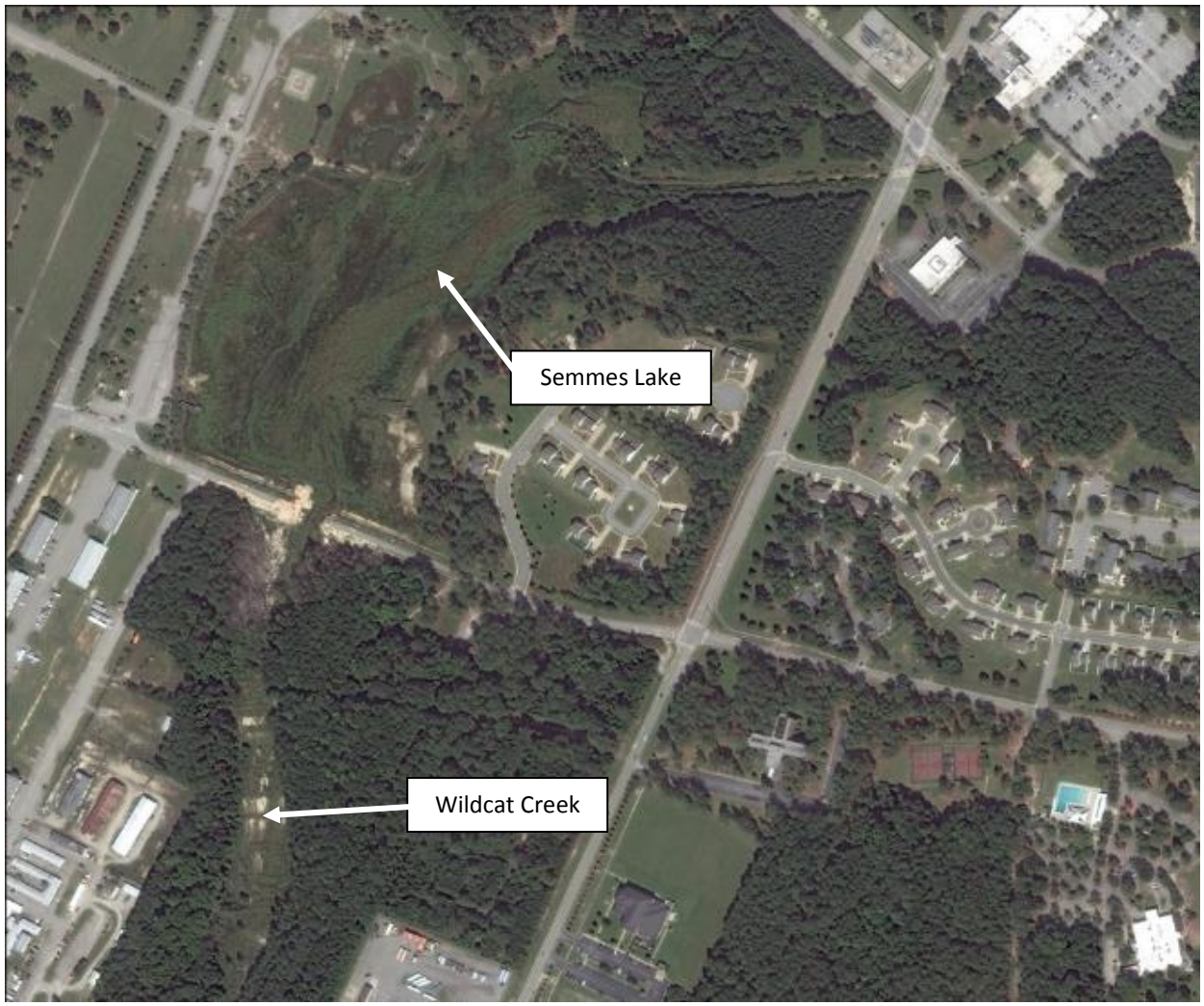
FINAL

ENVIRONMENTAL ASSESSMENT

REPLACEMENT OF SEMMES LAKE DAM

Fort Jackson, South Carolina



Prepared by USACE Charleston District

For Fort Jackson

October 2017

U.S. ARMY CORPS OF ENGINEERS CHARLESTON DISTRICT

Prepared by:

Jesse Helton — 18 OCT 2017

Jesse Helton
Planning and Environmental Branch
CESAC-PM-PL

Date

Reviewed by:

Diane Perkins — 18 Oct 2017

Diane C. Perkins
Chief, Planning and Environmental Branch
CESAC-PM-PL

Date

Fort Jackson

Reviewed by:

18 Oct 17

Andy Poppen:
Environmental Division Chief
DPW-ENV

Date

18 Oct 17

Robert F. Gay
Attorney-Advisor
Administrative Law Division
Office of the Staff Judge Advocate

Date

Approved by:

18 Oct 17

STEPHEN F. ELDER
COL, LG
Commanding

Date

This page intentionally left blank

Contents

Appendices

APPENDIX A: Soils

APPENDIX B: Wildcat Creek Watershed

APPENDIX C: Floodplain Data

APPENDIX D: Endangered Species

APPENDIX E: Cumulative Impacts documents

APPENDIX F: Comments Regarding the Draft EA

APPENDIX G: Comments from the Public Meeting

List of Preparers and Reviewers

Name	Affiliation	Duty
Jesse Helton	USACE Charleston District	Preparer
Alan Shirey	USACE Charleston District	Preparer
Mark Messersmith	USACE Charleston District	Reviewer
Diane Perkins	USACE Charleston District	Reviewer
Brian Nutter	USACE Charleston District	Reviewer
Jonathan Jellema	USACE Charleston District	Reviewer
Andy Poppen	Fort Jackson	Reviewer
Stanley Rikard	Fort Jackson	Reviewer
Bob Gay	Fort Jackson	Reviewer
Catheren Gill	USACE Wilmington District	Reviewer
Jennifer Owens	USACE Wilmington District	Reviewer
Ed Dunlop	USACE Wilmington District	Reviewer
John Hazelton	USACE Wilmington District	Reviewer

This page intentionally left blank

1. Introduction and Background

1.1. Location

The US Army Training Center and Fort Jackson is centrally located within the State of South Carolina in Richland County (Figure 1.1). The fort includes more than 52,000 acres, with more than 100 ranges and field training sites and 1,160 buildings. Soldiers, civilians, retirees and family members make up the Fort Jackson community. More than 3,500 active duty Soldiers and their 12,000 family members are assigned to the installation and make this area their home.

