APPENDIX C: DRAFT STATEMENT OF FINDINGS FOR WETLANDS AND FLOODPLAINS

Statement of Findings: Wetlands and Floodplains

Fort Pulaski Bridge Project
Fort Pulaski National Monument
Chatham County, Georgia
Project Number PRA-FOPU 10(3)

Recommended:

____ _______________
Superintendent, Fort Pulaski National Monument   Date

Concurred:

____ _______________
Chief, Water Resources Division, Washington Office   Date

Approved:

____ _______________
Director, Southeast Region   Date

Introduction

Executive Order (EO) 11990, *Protection of Wetlands*, and EO 11988, *Floodplain Managemen*t, require the National Park Service (NPS) and other federal agencies to evaluate the likely impacts of action in wetlands and floodplains, respectively. NPS Director's Order #77-1: Wetland Protection and Procedural Manual #77-1 provide NPS policies and procedures for complying with EO 11990. NPS Director's Order 77-2: Floodplain Management and the Procedural Manual 77-2: Floodplain Management provide NPS policies and procedures for complying with EO 11988.

This Statement of Findings (SOF) has been prepared to comply with EO 11990 and 11988. The Fort Pulaski National Monument (Park) has prepared and made available an Environmental Assessment (EA) for the proposed replacement of the Fort Pulaski Bridge. In the EA, the NPS identified the replacement of the Fort Pulaski Bridge with a two-lane bridge on a new alignment as the preferred alternative.

The purpose of this SOF is to present the rationale for the proposed improvements to the Fort Pulaski Bridge in the floodplain area and to document the anticipated effects on these resources. The project area is located in a Class 1 Action, per DO #77-2. Avoidance of impacts to the floodplain is not possible because the existing bridge is located in the 100-year floodplain; therefore, any improvements made to the existing bridge would be located in the floodplain.

Proposed Action

Under the preferred alternative, Replace on a New Alignment (Two Lane Bridge), the existing bridge would be replaced with a new bridge that meets current American Association of State Highway and Transportation Officials (AASHTO) specifications with regards to lane width, shoulder width, live load capacity, and crash worthy railing system. A new two-lane bridge would be built upstream of the existing bridge. The bridge would be approximately 29 feet wide (including the railing width) with two 11-foot wide travel lanes and a five-foot shoulder.

There would be a total of 114 concrete piles installed to construct the bridge. Eighteen piles would be installed in the banks of the River for the abutments and wingwalls. There would be six piles driven per bent on each lane of the bridge, except for bents 3, 6, 7 and 10, which would have 12 piles per bent. The pile caps would be constructed, upon which a concrete beam would be placed. A cast-in-place concrete overly would be constructed over the precast bridge deck panels. The intermediate spans of the bridge would be built to a length of 105 feet, and the length of the end spans would be 70 feet. There would be 13 spans and 12 bents. The existing bridge would remain open to traffic during construction.

Riprap would be placed at each of the bridge abutments in order to protect the abutments from scour. It is estimated that 20,500 square feet (4,000 cubic yards) of riprap would be placed at both ends of the bridge.

The bridge would be constructed in one construction phase. After construction is completed and the new bridge is open, the existing bridge would be removed.

Site Description

Fort Pulaski National Monument includes most of Cockspur Island and all of adjacent McQueens Island in Chatham County, Georgia. The jurisdictional boundary of the Park ends at the mean high water elevation. The Fort Pulaski Bridge across the South Channel of the Savannah River was originally constructed in 1938. The bridge is approximately 1,300 feet in length and carries a two-lane roadway. The bridge is comprised of 62 composite timber/concrete spans and one steel span. Each span is approximately 20 feet in length, and the bridge has a main channel span of approximately 40 feet. The 64 bents are each comprised of five timber piles and a timber bent cap. There are a total of 330 timber piles supporting the structure.

Wetlands in the Study Area

National Wetland Inventory Maps show the presence of one wetland type in the study area, E2EM1N. E2EM1N wetlands are estuarine, intertidal, emergent wetlands that are dominated by species that normally remain standing at least until the beginning of the next growing season. The tidal water alternately floods and exposes the land surface at least once daily. Wetlands in the study area perform biotic and hydrologic functions (U.S. Fish and Wildlife Service, 2010).

The wetlands in the study area were delineated by Jerry Cordy of Dial Cordy and Associates Inc. in October 2011. Mr. Cordy became a Certified U.S. Army Corps of Engineers Wetland Delineator in 1993 and has extensive experience conducting wetland delineations. A copy of his resume can be found in appendix A.

Intertidal Wetlands

Wetlands in the study area are intertidal wetlands, and include estuarine, intertidal, emergent, persistent wetlands (E2EM1), estuarine, intertidal, unconsolidated shore, mud wetlands (E2US3), and estuarine, intertidal, rocky shore, rubble, artificial wetlands (E2RS2r) (Figure 1). The limits of the intertidal zone are from the upland edge of the wetland to the extreme low water elevation of spring tides, or mean low low water (MLLW). The MLLW elevation in the study area is -4.05 feet. The E2EM1 wetlands are a near monoculture comprised of cordgrass (*Spartina alterniflora*). The upper fringe of the marsh on this site is very narrow and is a mix of *Spartina alterniflora* and bushy seaside tansy *Borrichia frutescens*. Other species present in the tidal area include bushy seaside tansy, saltgrass (*Distichilis spicata*), and eastern baccharis (*Baccharis halimifolia*).

