, and an average stream depth was measured at all runs and glides.

Meanders are bends in stream channels that naturally form as streams flow through floodplains (ODNR 2000). The planimetric view of the stream can be used to describe percent meandering and other geometric relationships such as average radius of curvature, which was defined in this study reach. The radius of curvature can be used to evaluate channel resistance to erosion (Rosgen 1996). Meanders increase the quality and quantity of stream habitat and reduce flows by dissipating energy.

A **riffle** is an area of shallow rapids where faster water flows over completely or partially submerged obstructions to produce surface agitation, but standing waves are absent. The substrate in a riffle is usually composed of gravel, pebble, and cobble-sized particles (USDA Forest Service 1989). Riffles improve water quality by increasing dissolved oxygen, provide spawning habitat for many aquatic species and productive areas for benthic macroinvertebrates, and create silt-free substrates (ODNR 2000)

A **glide** generally possesses both riffles and pool attributes and is characterized by moderately shallow water with an even flow that lacks pronounced turbulence. Glides are normally located at the transition between pool and the head of a riffle, glides are occasionally found in long, low gradient stream reaches with stable banks and no major flow obstructions. The substrate in a glide is usually composed of gravel and cobbles (USDA Forest Service 1989). A run is a deep area in a stream where water flows fast with little or no turbulence and normally is located at the transition from a riffle to a pool. Runs and glides were grouped together in the stream

assessment since both features provide similar habitat. Runs and glides provide critical habitat for many aquatic species and are areas utilized in spawning, feeding, and resting (ODNR 2000).

A **pool** is a deep area in a stream where water flows slowly with no turbulence. There are four types of pools: 1.) large-shallow, 2.) large-deep, 3.) small-shallow, and 4.) small-deep. A large pool is described as greater than half the cross-section of the stream and a deep pool is at least three feet deep (Barbour et. al. 1999). Additionally, logs, root wads, boulders or stream banks can cause backwater pools to form as water swirls around the obstacle. Pools normally have finer substrates such as silts and sands compared to riffles and have the potential to either scour or fill in with these substrates. Pools provide critical habitat for many aquatic species and are areas utilized in spawning, feeding, and resting. Pools also provide refuge during droughts and the winter. Deeper pools provide aquatic species cover for protection from terrestrial predators (ODNR 2000).

The **pool to riffle ratio** is the ratio of the surface area or length of pools to the surface area or length of riffles in a given stream reach, frequently expressed as the relative percentage of each category (USDA Forest Service 1989).

Physical Features Observed in Stream Reach

A total of 5 pools, 6 runs/glides, and one riffle were identified within the surveyed stream reach (Table 2-1). Of the 480 total feet surveyed, 27 percent of the reach was composed of pools, 69 percent was composed of runs/glides, and less than 1 percent was composed of riffles. The depth of the pools ranged from 1.7 ft to 3.1 feet deep and included both large shallow and small shallow pools. The depth of the runs/glides ranged from 0.4 feet to 0.9 feet deep and the average depth was 0.6 feet deep. The depth of the riffle in the survey reach was 0.3 feet deep.

Additionally, the riverbed elevation dropped 1 ft over the 480 ft survey reach, resulting in an average gradient of 0.0022 ft/ft. The average radius of curvature of the bend located at the stream reach is 120 ft. The average stream width was approximately 20 ft. These calculations were completed in the office using the existing topography design drawings (Appendix B, Drawings 2 and 3).

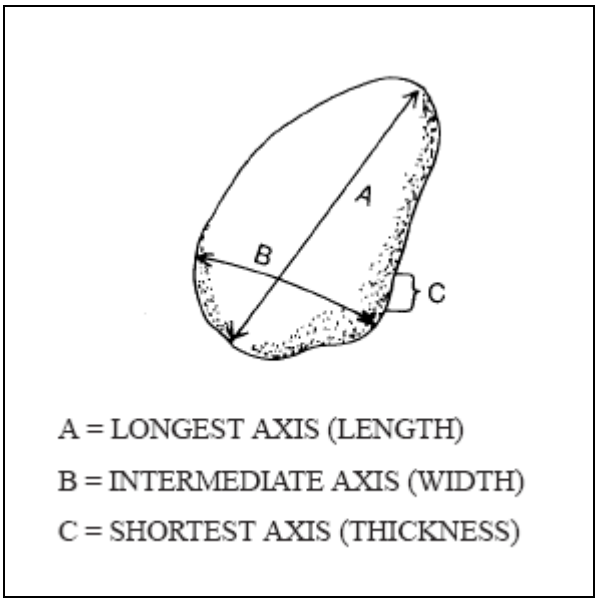
Table 2-1. Physical Features Observed During a Stream Survey in the Manasquan River, October 2004

ID	Type of Feature	Length (ft)	Width (ft)	Depth (ft)	Approximate Volume (ft^3)	Pebble Count Sample No.
1	Run/glide	135	25	0.6	2,025.0	1*
2	Pool	14	10	2.0	280.0	2
3	Run/glide	32	20	0.7	448.0	3*
4	Pool	11	6	1.71	112.9	4
5	Run/glide	36	20	0.9	648.0	5*
6	Pool	15	7.5	1.82	204.8	6
7	Run/glide	17	15	0.5	127.5	7*
8	Pool	11	13.6	2.32	347.1	8
9	Riffle	4	4	0.3	4.8	9*
10	Run/glide	4	10	0.4	16.0	-
11	Pool	72	9	3.1	2,008.8	10
12	Run/glide	91	20	0.7	1,274.0	11*

**nonpool features combined in pebble count data.*

2.2.1.2 Current Substrates

The substrate of the streambed and banks are important indicators of the make-up of a stream and influence the character, hydraulics, erosion rates, sediment supply and other parameters (Harrelson 1994). The type of material in a streambed can be quantified through a pebble count using the technique described as the Wolman Pebble Count (1954). A representative pebble count procedure was utilized that includes a stratified, systematic sample method that proportionally samples all bed features within the bankfull channel through a defined reach (Rosgen 2004). Initially, the stream reach is divided into two categories: 1) pools, and 2) riffles, runs, and glides. The total distance of the reach is then divided into pool and non-pool feature lengths and these features are sampled as evenly as possible based upon the percent of total reach. Particles were collected at evenly spaced intervals across the channel at the selected cross sections. Because the channel width was small, particle sampling included only those particles within the channel and did not include bankfull particles, to reduce the potential to skew the particles that make up the boundary of the channel. The intermediate axis (B-axis) of each particle was measured with a scale in the field (See Figure 2-1). The dominant particle size is then determined to characterize the channel substrate.



Source: Harrelson 1994

Figure 2-1. The Axes of a Pebble – The B Axis is Measured in the Wolman (1954) Pebble Count.

Within the reach (~480 ft in length), approximately 30 percent was comprised of pools and 70 percent of the reach was comprised of non-pools (riffles, runs, and glides). Fifty-five percent of the pebble count stations were located at non-pools and forty-five percent of the pebble count stations were located in pools. Because only one small riffle (1 ft wide by 4 ft long) was observed within the reach, only one sample was collected within a riffle. Ten total samples were collected in runs/glides and pools to evenly sample all features. A total of 11 pebble count stations were recorded (Table 2-2). Because the width (wetted width) of the channel was approximately 30 ft wide, one sample was collected approximately every three feet moving perpendicular across the channel at the selected cross sections. The upper limit of each particle size class was graphed versus the cumulative percent finer than as shown in Figure 2-2. Based on this graph, the indexed D50 can be determined. The D50 is defined as 50 percent of the sampled population is equal to or finer than the representative particle diameter. This number determines the dominant particle size, which can be compared to or combined with the particle size of greatest observation. From Figure 2-2, the D50 is 0.07 inches, which is characterized as very coarse sand.

Figure 2-2. Manasquan River Pebble Count Data - Cumulative % versus Particle Size

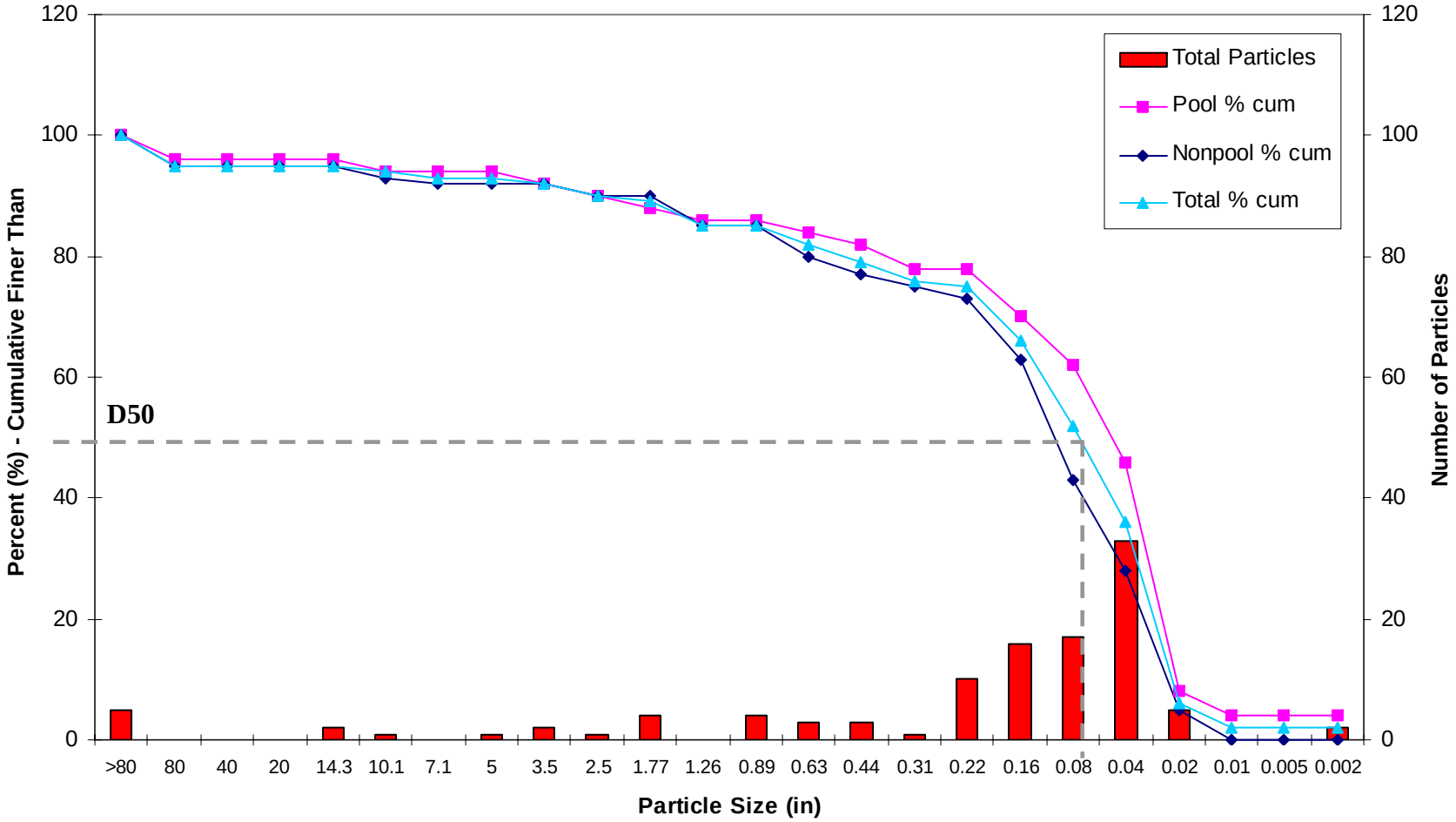


Table 2-2. Results of Representative Pebble Count of Substrate Collected in the Manasquan River, October 2004

Particle Category	Particle Size (in)	Particle type	Pool total	Pool % cum	Non-pool* total	Non-pool* % cum	Total	Total % cum
Sand	0.002	silt/clay	2	4	0	0	2	2
	0.005	very fine	0	4	0	0	0	2
	0.01	fine	0	4	0	0	0	2
	0.02	medium	2	8	3	5	5	6
	0.04	coarse	19	46	14	28	33	36
	0.08	very coarse	8	62	9	43	17	52
Gravel	0.16	very fine	4	70	12	63	16	66
	0.22	fine	4	78	6	73	10	75
	0.31	fine	0	78	1	75	1	76
	0.44	medium	2	82	1	77	3	79
	0.63	medium	1	84	2	80	3	82
	0.89	coarse	1	86	3	85	4	85
	1.26	coarse	0	86	0	85	0	85
	1.77	very coarse	1	88	3	90	4	89
	2.50	very coarse	1	90	0	90	1	90
Cobble	3.50	small	1	92	1	92	2	92
	5.00	small	1	94	0	92	1	93
	7.10	large	0	94	0	92	0	93
	10.1	large	0	94	1	93	1	94
Boulder	14.3	small	1	96	1	95	2	95
	20	small	0	96	0	95	0	95
	40	medium	0	96	0	95	0	95
	80	large very large	0	96	0	95	0	95
Bedrock	>80	bedrock	2	100	3	100	5	100

**Nonpool corresponds to pebbles collected in riffles and run/glide features.*

In addition to the pebble count data, a visual observation of the inorganic substrates was estimated in the field (Table 2-3). Similarly to the pebble count data, sand visually appeared to make up the majority of the substrates in the channel and clay and bedrock made up the least amount of substrates in the channel. Sandy point bars were observed along the inside of the meander on the left streambank and also at run/glide #12 on the left streambank. A large amount of iron flocculent in the sandy areas was observed in the study reach and seeping from the left streambank at the downstream end of the reach. Bedrock and large boulders were observed at the streambank adjacent to pool #11 on the right bank and further downstream on the right bank at run/glide #12.

Table 2-3. Inorganic Substrate Components Observed During a Stream Survey in the Manasquan River, October 2004

Substrate Type	Diameter (in)	% Composition in Sampling Reach
Bedrock	>80	1
Boulder	10.1 – 80	2
Cobble	2.50 – 10.1	5
Gravel	0.08 – 2.50	15
Sand	0.002 – 0.08	65
Silt	0.0002 - 0.002	11
Clay	<0.0002	1
TOTAL		**100**

2.2.2 Habitat Assessment

The NJDEP, Bureau of Freshwater and Biological Monitoring uses the Rapid Bioassessment (RBA) procedure adopted from the USEPA's *Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers* (Barbour et. al. 1999). Therefore, the RBA Habitat Assessment Field Data Sheet for Low Gradient Streams was completed for the stream reach to be consistent with the NJDEP protocol for habitat assessment. Ten criteria are used to characterize habitat in this assessment with the scoring ranges of: scores of 0 to 2 for poor conditions, 3 to 5 for marginal conditions, 11 to 15 for suboptimal conditions, and 16 to 20 for optimal conditions. The following habitat parameters were analyzed as part of this method:

- Epifaunal Substrate / Available Cover
- Pool Substrate Characterization
- Pool Variability
- Sediment Deposition
- Channel Flow Status
- Channel Alteration
- Channel Sinuosity
- Bank Stability (left and right banks)
- Vegetative Protection (left and right banks)
- Riparian Vegetative Zone Width (left and right banks)

A total score of 114.5 was calculated for the stream reach assessed on the Manasquan River, during the October survey. This corresponds to a habitat assessment score of 11.5, indicating suboptimal conditions. Among the highest scoring parameters were channel alteration - none was observed (score of 20) and left bank vegetative protection and zone width - no disruption was observed (score of 9.5 and 10). Among the lowest scoring parameters were bank stability

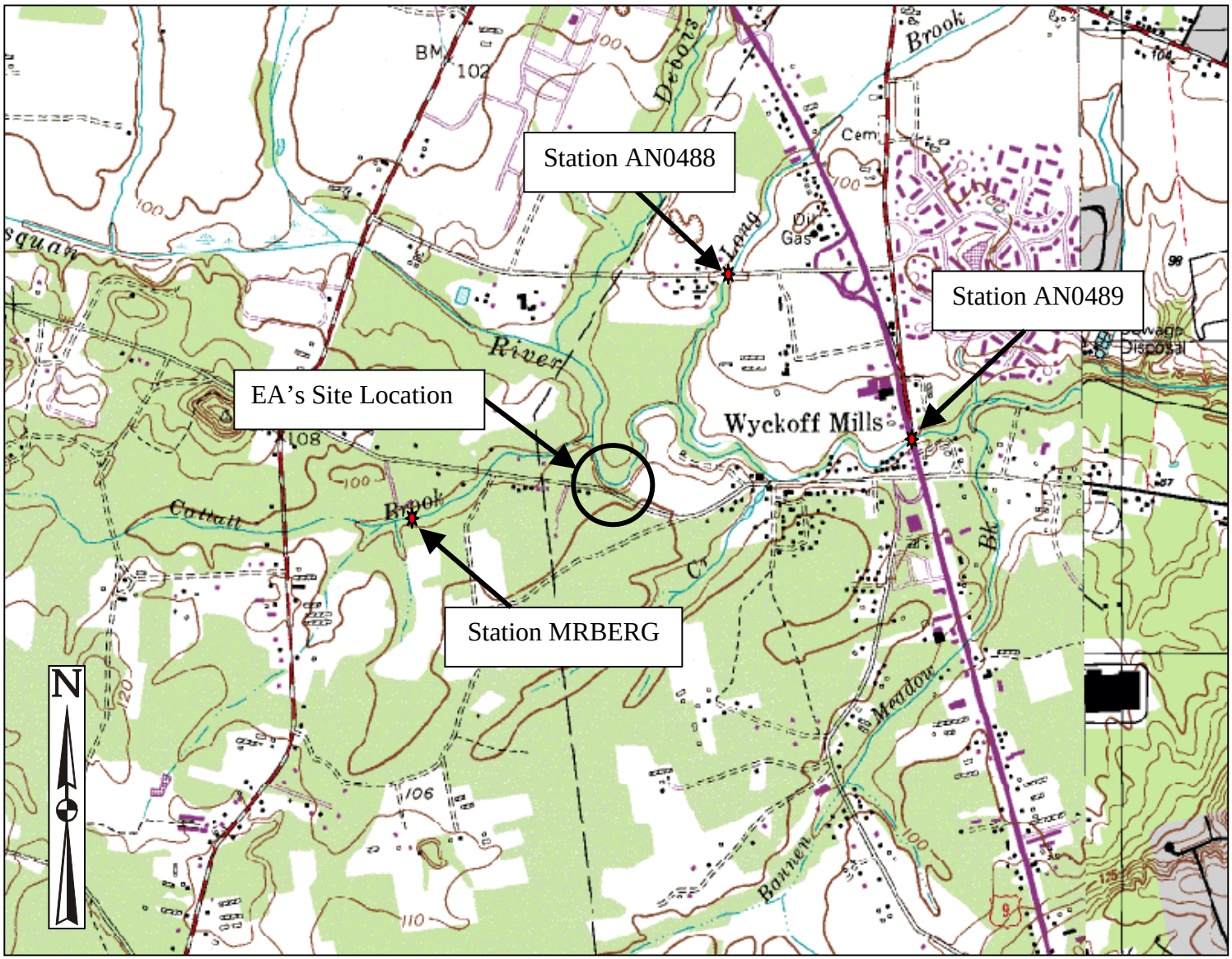
for right bank - active incision is occurring (score of 0) and riparian vegetative zone width for right bank - narrow area due to adjacent road and bank erosion (score of 4). Also of note, the parameter epifaunal substrate / available cover was categorized as marginal and obtained a low score of 6.