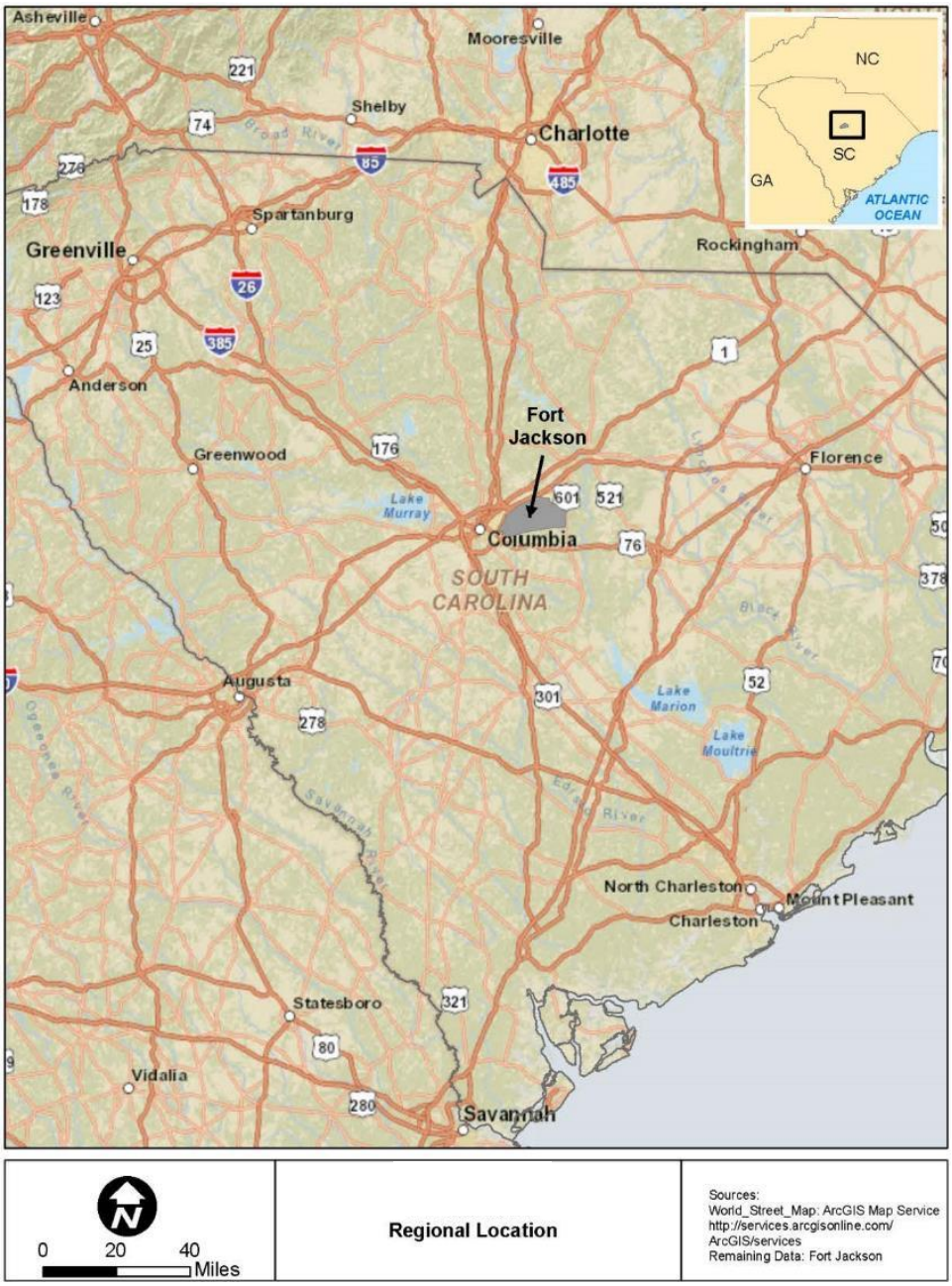


Figure 1.1 - Fort Jackson Regional Location

Semmes Lake is located off Semmes Road. The lake is located completely within the boundaries of Fort Jackson's Military Reservation and, as such, is owned by the Federal Government. Figure 1.2 shows the historic location of Semmes Lake and the locations of nearby Upper and Lower Legion Lakes.

Figure 1.2 - Semmes Lake Location Map.

1.2. History

1.2.1. Semmes Lake Description

Semmes Lake

Aerial photography supports the existence of Semmes Lake in 1935. Prior to the loss of Semmes Dam, the dam's earthen embankment was approximately 970 feet long with a structural height of approximately 27 feet. The crest consisted of a two-lane paved roadway that was approximately 45-feet wide and approximately 970 feet-long. The normal reservoir capacity was approximately 167.3 acre-feet, and the maximum capacity was approximately 317.8 acre-feet. The top of dam elevation varied between approximately 220.7 feet and approximately 222.0 feet NAVD88.

Although the original purpose of the dam is uncertain, it appears it was not planned for flood control, water supply, or environmental purposes. However, the lake did provide a stormwater detention function for runoff from upper Wildcat Creek.

Semmes Lake Dam was an earthen dam with a drop inlet and reinforced concrete pipe as the primary outlet. The outlet works was near the middle section of the dam and consisted of a concrete box, drop intake structure with trash-racks. The control mechanism was a gate that was operated from the top of the structure via a wheel. The connecting outlet was a reinforced concrete pipe (RCP) that discharged into a channel lined with riprap. The emergency spillway is along the left abutment of the dam and allows water to pass under the roadway. The emergency spillway flowed into a concrete-lined channel that discharged in the downstream area.

1.2.2. Rainfall Event and Semmes Dam Breach

During a four day period from October 2-5, 2015 a stalled mid-latitude weather system directed a stream of deep tropical moisture across South Carolina resulting in record-breaking rainfall totals across the state (Figure 1.3). The 4-day rainfall totals in the Columbia area exceeded the 1,000-year recurrence intervals as referenced to the point precipitation frequency estimates in NOAA Atlas 14 (CISA, 2015). Total rainfall exceeded 20 inches across much of eastern South Carolina (Figure 1.4). Semmes Dam failed during this historic storm event. Figure 1.5 shows a comparison of Semmes Lake prior to the storm and after the breach. Wildcat Creek currently meanders through the exposed Semmes lakebed and through the dam breach largely unimpeded.

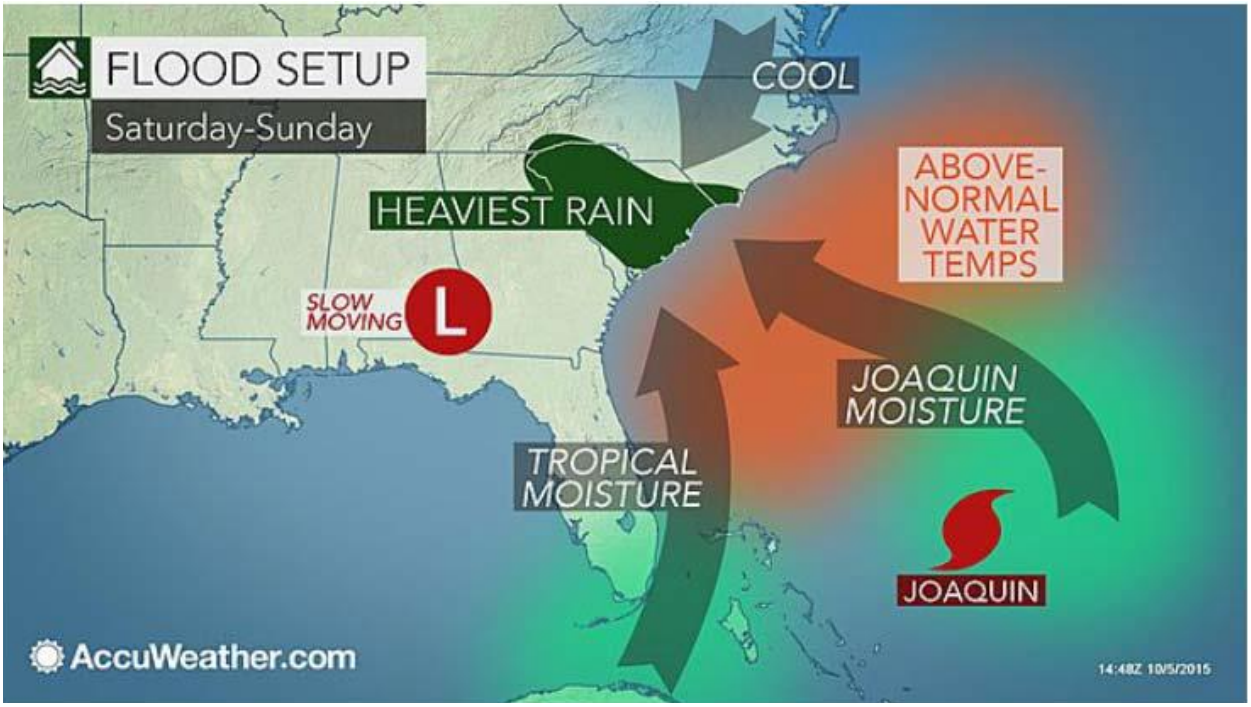


Figure 1.3 – October 3-4 2015 Confluence of Weather Systems Impaction North and South Carolina (source, AccuWeather.com 2015)