E2RS2 is present in the study area surrounding the abutments of the bridge where riprap had been placed to protect the bridge. Although the riprap area is within the intertidal zone, these areas are manmade features. The Corps of Engineers regulates this area as a Water of the United States. The Corps of Engineers Section 404 jurisdiction for the South Channel of the Savannah River, a Water of the United States, extends landward to the highest annual tide line. The intertidal shoreline is also subject to regulation as navigable waters under Section 10 of the River and Harbor Act, with jurisdiction ending landward at the mean high tide line (Dial Cordy and Associates Inc. 2011).

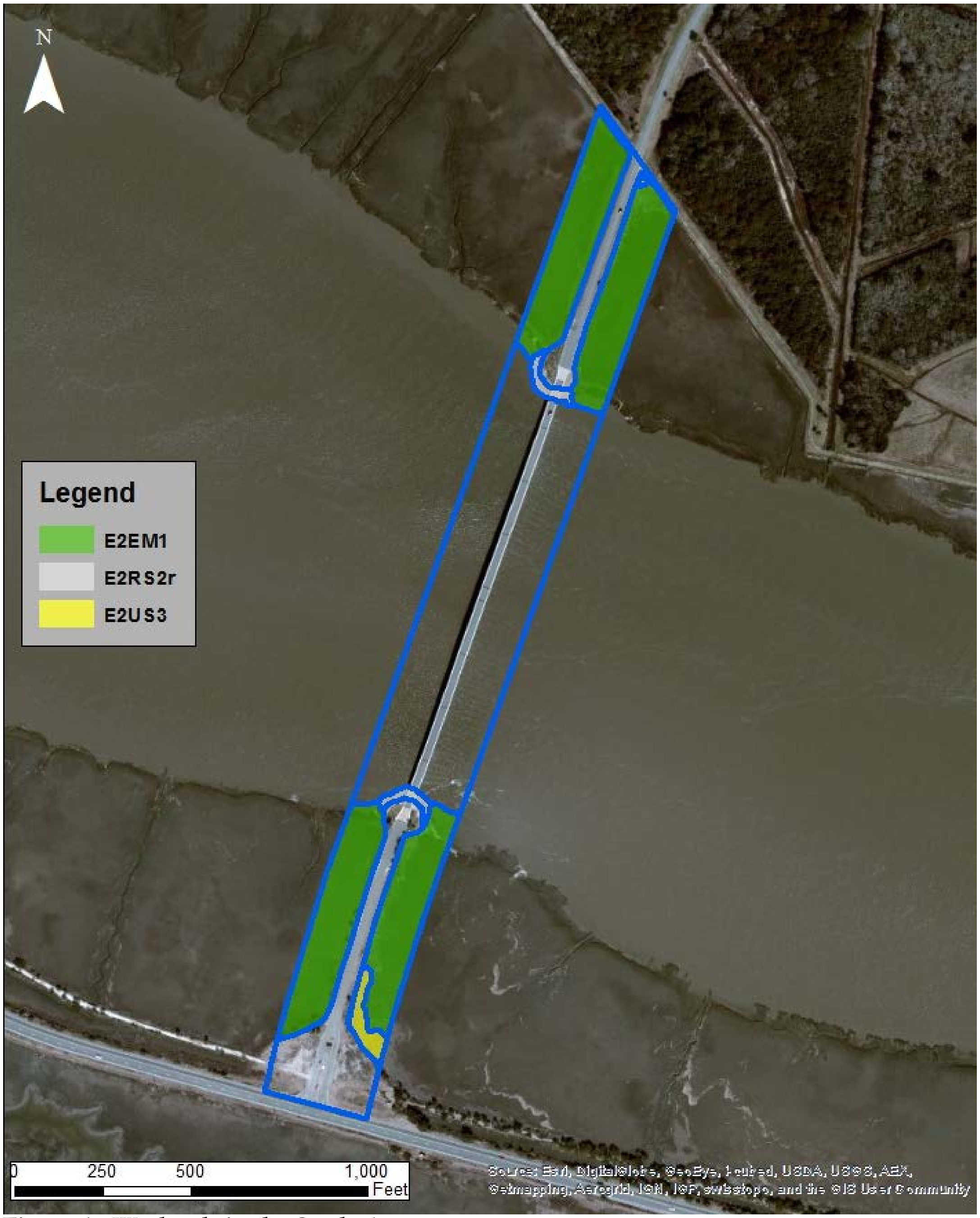

Figure 1. Wetlands in the Study Area

Wetland Functions and Values

<u>Biotic Functions</u>

The wetland communities provide habitat to a variety of wildlife species. Georgia's salt marshes are some of the most biologically productive natural systems. They produce nearly twenty tons of biomass to the acre according to the Georgia Department of Natural Resources. The productivity helps to make the salt marshes primary nursery areas for blue crabs, oysters, shrimp and other fish and shellfish. Young shrimp and other marine organisms also use the salt marshes to avoid predation. Two fiddler crab species were observed on the project side; the mud fiddler (*Uca pugnax*), found in both high and low marsh, and the sand fiddler (*U. pugilator*), occurring near the landward edges of the marsh. A great blue heron (*Ardea herodias*) and snowy egrets (*Eggretta spp.*) were observed foraging in the marsh (Dial Cordy and Associates Inc, 2011).

Hydrologic Functions

The wetlands within the project area provide functions of flood storage, erosion and sediment control, detritus export and water purification. In addition, salt marshes help filter pollutants from the water and act as buffers against offshore storms. Incoming tides bring in nutrients from estuaries connected by tidal creeks to the marshes. The nutrients nourish and feel the grasses of the marsh. Outgoing tides carry nutritious marsh products, including detritus produced from decaying *Spartina*, back into the estuaries. There, the products help to sustain large number of other marine organisms. The outgoing tides also remove wastes from the marsh.