Monmouth County Department of Health (DOH) uses the RBA protocol in local rivers and streams as part of the NJDEP, Bureau of Freshwater and Biological Monitoring network. Monmouth County monitors over 143 stream sites as part of this program. Three of these stations are located in the vicinity of the surveyed stream reach (Figure 2-3). One station (MRBERG) is located on Cattail Creek approximately 0.60 stream miles upstream of the reach and two stations (AN0488 and AN0489) are located approximately 1.0 stream miles downstream of the stream reach (Table 2-4). All three stations achieved habitat scores (154, 128, 126) higher than the surveyed stream reach (114.5) included in this report, although all stations indicated suboptimal conditions.

Table 2-4. Habitat Scores for Manasquan River Stream Sampling Stations Located Upstream and Downstream of Project Site

ID No.	Station Name	Waterway	Station Location	Town	Habitat Score
--	Study Site	Manasquan River	Casino Road	Howell	114.5
130	MRBERG	Manasquan River	Bergerville Rd (US*)	Howell	154 [a]
---	AN0488	Manasquan River	Strickland Rd (DS*)	Howell	128 [a]
56	AN0489	Manasquan River	Route 9 (DS*)	Howell	126 [a]

[a]Source: NJDEP 2001
[v]Source: DOH
**DS: downstream, US: upstream*



Source: Topozone 1999-2003, USGS Adelphia Quad

Figure 2-3. Location Map of Surveyed Stream Reach and Upstream and Downstream Monmouth County Department of Health and New Jersey Department of Environmental Protection Rapid Bioassessment Stations

2.2.2.1 Riparian Habitat

A habitat assessment of both the left and right riparian areas of the streambank was completed within the study area. The right streambank is actively incising and depths of approximately 26 feet were recorded in the study area (USACE 2003). A dry, deciduous forest with steep topography is located along Casino Road adjacent to the stream. The dominant canopy plant species observed along the right bank were American beech (*Fagus grandifolia*) of approximately 80-100 feet tall with a 10-18" diameter at breast height (DBH). Sub-dominant plant species included red maple (*Acer rubrum*) and tulip poplar (*Liriodendron tulipifera*) of 60-80 feet tall with a 10-18" DBH. The understory was thin and the species observed included American beech saplings and blueberry species (*Vaccinium* sp.). A raised island that acts as a floodplain is located along the right bank at the upstream end of the reach.

A forested wetland and open emergent marshes are located along the left streambank within the study area. The dominant canopy species observed included red maple of approximately 80-100 feet tall with a 10-18" DBH and the sub-dominant canopy species included pignut hickory (*Carya tomentosa*) of 40-60 feet tall with a 6-10" DBH. Understory species included the shrub species spicebush (*Lindera benzoin*) and arrowood viburnum (*Viburnum dentatum*), and the vine form of poison ivy (*Toxicodendron radicans*). Open herbaceous areas were dominated by Japanese stiltgrass (*Microstegium*) and lady's thumb smartweed (*Polygonum persicaria*). Sub-dominant tree species included box-elder (*Acer negundo*), silver maple (*Acer saccharinum*), and American beech.

It was estimated during the October 2004 site visit that 90% of the stream channel is shaded due to the maturity of the riparian vegetation. A shaded riverine aquatic environment provides habitat for juvenile fish species through the riparian vegetation, which provides cool temperatures and cover for benthic macroinvertebrates.

2.2.2.2 In-Stream Habitat

Habitat characteristics are among the most important variables affecting benthic and fish community composition and proper characterization of the habitat parameters is critical to accurately evaluating biological conditions. Important in-stream habitat features observed during the stream assessment included submerged aquatic vegetation (SAV), large woody debris (LWD), and other features such as large cobble, boulders, undercut banks, and leaf pack. These features are described below and by ID in Table 2-5.

Table 2-5. Significant In-Stream Habitat Features Observed During a Stream Survey in the Manasquan River, October 2004

ID	Type of Feature	Significant Features Noted
1	Run/glide	Four small patches (1ft^2) of SAV, leaf packs
2	Pool	LWD = 37.7 ft^2
3	Run/glide	Live root wad with undercut banks
4	Pool	-
5	Run/glide	Discharge from pipe, LWD = 10.76 ft^2
6	Pool	-
7	Run/glide	-
8	Pool	Deep pool with LWD =10.76 ft^2 in bottom of pool
9	Riffle	Small riffle with large substrates
10	Run/glide	-
11	Pool	Bedrock and group of boulders along pool on right bank
12	Run/glide	Group of boulders and live root wad with undercut banks along right bank, point bar along left bank, leaf packs, LWD = 26.9 ft^2

Submerged Aquatic Vegetation

SAV provides refuge, spawning/nursery habitat, and food for aquatic fauna. SAV also protects banks from soil erosion, stabilizes stream substrates, and increases habitat diversity. Two freshwater SAV species were observed rooted in the sandy substrates near the left bank at Run/glide #1. Three small patches (1ft^2) of common waterweed (*Elodea canadensis*) and one small patch (1ft^2) of wild celery (*Vallisneria americana*) were observed. No SAV was observed upstream or downstream of the reach. Both of these SAV species are native to the U.S., made up less than 1 % of the stream reach, and appeared to be unrepresentative of the surrounding area.

Large Woody Debris

LWD is submerged tree material that is large enough (>6" in diameter) to remain secure within the channel and provides critical habitat, cover, and food sources for benthic and fish species. LWD helps protect banks from soil erosion, increases habitat diversity, and reduces flooding impacts by slowing stream flows and redirecting flow to create scour pools and gravel bars (ONDR 2000). Recording the presence of LWD involves measurements based on visual estimates taken by a wading observer (Barbour et. al. 1999). Submerged LWD provides habitat and cover for macroinvertebrates and fish species, and therefore, only woody debris (e.g. root wads, standing trees/stumps, accumulations of logs/limbs) that was identified below the water surface was measured and recorded. Length and width measurements (to the nearest 1.6 ft) were reported for all LWD within the stream reach and recorded on the site map. The length and width of each LWD formation was multiplied, and a total LWD area was obtained to show the aquatic

habitat area directly exposed to LWD. This total LWD was then divided by the water surface area within the sampled reach to obtain LWD density (Barbour et. al. 1999).

Root wads are considered LWD and refer to the trunk of a tree with the roots attached and the soil removed, therefore exposing the roots and providing additional habitat for fish and benthos. Two large root wads were located along the right streambank at Run/glide #3 and at Run/glide #12. The root wads observed in the stream reach were not submerged at the time of the survey, and were not included in the LWD calculations, but are most likely submerged during portions of the year. The banks were undercut below the root wads. The undercut areas also provide habitat and cover for aquatic species from terrestrial predators.

Within the study reach, approximately 78 ft^2 of LWD was observed in the form of submerged stumps in the pools and submerged logs along the streambanks. Live root wads along the right streambank were observed due to the actively incising channel, but were not submerged and therefore not included in these calculations. The stream reach length is approximately 480 ft measured from the centerline and an average width of 20ft = 9,600 ft^2. Therefore, LWD makes up less than 1% of the study reach.

Other Features

Additional features such as leaf packs, large cobble, and boulders also provide additional in-stream habitat for aquatic fauna. Boulders are rocks with a diameter greater than 10 inches that function to slow stream flows thus, creating eddies and backwater areas. Large, exposed cobble and boulders were observed within the stream reach and provide opportunities for habitat in the form of cover and substrate. A group of boulders (approximately 3-5 rocks) were located at Pool #11 at the edge of the pool on the right streambank, along the right streambank at Run/glide #12, and a group of large cobble (approximately 3-5 rocks) was located further downstream on the right streambank at Run/glide #12.

Leaf packs are bundles of old (four to six months) decomposing leaves that are clumped together to provide a major source of energy in the form of organic carbon. This organic detritus (as coarse particulate organic matter) fuels secondary production through the physical breakdown of leaves and the conversion of leaf material into smaller particles, microbial biomass, and animal tissue. Benthic macroinvertebrates that are within the detritivorous group (e.g. Gammaridae, Elmidae, Tipulidae, Phryganeidae, etc.) (Merrit and Cummins 1996) are considered shredders and require this type of leaf pack habitat for survival. Small groupings of leaf pack habitat were observed at the upstream portion of the stream reach, at Run/glide #1 and at the downstream portion of the stream reach at Run/glide #12.

2.2.3 Biological Indicators Present

2.2.3.1 Benthic Macroinvertebrate Analysis

The Rapid Bioassessment Protocol procedure used by the NJDEP is based on USEPA's Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers (Barbour et al. 1999). The procedure involves the use of a dipnet in sampling of stream bottoms to collect insects, mollusks, and crustaceans that are collectively called "macroinvertebrates". Benthic macroinvertebrates are bottom-dwelling invertebrate organisms that can be viewed with the naked eye. Samples are collected using a multi-habitat sampling approach, concentrated on the most productive habitat of the stream, the riffle/run areas (when available), using a 0.025-inch mesh D-framed dipnet. On streams without riffles (primarily in the Coastal Plain), woody snags, banks, and macrophytes are the primary habitats sampled. The samples are preserved with formalin or alcohol, labeled, and transported to the laboratory for sorting and identification. In the laboratory, samples are rinsed through a 0.023-inch sieve with water to remove preservative and organisms were removed from extraneous materials such as leaves and sand. Sorting is typically performed by evenly dispersing the sample in a gridded pan, then removing organisms from randomly selected grids until at least 100 organisms are obtained. However, the sample size from this survey was small, therefore, the total number of organisms (156) were identified by an experienced taxonomist to the family level. Laboratory methods followed guidance from Plafkin et al. (1989).

2.2.3.1.1 Field Collection Results

In order to assess the existing instream biota, benthic macroinvertebrate samples were collected during the stream assessment in October 2004. Benthic communities were sampled using proportional habitat sampling (i.e. 20 jabs using a dip net based on the amount of different microhabitat within the sampling reach) starting from downstream and moving upstream (Barbour *et. al*. 1999). For example, if a reach included 10% LWD, 30% root wad, and 60% riffle, then approximately two, six, and 12 benthic samples, respectively, would be collected at each of these habitat types. For this survey, a total of 20 dipnet samples were collected throughout the stream reach from various in-stream habitat types, including leaf packs, LWD, and snags. Specific sample proportions of each type of habitat for this study included four samples from cobble habitat, eight samples from LWD/snags, and eight samples from leafpacks. Samples from each habitat type were composited, placed in a jar with external labels, preserved with 10 percent formalin, and returned to EA’s biological laboratory for processing and identification.

During the benthic sampling, a type of brown algae was observed attached to cobble at the downstream end of the reach and no crayfish were observed during the stream assessment.

A total of 156 individuals were collected during the survey that comprised nine taxonomic orders and 17 families, which included invertebrates from various trophic structures (e.g. shredders, scrapers, and predators) (Table 2-6). The dominant taxa were the family Hydropsychidae (order Trichoptera), which had a total of 71 individuals, followed by two other families, Chironomidae with 30 individuals and Tubificidae with 17 individuals. The NJDEP utilizes family tolerance values (FTV) to determine the relative levels of impairment occurring in the stream. For the families collected during this survey, several are considered sensitive taxonomic groups (Corydalidae: FTV 0; Gomphidae: FTV 1; Aeshnidae: FTV 3; Tipulidae: FTV 3) while others are more tolerant (Psychodidae: FTV 10; Corixidae: FTV 9) of stream impairment and declining water quality. Eleven of the 16 total taxa (or 105 of the 156 individuals) are considered sensitive (0-5 FTV), which is approximately 70% of the total. This number is relatively high when compared to other stations located downstream of the project area.

Table 2-6. Benthic Macroinvertebrate Laboratory Bench Sheet from a Sample Collected in the Manasquan River, October 2004

Order	Family	Common Name	Organism Count	Family Tolerance Value (FTV)
Caenogastropoda	Viviparidae	Mystery snail	1	6[a]
Tubificida	Tubificidae	Freshwater worm	17	10[a]
Amphipoda	Gammaridae	Scud	4	4[b]
Coleoptera	Dytiscidae	Predaceous diving beetle	1	5[d]
	Elmidae	Riffle beetle	9	4[b]
Megaloptera	Corydalidae	Dobsonfly	4	0[b]
	Sialidae	Alderfly	6	4[b]
Trichoptera	Hydropsychidae	Caddisfly	71	4[b]
	Phryganeidae	Caddisfly	1	4[b]
Hemiptera	Corixidae	Water boatmen	1	9[e]
Odonata	Aeshnidae	Dragonfly	1	3[b]
	Calopterygidae	Dragonfly	6	5[b]
	Gomphidae	Dragonfly	1	1[b]
Diptera	Chironomidae	Midgefly	30	6[b]
	Ephydridae	Shorefly	1	6[b]
	Psychodidae	Sandfly	1	10[c]
	Tipulidae	Cranefly	1	3[c]
Total Number of Organisms Recovered			**156**	**---**

[a]NJDEP (1992 -1996), [b]USEPA (1989), [c]Hillsenhoff (1987), [d]NYDEP (1989), [e]Lenat (1993)

Two stations located downstream of the project area were reviewed for comparison with the study area: AN0488, which is located on a tributary (Long Brook) of the Manasquan River and AN0489, which is located further downstream in the Manasquan mainstem at the Rt. 9 crossing. For station AN0488, the number of sensitive taxa collected in 1999 was approximately 8% and for station AN0489, the number is 45%.

2.2.3.1.2 Analysis of Results

The data analysis scheme uses five biological metrics to calculate the New Jersey Impairment Score (NJIS). Metrics are predictable measures of the benthic community's response to stresses, such as changes in water quality or habitat degradation. Each metric measures a different component of community structure and has a different range of sensitivity to pollution stress. Deficiency of any one metric will not invalidate the entire biometric approach. Sensitive taxa were identified from the reach using reported family tolerance values from various sources (NJDEP 1992 –1996; USEPA 1989; Hillsenhoff 1987; NYDEP 1989; Lenat 1993). The following metrics, based on family-level taxonomy, are used in assessing a NJIS score:

Taxa Richness

Total numbers of families present in the sub-sample. This metric is calculated by simply totaling each different family name in the subsample. This parameter will become reduced in response to stress.

% Contribution of the Dominant Family (%CDF)

Percentage of the total number of the sub-sample organisms in the numerically dominant family. This parameter is an indication of community balance and will increase in response to stress.

E+P+T

Total number of families present belonging to the orders Ephemeroptera, Plecoptera, and Trichoptera, commonly known as mayflies, stoneflies, and caddisflies. This metric summarizes the taxa richness within the insect groups that are generally considered pollution sensitive. This parameter will become reduced in response to stress.

%EPT

Percentage of the total number of organisms in the sub-sample belonging to the EPT orders. This parameter will also become reduced in response to stress.

Modified Family Biotic Index (FBI)

A weighted sum of the Family Tolerance Values (FTV), based on Hilsenhoff's scale of 0 being the most pollution intolerant and 10 being the most pollution tolerant. This parameter will increase in response to stress. To calculate this metric, use the FBI calculation below:

$$FBI = \sum x_i t_i / n$$

where:
x_i=number of individuals within a family
t_i=tolerance value of a family
n=total number of organisms within the sample

Based on the NJIS protocol, a biological assessment of a stream is determined to be non-impaired if the total score is between 24-30, moderately impaired if the total score is between 9-21, and severely impaired if the total score is between 0-6. Table 2-7 provides the results of the five biometric analyses for collected macroinvertebrates from this study. The overall score is 18, which indicates that this stream reach is moderately impaired.

Table 2-7. Biometric Results of Benthic Macroinvertebrate Data from the Manasquan River, October 2004

Metric	Calculated Metric[a]	NJIS Score[b]
Taxa Richness	17	6
E+P+T Index	2	0
% EPT	46.2	6
%CDF	45.5	3
FBI	5.04	3
Total Score	**---**	**18**

[a]Calculated metrics are determined from the macroinvertebrate data collected from this study
[b]Scores are provided by NJDEP critieria for screening water quality; based on the calculated metric value the scores range from 0-6.

The proportion of impaired streams (either moderately or severely) in the Manasquan River Watershed (Management Area #12) is approximately 93% of the total sites monitored (43) (NJDEP 2001). Only 3 stations out of the total were considered non-impaired, and those were located in the northern and southernmost areas of the region (Atlantic Water Region). The study area location for this project is located between these two areas. Furthermore, the monitoring data outlined in the NJDEP (2001) report identified acute macroinvertebrate abnormalities (i.e. <5% of the specimens exhibited mouthpart deformities) in the family Chironomidae, a majority of the sites within the Management Area #12 included significant abnormalities in this family.

While the current study did not include identifications of macroinvertebrate abnormalities, consideration of these data was included in the comparison with previous monitoring data.

As described in Section 2.2.2, the Monmouth County DOH uses the RBA protocol in local rivers and streams as part of the NJDEP monitoring network. Three of these stations are located in the vicinity of the surveyed stream reach (Figure 2-3). One station (MRBERG) is located approximately 0.60 stream miles upstream of the reach and two stations (AN0488 and AN0489) are located approximately 1.0 stream miles downstream of the stream reach. RBA sampling and comparisons of data from the same seasons as historical sampling, provides some correction and minimization of annual variability (USEPA 1989). The season of the year during which sampling gear is most effective is an important consideration for selecting an index period. Certain seasons should be avoided, including freezing conditions and high flow periods in the spring, which may impede the ability to sample with selected gear. RBA sampling has historically occurred at the stations describe above in the Manasquan River in April, June, September, and October. Because the benthic macroinvertebrates sampling for the survey reach occurred during October, it is acceptable to compare and evaluate the historical NJIS scores.