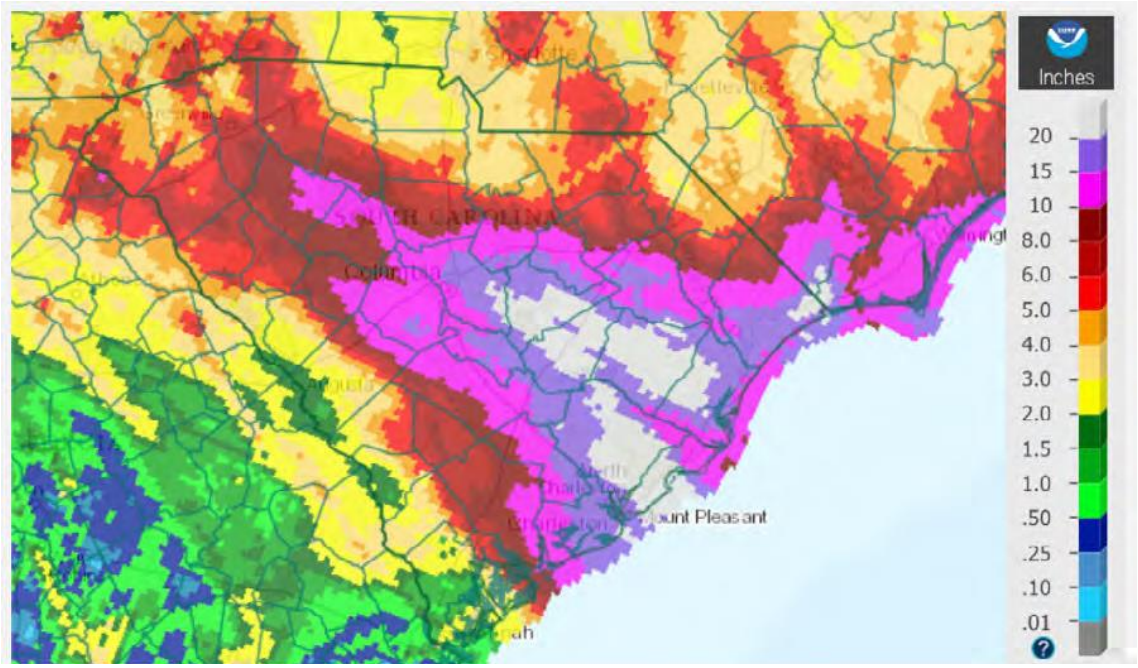


Figure 1.4 - National Weather Service Rainfall Totals for October 1-5, 2015 (source, NWS 2015)

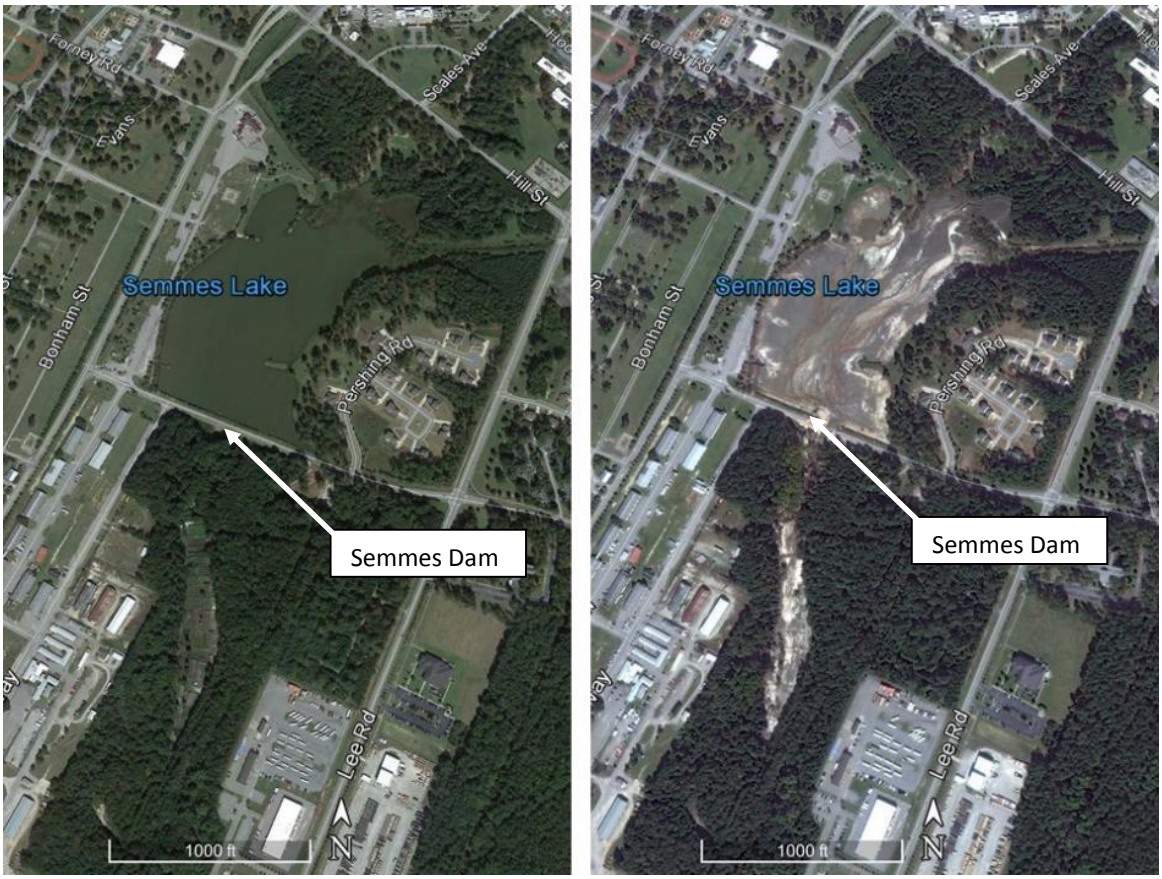


Figure 1.5 - Semmes Lake Before (left) and After Dam Breach (right).

1.3. Purpose, Need, and Scope of Analysis

The National Environmental Policy Act of 1969 (NEPA), 42 USC 4321, requires federal facilities to evaluate the environmental impacts of a proposed action and any associated alternative actions prior to implementation of the action.

This Environmental Assessment (EA) considers the direct, indirect, and cumulative effects of the Proposed Action, the No Action Alternative, and other alternatives over the reasonably foreseeable future. It was prepared in accordance with NEPA and implementing regulations of the Council on Environmental Quality (CEQ) (40 CFR 1500-1508), and the Army (32 CFR Part 651, Environmental Analysis of Army Actions). An EA is "routinely used as a planning document to evaluate environmental impacts, develop alternatives and mitigation measures, and allow for agency and public participation," and "provides the decision maker with sufficient evidence and analysis for determining whether a FNSI [Finding of No Significant Impact] or an EIS [Environmental Impact Statement] should be prepared." 32 CFR 651.20.

The purpose of this EA is to analyze and evaluate the environmental impacts of alternatives to address the loss of Semmes Dam due to historic flooding (described in Section 1.2.2).

This EA provides a discussion of the affected environment and the potential impacts to the physical, natural, and socioeconomic resources from the alternative actions for revitalization of Semmes Lake, and infrastructure associated with this area. The lake and the surrounding area were damaged due to the October 2015 flood event discussed in Section 1.2 of this document. This EA will help inform Army decision makers and the public of the environmental consequences from the alternatives for revitalization of Semmes Lake and infrastructure associated with these areas. Impacts are evaluated on both a direct and indirect basis and on a short-term, long-term, and cumulative basis. Specifically, the topics that are covered in this EA include:

- Land Use
- Climate
- Physiography, Geology, Topography, and Soils
- Surface Water and Stormwater
- Ground Water
- Floodplains and Wetlands
- Fish and Wildlife
- Vegetation
- Threatened and Endangered Species
- Air Quality
- Noise
- Cultural Resources
- Hazardous Materials & Hazardous Waste Management
- Environmental Justice and Socioeconomic Conditions
- Aesthetics and Recreation
- Cumulative Impacts

1.4. Alternatives Considered but Screened Out

An array of alternatives were considered to address the loss of Semmes Lake and the benefits it provided. Several of these alternatives were screened out early in the alternative formulation process

and are described below. The remaining alternatives were carried forward for additional analysis and evaluation and are described in Section 2 of this document.