The E2EM1 wetlands is inundated usually twice daily by high tides. On average, the high and low tides differ by a range of 6.92 feet. Mean high water and mean low water elevations are 3.08 feet and -3.84 feet (NAVD88), respectively (NOAA).

Cultural Values

The culture value of the wetlands within the study area is intrinsically high due to their location within the Fort Pulaski National Monument. The E2EM1 wetlands are part of the cultural landscape of the Park. However, no historic or archeological sites were identified during the Phase I Archeological Investigation.

Floodplains in the Study Area

Federal Emergency Management Agency (FEMA) Flood Insurance Rate maps show that the project area is within a Zone VE flood hazard zone (Figure 2). Zone VE is the flood insurance rate zone that corresponds to areas within the one percent annual chance coastal floodplain that have additional hazards associated with storm waves (FEMA). The base flood elevation is the computed elevation to which floodwater is anticipated to rise during the base flood. The base flood is the flood having a one percent chance of being equaled or exceeded in any given year. This is also referred to as the 100-year flood. The base flood elevation in the study area is between 17 and 18 feet. In this area, the Savannah River exhibits one of the highest tidal ranges on the U.S. East Coast. The differences between low tide and high tide can be more than seven feet (Seabrook, 2009).

The Fort Pulaski Entrance Road was constructed on fill material, and sits approximately four feet above the surrounding E2EM1 wetlands. The hydraulics of the site is a combination of riverine and tidal processes. The mean high water and mean low water elevations in the project area are 3.08 feet and -3.84 feet, respectively. The flood stage in the project area is 9.2 feet.

Figure 2. Floodplain Map of the Study Area

The Fort Pulaski Bridge was rehabilitated in 1965. More recently, repair projects in 1996 and 2008 have been completed to extend the life of the bridge. However, the bridge has continued to deteriorate. The timber piles, steel beams and bearings, and composite timber/concrete spans all exhibit signs of deterioration. In addition, the embankment no longer provides adequate protection from the flow of the River.

Impacts to Estuarine, Intertidal, Emergent Wetlands

Location	Impact Area (square feet)
North Abutment	7,900
South Abutment	9,200

Approximately 0.40 acres of E2EM1 wetlands would be permanently filled by the placement of fill material to construction the roadway approaches and abutments of the new bridge (Figures 3 and 4). Although there would be impacts to the riprap, the impacts would result from the placement of riprap to protect the abutments of the new bridge.

There would be no temporary impacts to E2EM1 wetlands during construction. Sheet piling would be installed temporarily in order to dewater the area to construct the bridge abutments, impacting only the E2RS2. Silt fence and construction fencing would be placed along the fill limits. The fill would be placed from the existing road and graded in layers to meet the final grade. Geo-fabric may also be used to wrap the layers of fill material. Construction equipment access through the E2EM1 wetlands would not be necessary in order to construct the bridge or the roadway approaches. Construction of the approaches and bridge would be accessed from the existing roadway shoulders and new approaches.

After the existing bridge is removed, the approach areas (totaling approximately 0.50 acres) would be restored to E2EM1 wetlands.