The upstream station, (MRBERG), located on Cattail Brook at the Bergerville Road crossing was identified from agency reports and used to compare benthic data collected during the October 2004 survey. The average NJIS score for this station from eight monitoring events (2001-2004) is 18, which is considered moderately impaired and directly comparable to the project location near Bergerville Rd. Downstream stations were somewhat lower than the project location, with an NJIS rating of 9 and 15 (moderately impaired) for AN0488 and AN0489, respectively (Table 2-8).

Taxa richness for the study reach was calculated (17) and determined to be somewhat higher than the downstream location AN0488 (12) during a fall 1999 survey, but comparable to another downstream location AN0489 (18). The percent dominant taxon for the study reach was 46%, which is somewhat higher than the downstream station AN0489 (CDF = 33%). While in general terms lower CDF percentages indicate a better distribution of the taxa, however upon reviewing the data from AN0489, the dominant family was Tubificidae and is considered highly tolerant (FTV = 10) of pollution. The dominant taxa, which made up the 45.5% in the October 2004 study, were from the family Hydropsychidae (Trichoptera), a relatively sensitive family (FTV = 4). This indicates that the water quality within this section of the Manasquan River supports the survival of a sensitive benthic community. This is again supported by the %EPT metric (46.2%) from the study reach, which is considerably higher than downstream stations. Downstream stations indicated a much lower percentage of Ephemeroptera, Plecoptera, and Trichoptera

species, where the reported %EPT was 0 and 4% for AN0488 and AN0489, respectively (NJDEP 2001). The number of EPT taxa in the October 2004 study was limited to the Trichoptera order, with 71 Hydropsychidae and one Phryganeidae.

Family Biotic Index values for the study reach (FBI = 5.04) were lower than those calculated for downstream stations AN0488 (FBI = 7.95) and AN0489 (FBI = 6.92). These lower values indicate that the aquatic environment at the study reach is not as impaired or stressed (e.g. poorer water quality, loss of critical habitat, etc.) as the downstream stations.

Table 2-8. NJIS Scores for Manasquan River Stream Sampling Stations Located Upstream and Downstream of Project Site

ID No.	Station Name	Waterway	Station Location	Town	NJIS Score
--	Study Site	Manasquan River	Casino Road	Howell	18
130	MRBERG	Manasquan River	Bergerville Rd (US*)	Howell	18[b]
---	AN0488	Manasquan River	Strickland Rd (DS*)	Howell	9[a]
56	AN0489	Manasquan River	Route 9 (DS*)	Howell	15[a]

[a]*Source: NJDEP 2001*
[b]*Source: DOH*
**DS: downstream, US: upstream*

2.2.3.2 Additional Biological Indicators

2.2.3.2.1 Terrestrial Wildlife

Wildlife species utilizing the stream reach and adjacent terrestrial habitat were generally noted during the reconnaissance. Raccoon tracks were observed along the left streambank on the gravel bar and deer scat was observed in the forested wetland riparian zone. Avian species were heard but not identified. The riparian zone along the left bank therefore provides habitat for typical terrestrial wildlife.

2.2.3.2.2 Visual Fish Assessment

The stream reach appeared passable to fish during the field reconnaissance on 12 October 2004; no fish barriers were observed within the stream reach and two small fish approximately 2" in length were observed but not identified because a scientific collection permit was not obtained

for this survey. Some recent downed trees were observed at the downstream end of the reach, but did not act as a fish blockage. No barriers were observed at the upstream end of the reach. Manasquan River flows were obtained from the USGS station (01408000) at Squankum, NJ for 12 October 2004. The flows at Squankum were adjusted to the site using a drainage area scaling factor of 0.376 (See Section 2.3.1 for more drainage area details). The site-adjusted flow on 12 October was 12.4 cfs, which was slightly below the median daily site-adjusted flow of 13.2 cfs, based on 72 years of recorded data (USGS 2004).

The EA written for the project describes that the Manasquan River in the vicinity of the project site supports a variety of fish and that a trout fishery is located downstream of the study reach (USACE 2003). The study reach area is stocked annually for recreational trout fishing. A sea run brown trout program is also run by the DFW that stocks 8-inch brown trout in the freshwater/tidal and brackish portions of the Manasquan River; the nearest stocking point is located at Preventorium Road Bridge opposite Howell High School, approximately 5 miles from the study reach (Mid-Atlantic Fly Fishing Guide 2004). Other common freshwater fish species described in the project vicinity in the EA include black crappie, bluegill, brown bullhead, golden shiner, silvery minnow, white sucker, yellow perch, pumpkinseed, and tessellated darter (USACE 2003). In addition, anadromous and catadromous species such as alewife, American eel, blueback herring, white perch, and sea lamprey may be found near the project site (USACE 2003).

2.2.4 Water Quality Data

Water quality data were collected in the middle portion of the study reach during the site visit using a YSI 6820 water quality meter. Results of these data appeared within the normal range for a stream of this size that supports the fauna discussed in previous sections of this report (Table 2-9). Historic water quality monitoring in the upstream stations indicates that the Manasquan River is a coldwater stream because water temperatures range from 48.7 in the spring to 58.3 ^{o}F in late summer. Downstream temperatures were similar during the September 1999 monitoring effort, where temperatures ranged from 54.9 to 56.1 (NJDEP 2001). Conductivity in the stream reach (192 umhos) was similar to downstream measurements, where they ranged from 208 to 217 umhos.

Table 2-9. Water Quality Parameters Recorded Within the Study Reach in Manasquan River, October 2004

Temperature (°F)	Specific Conductivity (umhos)	DO (ppm)	Turbidity (NTU)	Salinity (ppm)
55.4	192	12.4	7.8	0.12

3.0 Manasquan River Hydraulic Studies

3.1 HEC-2 Model and Analysis

The USACE modeled an 8.5-mile portion of the Manasquan River using a hydraulic (HEC-2) model for a flood insurance study for the Township of Howell that was published in July of 1982 (USACE 2004). A new HEC-2 model was run in November 2002 using an updated cross-sectional survey data from May 1990 and October 2000 to reflect the current topography of the study area compared to the 1982 data. The USACE remodeled one cross-section to investigate the impacts of the proposed CCS wall design on water surface elevations using frequency-discharge data. The October 2000 survey collected cross-sectional data at 25-ft intervals along a 600-ft reach encompassing a bend. The re-modeled cross-section was based on data at station 4+00, and this station corresponded to location 33230 in the 1980 HEC-2 model. In the 1980 model, stations adjacent to station 33230 were located 1,620 ft upstream and 1,630 ft downstream. Profiles at the cross section were computed for the 10-, 50-, 100-, and 500-year events and for higher discharges within these events. The hydraulic model was run for existing conditions and for the proposed project conditions using a new cross-section. The profiles from both model runs were then compared to determine the effect of the project on the water surface elevations (Table 2-10).

The results indicate that the excavation of the left bank would provide more channel capacity than will be lost by the placement of the CCS wall (USACE 2004). Additionally, the model shows that for the range of frequencies, the with-project water surface elevations are lower than the without-project elevations (USACE 2004). This hydraulic model indicates that stage heights would be reduced because the modified channel would have greater capacity than the existing channel (USACE 2003).

Table 2-10. Results of a HEC-2 Model for the Manasquan River Study Reach

Storm Event	Flow (cfs)	Water Surface Elevation Existing Condition (ft)	Water Surface Elevation With Proposed CCS Wall (ft)	Difference in Water Surface Elevation (ft)
10-year	893	73.79	72.24	-1.55
50-year	1,271	74.39	73.27	-1.12
100-year	1,450	74.63	73.56	-1.07
	1,550	74.76	73.82	-0.94
	1,650	74.88	74.00	-0.88
	1,750	75.00	74.16	-0.84
500-year	1,896	75.16	74.39	-0.77
	1,950	75.22	74.47	-0.75
	2,100	75.38	74.69	-0.69

3.2 HEC-RAS Model and Analysis

The USACE River Analysis System (HEC-RAS version 3.1.2) software was used to analyze the river hydraulics in one-dimensional steady-state flow for the Manasquan River stream reach assessed in this report. The purpose of the HEC-RAS model was to generate water surface profiles (river depths and velocities) at specified stream cross-sections for steady, gradually-varied flow during low flow scenarios for use in a biological assessment. Nine cross-sections were modeled for the existing stream reach conditions, and one cross-section was modeled for the with-project scenario, the proposed CCS wall. The analysis included the scaling of USGS river flows to the site, the calculation of historical low flow statistics, and the execution of HEC-RAS.

3.2.1 HEC-RAS Methodology

Manasquan River flows were obtained from the USGS station (01408000) at Squankum, NJ. At Squankum, the Manasquan River has a drainage area of 44 mi^2. The drainage area associated with the site was planimetered from the USGS Adelphia quad resulting in a value of 16.54 mi^2. Flow statistics at Squankum were adjusted to the site using a drainage area scaling factor of 0.376.

Historical USGS flows at Squankum are available from 1931. For this analysis, the data set were confined to the most recent 20-year available period (October 1983 to September 2003). A frequency distribution of daily USGS flows for this 20-year period is provided in Table 2-11.

Table 2-11 indicates that the historical mean and median flows are 69 cfs and 50 cfs, respectively at Squankum. Applying drainage area scaling, the resulting median flow at the site is 18.8 cfs.

For the biological assessment, a low flow 7Q10 condition was selected and is defined as the lowest 7-day average flow with a 10-year recurrence interval for the study site. This flow is commonly used for permitting purposes. Low 7-day flows for a range of return intervals were determined from the 20-year Squankum data set using a log Pearson procedure. The results of this analysis are provided in the Table 2-12.

Table 2-11. Frequency Distribution of Daily USGS Flows on the Manasquan River at Squankum, NJ, October 1983 - September 2003

Percentile (%)	Flow by Month and Annually (cfs)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0	19	23	22	29	25	20	13	11	12	12	15	10	10
1	22	24	27	30	27	22	14	11	13	17	17	19	15
5	31	29	39	34	30	23	17	14	18	18	19	24	20
10	35	36	44	37	33	25	20	17	19	20	24	29	23
15	38	43	48	41	36	27	21	20	20	22	26	34	26
20	42	47	51	48	40	28	22	22	22	23	29	37	29
25	45	51	54	53	43	29	23	24	23	24	31	40	32
30	48	54	58	58	46	31	25	26	24	25	34	42	35
35	52	57	62	62	49	33	26	28	25	27	35	44	38
40	56	61	66	67	51	34	27	29	26	29	37	47	42
45	58	65	71	70	54	38	29	31	28	31	39	50	46
50	63	68	75	75	56	40	31	34	31	33	42	52	50
55	66	72	82	80	59	43	34	37	33	34	45	55	54
60	69	76	88	83	64	49	38	40	35	37	50	59	58
65	74	80	94	88	68	54	42	43	37	39	55	65	64
70	80	83	101	94	73	58	46	48	41	43	60	71	69
75	90	91	110	101	80	65	52	54	45	48	67	78	77
80	103	101	124	111	88	72	59	59	54	52	72	88	86
85	115	114	147	126	99	83	67	67	64	63	83	104	99
90	141	136	189	152	124	102	87	85	82	77	109	136	121
95	197	188	304	218	171	158	127	131	112	109	154	200	177
99	520	313	796	450	686	396	266	366	377	281	280	492	397
Mean	84	82	107	93	79	60	48	51	47	46	58	76	69
Max	858	431	1,190	1,010	1,070	753	862	1070	911	768	562	1,030	1,190
Obs	620	565	620	600	620	600	620	620	600	620	600	620	7,305

Table 2-12. Manasquan River Flow Statistics (cfs) from a 10-year Recurrence Interval

Station	Type of Flow			
	7Q2	7Q5	7Q10	Median
Squankum	21.3	16.2	13.9	50
Study Site[a]	8.01	6.09	5.23	18.8

[a]*Flows at Squankum were scaled to the study site using a 0.376 scaling factor.*

3.2.2 HEC-RAS Model Results

At the Manasquan River site, cross-sectional profiles were available at 25-ft intervals along a 600-ft reach (cross sections 0+25 to 6+25). The 0+25 cross-section is at the upstream and the 6+25 cross-section is at the downstream end of the study reach (See Appendix B, Drawing 2 for location of cross-sections). A total of nine cross-sections were used in HEC-RAS. The cross-sectional HEC-RAS model results are included in Appendix E. Elevations were tabulated from the drawings for the 0+25 cross-section and at additional 100-ft intervals using cross-sections 1+00 to 6+00. Since cross-section 4+00 is located on a sharper bend, the 3+75 and 4+25 cross-sections were also used to better delineate the channel geometry in the study reach.

The nine cross-sections representing the reach from 0+25 to 6+00 were entered into HEC-RAS. A Mannings coefficient of 0.025 was used for the channel based on the historical HEC-2 runs performed by USACE. Since this analysis only addresses low flow conditions, out of bank flows were not of concern. The HEC-RAS model was executed for the 18.8 cfs median flow and the 5.23 cfs 7Q10 flow. The results of these model runs are summarized in Table 2-13. Table 2-13 indicates that at the 18.8-cfs median flow, average depths at the nine cross-sections ranged from 0.46-ft to 0.67-ft deep and average channel velocities ranged from 1.10-ft/sec to 2.57-ft/sec. At the 5.23-cfs 7Q10 flow, average transect depths ranged from 0.26-ft to 0.50-ft and channel velocities ranged from 0.82-ft/sec to 2.25-ft/sec.

One cross-section was modeled for the with-project scenario (Table 2-14). This cross-section was based on data at station 4+00, which corresponded to location 33230 in the 1980 HEC-2 model and the cross-section remodeled with HEC-2 using the updated survey data in November 2002. The HEC-RAS model results for the 7Q10 flows indicate that the cross-sectional area at the 4+00 river station will increase from 3.60 to 4.40 ft^2 and the maximum water depth will be increase from 5.28 to 10.2 inches.

Table 2-13. HEC-RAS Model Results for Existing Conditions in the Manasquan River at a Historical Median and a 7Q10 Flow

Historical Median Flow									
River Station	Distance (ft)	Flow (cfs)	Min Chan Elevation (ft)	W.S. Elevation (ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Max Depth (ft)	Average Depth (ft)
0+25	575	18.8	88.5	89.94	1.63	11.52	18.04	1.44	0.64
1+00	500	18.8	89.0	89.88	1.13	16.70	26.67	0.88	0.63
2+00	400	18.8	89.0	89.82	1.10	17.10	29.97	0.82	0.57
3+00	300	18.8	88.4	89.74	1.28	14.73	19.75	1.34	0.75
3+75	225	18.8	88.7	89.54	2.57	7.33	15.78	0.84	0.46
4+00	200	18.8	88.6	89.49	1.92	9.79	16.06	0.89	0.61
4+25	175	18.8	88.1	89.48	1.38	13.65	18.44	1.38	0.74
5+00	100	18.8	88.3	89.41	1.41	13.31	19.89	1.11	0.67
6+00	0	18.8	88.2	89.29	1.53	12.29	22.59	1.09	0.54

7Q10 Flow									
River Station	Distance (ft)	Flow (cfs)	Min Chan Elevation (ft)	W.S. Elevation (ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Max Depth (ft)	Average Depth (ft)
0+25	575	5.23	88.5	89.51	0.93	5.65	11.19	1.01	0.50
1+00	500	5.23	89.0	89.46	0.82	6.37	20.65	0.46	0.31
2+00	400	5.23	89.0	89.34	0.97	5.41	19.56	0.34	0.28
3+00	300	5.23	88.4	89.28	0.74	7.06	13.80	0.88	0.51
3+75	225	5.23	88.7	89.12	2.25	2.33	8.92	0.42	0.26
4+00	200	5.23	88.6	89.04	1.45	3.60	11.25	0.44	0.32
4+25	175	5.23	88.1	89.03	0.82	6.40	13.64	0.93	0.47
5+00	100	5.23	88.3	88.98	0.89	5.88	14.21	0.68	0.41
6+00	0	5.23	88.2	88.87	1.11	4.71	13.98	0.67	0.34

Table 2-14. HEC-RAS Model Results for Existing Conditions and With Proposed Project Scenario for a Cross-Section in the Manasquan River at a Historical Median and a 7Q10 Flow

Model Scenario	River Station	Flow (cfs)	Min Chan Elevation (ft)	W.S. Elevation (ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Max Depth (ft)	Average Depth (ft)
Existing Conditions	4+00	5.23	88.6	89.04	1.45	3.60	11.25	0.44	0.32
	4+00	18.8	88.6	89.49	1.92	9.79	16.06	0.89	0.61
With Proposed Project	4+00	5.23	67.0	67.86	1.19	4.40	11.06	0.85	0.40
	4+00	18.8	67.0	68.34	1.53	12.28	21.41	1.33	0.57

3.3 Fish Passage Assessment

Such a stream typically supports smaller fish species such as minnows and dace, and perhaps the young of larger species. USACE (2003) listed a number of species in the project vicinity including golden shiner, silvery minnow, white sucker, yellow perch, bluegill, and tessellated darter. It was also suggested that migratory species such as alewife and blueback herring may be found in the project area. Additionally, the study reach area is stocked annually for recreational trout fishing (USACE 2003). Based on distributional records (Lee et al. 1980), other small-stream fish that could potentially occur in the project area include creek chub, fallfish, and blacknose dace.

The physical conditions at nine transects were defined for the study reach using a historical median flow for the last 10 years and the 7Q10 to determine low flow conditions and the corresponding water surface elevations for nine cross-sections and are displayed in Table 2-13. The maximum water depths—the limiting factor for fish passage—varied from 0.34 to 1.01 feet (4-12 inches). One transect with the 4-inch depth at low flow would be the potential limiting location for fish passage through the project area.

There is little specific research on the minimum depths required for passage of small freshwater fish. The USFWS developed Habitat Suitability models for a variety of fish species in the 1980s (Twomey et. al. 1984), but the depth component of these efforts was directed at the "optimum" that would be chosen by a fish with all depths available, rather than the minimum depth for swimming. One area that minimum depths for fish passage specifically come into play is in the design of road culverts. TranSafety, Inc. (1997) summarized research conducted in Virginia on proper design specifications. Based on this work, a minimum depth of 3.5 inches was

recommended for culvert design and targeted at the passage of trout species. This depth is less than the shallowest maximum depth during low flow conditions in the Manasquan project area.

There is very little likelihood that an exception would be granted for the requirement for maintaining depths in a new watercourse "at least as deep as in the pre-construction channel…." [NJAC 7:13-3.6(c)(1) and (c)(2)(i).] Such an exception may only be granted if "the pre-construction channel does not allow for the upstream passage of fish during low-flow conditions." The Manasquan River in the project area is a small stream, with wetted widths under median flows varying from 15 to 30 feet, and 9 to 21 feet under 7Q10 low-flow conditions (Table 2-13).