Remove Breached Embankment (not carried forward for further analysis)
This alternative did not include replacing Semmes Dam and left the dry lake bed in place. The 1,000-foot section of Semmes Road between Essayons Way and Pershing Road would not be replaced and the remaining earthen dam embankment would be removed and the area re-graded. This alternative was rejected because it would provide little in the way of effective stormwater detention and because post-dam discharge rates would increase the 1% annual chance event (ACE) flood elevations downstream by approximately 2.1 feet.

Replace Semmes Road; No Lake or Dam (not carried forward for further analysis)
This alternative included rebuilding the Semmes Road embankment and restoring vehicular traffic. A 48 foot wide bridge would be placed under the road to provide passage of Wildcat Creek. This alternative was rejected because the Semmes Road embankment would have impounded over 50 acre-feet during the 0.2% ACE flood which would mean that the road embankment should be built to dam standards. A dam is defined as any structure impounding more than 50 acre-feet or is above 6 feet in height; any dam meeting either of these criteria must be constructed to the appropriate dam safety standards. Building a structure meeting the definition of a dam without meeting dam safety standards would be unacceptable. This alternative was also rejected because post-dam discharge rates would increase the 1% ACE flood elevations downstream by approximately 2.1 feet.

2. Alternatives and Proposed Action

2.1. Alternative 1 - No Action

A basic alternative to any proposed plan is the "No Action" alternative. The No Action Alternative would leave Semmes Lake (and the remnants of the dam) in its current condition (Figure 2.1). The breach in the dam would likely increase in width over time as a result of erosion due to surface runoff during storm events and erosion due to high flows in Wildcat Creek during storm events. There would be little effective stormwater detention. The downstream face of the dam would likely also continue to erode due to surface runoff during storm events.

2.2. Alternative 2- Remove Dam Embankment and Road; Provide Stormwater Detention

This alternative would remove the existing earthen embankment and the road remnants (Figure 2.2). In order to maintain the stormwater detention function that Semmes Lake provided prior to October 2015, stormwater detention ponds would be constructed. To achieve the required stormwater capacity, detention ponds would be needed both in the old lakebed and downstream of the former lake in the Wildcat Creek channel. Construction of the detention ponds would require construction of several earthen berms approximately 5 feet high.

2. 3. Alternative 3 - Rebuild the Dam and Road; Dry dam

Alternative 3 (Figure 2.3) consists of rebuilding the dam and operating it as a dry dam. A dry dam is a dam that holds minimal-to-no water during normal conditions. It would only hold water during storm events. This alternative would maintain the stormwater detention capacity that existed prior to October 2015. The alternative involves