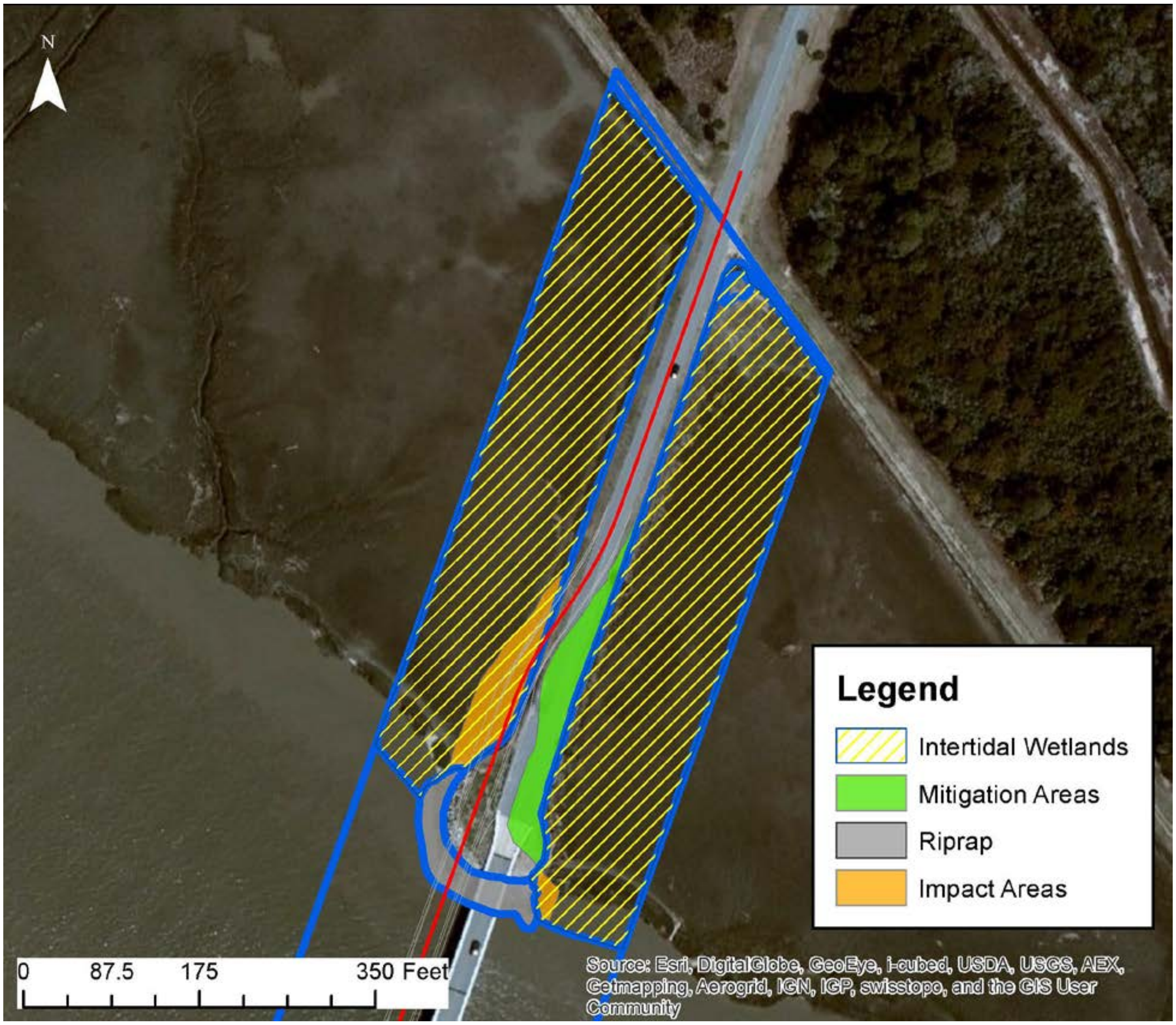

Figure 3. Northern Bridge Approach

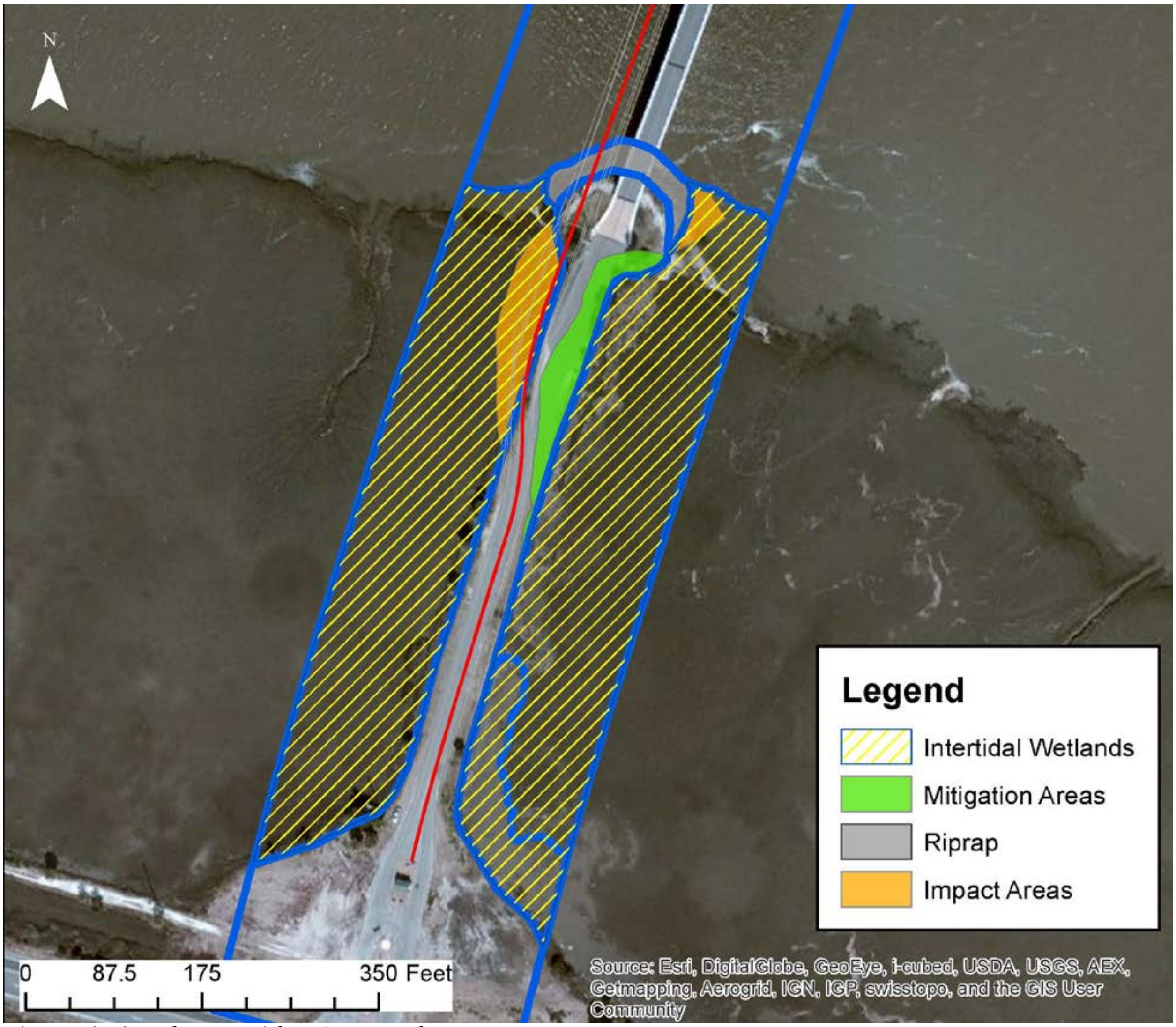

Figure 4. Southern Bridge Approach

Justification for Use of the Wetlands and Floodplains

Wetlands
Recent assessments of the bridge have deemed it structurally deficient and its current configuration poses a safety hazard to pedestrians and bikers who must share the narrow bridge with vehicular traffic. The bridge provides the only ingress and egress to Fort Pulaski and Cockspur Island, so maintaining the bridge in a safe condition is essential to park operations. The bridge also provides access to a U.S. Coast Guard Station and to the Savannah Bar Pilots, which operate on the west end of Cockspur Island.