Based on the above paragraphs, it is highly unlikely that the 7Q10 flow condition would inhibit passage of fish up- or downstream in the Manasquan River project area. Additionally, during the visual fish passage assessment, no fish barriers were observed within the stream reach or upstream or downstream of the reach and two small fish approximately 2" in length were observed within the study area.

4.0 Evaluation of Restoration Design Plans

4.1 Description of Proposed Streambank Stabilization

The proposed streambank stabilization includes design plans for a 200 ft CCS retaining wall. A CCS wall is a three-dimensional honeycomb structure made of polyethylene cells that is proposed along the right streambank (USACE 2003). The CCS wall acts as a hard structure and may be filled with either stone or concrete below the water level and may be filled with stone or topsoil above the water level and then planted for aesthetic purposes. The cross-section details of the CCS wall structures is included in design Drawing 3 in Appendix B, and the planview details are included in design Drawing 2 in Appendix B. The planview details and materials described in Drawing 2 have the potential to change prior to final project design. As described in the EA, the cells in the lower portions of the CCS wall would be filled with concrete to protect the lower banks and the cells on the upper portions of the bank would be filled with soil and vegetated (USACE 2003).

In addition to constructing a CCS retaining wall to control erosion along the right streambank, the centerline of the stream would be moved approximately 10 feet to the north and away from the existing right bank to provide a stable foundation and slope for the wall (USACE 2003). The channel will be shifted north toward the inside of a meander bend, into a gravel point bar and forested wetlands along the streambank. The design drawings show that the existing bottom elevation of the channel will be returned to pre-construction elevations. The left bank will be excavated to maintain streamflow – a coir fabric biolog will be planted with willows at the bank toe and will be seeded and mulched on the excavated bank. As part of the proposed stream restoration, the stream channel will be shifted approximately 10 feet.

Construction of the CCS wall includes the temporary excavation of approximately 3.5 ft below the existing bottom elevation of the stream channel to anchor the wall into the stream bottom with an articulating concrete block scour apron that is the leveling layer and a maximum of 6 inches thick. A drainage system is also proposed behind the CCS wall to provide adequate drainage along the right streambank. The project life span for the CCS wall is expected to be greater than 50 years and cost approximately $450,000 (USACE 2003).

4.2 Future Requirements for Restoration Design Plan

An evaluation of the channel design prepared by the USACE is required as part of this study to determine the extent to which the modified channel duplicates the pre-construction character of the channel. The streambank stabilization restoration plans are currently at 30% design and do

not yet show the level of detail to determine compliance with NJAC 7:13-2.9c and 7:13-3.6c and f. Therefore, this section of the report discusses details that the 100% design plans should include for compliance with NJAC 7:13-2.9c and 7:13-3.6c and f. Requirements for the restoration design plans are divided into the following four categories for discussion: 1) scheduling, construction, and logistical details, 2) in-stream and channel details, 3) riparian and adjacent vegetation details, and 4) biological requisites. The requirements described below do not include an evaluation of construction/engineering feasibility or costs associated with the recommendations.

4.2.1 Scheduling, Construction, and Logistical Details

- A detailed construction schedule will be required for the 100% design plans for the contractor. The schedule should detail the time of year and extent of time that each task should require for completion. The sequence of construction events by "station" should be described in full detail for contractor. The time of year construction schedule should be sensitive to when fish spawning or other important aquatic activities typically occur. From NJAC 7:7A, all in-stream work will be avoided from March 15 to June 15 to minimize impacts to the growth and propagation of fish, other aquatic life, and wildlife in the stream during this period in "trout-stocked waters; trout maintenance waters; and an area within one mile upstream of a trout-stocked or a trout maintenance water" (NJDARM 2004).

- The minimum size of equipment possible to complete the work will be used and all equipment should be specified for in-stream, riparian, and adjacent habitat work.

- The equipment access route and temporary staging area will reduce impacts to the public and will be located along the right streambank, within the "limit of contractor work," and outside of the forested wetland located immediately adjacent to the left streambank. These locations will be specified on the design plan.

- The location of all utilities (including electrical, sewer, stormwater) and roadways should be included in the design drawings to insure they are not disturbed during construction.

- Design specifications of the cell structures in the CCS wall should be included in final design plans along with a detailed construction sequence of the wall.

- The details of the flow diversion structures and locations should be included for the contractor. All in-stream work will take place in the "dry" and a temporary conduit will

divert flow from the stream.

- Details of the drainage structure behind the CCS wall will be included in the cross-section drawings, including type and size of materials used.

4.2.2 In-Stream and Channel Details

- The 30% cross-section design drawings show that the bottom elevation will be excavated for placement of the toe and backfilled to the existing bottom elevation. If, during this process, the excavated material must be placed, it will be stockpiled in an appropriate location, consistent with the Erosion and Soil (E&S) plan. If possible, the excavated material will be reused in the construction of the new channel.

- Behind the CCS wall, where compacted backfill is proposed, the amount and type/size of the material will be specified by cubic yards and will be similar to existing conditions.

- Additional cross-sections showing the proposed CCS wall should be included if conditions change within the 200 feet proposed for the wall. Additionally, the location and profile for the new thalweg will be provided in all cross-sectional design drawings.

- The 30% cross-section design drawings show what appears to be a loss of approximately 50% of the wetted channel from a deeper-water habitat to a shallower-water habitat due to grading into the existing left bank. This loss of deeper water habitat would pose an impact to aquatic biota and should be mitigated for in the design. All existing pools as described in Section 2.2.1.1 should, therefore, be included in the new design drawings and developed during the in-stream construction of the new channel. The total volume of pools that should be included in the final channel is approximately 3,000 ft^3.

- The type of substrate that will be used for the new wetted channel should be described and similar to existing conditions as described in Section 2.2.1.2, which characterized dominant existing substrates as coarse sand.

- The pool/nonpool features and depths of the existing channel, which have been described in Section 2.2.1.1, should be constructed in similar ratios as part of the new channel. Approximately 30 percent of the study reach was comprised of pools and 70 percent of the reach was comprised of non-pools (riffles, runs, and glides). The total volume of riffles that should be included in the final design is approximately 5 ft^3, the total volume of runs/glides that should be included in the final design is approximately 4,500 ft^3, and the total volume of

pools that should be included in the final design is approximately 3,000 ft^3, as described above.

- The existing stream reach is located along a meander bend with an average radius of curvature of the bend of 120 ft. Additionally, the riverbed elevation dropped 1 ft over the 480 ft survey reach, resulting in an average gradient of 0.0022 ft/ft. The radius of curvature of the meander and the average stream gradient should be designed in the new drawings as similar to existing conditions of 120 ft and 0.0022 ft/ft, respectively.

4.2.3 Riparian and Adjacent Vegetation Details

- A CCS wall is proposed along the right streambank within the channel where actively incising banks are sloughing off into the stream. Behind the CCS wall, compacted backfill is proposed as part of the stabilization. Based on the 30% design drawings, the CCS wall is designed at approximately 50% of the height of the 26-foot tall incising banks. The right bank above the CCS may continue to slough off until it stabilizes, and may result in the loss of the existing mature riparian buffer. If this occurs, less shade and habitat will be available adjacent to the channel and the new CCS wall may become destabilized. The mature trees along the right streambank will be stabilized prior to initial construction activities to minimize these losses.

- The existing stream channel was observed to be 90% shaded during a site visit in October 2004 when leaf drop had already started for the season. If the channel is shifted approximately 10 feet to the north, the existing, mature riparian buffer on the right bank may shade the new channel less. Approximately 10 average size trees (approximately 40 feet tall with a 6" DBH) could potentially be removed on the left streambank associated with shifting the channel, which will reduce the amount of existing shade on the stream. Shade is important to maintain a low stream temperature for fish and macroinvertebrates. If trees require removal during construction activities, the loss of shading will be mitigated by preserving and transplanting as many mature and average-size trees as possible during the construction. If this is not possible, new native trees (American beech, silver and red maples, green ash, etc.) large enough to provide the same percentage of canopy coverage (approximately 90%) should be replanted along the newly constructed streambanks.

- If trees require removal, a planting plan and schedule for the left bank that is proposed to be excavated and shifted 10 feet to the north should be completed and include native species and requirements. As discussed above and if possible, existing trees should be transplanted to

save money and resources. The 30% design drawings specify a coir fabric biolog with willow plantings at the bank toe. No willow species were observed at the site during the field reconnaissance. Additionally, willow species require more sunlight than may be available on the left bank. Existing native species that were observed at the site during the field reconnaissance are recommended and include the understory species spicebush and arrowwood viburnum, and the canopy species red maple, silver maple, and American beech. For proposed plantings, a list of species, the percent by volume, and total number of stakes should be specified.

- At the excavated bank and on the top layer of the CCS wall, seeding and mulching are described in the 30% design drawings. If this is a temporary stabilization technique for the bank, it should be noted and no non-native or invasive seeds should be used for either temporary or permanent stabilization measures. Optimally, the excavated bank should be planted with the same species described above that will provide similar amounts of shade that the existing species provide. The top layer of the CCS wall should be planted with shallow-rooted species to maintain the integrity of the CCS wall, potentially native, non-invasive vine species (discussed in more detail below). Behind the CCS wall, this area should be planted with the same species described above that will provide similar amounts of shade that the existing species provide and will best take up water to ensure the integrity of the drainage constructed behind the CCS wall.

- If the CCS wall will be planted, it is recommended that the following native, non-invasive vine species be planted that are tolerant of light shade:

    1. Coral honeysuckle (*Lonicera sempervirens*),
    2. American bittersweet (*Celastrus scandens*) – tolerant of poor soil
    3. Trumpet vine (*Campsis radicans*) – tolerant of poor soil
    4. Virginia creeper (*Parthenocissus quinquefolia*)
    5. Crossvine (*Bignonia capreolata*)

- It is recommended that concurrent with the left bank excavation and plantings, the herbaceous understory species Japanese stiltgrass be removed. This is a non-native and invasive species that is a threat to habitat quality and is extremely difficult to control (NJDFW 2004). However, the extent of Japanese stiltgrass may go beyond the "contractor limit of disturbance," and complete removal of this species may not be an option at this time.

- A forested wetland is located along the left bank of the stream, where the channel will be shifted approximately 10 feet to the north. If wetland mitigation will be located on-site, or in the project vicinity, the location should be included in the design plans. A wetland planting and monitoring plan may be required and could be created during the construction phase of the project. Additionally, the design plans should describe the existing wetlands, the acreage that will be removed, and detail wetland type.

- Details that describe the method of existing vegetation removal should be included in the design plans. As discussed earlier, if existing trees can be preserved or transplanted this should be described. The disposal of any vegetation, including Japanese stiltgrass should be specified. Each tree that will be removed should be described by species and average size so comparable trees can be planted following construction.

- In the 30% design drawings, plantings are proposed for the outer right bank CCS cells. The species that will be planted should be specified and how the vegetation will be stabilized when first planted before establishment techniques should be described.

4.2.4 Biological Requisites and Details

The in-stream habitat characteristics are among the most important variables affecting the benthic and fish community composition. The significant in-stream habitat features observed during the stream assessment included SAV, LWD, and other features such as large cobble, boulders, undercut banks, and leaf pack. The following bullets describe the in-stream features that should be included in the final design drawings.

- SAV and leaf pack were observed within the study reach. Three small patches ($1ft^2$) of common waterweed and one small patch ($1ft^2$) of wild celery were observed and made up less than 1 % of the stream reach ($4ft^2$ total). Additionally, small groupings of leaf pack habitat were observed within the study reach and also and made up less than 1 % of the stream reach. This habitat will most likely return naturally at the completion of the construction activities.

- Within the study reach, approximately 78 ft^2 of LWD was observed in the form of submerged stumps in the pools and submerged logs along the streambanks and made up approximately 1% of the stream reach. When possible, the tree stumps located in the existing channel will be reused in the final design for habitat in the new channel. Areas of similar size of LWD should be included in the final design drawing to ensure no net loss of habitat. LWD can be

combined in the restoration designs to: 1.) protect the streambank from erosion through deflections, 2.) provide in-stream habitat and overhead cover for fish, 3.) provide shade, detritus, terrestrial insect habitat, and 4.) provide diversity of habitats (Rosgen 1996).

- Features such as large cobble, and boulders provide additional in-stream habitat for aquatic fauna. Two groups of boulders (approximately 3-5 rocks) and a group of large cobble (approximately 3-5 rocks) were located within the study reach. Similar groupings of boulders should be included in the final design drawings to provide instream cover and create scour pools for fish and aquatic habitat (Rosgen 1996).

- The HEC-2 model results indicate that the excavation of the left bank would provide more channel capacity than will be lost by the placement of the CCS wall (USACE 2004). Additionally, the model shows that for the range of frequencies, the with-project water surface elevations are lower than the without-project elevations (USACE 2004). This hydraulic model indicates that flood stage heights would be reduced because the modified channel would have greater capacity than the existing channel (USACE 2003).

- Based on a HEC-RAS model and the resulting water surface elevation levels for nine cross sections within the stream reach during low flow conditions, fish can pass through the study reach. Also, no visual fish blockages were observed within the study reach or upstream or downstream of the project area. These data verify that the pre-construction channel allows for the upstream passage of fish during low-flow conditions. Therefore, the proposed project design plans should allow for fish passage through the relocated channel based on provisions in NJAC 7:13-3.6(c)(1) and (c)(2)(i), which states that water depths in a new watercourse must be maintained "at least as deep as in the pre-construction channel [and an exception may only be granted if] the pre-construction channel does not allow for the upstream passage of fish during low-flow conditions." Because the pre-construction channel allows for the upstream passage of fish during low-flow conditions, the relocated channel must also allow for the upstream passage of fish during low-flow conditions. The new channel should be designed so that minimum water depths within the study reach are not less than the maximum water depths as determined based on the 7Q10 flows described in Table 2-13. The HEC-RAS model results for the 7Q10 flows indicate that the cross-sectional area at the 4+00 river station will be increased from 3.60 to 4.40 ft^2 and the maximum water depth will be increased from 5.28 to 10.2 inches. This increase in flow area and maximum water depth under low flow conditions may have a positive impact on the aquatic community, including the fish species. Also, the model indicates that the with-project scenario at the 4+00 river

station increases the average water surface elevation level from 3.84 to 4.8 inches, which would still be considered passable to fish.

5.0 Conclusions and Recommendations

5.1 Conclusions

This study was conducted in response to the DFW statement detailed in Section 1.0 and to characterize the current conditions in the stream channel with respect to the cited sections of the NJAC and to assess if the proposed design replaces the existing stream habitat adequately, as specified in the regulations. The habitat features defined for the channel to document the existing conditions include bottom substrate type, percentage of pools/riffles/runs/glides, stream width, depth and gradient, radius of curvature, and any in-stream habitat enhancement devices observed in the watercourse, including LWD and boulders/cobble. These features should be replaced in similar ratios in the final design plans as specified by DFW for compliance with the NJAC.

Hydraulic models were included as part of this study to characterize water surface elevations and stage heights during flooding and low flow conditions for both the existing stream and the proposed project. For the range of frequencies, the HEC-2 model shows that the with-project water surface elevations are lower than the without-project elevations. Stage heights would also be reduced since the modified channel would have greater capacity than the existing channel (USACE 2003). This reduction in stage height was analyzed in HEC-2 for flood scenarios only. The HEC-RAS model results for the 7Q10 flows indicate that both the cross-sectional area and the maximum water depth will be increased for the proposed design. The increase in flow area and maximum water depth demonstrate no net loss in overall aquatic habitat (excluding other aquatic features) and this increase could potentially have a positive impact on the aquatic community, including the fish species.

Because the streambank stabilization restoration plans are at 30% design and do not yet show the level of detail to determine compliance with NJAC 7:13-2.9c and 7:13-3.6c and f, the previous section discussed details that the 100% design plans should include for compliance with NJAC. These requirements for the restoration design plans were divided into four categories for discussion: 1) scheduling, construction, and logistical details, 2) in-stream and channel details, 3) riparian and adjacent vegetation details, and 4) biological requisites. A table that summarizes the evaluation of the restoration plan is included below (Table 5-1).

5.2 Recommendations

It is recommended that the details discussed in Section 4.0 and Table 5-1 are included in the 100% design drawings for compliance with NJAC 7:13-2.9c and 7:13-3.6c and f.

Table 5-1. Matrix of Recommendations for 100% Design Provisions for Manasquan River Streambank Stabilization Project

Future Requirements	Project Provisions for Habitat Restoration
Scheduling, Construction and Logistical Details	• From NJAC 7:7A, all in-stream work will be avoided from March 15 to June 15 to minimize impacts to aquatic biota. • The access route and temporary staging area will reduce impacts to both the environment and public, and will be located along the right streambank within the "limit of contractor disturbance," and outside of the forested wetland. • Flow diversion structures and in-stream work will be completed in the "dry" and detailed in the plans – a temporary conduit will divert flow from stream. • Design specifications of drainage structure proposed behind CCS wall will be included. • Include design specifications of the cell structures in the CCS wall and a detailed sequence of construction for the wall.
In-Stream and Channel Details	• Location and amount of excavated material placement will be specified. Material will be stockpiled in an appropriate location consistent with the E&S plan; and if possible, reused. • Amount and type/size of the compacted backfill material and substrate of the new channel will be specified to be similar to existing conditions. • Additional cross-sections showing the proposed CCS wall and profile of the new thalweg will be provided. • The pool/nonpool features and depths of the existing channel will be constructed in similar ratios as part of the new channel - approximately 30 percent pools and 70 percent non-pools (riffles, runs, and glides). • Existing in-stream features will be detailed in the new design drawings and developed during the in-stream construction, including 3,000 ft^3 of pools, 5 ft^3 of riffles, and 4,500 ft^3 of runs/glides. • The radius of curvature and average stream gradient will be similar to the existing conditions of 120 ft and 0.0022 ft/ft.
Riparian and Adjacent Vegetation	• Existing mature trees along the right streambank will be stabilized prior to initial construction activities. • If trees require removal during construction, loss of shading will be mitigated by preserving and transplanting trees, when possible during construction. If not feasible, new native trees large enough to provide the same percentage of canopy coverage (approximately 90%) should be replanted along streambanks. • For all new plantings, native species that currently exist at the site should be included in the plans and seed mixes and a list of species, the percent by volume, and total number of stakes should be specified. • Removal of the non-native and invasive species Japanese stiltgrass during excavation activities along left bank to increase habitat quality is recommended. • Method of vegetation removal should be detailed and existing trees should be preserved or transplanted when possible. • It is recommended to plant native species on the CCS wall. If vines are preferred, see list of recommended species in Section 4.2.3.
Biological Requisites	• 1% of the new in-stream design should include large woody debris (LWD) – tree stumps in existing channel will be reused in final design for habitat • Two groups of boulders (approximately 3-5 rocks) and a group of large cobble (approximately 3-5 rocks) should be included in the final design drawings. • Final design plans will provide for fish passage during low flow conditions.