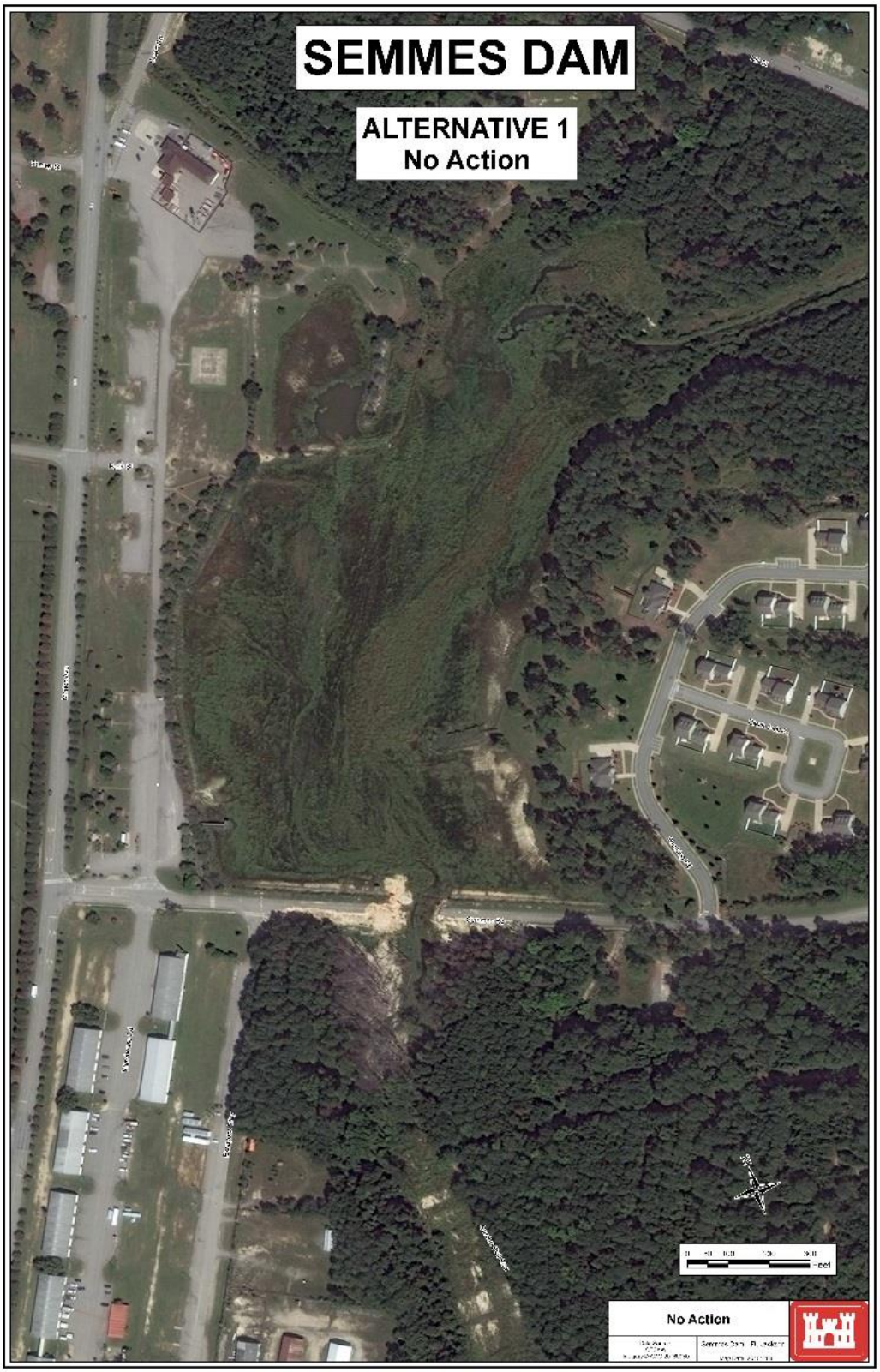


Figure 2.1. Alternative 1 - No Action Alternative

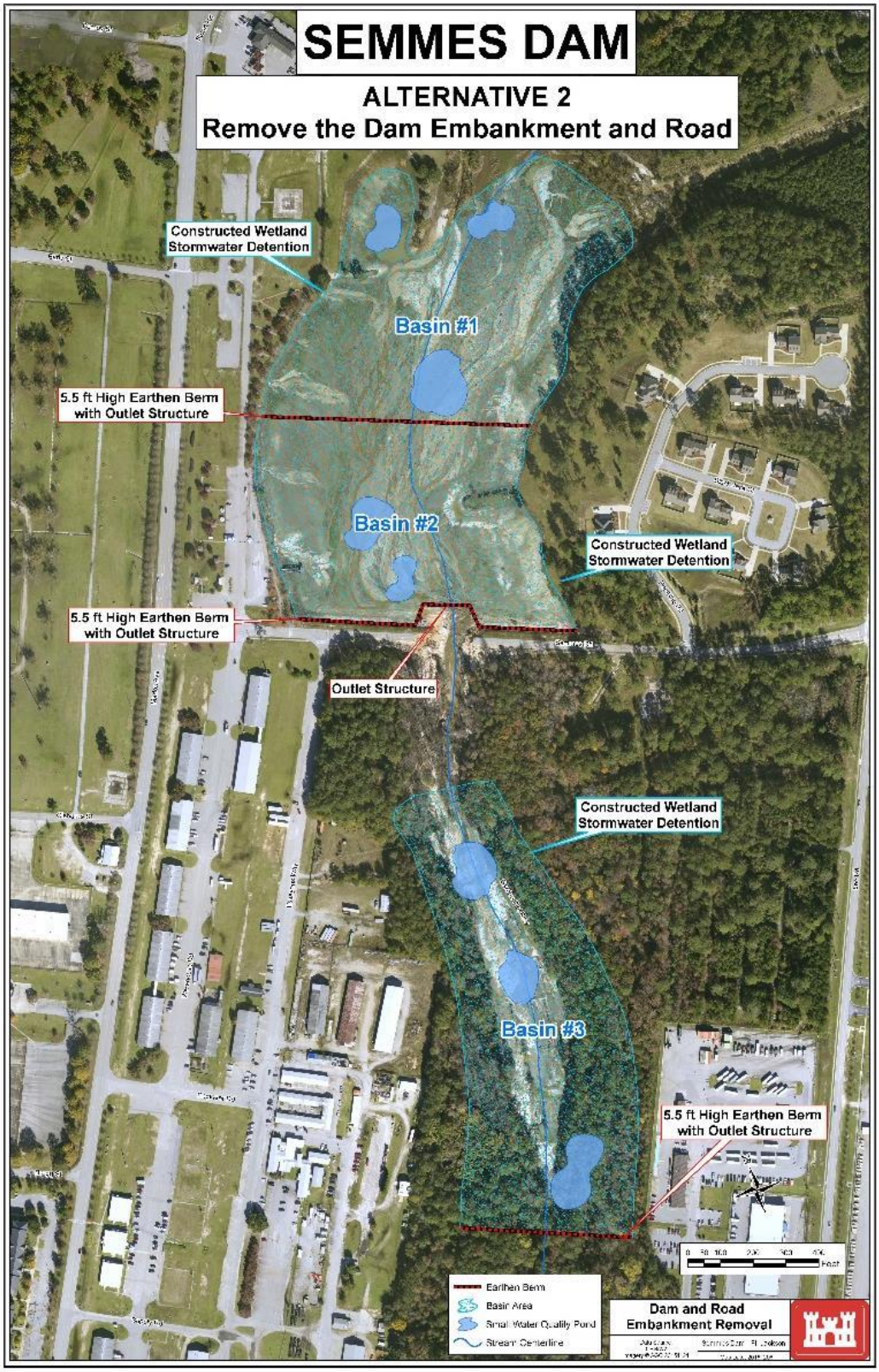


Figure 2.2 – Alternative 2 Remove Dam Embankment and Road; Provide Stormwater Detention (Conceptual Design)

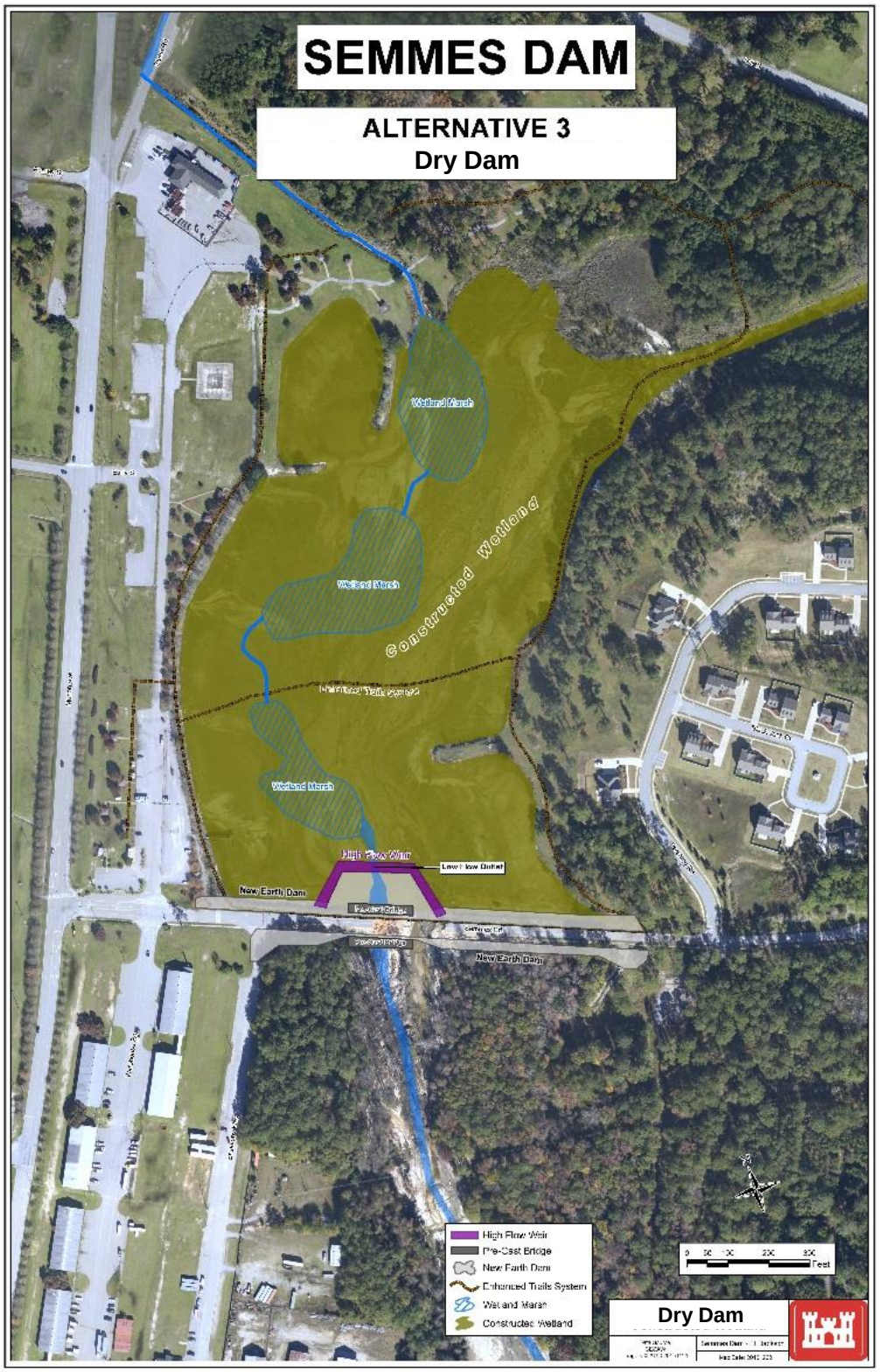


Figure 2.3 - Alternative 3 Rebuild the Dam and Road; Dry Dam (Conceptual Design)

rebuilding the dam with a high flow weir constructed in the Wildcat Creek streambed at the dam. This weir would allow normal low flows in Wildcat Creek to pass without causing any impoundment, but would progressively impound more water with increasing flow in Wildcat Creek associated with storm events. Water levels in the lakebed would be approximately 10 feet deep during the 4% annual chance storm event and would slowly drain after the storm. Because the dam would impound water during storm events, the dam would have to be constructed to current dam safety standards and would be listed on the National Inventory of Dams. Periodic inspections and maintenance would be performed as required by dam safety standards.

2. 4. Alternative 4- (Preferred Alternative) Rebuild the Dam and Road; Wet dam (Lake)

Fort Jackson is proposing to rebuild the Semmes Lake dam. This alternative would maintain the stormwater detention capacity that existed prior to October 2015. The dam would be an earthen embankment constructed to current dam safety standards and designed to not overtop during storms up to the calculated Inflow Design Flood (IDF) which is based on the Probable Maximum Precipitation (PMP – approximately equal to 0.001% chance storm {i.e., a one in 100,000 year event}), and, in turn, the Probably Maximum Flood (PMF – the runoff from the PMP). Consistent with dam safety standards, the PMF was properly reduced to the discharge at which dam failure will not significantly increase the downstream hazard. Analysis indicated that dam failure for the 80% PMF resulted in the same downstream hazard as the 100% PMF. The 80% PMF was used as the IDF for the spillway design. The dam would have a top elevation of 224½ feet above mean sea level and a top width of 48 feet. The upstream face of the dam would be protected by rip-rap. The spillway for the dam would be moved to the western end of the dam and would be constructed as a labyrinth weir. A labyrinth weir is designed to progressively pass more water with increasing inflow into the lake. The weir would be designed to maintain a normal pool elevation in the lake of 215 feet above mean sea level. Semmes Road and a pedestrian sidewalk would be re-constructed on top of the dam. The dam would be listed on the National Inventory of Dams and would undergo periodic inspections and maintenance as required by dam safety standards.