Floodplains
The study area lies within the 100-year flood hazard zone. The project has been proposed to repair or replace the existing Fort Pulaski Bridge. All of the alternatives would require crossing

the South Channel of the Savannah River. Therefore, there is no practicable alternative site within which to conduct the proposed action. Replacement of the bridge is needed to maintain safe access to the Park. No occupancy of floodplain areas will be encouraged by the implementation of this project. The new bridge would be located adjacent to the existing bridge so that a portion of the existing roadway approaches can be reused, minimizing the impact on previously undisturbed areas.

Investigation of Alternative Sites

In addition to the preferred alternative, six other action alternatives and a no action alternative were considered. The purpose of this project is to provide safe access to the Fort Pulaski National Monument. Fort Pulaski road is utilized by pedestrians and cyclists, as well as vehicles.

Alternative A - No Action Alternative
Under Alternative A, the No Action Alternative, no substantial improvements would be performed other than in accordance with routine maintenance operations. Emergency repairs would likely be necessary. Under the No Action Alternative, wetlands would not be affected. Analysis of the No Action Alternative is required as part of the NEPA process in order to provide a basis for the comparison of other feasible alternatives.

Alternative B - Emergency Repairs
The bridge would continue to be monitored every two years. Emergency repairs would be made to address all serious structural deficiencies on an as needed basis depending on the results of the most recent inspection. It is anticipated that the needed repairs would be similar to the repairs made in 2008, which included jacketing the piles with a fiber-reinforced polymer (FRP) jacket that was then filled with epoxy grout to encapsulate the timber and thus reducing the rate of deterioration.

Alternative C - FRP Jacketing of All Piles
All of the 310 timber piles would be jacketed with a fiber-reinforced polymer (FRP) jacket that would then be filled with epoxy grout to encapsulate the timber and thus protect it from further deterioration. The wrapping would extend approximately two feet below the mud line and approximately two feet above high water level. Additional substructure (elements of the bridge that support the deck) repairs would include replacing timber cross bracing and bent caps, installing timber corbels, and repairing concrete bent caps. Superstructure repairs would also be completed, and would likely consist of cleaning and painting all of the structural steel in the main span, cleaning exposed rebar in the bridge deck and diaphragms in the main span and coating them with protective sealant, and replacing timber deck shims.

Alternative D - Rehabilitation of Existing Bridge
FRP jackets would be installed on the most deteriorated timber piles as identified by previous bridge inspections. The jacket would be filled with epoxy grout to encapsulate the timber and protect it from further deterioration. The wrapping would extend from the mud line (but not below) to above the high water level. Sections of severely deteriorated timber piles may be replaced, if needed. It is estimated that 40 piles would have new FRP jackets installed, 30 piles would have their existing FRP jackets replaced, and that ten piles would have sections replaced and FRP jackets installed. Additional substructure repairs would include replacing timber cross

bracing and bent caps, installing timber corbels, and repairing concrete bent caps. Superstructure repairs would also be completed, and would likely consist of cleaning and painting all of the structural steel in the main span, cleaning exposed rebar in the bridge deck and diaphragms in the main span and coating them with protective sealant, and replacing timber deck shims. Riprap would also be replaced around the bridge abutments. It is estimated that 18,500 cubic feet of riprap would be placed at the north abutment and 29,000 cubic feet would be placed at the south abutment. Dewatering would be necessary in order to install the riprap and may also be necessary to replace sections of deteriorated timber piles. It is anticipated that the access for the repairs would be from a barge located alongside the pile bents. The barge would likely be moored.

Alternative E - Install Additional Support on Existing Bridge
Two new steel piles and one new floorbeam would be installed on each side of the existing pile bent (a bent is a substructure unit supporting each end of a bridge span). The new piles and floorbeams would support the existing superstructure. The existing substructure would not carry any loads. The steel piles would be driven into the river bottom with an impact hammer on a barge. Although concrete piles perform better than steel piles in a corrosive environment, the use of driven concrete piles is not feasible because driving concrete piles would cause settlement to the existing substructure.

Alternative F - Replace on Existing Alignment
The existing bridge would be replaced with a new bridge that would be built in sections on the same alignment. The most deteriorated bridge spans would be replaced first and emergency repairs would be made as they are needed to maintain the remaining sections until they can be replaced. In order to replace a section of the existing bridge, a section of the existing bridge would be demolished. Barriers would be installed to route traffic around the section under construction. Concrete piles would be driven into the river bottom. There would be six piles supporting each bent of the bridge. The pile caps would be constructed, upon which a concrete slab or beam would be placed. The bridge deck would be cast offsite and then set in place with a crane positioned on a barge in the River. The new bridge would have two 12-foot travel lanes and two 4.5 foot shoulders, and would be approximately 36 feet wide including the railing width. The length and number of bridge deck segments would be dependent on the type of deck. A concrete slab bridge deck would be built to a length of 40 feet, and a concrete beam bridge deck would be built to a span length of 80 feet. A concrete slab bridge deck would require 33 spans (deck segments) and 32 bents. A concrete box beam deck would require 17 spans and 16 bents. One lane of traffic would be maintained throughout construction.

Riprap would be placed at each of the bridge abutments in order to protect the abutments from scour. It is estimated that 52,500 cubic feet of riprap would be placed at each end of the bridge.

The bridge would be replaced in multiple construction phases as funding is available. At least four phases would be necessary given the current funding levels and projected cost of the project. The duration of each construction phase would be approximately one year.

Alternative G - Replace on a New Alignment (Two One-Lane Bridges)
The existing bridge would be replaced with two new one-lane bridges that meet current AASHTO specifications with regards to lane width, shoulder width, live load capacity, and crash worthy railing system. Two one-lane bridges would be built. Each one-lane bridge would be approximately 22 feet wide with a 12-foot wide travel lane and two three-foot wide shoulders.