6.0 References

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Appendix A

Stream Encroachment Permit Package and DFW Letter Response

James E. McGreevey
Governor

State of New Jersey
Department of Environmental Protection

Bradley M. Campt
Commissioner

Office of Permit Coordination and Environmental Review
PO Box 418
Trenton, NJ 08625-0418
Phone 609-292-2662
Fax 609-292-4608
Ken.koschek@dep.state.nj.us

January 14, 2004

Mr. Minas M. Arabatzis
Chief, Planning Division
Philadelphia District
Corps of Engineers
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107-3391

RE: **Manasquan River at Bergerville Road**
Streambank Stabilization
Howell Township, Monmouth County

Dear Mr. Arabatzis:

The Office of Permit Coordination and Environmental Review of the New Jersey Department of Environmental Protection (NJDEP) has completed its review of the Environmental Assessment (EA) for the proposed Streambank Stabilization of the Manasquan River at Bergerville Road in Howell Township, Monmouth County. We offer the following comments and recommendations for your consideration.

Regulatory Requirements

A freshwater wetlands permit and a stream encroachment permit will be required for the project from our Department's Land Use Regulation Program (LURP).

Natural Resources

The NJDEP's Division of Fish and Wildlife (DFW) has the following comments and concerns regarding the selected alternative relative to fish and wildlife resources. The proposed action is the construction of a Cellular

Containment System or CCS retaining wall as well as a slight realignment of the road eroding meander in the Manasquan River at Bergerville Road.

While the DFW agrees that the proposed solution is the least environmentally damaging alternative that fulfills the objectives, they also note that the EA does not discuss the issue of stream restoration following the proposed realignment. The criteria of a Stream Encroachment Permit at N.J.A.C. 7:13-2.9 (c) and 7:13-3.6 (c), (f) will require the replacement of instream habitat characteristics such as substrate type, pool/riffle ratio, width/depth/velocity characteristics, cross channel configuration (i.e. low flow channel), bank vegetation/overhead canopy, etc./ Design of a functional and stable channel following realignment may require the aid of a professional stream geomorphologist; a rip-rap lined trough in the realignment reach would be unacceptable to the DFW and would not meet the requirements in the existing stream encroachment regulations. Since the resulting design on stream restoration can alter the acceptability of the project and the DFW's position on the environmental impacts, the NJDEP recommends that the details of the stream restoration be provided to the review agencies. A commitment and details on stream restoration should be provided prior to a Finding of No Significant Impact (FONSI).

Thank you for providing the NJDEP the opportunity to comment on the EA.

Sincerely,

Kenneth C. Koschek
Supervising Environmental Specialist
Office of Permit Coordination
& Environmental Review

C: Andrew Didun, NJDEP

State of New Jersey

Department of Environmental Protection

STREAM ENCROACHMENT ADMINISTRATIVE CHECKLIST

ADMINISTRATIVE CHECKLIST AND ENGINEERING DATA SHEET, REVISED AUGUST 1, 1997,(5/99)

To apply for a stream encroachment permit, please complete this form and submit the necessary information as detailed in the attached application package to the following address:

Postal Mailing Address:
NJDEP, Land Use Regulation Program
P.O. Box 439
Trenton, NJ 08625-0439

Street Address (Courier Service):
NJDEP, Land Use Regulation Program
501 East State Street, Station Plaza Five, Second Floor
Trenton, NJ 08609

Your project will need a stream encroachment permit if you have proposed:

Certain minor activities in these areas are not regulated and do not require a stream encroachment permit. For more information, please contact the Department or refer to the *Flood Hazard Area Control Act Rules.*

- ☑ Construction, grading, or other disturbance within a 100-year flood plain.
- ☑ Construction, grading, or other disturbance within a stream-buffer *(either 25 ft. or 50 ft.: see 1 below).*
- ☐ The construction of a point discharge within or discharging to a 100-year flood plain.

The following items must be submitted for all projects:

- ☑ This checklist sheet.
- ☑ The project review fee.
- ☑ One completed LURP-1 application form with original signatures.
- ☑ Two sets of location maps.
- ☑ Two sets of mounted color photographs of the site. REFER TO ATTACHED ENVIRONMENTAL ASSESSMENT
- ☑ Three copies of an environmental report for the project
- ☐ Six sets of signed and sealed, individually folded drawings of the project.

The following items are necessary only for certain projects:

- ☐ Proof of local notice.
- ☐ Hardship waiver with analysis.
- ☐ Calculations (one signed and sealed copy of each that apply).
- ☐ Net-fill.
- ☐ Hydrologic.
- ☐ Hydraulic
- ☐ Storm water management.
- ☐ Water quality
- ☐ Stability analysis.
- ☐ Soil erosion and sediment control plans.

Please answer the following questions:

1. The channel will have a 50 ft. wide stream-buffer if any one of the following is answered "yes". Otherwise, the channel will have a 25 ft. wide stream-buffer.

   Yes (No)

   Does this project affect a trout associated watercourse?
   Does this project affect a Category-One watercourse?
   Does this project affect a watercourse associated with threatened or endangered species?
   Will the proposed work expose deposits of acid-producing soils?

2. Flood plain limits. Please check one.

☑ The flood plain referenced for this project is based on a New Jersey Flood Hazard Area map.

6. Application(s) for: (Please check all that apply)

Stream Encroachment:	Permit		✓	Waiver	
CAFRA:	Individual Permit			General Permit	
	Exemption Request			Permit by Rule	
Freshwater Wetlands:	Individual Permit		✓	General Permit (Specify #)	
	Transition Area Waiver			Letter of Interpretation	
	Exemption Request			Open Water Fill Permit	
Waterfront Development:	Residential			Commercial	
Upland Waterfront Development:	Residential			Commercial	
Water Quality Certificate		✓		Tidal Wetlands (1970)	
Federal Consistency Determination				Jurisdictional Determination	
Permit Modification (specify)					
Other (specify)					

7. Indicate below if any of the following approvals, denials or certifications were received for the project site or are required for the proposed project:
   - In Column A, indicate application status: (*P for* - pending, *A for* - approved, *D for* - denied, *T for* - to be applied for, or *O for* - other (explain other).
   - In Column B, indicate application, permit, or docket number.

NONE

	A	B		A	B
CAFRA Permit			Stream Encroachment Permit		
CAFRA Exemption			Stream Encroachment Waiver		
Waterfront Development Permit			Water Quality Certificate		
Tidal Wetlands (1970) Permit			Tidelands (Riparian) Conveyance		
Statewide General Freshwater Wetlands Permit			Dam Construction or Repair Permit		
Freshwater Wetlands Letter of Interpretation			Pinelands Certificate of Filing		
Freshwater Wetlands Transition Area Waiver			D & R Canal Commission Certificate		
Individual Freshwater Wetlands Permit			Federal Permits (Specify)		
Freshwater Wetlands Exemption			State Permits (Specify)		
Permit Modification (specify # & type)					

APPLICANT SIGNATURE*

*All applicants must complete this section including those applying for Permit by Rule.

I certify under penalty of law that the information provided in this document is true and accurate. I am aware that there are significant civil and criminal penalties for submitting false or inaccurate information. (If corporate entity, print/type the name and title of person signing on behalf of the corporate entity.)

Brian Mahoney
~~Signature of Applicant/Owner~~ ON BEHALF OF HOWELL TOWNSHIP

8/1/03
Date

Signature of Applicant/Owner

Date

A. PROPERTY OWNER'S CERTIFICATION

I hereby certify that the undersigned is the owner of the property upon which the proposed work is to done. This endorsement is certification that the owner grants permission for the conduct of the proposed activity. In addition, I hereby give unconditional written consent to allow access to the site by representatives or agents of the Department for the purpose of conducting a site inspection or survey of the project site.

In addition, the undersigned property owner hereby certifies:

1. Whether any work is to be done within an easement - Yes _____ No X
2. Whether any part of the entire project (e.g., pipeline, roadway, cable, transmission line, structure, etc.) will be located within property belonging to the State of New Jersey - Yes __ No X

Note: This certification pertains only to Block 139, Lot 1.01.

01-15-03
Date

Timothy J. Konopka, Mayor
251 Preventorium Road, P.O. Box 58
Howell, New Jersey 07731
Type or Print Name and Address of Owner, if different from item 1 on Page 1

Signature of Property Owner

B. APPLICANT'S AGENT

NOTE: Notary seal is required when an agent is used.

Howell Township
I Steve Harriott, the Applicant/~~Owner,~~ authorize to act as my agent/representative in all matters pertaining to my application the following person:

Name Steven P. Harriott

Occupation/Profession Professional Wetland Scientist

Brian M.
(Signature of Applicant/~~Owner~~) on behalf of Howell Twp

AGENT'S CERTIFICATION

Sworn before me
this day of
_____ 19 _____

I agree to serve as agent for the above-mentioned applicant

(Signature of Agent)

Notary Public

C. STATEMENT OF PREPARER OF PLANS, SPECIFICATIONS, SURVEYOR'S OR ENGINEER'S REPORT

I hereby certify that the plans, specifications and engineer's report, if any, applicable to this project comply with the current rules and regulations of the New Jersey Department of Environmental Protection with the exceptions as noted.

Brian Mulvenna
Signature

Brian Mulvenna 10/28/03
Type: Name and Date

Project Mgr, USRC
Position, Name of Firm

(revised through June 1995)

STREAM ENCROACHMENT ENVIRONMENTAL REPORT CHECKLIST

* → REFER TO ATTACHED ENVIRONMENTAL ASSESSMENT - TO ANSWER ALL THESE CRITERIA

Applicant
Stream
Watershed
NJ SWQS Stream Classification
Project Description (NJAC 7:13-4.1(j)1 & 2)
- Scope and Nature
- Temporary & permanent changes to site
- Project location
- Administrative History with the Land Use Regulation Program

Site Conditions (NJAC 7:13-4.1(j))
Identity and qualifications of authors (NJAC 7:13-4.1(j)8)

Environmental Review Elements

As part of the required Environmental Report (N.J.A.C. 7:13-4.1(j)), please explain how the proposed project meets each of the following rules or explain how the rule is not applicable. For those elements with separate Environmental Standards, the Engineering Standards need not be addressed here.

NJAC 7:13-2.5 Watercourse Cleaning

NJAC 7:13-3.5 & 3.6 Fish Protection & Low Flow Fish Passage (see NJAC 7:13-4.1(j)4 also)

NJAC 7:13-2.16(c) Bridges and Culverts

NJAC 7:13-2.9 & 3.6(c) Channel Modification

NJAC 7:13-3.7 Acid Soils (see NJAC 7:13-4.1(j)6 also)

NJAC 7:13-3.5 & 3.6 Timing Restrictions

NJAC 7:13-3.2 Near Watercourse Vegetation Protection

NJAC 7:13-3.3 Soil Erosion and Sediment Control

NJAC 7:13-2.8 Stormwater Mgmt & Water Quality (see NJAC 7:13-4.1(j)5 also)

NJAC 7:13-2.7 Disposal of Spoils

NJAC 7:13-3.8 Wetlands

NJAC 7:13-3.5 & 3.6 Lake Lowering (Fish Protection)

NJAC 7:13-3.9 Threatened or Endangered Species (see NJAC 7:13-4.1(j)7 also)

- ☐ The flood plain referenced for this project is a FEMA tidal flood elevation.
- ☐ The flood plain referenced for this project is a FEMA flood study which was based on a fully developed watershed, or where a regional storm water management plan exists.
- ☐ The flood plain limits are unknown and calculations have been submitted to delineate it.
- ☐ The flood plain limits are unknown and do not need to be delineated for this project.

3. Does this project involve any of the following?
If any one of the following is answered "yes", then this project is a major project.

(Yes) No

New bridge or culvert.
Replacement bridge or culvert that is at all different from the existing structure.
Review of net-fill calculations not associated with the construction of one single-family home.
Detention or retention pond located partially or completely within the flood plain.
Review of hydrologic or hydraulic calculations for a flood plain study.
Substantial channel improvement, realignment or relocation.
✓Proposed retaining wall greater than 100 feet in length and more than four feet high.
Any stream encroachment activity associated with a commercial site of any size where more than one acre of the site lies within a flood plain.
Any stream encroachment activity associated with a residential subdivision of more than ten acres no matter how much of the site is located within a flood plain.

4. If any one of the following questions is answered "yes", then proof of local notice is required for this project.

(Yes) No

✓Is this a major project as determined in question number 3 above?
Is this site adjacent to a trout-associated watercourse?
Will the proposed work expose acid-producing soils?
Does this project request a hardship exemption of the rules?

5. Net-fill within the flood plain. Please check one.

- ☐ No net-fill is proposed within the flood plain.
- ☐ The amount of fill to be placed within the flood plain is negligible and obviously meets the limitations of the rules without having to review net-fill calculations.
- ☑ Net-fill calculations have been prepared to prove that this project meets the limitations of the rules.

6. Hydrologic and hydraulic calculations.
If any one of the following is answered "yes", then hydrologic and hydraulic calculations must be submitted.

Yes (No)

This project involves the construction of a new bridge or culvert where none currently exists.
This project involves the construction of a replacement bridge or culvert that is different in size, shape, skew, location or alignment from the existing structure.
The peak flood will change as a result of this project.
The size, shape, skew, location or alignment of the stream channel will be altered as a result of this project.
The limits of the flood plain are unknown and need to be delineated in order to demonstrate compliance with the requirements of the rules, such as net-fill limitations, lowest floor elevations, or storm water management.
The limits of the flood plain are unknown and need to be delineated in order to establish stream encroachment lines.

7. Storm water management.
If any one of the following is answered "yes", then storm water management calculations must be submitted. Note: This question does not apply to the construction of one single-family home.

Yes (No)

This project involves the creation of one or more point discharges.
The volume and/or rate of storm water runoff from the site will increase as a result of this project.
More than 5,000 sq. ft. of new impervious area is proposed.

8. The review fee for this project has been calculated as follows:

Number of minor elements 1 x $ 300 = 300.00

Number of major elements 1 x $ 2000 = 2,000 +

Total = $ 2,300.00

NOTE: For a culvert or bridge constructed for a driveway serving one single-family home, the review fee is $ 1400 if net-fill calculations are necessary and $ 1000 if not. The review fee for all other projects is calculated as shown above.

State of New Jersey
Department of Environmental Protection
Land Use Regulation Program Application Form (LURP #1)

PLEASE PRINT OR TYPE THE FOLLOWING: (Complete all sections unless otherwise noted)
NOTE: If you are applying for a CAFRA Permit by Rule, you need to complete items 1 thru 6 and the signature area on page 3 only.

1. Applicant Name BRIAN MULVENNA/PROJECT MANAGER Daytime Phone # (215) 656-6599
   Address SPECIAL STUDIES SECTION, PLANNING DIVISION, USACE, 100 PENN SQUARE EAST
   City PHILADELPHIA State PA Zip 19106

2. Agent Name STEVE HARRIOTT Firm VERSAR, INC.
   Address 9200 RUMSEY ROAD Phone # (410) 740-6099
   City COLUMBIA State MD Zip 21045

3. Project Name MANASQUAN RIVER EMERGENCY STREAMBANK STABILIZATION Location (Street Address) BERGERVILLE ROAD
   Municipality HOWELL TOWNSHIP County MONMOUTH
   Block(s) 139 Lot(s) 16.03 AND 1.01
   State Plane Coordinates N 4922.4644 feet E 5071.2932 feet
   Nearest Waterway MANASQUAN RIVER Watershed MANASQUAN RIVER

4. Total Fees 250.00 (See attached fee schedule) Fees Paid* _____ Project Cost _____ Check Number _____
   (Official Use Only)

5. Project Description: REFER TO ATTACHED ENVIRONMENTAL ASSESSMENT FOR DETAILED DESCRIPTION. STABILIZE APPROXIMATELY 420 LINEAR FEET OF THE RIGHT BANK OF THE MANASQUAN RIVER USING A CELLULAR CONFINEMENT SYSTEM (CCS) WALL DESIGN. THE FOUNDATION FOR THE CCS WALL WOULD EXTEND OUT ABOUT 10 FEET FROM THE CURRENT BANK, RESULTING IN A SLIGHT SHIFT IN THE STREAM CENTERLINE TOWARD THE NORTH.

FOR OFFICIAL USE ONLY

File Number		Permit Code	
Date Received		Project Manager	
20th Day		Project Engineer	
90th Day		Date Entered	
ASU Date		Points Assigned	
Xref File #			

ATTACHMENT A
Freshwater Wetlands Application Checklist
Model Letter – Notice to Neighboring Landowners
(copy this letter, fill in the blanks, and send to all parties listed in item 3 on the applicable application checklist)

Date:_____

Re: Application submitted by:

_____
(Print applicant's name)

Regarding property at:

_____
(Street address of property)

_____
(Block and lot of property)

_____
(Town and county)

Dear Interested Party:

I am sending you this letter to inform you that I am submitting an application for a permit or approval to the New Jersey Department of Environmental Protection (NJDEP) under the Freshwater Wetlands Protection Act rules, N.J.A.C. 7:7A. The permit or approval will either establish the boundary of freshwater wetlands on the above property, or will authorize me to conduct regulated activities on the property.

I am applying for the following approval(s):

_____ Letter of interpretation (establishes the official boundary line of any regulated freshwater wetlands, open waters, or transition areas on the property, and if freshwater wetlands are present, identifies their resource value)

_____ General permit authorization (authorizes regulated activities, such as construction or development, in wetlands and adjacent transition areas)

inspection will involve only a visual inspection and possibly minor soil borings using a 4" diameter hand auger. The inspection will not result in any damage to vegetation or to property improvements.

The NJDEP welcomes any comments you may have on my application. If you wish to comment on my application, comments should be submitted to the NJDEP *in writing* within 15 days after you receive this letter. However, written comments will continue to be accepted until the NJDEP makes a decision on the application. Comments cannot be accepted by telephone. Please submit any comments you may have *in writing, along with a copy of this letter*, to:

New Jersey Department of Environmental Protection
Land Use Regulation Program
P.O. Box 439
Trenton, New Jersey 08625
Att: (County in which the property is located) Section Chief

When the NJDEP has decided whether or not my application qualifies for approval under the Freshwater Wetlands Protection Act rules, NJDEP will notify the municipal clerk of the final decision on my application.