Figure 2.4 - Alternative 4 – Rebuild the Dam and Road; Wet Dam (Lake) (Conceptual Design)

3. Affected Environment and Environmental Consequences

The focus of this EA is Semmes Lake and the immediate vicinity. For additional information about environmental conditions at Fort Jackson, please see part 1 and 2 of the Programmatic Environmental Assessment Real Property Master Plan Forth Jackson, South Carolina http://jackson.armylive.dodlive.mil/files/2014/05/Fort-Jackson-Real-Property-Master-Plan-PEA-Pt-1.pdf and http://jackson.armylive.dodlive.mil/files/2014/05/Fort-Jackson-Real-Property-Master-Plan-PEA-Pt-2.pdf

3.1. Land Use

3.1.1. Affected Environment

This section describes the existing land use of the area surrounding Semmes Lake, taking into consideration both natural or human modified activities. Natural land use classifications include wildlife areas, forests, and other open or undeveloped areas. Human-modified land use classifications include residential, community, commercial, industrial, utilities, agricultural, recreational, and other developed uses. Land use is regulated by management plans, policies, and regulations determining the type and extent of land use allowable in specific areas and protection specially designated for environmentally sensitive areas.

Semmes Lake is located adjacent to three land use categories. Semmes Lake is bordered on the west shore, north shore, and the upper east shore by areas designated for community land use. The lower east shore is bordered by residential land use areas. Beginning adjacent to Semmes Lake Road and extending downstream along Wildcat Creek the land use category is industrial.

3.1.2. Environmental Consequences

Alternative 1 - No Action

The No Action Alternative would not result in any significant or negative impacts to land use compared to the existing state or the pre-flood state. Although this alternative would result in the loss of Semmes Lake, it would not have a significant impact on land use in the area. Land use designations or the ability to use the land would not change if this alternative was implemented.

Alternative 2 - Remove Dam Embankment and Road; Provide Stormwater Detention

Construction of Alternative 2 would not result in any significant or negative impacts to land use. Although this alternative would result in the loss of Semmes Lake, it would not have a significant impact on land use in the area. Land use designations would not change if this alternative was implemented.

Alternative 3 - Rebuild the Dam and Road; Dry dam

Construction of Alternative 3 would not result in any significant or negative impacts to land use. Although this alternative would result in the loss of Semmes Lake, it would not have a significant impact on land use in the area. Land use designations would not change if this alternative was implemented.

Alternative 4 (Preferred Alternative)

Construction of Alternative 4 would not result in any significant or negative impacts to land use. Construction of this alternative would generally return the area to its pre-flood condition. As such, no changes from historic (pre-flood) land uses in the area would occur with construction of this alternative.

3.2. Climate

3.2.1 Affected Environment

According to the Köppen climate classification, South Carolina is classified as a humid subtropical climate. The predominant climatic factors are the Installation's location in the lower latitudes and its proximity to the Appalachian Mountains to the west, which block the approach of unseasonable cold weather in the winter. Columbia, located in central South Carolina, typically experiences its coldest month in January with an average high of 55 °F and warmest month in July with an average high of 92 °F. The average annual temperature is approximately 75 °F while on average receiving 48 inches of precipitation per year, mostly during June, July, and August. During these months, the city of Columbia receives between five and five-and-one-half inches of rain per month. In general, the state of South Carolina has warmed by one-half to one degree (F) over the last century; however, this increase is less than that of most of the nation (USEPA 2016). It is expected that in the coming decades, changing climate in South Carolina will lead to an increase in the number of unpleasantly hot days, an increase in heat-related illness, an increase in inland flooding, a decrease in crop yields, and harm to livestock (USEPA 2016).

3.2.2. Environmental Consequences

Alternative 1 - No Action

The No Action Alternative would not result in any significant environmental impacts on climate because the greenhouse gas emission would not change significantly, over time, from the current condition. The No Action Alternative would lead to a minor long-term decrease in the climate change resiliency of the area by providing undependable stormwater detention. Adequate stormwater detention provides protection from more frequent severe storms and flooding associated with climate change, which increases the climate change resiliency of the area.

Alternative 2 - Remove Dam Embankment and Road; Provide Stormwater Detention, Alternative 3- Rebuild the Dam and Road; Dry dam, and Alternative 4 (Preferred Alternative)

Construction of any of the action alternatives would not result in any significant or negative environmental impacts on climate, and would not cause changes to the area's climate. Construction of any action alternative would increase the climate change resiliency of the area by providing reliable stormwater detention. Adequate stormwater detention provides protection from more frequent severe storms and flooding, associated with climate change, thereby increasing the climate change resiliency of the area. Minimal amounts of greenhouse gases would be created during construction of any action alternative. Best management practices (discussed in the air quality section) would be followed to reduce greenhouse gas emissions due to construction. Construction of any action alternative would lead to no long-term increase in greenhouse gas emissions.

3.3. Physiography, Geology, Topography, and Soils

3.3.1 Affected Environment

Fort Jackson contains two physiographic provinces: the Piedmont Plateau and the Atlantic Coastal Plain. Fort Jackson is located in the northwestern portion of the Atlantic Coastal Plain, referred to as the "Sand Hills", which joins with the Piedmont Province running north and west. The Sand Hills are a region of low to moderate relief and gently rolling plains with numerous streams and springs that are fed by groundwater. Local relief in the high plains of the reservation is largely between 165 and 250 feet. Slopes are predominately between three and eight percent at Fort Jackson. In the areas along narrow stream valleys, slopes commonly exceed 15 percent. The highest elevation on the Installation is 540

feet above sea level in the west-central portion of Fort Jackson; the lowest point is less than 160 feet above sea level occurring in the floodplain of Colonels Creek in the southeastern portion of Fort Jackson. The second physiographic province, known as the Piedmont Plateau also contains numerous streams and water bodies. Ridge tops are broad sloping gentle to moderate toward the streams. The stream floodplains are often narrow. The Fall Line, a zone which marks the boundary between the younger, softer sediments of the Coastal Plain Province and the ancient, crystalline rocks of the Piedmont Province, lies approximately four miles west of the cantonment area.

Rocks in the Piedmont Plateau are shale and schist, rather than true slate. The principal rock type is argillite and fine-grained rock with a high content of silica and alumina. The principal geologic formation in the Sand Hills is the Tuscaloosa, which consists of unconsolidated marine deposits of light-colored sands and kaolin clays. Most of the soils at Fort Jackson are formed from sediment of the Tuscaloosa. A layer of Quaternary sand terrace overlies the Tuscaloosa formation, which lies upon a complex of old metamorphic and igneous rock. The Tuscaloosa complex generally consists of clay strata overlying unconsolidated sands. Near the northern boundary of the installation, the older crystalline rocks of the Carolina Slate Group outcrop at the surface. In the northwestern portions of Fort Jackson, Pleistocene sands and gravel are present at the ground surface.

Soils serve a critical role in the natural and human environment, affecting vegetation and habitat, water and air quality, and the success of the construction and stability of roads, buildings, and shallow excavations. A soil survey conducted by the United States Department of Agriculture (USDA) concluded that soils in the Fort Jackson coastal plain are predominantly well drained on the higher plains and side slopes and somewhat poorly drained in the valleys. These soils have a sandy surface layer and a predominantly loamy sub-soil.

Semmes Lake Soils

The soils surrounding Semmes Lake are classified as Pelion-Johnston-Vaucluse soils. The soils along the tail waters of Semmes Lake are classified as Urban Complex. Areas classified as Urban Complex generally consist of more than 85% impervious surfaces. However, this classification can also include areas that are mostly fill material other than soils and some areas in which the profile has only been slightly altered by cutting, filling or grading. A soil map and descriptions of Soil Classifications found adjacent to Semmes Lake are included in Appendix A.