Concrete piles would be driven into the river bottom. There would be four piles per bent on each lane of the bridge. The pile caps would be constructed, upon which a concrete slab or beam would be placed. The bridge deck would be cast offsite and then set in place with a crane positioned on a barge in the River. The length and number of bridge deck segments would be dependent on the type of deck. A concrete slab bridge deck would be built to a length of 40 feet, and a concrete beam bridge deck would be built to a span length of 80 feet. A concrete slab bridge deck would require 33 spans (deck segments) and 32 bents. A concrete box beam deck would require 17 spans and 16 bents. One lane of traffic would be maintained throughout construction.

Riprap would be placed at each of the bridge abutments in order to protect the abutments from scour. It is estimated that 52,500 cubic feet of riprap would be placed at each end of the bridge.

The bridge would be replaced in multiple construction phases as funding is available. At least four phases would be necessary given the current funding levels and projected cost of the project. The duration of each construction phase would be approximately one year. The first one-lane bridge would be built in at least two construction phases due to funding limitations. Once constructed, the new one-lane bridge would carry all truck loading with a signal system. The existing bridge would then only serve cars and other light vehicles until the second one-lane bridge is built. The second one-lane bridge would also be built in phases. The number of phases would be dictated by available funding. The existing bridge could service as a pedestrian/fishing bridge for several years.

Other Permits

In order to construct the project, additional permits and approvals would be necessary.

The United States Corps of Engineers has authority over the discharge of fill or dredged material into "waters of the United States." This includes authority over any filling, mechanical land clearing, or construction activities that occur within the boundaries of any "waters of the United States," which includes wetlands.

Clean Water Act Section 401 Water Quality Certification must be obtained. The 401 Water Quality Certification is a "certification," needed for any Federal permit involving impacts to water quality. Most 401 Certifications are triggered by Section 404 Permits issued by the U.S. Army Corps of Engineers. Typical types of projects involve filling in surface waters or wetlands. Section 401 of the Clean Water Act delegates authority to the States to issue a 401 Water Quality Certification for all projects that require a Federal permit (such as a Section 404 Permit). The "401" is essentially verification by the State that a given project will not remove or degrade existing, designated uses of "Waters of the State," or otherwise violate water quality standards. Mitigation of unavoidable impacts and inclusion of stormwater management features are two of the most important aspects of water quality review. This certification is issued by the Georgia Environmental Protection Division. Georgia EPD normally issues 401 Certification within 120 days of receipt of a complete application

A Coastal Marshlands Protection Act (OCGA 12-5-280, et seq.) Permit is required for any project which involves removing, filling, dredging, draining, or otherwise altering any marshlands. Marshland is defined as areas below the ordinary high water mark (Georgia Department of Natural Resources, 2003). Tidewaters are State-owned property.

Federal law prohibits the construction of any bridge across navigable waters of the United States unless first authorized by the Coast Guard. The Coast Guard approves the location and clearances of bridges through the issuance of bridge permits or permit amendments, under the authority of Section 9 of the Rivers and Harbors Act of 1899, the General Bridge Act of 1946, and other statutes. There is a mandatory 30-day public comment period.

The Georgia Erosion and Sedimentation Act of 1975 (O.C.G.A. 12-7) and its subsequent amendments require that primary and secondary trout streams maintain an undisturbed riparian buffer of 50 feet, and all other streams maintain a minimum buffer of 25 feet. The buffer distance is measured from where vegetation is removed by normal stream flow (England, 2001). The South Channel of the Savannah River is protected by the 25-foot buffer. An Application for a 25-Foot Vegetative Buffer Encroachment is required. The Environmental Protection Division has a review period of 60 days, after which there is a 30-day public comment period.

Mitigative Actions

Wetlands

<u>Avoidance and Minimization</u>
Avoidance of wetland impacts was investigated through Alternative F (provided that no additional riprap was installed beyond the footprint of the existing riprap). The Fort Pulaski entrance road provides access to the U.S. Coast Guard Life-Saving Station and the Bar Pilots, which are 24-hour operations. Vehicular access must be maintained at all times, which makes construction of a new bridge on the same alignment difficult. Phasing of the construction must be done in order to construct one lane of the bridge at a time. This also limits the type of bridge that can be constructed, because the new bridge must match the elevation of the new bridge in order to maintain traffic. These restrictions increase the cost of the project, making it cost-prohibitive, and also impact the duration of construction and the quality of the new bridge.

An upstream location and downstream location were analyzed in order to minimize impacts to wetlands. It was found that the upstream alignment impacted approximately 0.40 acres of wetlands, while the downstream alignment impacted approximately 0.52 acres of wetlands. Constructability analysis found that utility relocation costs would be similar for both alignments. The precast elements for the bridge would be delivered by barge, and set in place using a crane on a barge. Either an upstream or downstream alignment could be accessed by barge via the South Channel. Access through the Channel at the western end of Cockspur Island is shallow, but possible at high tide. Therefore, an upstream alignment was chosen.

The roadway approaches were designed in a manner to reduce the fill of the adjacent E2EM1 wetlands to the extent possible. The widths of the travel lanes and parallel parking spots were reduced, and the slopes were steepened to minimize wetland impacts. The new bridge would be built adjacent to the existing bridge, and a portion of the existing roadway approaches would be utilized as the approaches for the new bridge. The placement of riprap is necessary in order to protect the new bridge abutments from scour. The amount of riprap proposed to be placed has been minimized to the extent possible.

Compensatory Mitigation Requirements

The replacement of the bridge would impact approximately 0.23 acres of riprap. The riprap would be impacted by the replacement with new riprap to protect the new bridge. Since this impact is in-kind, and the functions of the wetland would not be impacted, no compensatory mitigation is required.