If you have questions about my application, you can contact me or my agent, address(es) below.

Sincerely,

_____
(Print applicant's name)

_____
(Applicant's address – *required*)

_____

_____
(Applicant's phone or e-mail – optional)

_____
(Applicant's agent's address, phone, and/or e-mail – optional)

_____ Individual transition area waiver (authorizes regulated activities, such as construction or development, in areas adjacent to wetlands)

_____ Individual freshwater wetlands permit (authorizes regulated activities, such as construction or development, in both wetlands and adjacent transition areas)

_____ Open water fill permit (authorizes regulated activities, such as construction or development, in open waters)

The activities for which my application requests NJDEP approval are (I have checked all of those that apply):

___ No regulated activities, just establishing where regulated wetlands (if any) are found on my property

___ Cutting or clearing of trees and/or other vegetation

___ Placement of pavement or other impervious surface

___ Placement of one or more buildings or other structures

___ Expansion of existing pavement, buildings, or other structures

___ Other (describe):

_____

_____

_____

If you would like to inspect a copy of my application, it is on file at the Municipal Clerk's Office in the town in which the property is located, or you can call the NJDEP at (609) 777-0456 to make an appointment to see my application at NJDEP offices in Trenton during normal business hours.

The rules governing freshwater wetlands permits and approvals are found in the NJDEP's Freshwater Wetlands Protection Act rules at N.J.A.C. 7:7A. You can view or download these rules on the NJDEP Land Use Regulation Program website at www.state.nj.us/dep/landuse, or you can find a copy of these rules in the county law library in your county courthouse.

As part of the NJDEP's review of my application, NJDEP personnel may visit my property, and the portion of any neighboring property that lies within 150 feet of my property line, to perform a site inspection. This site

Appendix B

Oversized Project Design Drawings

Appendix C

Field Datasheets

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME Manasquan River	LOCATION Howell Township
STATION # ___ RIVERMILE ___	STREAM CLASS
LAT. ___ LONG ___	RIVER BASIN Manasquan
STORET #	AGENCY USACE
INVESTIGATORS STC, CDM, RAC	
FORM COMPLETED BY STC, CDM	DATE 10/12/04 TIME 1015 (AM) PM
	REASON FOR SURVEY proposed restoration

WEATHER CONDITIONS

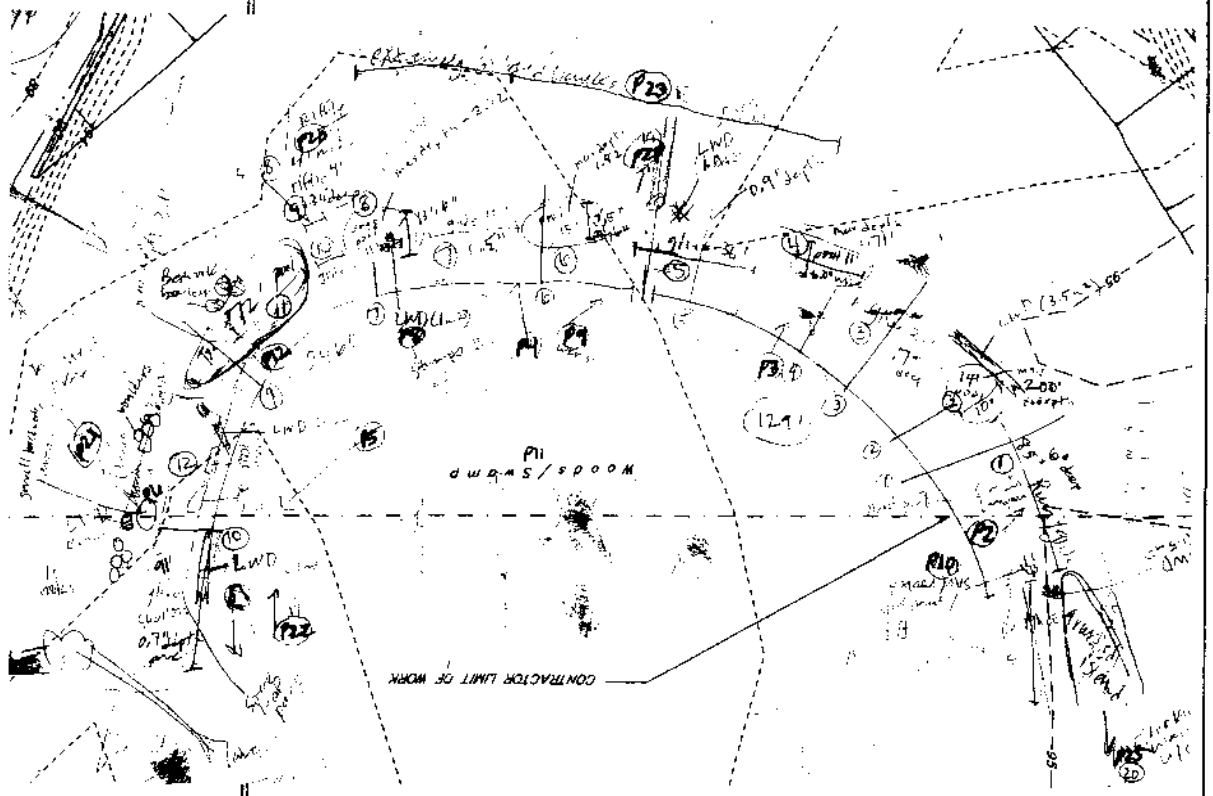
Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☐ ___%
☒	clear/sunny	☐

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

Air Temperature 60 °F

Other ___

SITE LOCATION/MAP Draw a map of the site and indicate the areas sampled (or attach a photograph)



NO Crayfish, 2 fish observed ~ 2" length - unknown species (no permit)

STREAM CHARACTERIZATION

Stream Subsystem: ☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type: ☐ Coldwater ☐ Warmwater

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

Catchment Area 16.5 mi²/km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
- [x] Forest
- [ ] Field/Pasture
- [ ] Agricultural
- [x] Residential
- [ ] Commercial
- [ ] Industrial
- [x] Other road along rt. bank.

Local Watershed NPS Pollution
- [ ] No evidence
- [ ] Some potential sources
- [ ] Obvious sources

Local Watershed Erosion
- [ ] None
- [ ] Moderate
- [ ] Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
- [x] Trees
- [ ] Shrubs
- [ ] Grasses
- [ ] Herbaceous

dominant species present Fagus grandifolia, Liriodendron tulipifera, Acer rubrum

INSTREAM FEATURES

Estimated Reach Length 377 m ft

Estimated Stream Width 30 m ft

Sampling Reach Area _____ m²

Area in km² (m²x1000) _____ km²

Estimated Stream Depth 1-1.5 ft m

Surface Velocity .084 ft m/sec (at thalweg)

Canopy Cover
- [ ] Partly open
- [ ] Partly shaded
- [x] Shaded 90-95%

High Water Mark _____ m

Proportion of Reach Represented by Stream Morphology Types
- [x] Riffle 1 %
- [x] Run 69 %
- [x] Pool 30 %

Channelized
- [ ] Yes
- [x] No

Dam Present
- [ ] Yes
- [x] No

LARGE WOODY DEBRIS

LWD 7.23 m²

Density of LWD <1% m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
- [ ] Rooted emergent
- [x] Rooted submergent (<10%)
- [ ] Rooted floating
- [ ] Free floating
- [ ] Floating Algae
- [x] Attached Algae (<10%)

dominant species present Elodea, etc. (algae?) Location marked on drawings

Portion of the reach with aquatic vegetation <1 %

WATER QUALITY

Temperature 13.0 °C

Specific Conductance 192 µs/cm

Dissolved Oxygen 12.4 mg/L

pH 5.7

Turbidity 7.8 NTU

WQ Instrument Used YSI 6820

salinity 0.12 ppm

Water Odors (upstream reach: sewage odor)
- [x] Normal/None
- [ ] Petroleum
- [ ] Fishy
- [ ] Sewage
- [ ] Chemical
- [ ] Other _____

Water Surface Oils
- [ ] Slick
- [ ] Sheen
- [ ] Globs
- [ ] Flecks
- [x] None
- [ ] Other _____

Turbidity (if not measured)
- [x] Clear
- [ ] Slightly turbid
- [ ] Turbid
- [ ] Opaque
- [ ] Stained
- [ ] Other _____

SEDIMENT/ SUBSTRATE

Odors
- [x] Normal
- [ ] Sewage
- [ ] Petroleum
- [ ] Chemical
- [ ] Anaerobic
- [ ] None
- [ ] Other _____

Oils
- [x] Absent
- [ ] Slight
- [ ] Moderate
- [ ] Profuse

Deposits
- [ ] Sludge
- [ ] Sawdust
- [ ] Paper fiber
- [ ] Sand
- [ ] Relict shells
- [x] Other high amount of iron flocculant - some algae on rocks present.

Looking at stones which are not deeply embedded, are the undersides black in color?
- [ ] Yes
- [ ] No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock	—	1	Detritus	sticks, wood, coarse plant materials (CPOM)	60
Boulder	> 256 mm (10")	2			
Cobble	64-256 mm (2.5"-10")	5	Muck-Mud	black, very fine organic (FPOM)	2
Gravel	2-64 mm (0.1"-2.5")	15			
Sand	0.06-2mm (gritty)	65	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm	11			
Clay	< 0.004 mm (slick)	1			

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

STREAM NAME Manasquan River	LOCATION Howell Township
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN Manasquan
STORET #	AGENCY USACE
INVESTIGATORS STK, RAC, CDM	
FORM COMPLETED BY STK, CDM	DATE 10/17/24 TIME 1258 AM (PM)
	REASON FOR SURVEY proposed restoration

Parameters to be evaluated in sampling reach

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

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

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern. actively incising rt bank.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line. closer to 2 times.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 0 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9.5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. road along rt. bank.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 114.5/10 = 11.45

EA Engineering, Science, and Technology, Inc.

HABITAT DATA FORM

Sample Number #1 - Manasquan River Coordinates: —

Location Right bank X —

Y —

Public/Private: Public	Date: 10/12/04	Time: 1201
Investigators(s): STK, CBM	County: Monmouth	
Photograph No: P26, 27	State: NJ	

[X] Deciduous woodland	[ ] Successional woodland	[ ] Emergent marsh
[ ] Coniferous woodland	[ ] Scrub-shrub	[ ] Mowed / maintained grass
[ ] Mixed Conif. / Decid.	[ ] Oldfield/pioneer	[ ] Agricultural field
[ ] Open water	[ ] Impervious / Developed	[X] Other - incised banks

Dominant Vegetation

Fagus grandifolia (T)		
Tulipifera liriodendron	(T)	
Acer rubrum (T)		
Vaccinium sp. (S)		

Wildlife Resources

Raccoon	T				

ID = O--Observed, T--Tracks, H--Heard, N--Nest, D--Den, B--Bedding area, S--Scat

Habitat Conditions

Site Attributes

- [ ] Wetland
- [ ] Critical habitat (RTE)
- [ ] Bare Soils
- [ ] Open water

Noteworthy Features

- [ ] Brush piles (non-living)
- [X] Herbaceous areas- grassed area
- [ ] Invasive/nuisance plants
- [ ] Non-native plants

Wildlife Presence

- [X] Avian species - heard
- [ ] Nuisance/feral animal species
- [ ] Non-native animal species

Habitat Corridor Form

- [ ] Narrow riparian fringe
- [X] Wide floodplain corridor- grassed area
- [ ] Fragmented/disturbed area
- [ ] Upland wildlife corridor

EA Engineering, Science, and Technology, Inc.

Station: #1	Date: 10/12/04	Time: 1201

Aquatic Resources

Surface Water Type	Substrate Type	Water Clarity	Aquatic Life
☐ Pond	☒ Fines	☒ Clear	☒ Fish
☐ Lake	☒ Sand	☐ Muddy	☐ Surface insects
☒ Stream	☒ Pebble/gravel	☐ Cloudy	☒ Benthic Inverts.
☐ River	☒ Boulder	☐ Stained	☒ Submerged Aq. Veg
☐ Dry Channel	☐ Fill/rubble		

Vegetation Notes

Canopy Species	Dominance	Height	DBH
☒ FAGR	☒ Dominant	☐ <20'	☐ <2"
	☐ Co-dominant	☐ 20-40'	☐ 2-6"
	☐ Sub-dominant	☐ 40-60'	☐ 6-10"
	☐ Infrequent	☐ 60-80'	☒ 10-18"
	☐ None	☒ 80-100'	☐ 18-30"
		☐ >100'	☐ >30"

Canopy Species	Dominance	Height	DBH
☒ ACRU	☐ Dominant	☐ <20'	☐ <2"
	☐ Co-dominant	☐ 20-40'	☐ 2-6"
	☒ Sub-dominant	☐ 40-60'	☐ 6-10"
	☐ Infrequent	☒ 60-80'	☒ 10-18"
	☐ None	☐ 80-100'	☐ 18-30"
		☐ >100'	☐ >30"

Understory Species	Understory	Duff Layer	Other Notes:
☒ FAGR Saplings and Vaccinium sp.	☐ Thick	☒ Thick (>2")	
	☒ Thin	☐ Thin (1-2")	
	☐ None	☐ None	
	☐ Vine		
	☐ Herbaceous		

Keywords

☐ Blowdown	☒ Disturbed area - adjacent to road	☐ Plantation	☐ Standing snags
☐ Bottomland	☒ Dry woods	☐ Prescribed burn	☐ Thin canopy or open areas
☐ Cavities in trees	☐ Floodplain	☐ Sewage treatment lagoon	☐ Wet woods
☐ Dead Standing	☐ Mudflat	☐ Sewer line right-of-way	☐ _____
☐ Fallen Wood	☐ Over-mature		
☐ Dense canopy			

Notes:

Extremely incised right bank ~ 26'
Steep topography adjacent to road down to streambanks.
Floodplain w/ grassed island at end of reach.

EA Engineering, Science, and Technology, Inc.

HABITAT DATA FORM

Sample Number #2 - Manasquan River Coordinates: —

Location Left Bank X —

Y

Public/Private: Public	Date: 10/12/04	Time: 1207
Investigators(s): STK, CDM	County: Monmouth	
Photograph No: P11	State: NJ	

☐ Deciduous woodland	☐ Successional woodland	☒ Emergent marsh - herbaceous areas
☐ Coniferous woodland	☐ Scrub-shrub	☐ Mowed / maintained grass
☐ Mixed Conif. / Decid.	☐ Oldfield/pioneer	☐ Agricultural field
☐ Open water	☐ Impervious / Developed	☒ Other - ~~Forested~~ wetland

Dominant Vegetation

		Subdominant veg:
Viburnum dentatum (S)		Acer negundo (T)
Lindera benzoin (S)		Polygonum persicaria
Toxicodendron radicans (V)		Acer saccharinum (T)
Acer rubrum (T)		Fagus grandifolia
Microstegium (H)		
Cornus tomentosa (T)		
Sicyos angulatus (V)		

Wildlife Resources

Deer	S				
Raccoon	T				

ID = O--Observed, T--Tracks, H--Heard, N--Nest, D--Den, B--Bedding area, S--Scat

Habitat Conditions

Site Attributes	Wildlife Presence
☒ Wetland	☒ Avian species
☐ Critical habitat (RTE)	☐ Nuisance/feral animal species
☐ Bare Soils	☐ Non-native animal species
☐ Open water	**Habitat Corridor Form**
Noteworthy Features	☐ Narrow riparian fringe
☐ Brush piles (non-living)	☐ Wide floodplain corridor
☒ Herbaceous areas	☐ Fragmented/disturbed area
☒ Invasive/nuisance plants - Microstegium, Sicyos	☐ Upland wildlife corridor
☐ Non-native plants	

NJ Wetlands gallery by Rutgers University

EA Engineering, Science, and Technology, Inc.

Station: #2	Date: 10/12/04	Time: 1201

Aquatic Resources

Surface Water Type	Substrate Type	Water Clarity	Aquatic Life
☐ Pond	☒ Fines	☒ Clear	☒ Fish
☐ Lake	☒ Sand	☐ Muddy	☐ Surface insects
☒ Stream	☒ Pebble/gravel	☐ Cloudy	☒ Benthic Inverts.
☐ River	☒ Boulder	☐ Stained	☒ Submerged Aq. Veg
☐ Dry Channel	☐ Fill/rubble		

Vegetation Notes

Canopy Species	Dominance	Height	DBH
☒ ACRU	☒ Dominant	☐ <20'	☐ <2"
	☐ Co-dominant	☐ 20-40'	☐ 2-6"
	☐ Sub-dominant	☐ 40-60'	☐ 6-10"
	☐ Infrequent	☐ 60-80'	☒ 10-18"
	☐ None	☒ 80-100'	☐ 18-30"
		☐ >100'	☐ >30"
Canopy Species	**Dominance**	**Height**	**DBH**
☒ CATO	☐ Dominant	☐ <20'	☐ <2"
	☐ Co-dominant	☐ 20-40'	☐ 2-6"
	☒ Sub-dominant	☒ 40-60'	☒ 6-10"
	☐ Infrequent	☐ 60-80'	☐ 10-18"
	☐ None	☐ 80-100'	☐ 18-30"
		☐ >100'	☐ >30"
Understory Species	**Understory**	**Duff Layer**	**Other Notes:**
☒ LIBE	☐ Thick	☒ Thick (>2")	Some open herbaceous areas dominated by Microstegium
	☒ Thin	☐ Thin (1-2")	
	☐ None	☐ None	
	☐ Vine		
	☐ Herbaceous		

Keywords

☐ Blowdown	☐ Disturbed area	☐ Plantation	☐ Standing snags
☐ Bottomland	☐ Dry woods	☐ Prescribed burn	☐ Thin canopy or open areas
☐ Cavities in trees	☒ Floodplain	☐ Sewage treatment lagoon	☐ Wet woods
☐ Dead Standing	☐ Mudflat	☐ Sewer line right-of-way	☐ _____
☐ Fallen Wood	☐ Over-mature		
☐ Dense canopy			

Notes:

Approximate number of trees on right bank that may be removed if channel is relocated 8-10' to the north: NI IN] these trees were smaller than the one of the dominant species: 40' tall, 6" DBH CATO, ACRU, Silver maple.