3.3.2. Environmental Consequences

Alternative 1 - No Action

The No Action Alternative would result in no significant impacts to physiography, topography, or geology. Erosion of the old dam and areas downstream of the old dam, would lead to minor negative impacts to soils. Erosion of the old dam and areas directly downstream of the old dam would result in transport of sediment downstream which would have negative, short-term impacts to soils until these areas are fully stabilized. Excessive sediment deposition can bury fish and wildlife habitat downstream of Semmes Dam and change the conveyance of stormwater during rain events.

Alternative 2 - Remove Dam Embankment and Road; Provide Stormwater Detention, Alternative 3 - Rebuild the Dam and Road; Dry dam, Alternative 4 (Preferred Alternative)

Construction of any of the action alternatives would not result in any significant or negative environmental impacts on physiography, topography, geology, or soils. Construction of any of the action alternative would provide a long-term positive environmental impact by allowing sediments from runoff to settle out of suspension during high flow events, thereby reducing sedimentation downstream of the dam. During construction of any action alternative, best management practices would be followed to reduce erosion and runoff.

3.4. Surface Water and Stormwater

3.4.1 Affected Environment

Fort Jackson lies within the boundaries of the Congaree River and the Wateree River basins in the City of Columbia. Streams at Fort Jackson are typical of those found in the Coastal Plain Province. The surface pattern is linear branching and streams occupy relatively broad valleys with gentle regional gradients to the south and southeast. Eventually, all streams leaving Fort Jackson flow into either the Wateree River or the Congaree River. The confluence of these rivers forms the Santee River. The Santee River continues in a southeasterly direction, eventually emptying into the Atlantic Ocean south of Georgetown, South Carolina.

There are four surface water drainage systems on the installation. All of the streams that are present on the eastern half of the reservation flow into Colonels Creek, a major tributary of the Wateree River, which flows southeastward across the installation. The other major surface water drainage system, Gills Creek, flows slightly southwesterly across the northwestern quarter of the installation. After leaving the installation, Gills Creek flows south through a series of lakes and is joined by Wildcat Creek prior to reaching the Congaree River. Wildcat Creek drains the major portion of the cantonment area. Semmes Lake was located on Wildcat Creek. The southern part of the installation is drained by the upper reaches of Cedar Creek and Mill Creek.

Semmes Lake has a watershed of 1.56 square miles, see Appendix B (Figure 1). The drainage above the dam is defined by an urban network of concrete pipes, culverts and ditches. From the dam, Wildcat Creek flows south under Washington and Ewell Roads. The 3,700 feet reach between Semmes and Ewell Roads consist of a low-lying floodplain and is undeveloped.

Below Ewell Road, Wildcat Creek flows west to Fort Jackson Blvd. This 3,000 feet reach of Wildcat Creek roughly defines the boundary line of Fort Jackson. The Kings Grant residential sub division is located south of Wildcat Creek along this boundary. About 650 feet upstream of Fort Jackson Blvd is an abandoned railroad embankment with a single 10 feet by 10 feet box culvert. This embankment is over 40 feet high and was noted as a potential restriction to flow. From Fort Jackson Blvd, Wildcat Creek continues west under Interstate I-77 and Shady Lane to join with Gills Creek below Lake Katherine. Semmes Dam is 2.25 miles upstream of the confluence of Wildcat Creek with Gills Creek. Gills Creek continues to flow south to join the Congaree River and then the Santee River. Gills Creek has a watershed area of 74.5 square miles at its confluence with the Congaree River.

The Semmes Lake Dam watershed is highly developed with institutional facilities, low and high density housing, and grassed open park areas. Based on the 2011 National Land Cover Dataset, the percentage of developed area including grassed areas within the watershed is 82%. Additional development within

the Semmes watershed is limited because most of the available land is within low-lying floodplains adjacent to Wildcat Creek. The streamflow characteristics of Wildcat Creek at the dam site are flashy and typical of urban watersheds with high impervious areas and a high percentage of piped storm drains.

Fort Jackson does not lie within an area controlled under a Coastal Zone Management Program (CZMP). Therefore, Fort Jackson's on-Post operations and activities are not managed or controlled by the CZMP.

3.4.2. Environmental Consequences

Alternative 1 - No Action

The No Action Alternative would lead to no changes from the current, post-breach conditions of the stormwater and surface water at Semmes Lake; however, the No Action Alternative would result in making permanent a long-term change in the handling of storm and flood waters. Increases in turbidity and increased downstream sedimentation are expected to occur until remnants of Semmes Dam and areas just downstream of Semmes Dam stabilize. The historic detention function of Semmes Lake has been lost. Selection of the No Action Alternative would lead to an increase in the 1% annual chance exceedance (ACE) flood levels downstream of Semmes Dam (Table 3.1). In addition, nuisance flooding downstream would likely become more prevalent, as shown in Table 3.1.

Table 3.1. Downstream Peak Surface Water Elevations, Previous Semmes Dam and No Dam

No.	Location	Previous Semmes Dam				No Dam at Semmes Road				Difference			
		1%	4%	10%	50%	1%	4%	10%	50%	1%	4%	10%	50%
1	Below Semmes	200.1	199.6	199.5	199.2	200.8	200.5	200.3	199.7	0.7	0.9	0.8	0.5
2	Up Washington Rd	191.3	189.1	188.2	186.8	191.8	191.4	190.8	188.3	0.5	2.3	2.6	1.5
3	Dn Ewell Rd	182.9	180.0	179.2	178.1	184.8	180.6	179.5	178.5	1.9	0.6	0.3	0.4
4	Kings Grant	182.7	178.0	175.3	173.8	184.8	179.6	176.0	174.2	2.1	1.6	0.6	0.4
5	Up RR Embankment	182.6	177.3	171.3	166.4	184.7	179.1	173.3	167.1	2.1	1.8	2.0	0.7
6	Dn RR Embankment	168.6	167.6	166.0	165.0	168.8	167.9	166.2	165.3	0.2	0.3	0.2	0.3
7	Up I-77	158.1	156.9	155.9	154.4	158.1	156.8	156.0	154.8	0.0	0.0	0.0	0.4
8	Junction Gills Creek	158.2	156.9	156.0	153.6	158.2	156.9	156.0	153.6	0.0	0.0	0.0	0.0

(Difference in feet, elevations in feet, NAVD 88) (A 2-D HEC-RAS model was used to determine the peak water surface elevations downstream of Semmes Dam at the eight reference locations identified in Appendix B (Figure 2). The RAS model simulations included the SCS frequency storms. The two model scenarios included; 1) the previous Semmes Dam and 2) no dam embankment with Wildcat Creek flowing unregulated at Semmes Road. The results are provided in Table 3.1.)

Alternative 2 - Remove Dam Embankment and Road; Provide Stormwater Detention

Construction of Alternative 2 would cause temporary changes to stormwater and surface water during construction. These impacts would consist of a short-term increase in turbidity and increased downstream sedimentation during construction that would subside shortly after construction activities cease. After construction, Alternative 2 would have a long-term positive impact to surface water and stormwater by reinstating storm water detention, and allowing sediment to settle out of stormwater runoff. Several wetlands would be constructed or expanded in the footprint of Semmes Lake and downstream of Semmes Road. These wetlands would improve the quality of water moving through them. Stormwater detention would be increased from the current condition and would match that of

Semmes Lake prior to the October 2015 breach. Best management practices such as silt fencing, mulching, temporary seeding and other erosion control practices would be implemented during construction to reduce impacts to water quality.

Alternative 3 - Rebuild the Dam and Road; Dry dam

Construction of Alternative 3 would cause temporary changes to stormwater and surface water during construction. These impacts would consist of a short-term increase in turbidity and increased downstream sedimentation during construction that would subside shortly after construction activities cease. After construction, Alternative 3 would have a positive long-term impact surface water and stormwater by reinstating stormwater detention, allowing sediment to settle out, and controlling erosion of the old dam and downstream areas. Stormwater detention would be increased from the current condition and would match that of Semmes Lake prior to the October 2015 breach. Best management practices such as silt fencing, mulching, temporary seeding, and other erosion control practices would be implemented during construction to reduce impacts to water quality.