The replacement of the bridge would also impact approximately 0.40 acres of E2EM1 wetlands. Compensation of wetland impacts is required by Director's Order #77-1. NPS requires a consistency with "no net loss of wetlands" and compensation wetlands must, at a minimum, provide 1:1 wetland function replacement. Compensation of wetland impacts is also required by the U.S. Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act. The Savannah District of the Corps Standard Operating Procedure for Compensatory Mitigation provides a method for calculating mitigation credits and also allows for compensatory mitigation supported by the Hydrogeomorphic Approach to assessing wetland functions. Coordination with the Corps would continue through final design of the project in order to determine the required compensatory mitigation. Coordination with National Marine Fisheries Service (NMFS) per the Magnusons Stevens Act determined that mitigation for fisheries impacts would also be necessary as a result of the impacts to E2EM1 wetlands.

The removal of the existing bridge would allow for 0.50 acres of E2EM1 wetlands to be restored on-site. During the permitting process, additional wetland compensation may be needed to meet the mitigation requirements of the Corps and NMFS. Upland areas south of U.S. 80 were identified as potential mitigation areas in order to meet the Corps' requirements for wetland mitigation. The installation of living shorelines in high erosional areas was also identified as potential mitigation to meet the Corps' requirements for wetland mitigation and NMFS requirements for Essential Fish Habitat mitigation. Coordination with NMFS, Georgia Department of Natural Resources – Coastal Resources Division and the Corps would continue throughout the development of the project to make sure proposed mitigation is acceptable. Mitigation requirements would be revisited and finalized during the permitting process.

Proposed Compensatory Mitigation

The roadway approaches of the existing bridge would be removed and restored to compensate for wetland loss or degradation and maintain consistency with the NPS "no net loss of wetlands" goal found in Director's Order #77-1 (Figures 3 and 4). The in-place restoration of 0.50 acres of upland area to E2EM1 wetlands would compensate for the loss of 0.40 acres of E2EM1 wetlands. This compensation is consistent with NPS compensatory mitigation requirements and maintains compliance with NPS Director's Order #77-1: Wetland Protection.

Figure 5. Location Map Showing Additional Mitigation Areas.

Additional Wetland Restoration Opportunities
Other permit processes may require additional compensatory mitigation and may or may not be implemented depending on the final decisions that will be made during other agency wetland permit review processes. These compensatory efforts are not required to meet the requirements of the NPS Director's Order #77-1: Wetland Protection. One proposed compensatory effort is to remove fill from two locations along U.S. Highway 80 and restore the areas to E2EM1 wetlands (Figure 5). In addition to the restoration of the two upland areas to E2EM1 wetlands, the installation of living shorelines may be implemented to restore a portion of the emergent wetland system that has been eroded and protect it from an anticipated increase in boat traffic through the Savannah River Channel. The structural breakwater portion of the living shorelines would be placed outside of the intertidal zone below MLLW. The installation of a breakwater would change the hydrology of the shoreline to encourage sedimentation in the area and restoration of the eroded shoreline.

Living shorelines are a more natural bank stabilization technique that uses plants, oyster reefs, and soil/sand in addition to rock. Living shorelines provide protection of the shoreline by absorbing wave energy while creating and improving habitat (Chesapeake Bay Foundation, 2007). Potential locations for living shoreline installation are identified in Figure 6. Further analysis regarding the effects of the breakwater feature on the littoral drift system (including potential upstream and downstream erosion or sedimentation modifications) will be analyzed. In addition, the viability of created oyster beds and submerged aquatic vegetation will be estimated in order to identify the location and size of the living shoreline that would provide the most ecological benefit.

Figure 6. Potential Locations for Living Shorelines are Shown in Red.

<u>Description and Functions of Compensation Wetland In Comparison to Impact Wetland</u>
The existing roadway approach areas would be restored to E2EM1 wetlands and would fully replace the functions lost at the project site. The compensation wetland would provide wildlife habitat, water storage, food chain support, and some water quality purification functions. Mitigation would occur at the impact site and additional mitigation may occur near the impact site, if necessary.

<u>Wetland Restoration Process</u>
The primary compensation areas are directly adjacent to the surrounding E2EM1 wetlands and the South Channel of the Savannah River; therefore, hydrology to support the compensation wetlands is already present.

Excavation would be required to construct the compensation wetlands. The site would be staked and the expected grades would be established. Approximately 3-4 feet of fill material would be removed by an excavator. Silt fence will be placed between the mitigation area and the existing wetland. The material would be hauled to an upland disposal site. The compensation wetlands would blend into the surrounding E2EM1 wetlands. The existing soils have been compacted. Compaction of the soil will be minimized during operations by utilizing equipment having low unit pressure ground contact and by limiting repeat passes over the same areas. In order to minimize the impacts of soil compaction, the area may be over-excavated and backfilled with topsoil if necessary.

The vegetation of the impact site, primarily a monoculture of *Spartina alterniflora*, would be cut into 12-inch square clumps. These would be transplanted into containers with an organic soil mixture (2:1 topsoil:sand ratio), and kept sub-irrigated with water (Center for Plant Restoration & Coastal Plant Research). Additional Spartina would be obtained in coordination with Georgia Department of Natural Resources – Coastal Resources Division.

Site analysis of the living shoreline would be completed to determine the most appropriate living shoreline for the site. The living shoreline would include structural elements such as segmented sills, jetties, groins or breakwaters, that would be installed to absorb wave energy and oyster reefs would be constructed. Depending on the location and design, the area between the existing shoreline and structural rock would be left to allow sediment of accumulate on its own or graded and filled with natural beach shoreline and marsh plantings (NOAA).