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Manasquan River	LOCATION Howell Township	
STATION # ____ RIVERMILE ____	STREAM CLASS —	
LAT ____ — LONG ____ —	RIVER BASIN Manasquan	
STORET #	AGENCY USACE	
INVESTIGATORS STK, CDM, RAC		LOT NUMBER —
FORM COMPLETED BY STK, CDM	DATE 10/12/04 TIME 1015 ⓐ PM	REASON FOR SURVEY proposed restoration

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☒ Cobble 3 % ☐ Snags ____ % ☐ Vegetated Banks ____ % ☒ Sand 95 % ☐ Submerged Macrophytes 0 % ☒ Other (LWD) 2 %
SAMPLE COLLECTION	**Gear used** ☒ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☒ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** 20 total ☒ Cobble 4 ☒ Snags 8 ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☒ Other (leafpack) 8
GENERAL COMMENTS	no crayfish observed 2 fish (2") observed, but unknown species (no permit)

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

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

FIELD OBSERVATIONS OF MACROBENTHOS

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

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

PEBBLE COUNT

Site: Managuan River
Party: STK, CDM, RAC
Reach: Casino Rd.
Date: 10/12/04
pool particle count 1 2 3 run/glide riffle

Inches	PARTICLE	Millimeters		1	2	3	TOT #	ITEM %	% CUM
0.002	Silt / Clay	< 062	SILT				2		
0.003	Very Fine	.062 - .125	SAND				0		
0.01	Fine	.125 - .25	SAND				0		
0.02	Medium	.25 - .50	SAND	2	3		2		
0.04	Coarse	.50 - 1.0	SAND	19	14		19		
.04 - .08	Very Coarse	1.0 - 2	SAND	8	9		8		
.08 - .16	Very Fine	2 - 4	GRAVEL	4	12		4		
.16 - .22	Fine	4 - 5.7	GRAVEL	4	6		4		
.22 - .31	Fine	5.7 - 8	GRAVEL	0	1		0		
.31 - .44	Medium	8 - 11.3	GRAVEL	2	1		2		
.44 - .63	Medium	11.3 - 16	GRAVEL	1	0	2	1		
.63 - .89	Coarse	16 - 22.6	GRAVEL	1	1	2	1		
.89 - 1.26	Coarse	22.6 - 32	GRAVEL	0	0		0		
1.26 - 1.77	Very Coarse	32 - 45	GRAVEL	1	0	3	1		
1.77 - 2.5	Very Coarse	45 - 64	GRAVEL	1	0		1		
2.5 - 3.5	Small	64 - 90	COBBLE	1	0	1	1		
3.5 - 5.0	Small	90 - 128	COBBLE	1	0		1		
5.0 - 7.1	Large	128 - 180	COBBLE				0		
7.1 - 10.1	Large	180 - 256	COBBLE			1	0		
10.1 - 14.3	Small	256 - 362	BOULDER	1	0	1	1		
14.3 - 20	Small	362 - 512	BOULDER				0		
20 - 40	Medium	512 - 1024	BOULDER				0		
40 - 80	Large-Vry Large	1024 - 2048	BOULDER				0		
	Bedrock			2	3		2		
				50	50	TOTALS →	100		

Bright bank only

PEBBLE COUNT				PEBBLE COUNT				PEBBLE COUNT			
Reach:				Reach:				Reach:			
Date: Nonpool				Date:				Date:			
TOT #	ITEM %	% CUM		TOT #	ITEM %	% CUM		TOT #	ITEM %	% CUM	
0											
0											
0											
3											
14											
9											
12											
6											
1											
1											
2											
3											
0											
3											
0											
1											
0											
0											
1											
0											
0											
0											
3											
10											

NOte: Orange (iron) sand throughout the reach.

Appendix D

Photographic Record of Field Reconnaissance

Photographic Record

Manasquan River
October 2004 Field Reconnaissance
Monmouth County, NJ

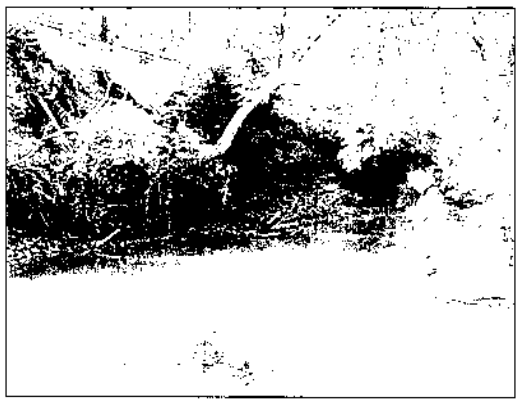
Upstream portion of reach with point bar on left bank.

Portion of reach directly downstream of discharge pipe.

Looking downstream at second curve in reach with point bar along left bank.

Live root wad that may become submerged and provide habitat during higher flows at Run/glide #12 – backwater area.

Large woody debris submerged in Pool #8.



Run/glide #5 with discharge pipe in background.

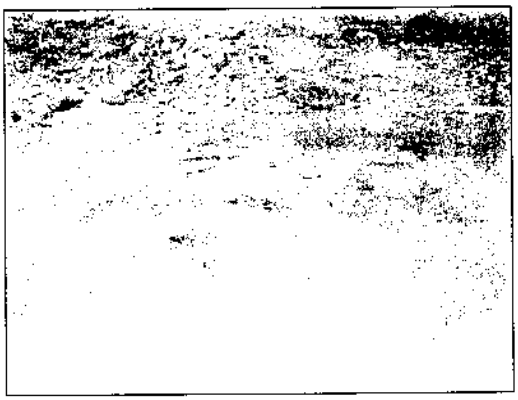
Photographic Record

Manasquan River
October 2004 Field Reconnaissance
Monmouth County, NJ

Benthic sampling and SAV at Run/glide #1.

Riparian area on left bank – open canopy.

Measuring depth at Pool #11 with group of boulders along right bank.



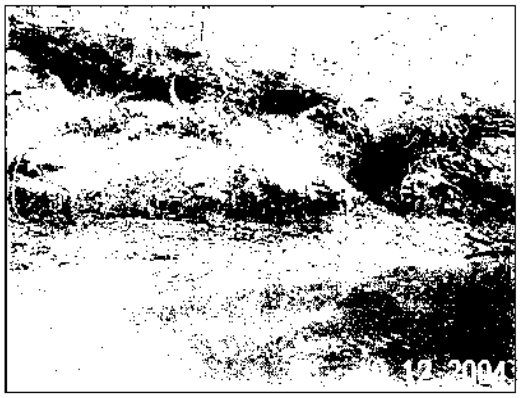
Riffle #9 along right bank.

Iron seep on left streambank at Run/glide #12.

Looking downstream at end of reach at recently downed tree.

Photographic Record

Manasquan River
October 2004 Field Reconnaissance
Monmouth County, NJ



Extremely incised right bank where CCS wall is proposed.

Discharge pipe on right bank.

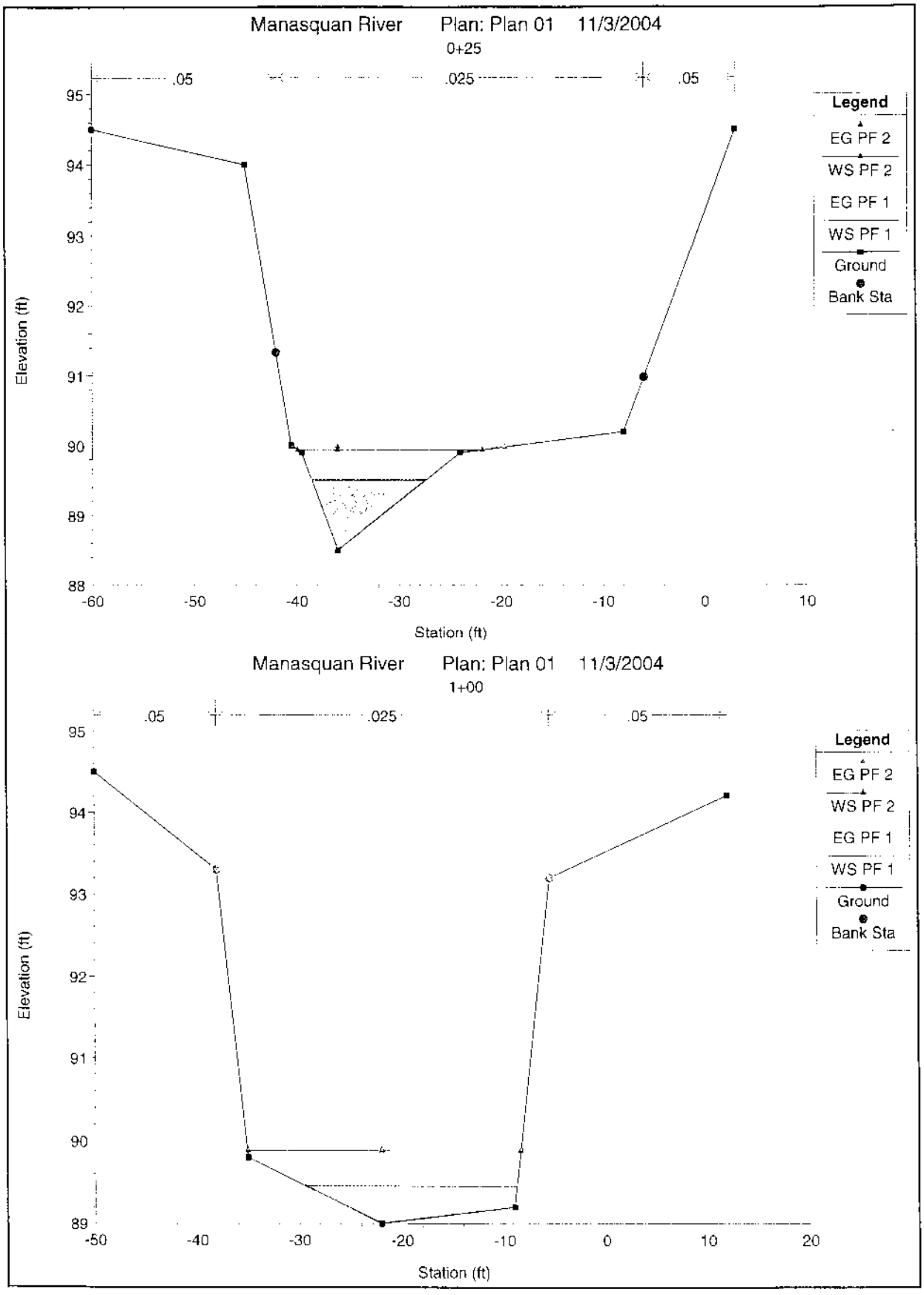
Looking upstream at beginning of reach – grassed island on right bank.

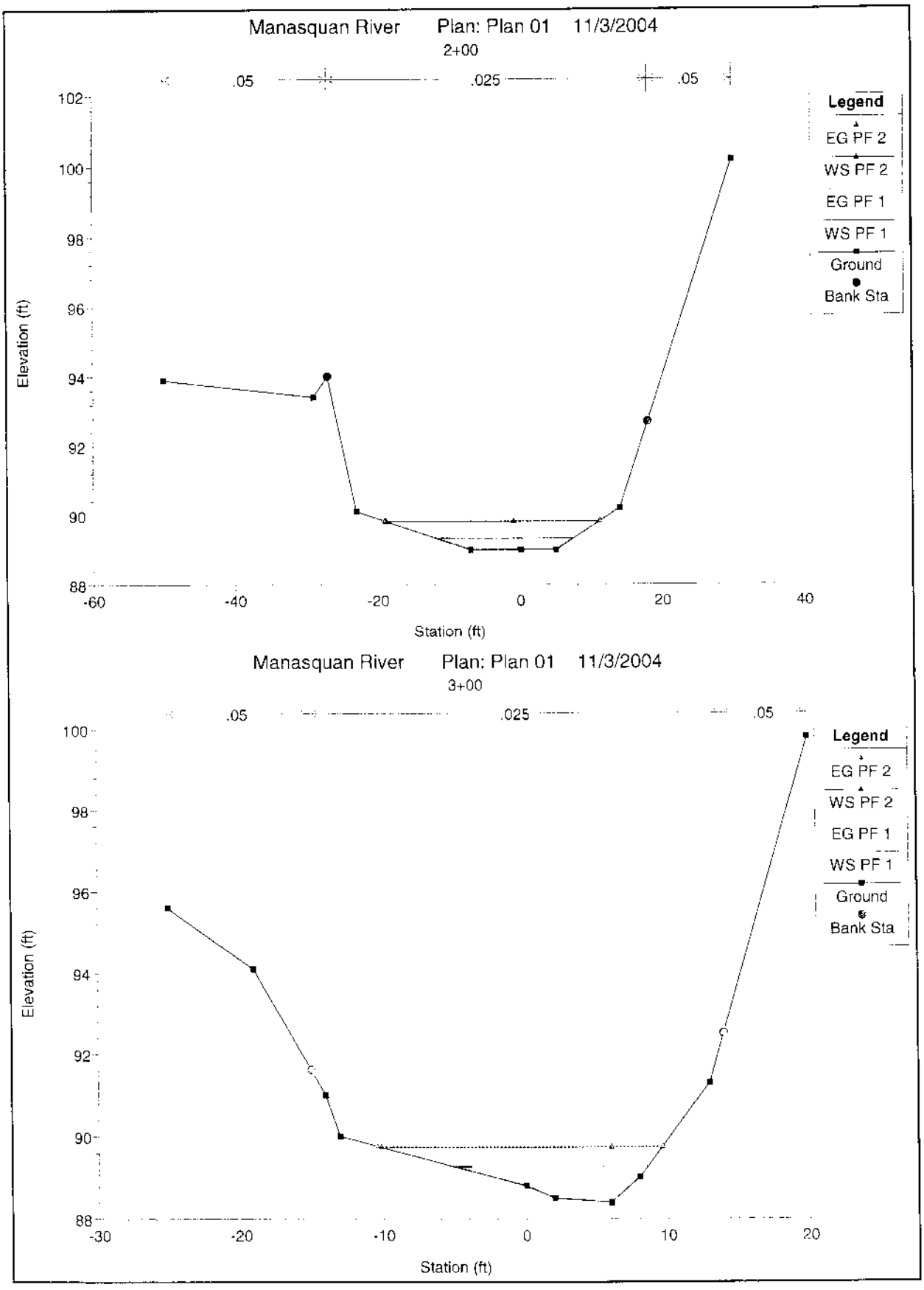
Riparian area on right bank – steep topography.

Appendix E

HEC-RAS Model Cross-Sections

Existing Conditions Cross-Sections


Manasquan River Plan: Plan 01 11/3/2004
0+25
.05
.025
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
95
94
93
92
91
90
89
88
-60
-50
-40
-30
-20
-10
0
10
Manasquan River Plan: Plan 01 11/3/2004
1+00
.05
.025
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
95
94
93
92
91
90
89
-50
-40
-30
-20
-10
0
10
20