Schedule:
The proposed compensation areas currently serve as the existing bridge approach road. It is necessary to keep the existing bridge open to traffic to provide access to Fort Pulaski during construction. After the construction of the new bridge is completed, the existing bridge would be demolished and the restoration of the compensation areas would begin.

The construction of the new bridge is anticipated to being in 2016. The duration of the entire construction project is estimated to be 15 months. Restoration of the approach road would most likely start approximately 12 months after the construction of the new bridge begins.

It is estimated that it would require two full growing seasons in order for the compensation wetlands to be fully functioning. Although the compensation area would be planted with *Spartina alterniflora* from the impact site, a recovery period is anticipated.

Construction of the living shoreline would commence at the same time as the construction of the project.

Monitoring and Maintenance:
The compensation wetlands and living shoreline would be monitored and maintained to ensure that they provide the same level of functions as the impacted wetlands. The wetlands and living shoreline would be monitored yearly for a period of five years.

Monitoring would be at the end of the growing season following the restoration, and then for five additional years thereafter. Monitoring would be carried out between June and August each year. At a minimum the annual monitoring report would:

- Reference regulatory permits authorizing the project activity
- Include a summary of the restoration
- Include photos of the restoration area with a photo identification key and location map.
- Calculate percent of herbaceous vegetation
- Identify species composition
- Identify any invasion of invasive species and outline corrective measures to control the species.

Funding Source:
The restoration of the compensation wetlands would be funded by the Federal Lands Transportation Program as part of the construction funding for the replacement of the Fort Pulaski Bridge.

Floodplains

The existing Fort Pulaski Bridge has a low chord elevation of 12.10 feet. The low chord elevation of the new bridge would be no lower than 12.10 feet. The low chord elevation of the bridge would be modified to ensure that there is no change in the 100-year flood water surface elevation in order to meet FEMA requirements. At least two feet of freeboard above the reference elevation would be provided in order to meet FHWA design standards. Freeboard is measured as the distance between the surface of the water at the reference elevation and the low chord elevation above the channel. The reference elevation in tidally influenced systems is a calculation of the 50-year storm tide added to the adjusted design wave height. Freeboard is necessary to provide clearance for debris movement under the bridge during large storm events.

Grade raises along the roadway approaches with the placement of fill material would be required to meet the elevation of the raised bridge. Riprap would also be placed at the abutments to protect the bridge from scour. This would result in the placement of approximately 7,000 cubic yards of fill material in the floodplain. The overall decrease in the number of piles in the South Channel of the Savannah River increases the conveyance area in the main channel.

The new bridge is designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 60). Design considerations were sensitive to the location within the Fort Pulaski National Monument cultural landscape. Altering the bridge drastically from the existing location and profile may cause an adverse effect to the cultural landscape.

The proposed action will not have an adverse impact on the floodplain and its associated value. Minimization and mitigation include the protection of human health and safety, protection of investment, and protection of floodplain resources and processes. Flooding in the project area is caused by traceable storm events, such as hurricanes and nor'easters that allow for adequate warning time. Harm or risks to human health and safety is minimized through a warning and evacuation plan.

The construction of a new bridge would replace an existing investment. Risk to the investment exists and would continue to exist after the bridge is replaced. The NPS would repair or reconstruct the facility if and when damage occurs.

Protection of floodplain resources and processes was achieved to the extent possible. The amount of riprap proposed to protect the bridge abutments was minimized to the extent possible.

Conclusion

The NPS and FHWA conclude that there is no practical alternative to improve safe access for pedestrians, cyclists and vehicles to access the Fort Pulaski National Monument. Mitigation and compliance with regulations and policies to prevent impacts to wetlands and water quality would be strictly adhered to during and after construction. Permits with other federal and state agencies would be obtained prior to construction activities. No long-term adverse impacts to wetlands would result from the Preferred Alternative. Therefore, the NPS finds the Preferred Alternative to be acceptable under Executive Order 11988 for floodplain management and Executive Order 11990 for the protection of wetlands.

References

Center for Plant Restoration & Coastal Plant Research. (n.d.). *Smooth Cordgrass Propogation Guide*. Retrieved July 17, 2014, from http://www.usm.edu/gcrl/cpr/docs/planting.guides/CPR.Spartina.alterniflora.pdf

Chesapeake Bay Foundation. (2007). *Living Shorelines for the Chesapeake Bay Watershed.*

Department of the Army, Corps of Engineers, Savannah District. (2004). *Standard Operating Procedures, Compensatory Mitigation.*

Dial Cordy and Associates Inc. (2011). *Fort Pulaski Bridge Rehabilitation/Replacement Wetland Delineation Report*. Jacksonville Beach.

Federal Emergency Management Agency. (n.d.). *Map Viewer*. Retrieved from https://hazards.fema.gov/femaportal/wps/portal/

National Park Service. (2003). *Procedural Manual #77-2: Floodplain Management.*

National Park Service. (2012). *Procedural Manual #77-1: Wetland Protection.*

NOAA . (n.d.). *Living Shorelines*. Retrieved September 18, 2014, from NOAA Habitat Conservation Restoration Center: http://www.habitat.noaa.gov/restoration/techniques/lsimplementation.html

NOAA. (n.d.). *Benchmark Sheet for 8670870, Fort Pulaski GA*. Retrieved July 16, 2014, from Tides & Currents: http://tidesandcurrents.noaa.gov/benchmarks.html?id=8670870

U.S. Fish and Wildlife Service. (2010, September 30). *Wetland Codes*. Retrieved March 2, 2011, from National Wetlands Inventory: http://www.fws.gov/wetlands/Data/WetlandCodes.html