Manasquan River Plan: Plan 01 11/3/2004
2+00
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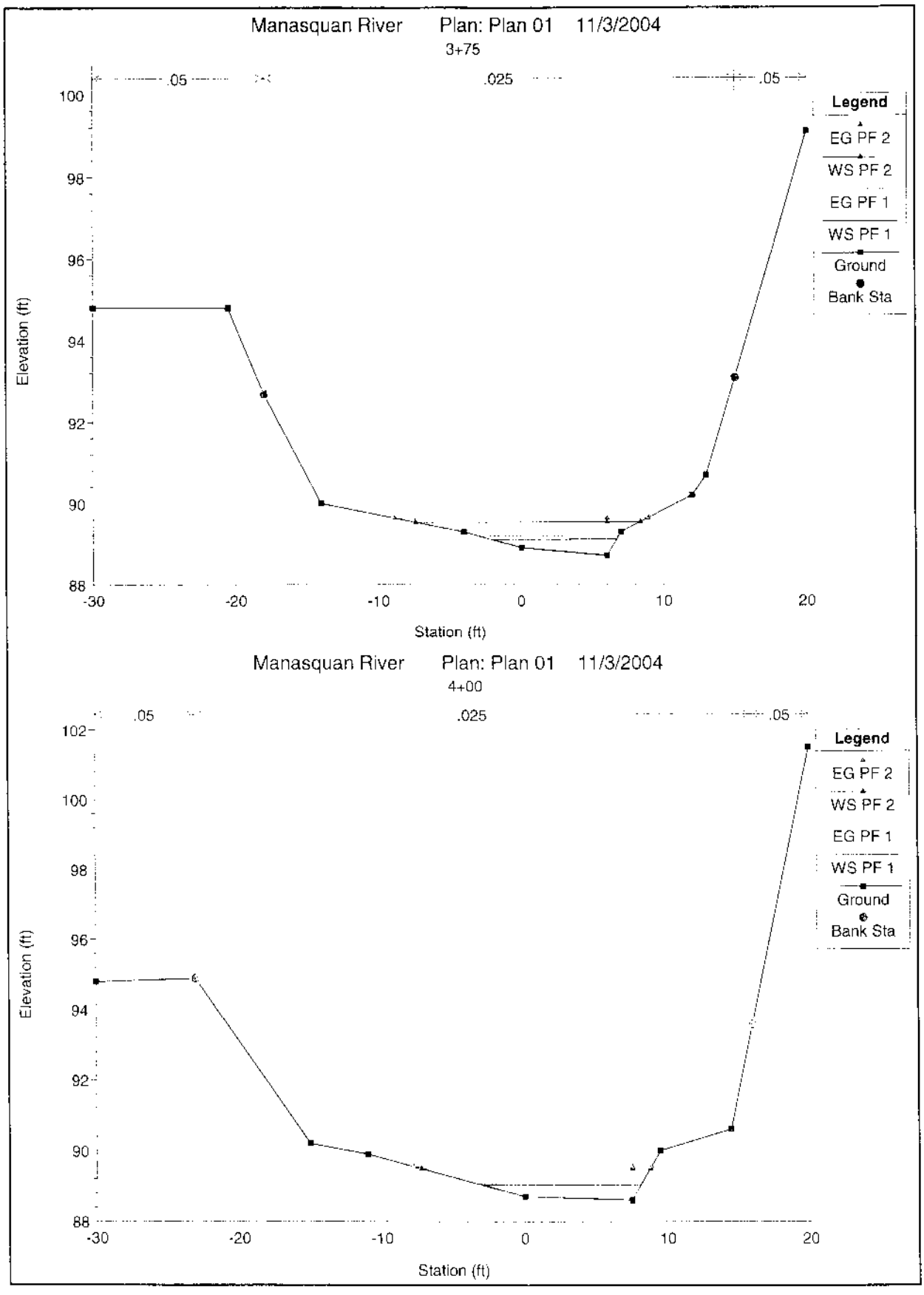
.025
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Manasquan River Plan: Plan 01 11/3/2004
3+00
.05
.025
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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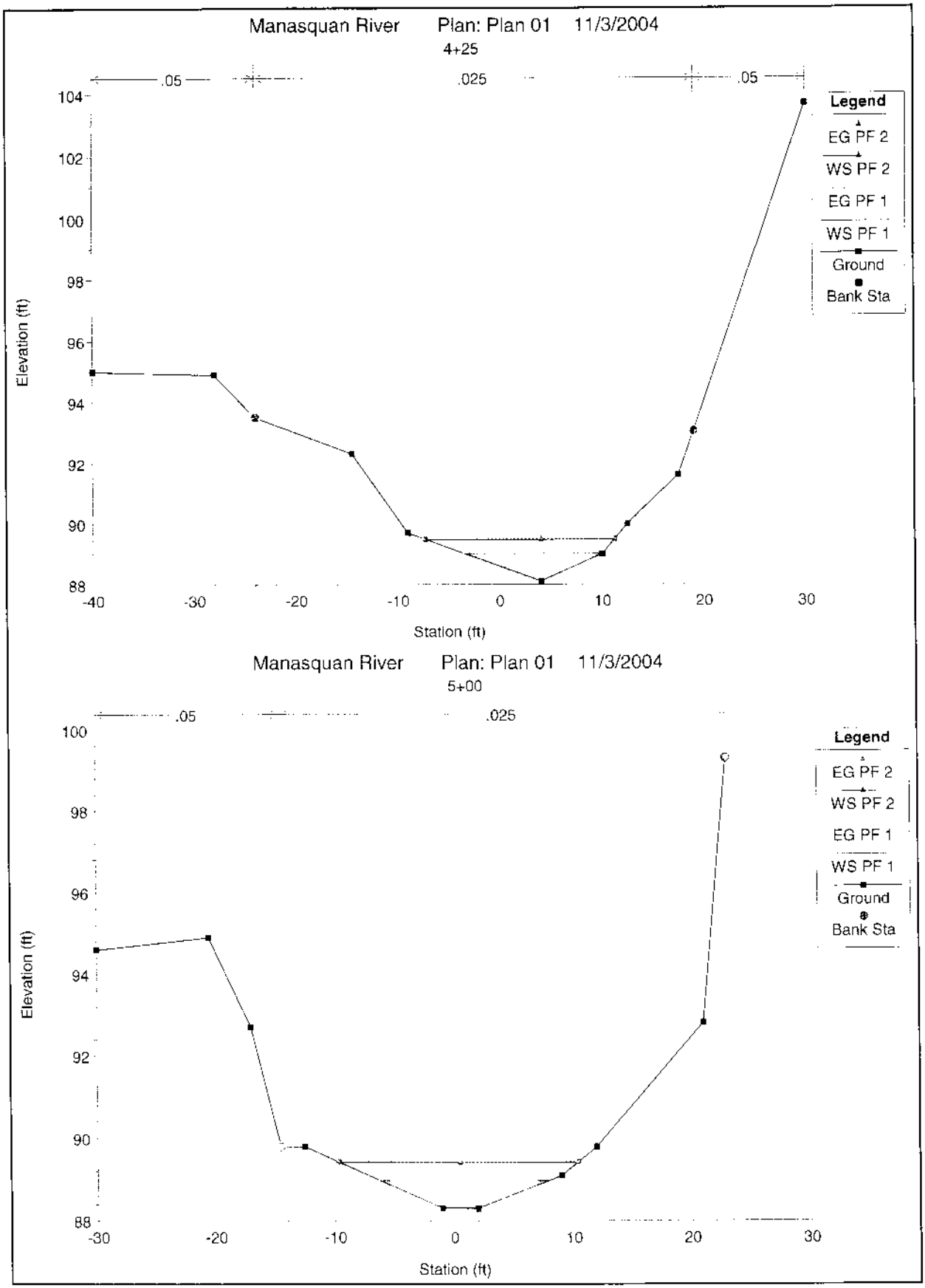
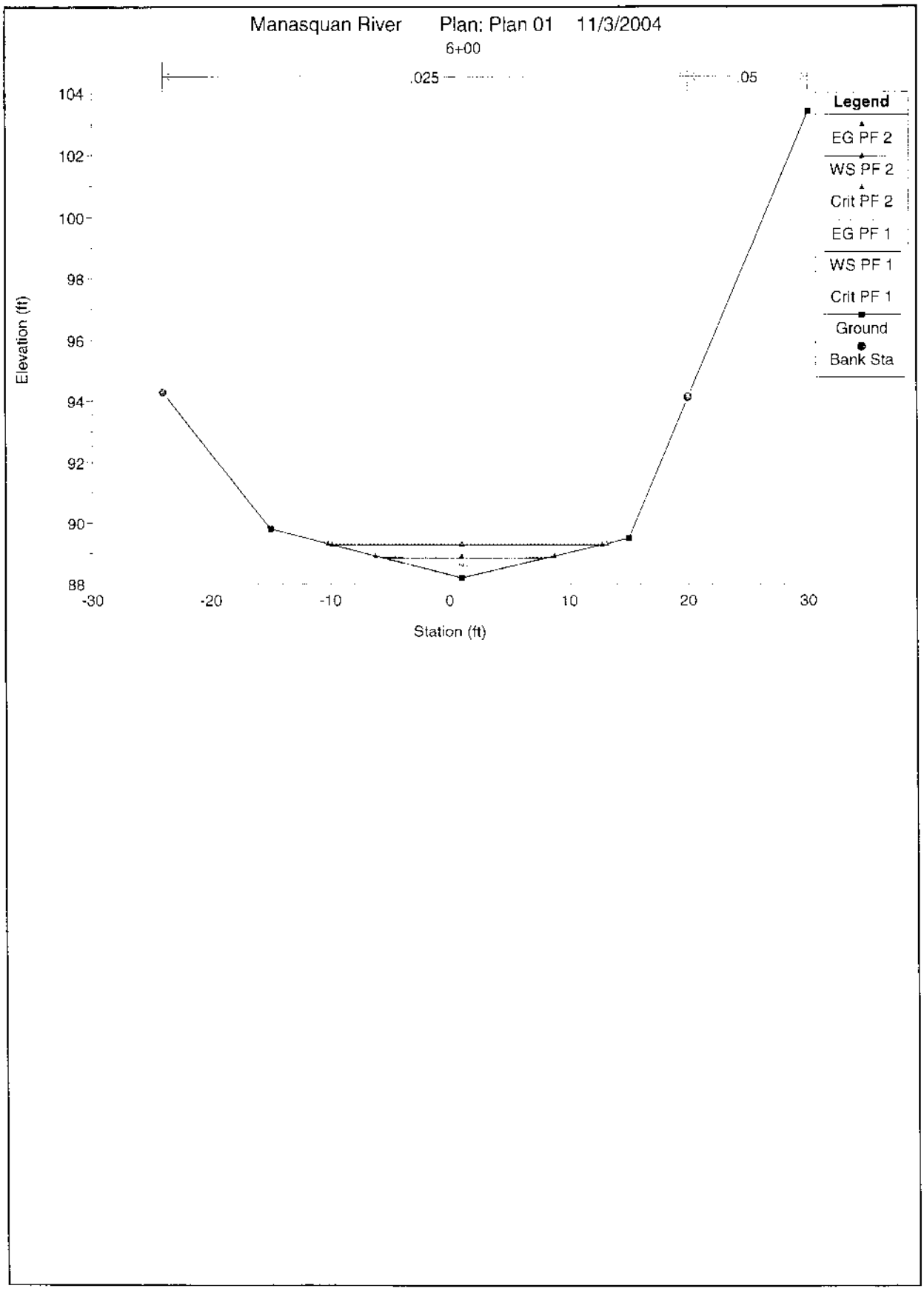
3+75
.05
.025
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
100
98
96
94
92
90
88
-30
-20
-10
0
10
20
Manasquan River Plan: Plan 01 11/3/2004
4+00
.05
.025
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
102
100
98
96
94
92
90
88
-30
-20
-10
0
10
20


Manasquan River Plan: Plan 01 11/3/2004
4+25
.05
.025
.05
104
102
100
98
96
94
92
90
88
Elevation (ft)
-40
-30
-20
-10
0
10
20
30
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Manasquan River Plan: Plan 01 11/3/2004
5+00
.05
.025
100
98
96
94
92
90
88
Elevation (ft)
-30
-20
-10
0
10
20
30
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta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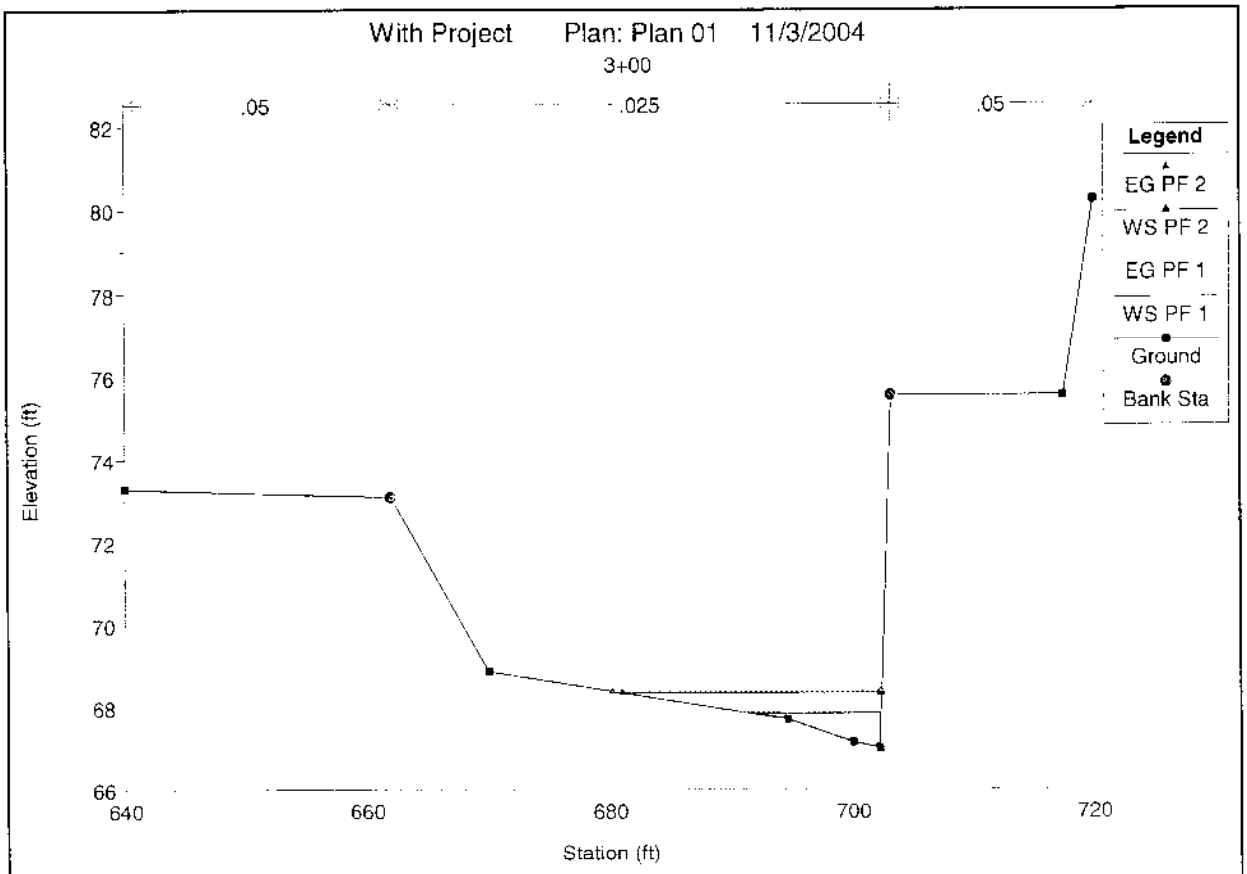
6+00
.025
.05
Legend
EG PF 2
WS PF 2
Crit PF 2
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
104
102
100
98
96
94
92
90
88
-30
-20
-10
0
10
20
30
Station (ft)

With Proposed Project (CCS Wall) Cross-Section


With Project Plan: Plan 01 11/3/2004
3+00
.05
.025
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
82
80
78
76
74
72
70
68
66
640
660
680
700
720
Station (ft)

Appendix F

Scope of Work

SCOPE OF WORK

Morphological Stream Design
Manasquan River at Bergerville Road
Streambank Stabilization Project
Howell Township, Monmouth County, New Jersey

1. General Information

1.1 Contract Number: DACA61-02-D-0001

1.2 Contract Action: Task Order No. 0022

1.3 Name of Project: Manasquan River at Bergerville Road Streambank Stabilization Project

1.4 Location of Project: Howell Township, Monmouth County, New Jersey

1.5 Firm Name & Address: EA Engineering, Science and Technology
11019 McCormick Road
Hunt Valley, MD 21031
(410) 527-2417
(410) 785-2309 FAX

1.6 Points of Contact:

Corps: Barbara Conlin
215-656-6557
215-656-6543 (fax)
barbara.e.conlin@usace.army.mil
Brian Mulvenna, P.E.
215-656-6599
215-656-6543 (fax)
brian.j.mulvenna@usace.army.mil

A/E: Christine Papageorgis
15 Loveton Circle
Sparks, MD 21152
410-771-4950
410-771-4204 (fax)
cpapageorgis@eaest.com

2. Project Description: The USACE Philadelphia District has prepared streambank stabilization design drawings, flood elevation calculations and a draft Environmental Assessment in support of a stream encroachment permit for stabilization of the embankment using a Cellular Confinement System (CCS) wall design and a relocation of the channel centerline ten feet to the north. The New Jersey Department of Environmental

Protection, Office of Permit Coordination and Environmental Review has reviewed this information and provided the following comment from the Division of Fish and Wildlife:

> "While the DFW agrees that the proposed solution is the least environmentally damaging alternative that fulfills the objectives, they also note that the EA does not discuss the issue of stream restoration following the proposed realignment. The criteria of a Stream Encroachment Permit at N.J.A.C 7:13-2.9 c and 7:13-3.6c,f will require the replacement of instream habitat characteristics, cross channel configuration (i.e., low flow channel), bank vegetation/overhead canopy, etc. "

The objective of this scope of work is to characterize the current conditions in the stream channel with respect to the cited sections of N.J.A.C. 7:13, to assess the extent to which the proposed design replaces those habitat criteria specified in the regulations, and to make recommendations where appropriate for amendments to the design specifications to provide habitat features.

3. Methodology

3.1 Review Existing Project Documentation

The information to be reviewed will include: the Draft Environmental Assessment, topography, the proposed streambank stabilization and channel relocation design plans, hydrologic and hydraulic studies, and other relevant published and unpublished technical reports and plans.

3.2 Morphological Stream Assessment

a. Conduct a field reconnaissance and photographic documentation of the study area.
b. Map geomorphic and habitat features of the project reach.
c. Conduct Level II and III Rosgen assessment surveys to characterize the current channel morphology; evaluate its departure from a potential stable form; determine the factors and processes influencing it; and determine its direction and rate of adjustment.
d. Current conditions that must be replaced as specified in the regulations are percent meandering, bottom substrate type, pool/riffle ratio, stream width, depth and gradient, and the placement of habitat enhancement devices within the watercourse. These will be defined for the existing channel. The capability of current low flow conditions to support fish passage will be assessed.
e. Plot and summarize the field data collected.
f. QA/QC and interpret the field data collected.
g. Evaluate the channel design prepared by the USACE to determine the extent to which the modified channel duplicates the pre-construction character of the channel including proportion of shading, pools, flats, riffles and cascades and areas for fish cover and shelter.
h. Make recommendations for modifications to provide these habitat features where needed.

3.3 Report Preparation: Prepare a report of findings and recommendations based on the results of the field studies and review of existing conditions hydrologic and hydraulic analysis.

This information shall be presented in a typewritten scientific report including sections describing the objective, methods, results, discussion, and conclusions. The results and analyses shall include but not be limited to graphical, tabular, and chart presentations of the data and findings. The conclusions section shall evaluate the potential impacts and recovery of the species found, and a discussion of the benefits the proposed project may have on the species. Original data sheets shall be provided in the appendices of the report (if applicable).

3.3 Report Text

The report shall include written discussions of, but not be limited to, the following sections: purpose/objective of the study, summary of findings, methods, results, comparisons with other areas (if applicable), discussion, and conclusions.

3.4 Appendices

Appendices shall contain of copy of the Scope of Work for the project. Appendices should also include appropriate data sheets, photos, and references, as well as a copy of the names of all subcontractors and their addresses.

4. Schedule of Milestones:

1) Complete a draft report of findings to date by November 10, 2004. This report will be presented to applicable resource agencies for review and concurrence. Three bound copies and one unbound copy of the draft report, 5 CD's, as well as a digital copy will be provided to the Corps.

2) Following receipt of comments on the draft report (and/or amended draft report) (from the Corps and resource agencies), the contractor will prepare a final report within 21 days of receiving comments and provide three bound copies and one unbound copy, plus 5 CD's of the final report. A digital version is also required.

5. Coordination: Attend a minimum of two office/field meetings to discuss project scheduling, compilation of existing data, field data collection, data plotting and analysis, surveying and hydrologic/hydraulic analysis, as well as the findings of the field studies and subsequent recommendations, and coordinate on developing final design plans and construction documents. Attend office/field meetings with the USACE and agency representatives.

6. Period of Performance

The total time in which the Contractor shall complete this Task Order will be 120 calendar days.

7. Compensation to the Contractor

In consideration for the performance of the work under this task order, the Contractor shall be paid in the amount of ____ for the work described herein. This shall constitute complete payment for all services required and expenses incurred in the work performance.

Contractor's Representative Date

Brian J. Mulvenna, P.E. Date
Project Manager

Bill Rothert, Date
A/E Contract Negotiator

Civil Project Management

20 August 2004

SUBJECT: Contract Number DACA61-02-D-0001

Mr. Peter Pellissier
EA Engineering, Science, Technology, Inc.
15 Loveton Circle
Sparks, Maryland 21152

Dear Mr. Pellissier:

Enclosed is the Scope of Work for Task Order Number 0022 under the reference contract. Task Order 0021 is for the review of design drawings, calculations and draft Environmental Assessment for stream-bank stabilization on the Manasquan River at Bergerville Road project, NJ. Technical questions should be directed to Brian Mulvenna (215) 656-6599. Please submit your proposal to the attention of William F. Rothert as soon as possible.

Sincerely,

William F. Rothert
A/E Contract Negotiator

Enclosure

Civil Project Management

20 August 2004

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EA Engineering, Science, Technology, Inc.
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Enclosure