Alternative 4 (Preferred Alternative)

Construction of Alternative 4 would cause temporary changes to stormwater and surface water during construction. These impacts would consist of a short-term increase in turbidity and increased downstream sedimentation during construction that would subside shortly after construction activities cease. After construction, Alternative 4 would have a positive long-term impact to surface water by reinstating storm water detention, allowing sediment to settle out of stormwater, and controlling erosion of the old dam and downstream areas. Stormwater detention would be increased from the current condition and would match that of Semmes Lake prior to the October 2015 breach. Best management practices such as silt fencing, mulching, temporary seeding and other erosion control practices would be implemented during construction to reduce impacts to water quality.

3.5 Ground Water

3.5.1. Affected Environment

Fresh groundwater is generally plentiful at Fort Jackson. The Tuscaloosa Formation, of the Upper Cretaceous age, underlies all of Fort Jackson and is the primary source of groundwater in the area. The formation consists of inter bedded, generally unconsolidated, fine to coarse sand and clay, causing groundwater to occur under both unconfined and confined (i.e., artesian) conditions. Groundwater occurs under water table conditions in the upper part of the zone of saturation. At a depth ranging from 100 to 250 feet, the permeable sand zones are frequently overlain by less permeable clay zones, and the groundwater exists under artesian conditions. Small quantities of groundwater may be available in the alluvial deposits along major streams. Fort Jackson is not located within a recharge area for a sole-source aquifer.

3.5.2. Environmental Consequences

Alternative 1 - No Action, Alternative 2 - Remove Dam Embankment and Road; Provide Stormwater Detention, Alternative 3 - Rebuild the Dam and Road; Dry dam, and Alternative 4 (Preferred Alternative)

Selection of the No Action Alternative or construction of any of the Action Alternatives would not result in any significant or negative environmental impacts on ground water, as none of the alternatives would

cause impacts to ground water. Semmes Lake did not provide a water source that would need to be replaced and the lake had no significant impact to ground water in the area.

3.6 Floodplains and Wetlands

3.6.1. Affected Environment

One hundred-year floodplains have been designated along all of the major waterways on Fort Jackson. These include lands along Gills Creek, Mill Creek, Cedar Creek, Wildcat Creek, and Colonels Creeks. Sections of developed areas, downstream of Fort Jackson, within the Wildcat Creek floodplain are shown on excerpts from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Richland County (FEMA, 2017) (Appendix C).

Development activities in regulatory floodplain areas are limited in accordance with Executive Orders (EO) 11988 and 11990. An analysis of the preferred alternatives for Semmes Lakes' compliance with these EOs is included in Appendix C. Also included in Appendix C is a draft Finding of No Practicable Alternative (FONPA) required by EO 11988 and Army policy.

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. 33 CFR 328.3(c)(4). These areas are known to support both aquatic and terrestrial species. Wetlands and other surface water features, which may include intermittent and perennial streams, are generally considered "waters of the United States" by USACE, and under their definition of "jurisdictional waters," are protected under Section 404 of the Clean Water Act and EO 11990.

Wetlands on Fort Jackson are non-tidal and are defined as occurring on floodplains along rivers and streams, in isolated depressions surrounded by dry land, along the margins of lakes and ponds, and in other low-lying areas where precipitation sufficiently saturates the soil (USEPA, 2012c).

The focus of Fort Jackson's wetlands management program is protection and maintenance of habitat. Per EO 11990, Fort Jackson's goal is to ensure "no net loss" of wetland acreage. Wetlands are likely present within the former lakebed of Semmes Lake. The area is currently undergoing a significant shift in its hydrologic regime due to the loss of the dam. Many of these areas may ultimately dry out. However, as the new course of Wildcat Creek is established, wetlands will likely develop along the new floodplain, within the old lakebed.

A jurisdictional determination has been conducted for the Semmes Lake area, and areas defined as "waters of the United States" are present. Required authorizations have been verified by USACE.

3.6.2. Environmental Consequences

Alternative 1 - No Action

Selection of the No Action Alternative would lead to changes from the current conditions regarding wetlands and floodplains within and around Semmes Lake. Wetlands are present within the bed of the former Semmes Lake site. With no action, the area will experience a significant shift in its hydrologic regime and waters of the United States due to the loss of Semmes Dam. Many of these areas may ultimately dry out; however, as Wildcat Creek establishes its new course, wetlands will likely develop

along the new floodplain, within the old lake bed. Selection of the No Action Alternative will have negative impacts on floodplains/flood insurance mapping and would require a Letter of Map Revision for the effective FEMA Flood Insurance Rate Maps. Loss of stormwater detention capacity, when compared to stormwater detention before Semmes Dam failed, would likely lead to an increase in the footprint of the downstream floodplain (Table 3.1). While this may have a positive impact to the natural environment, it would likely have a negative impact to the socioeconomic well-being of downstream communities and residents due to changes in flood insurance requirements. By selecting the No Action Alternative, it is anticipated that there would be an increase in the downstream FEMA 100-year flood elevations. Selection of the No Action Alternative would also increase the downstream FEMA 1% annual chance flood elevation and would have negative consequences for safety due to the loss of stormwater detention.

Alternative 2 - Remove Dam Embankment and Road; Provide Stormwater Detention

Alternative 2 would have a long-term negative impact to some waters of the United States and a long-term positive impact to stormwater detention. Several stormwater detention areas would be constructed in the floodplain downstream of Semmes Road. The construction of these detention areas would result in permanent fill being placed in waters of the United States. Temporary negative impacts to the floodplain of Semmes Lake immediately down stream of Semmes Road would occur during construction of the downstream detention areas. After completion of construction stormwater detention would match that of Semmes Lake prior to the October 2015 breach. As such, the floodplain downstream of Semmes Lake would remain unchanged and there would be no change in the flood elevations. Prior to construction, any required authorizations under Section 404 of the Clean Water Act will be obtained and appropriate mitigation secured, as may be necessary.

Alternative 3 - Rebuild the Dam and Road; Dry dam

Construction of Alternative 3 would result in negative impacts to some waters of the United States as a small amount of jurisdictional areas (approximately 0.6 acres) would be permanently filled during construction to ensure the new structure meets current dam safety standards. Construction of Alternative 3 would have a positive long-term impact to stormwater detention as it would roughly match the detention capacity of Semmes Lake prior to the October 2015 breach. As such, the downstream floodplain of Semmes Lake would remain unchanged and there would be no change in flood elevations. Prior to construction, any required authorizations under Section 404 of the Clean Water Act will be obtained and appropriate mitigation secured, as may be necessary.

Alternative 4 (Preferred Alternative)

Alternative 4 would have negative long-term impact to some waters of the United States. These negative impacts are due to a small amount of jurisdictional areas being permanently filled during construction (approximately 0.6 acres). Construction of alternative 4 would return most of the footprint of Semmes Lake to the open water present prior to the breach of the dam, with a fringe of wetlands that would form along the banks of Semmes Lake once the lake was refilled. Impacts to waters of the United States from construction of this alternative are outlined in Table 3.2. Construction of Alternative 4 would have a positive long-term impact to stormwater detention as it would match that of Semmes Lake prior to the October 2015 breach. As such, the downstream floodplain of Semmes Lake would remain unchanged and there would be no change in the flood elevations. This alternative is authorized under Nationwide Permit (NWP) 3. This alternative is also in compliance with Section 401 of the Clean

Water Act, as NWP 3 has been certified by the South Carolina Department of Health and Environmental Control.

Table 3.2 – Approximate waters of the United States impacts from construction of Alternative 4

Type and duration of impact to waters of the U.S.	Location	Approximate Acreage of waters impacted
Mechanized land clearing (permanent)	Downstream of Dam	1.3
Permanent Fill	Dam embankment and spillway	0.6
Temporary Fill	Earthen berm to divert Wildcat Creek during construction	0.5
Temporary Fill	Material stockpiles	5.6

3.7 Fish and Wildlife

3.7.1. Affected Environment

There is a wide variety of wildlife, including mammals, birds, fish, reptiles, amphibians, and invertebrates found on Fort Jackson that utilizes the diverse ecosystems present.

The majority of fish and wildlife species found on Fort Jackson are typical of the Sand Hills region of South Carolina. Over the years, baseline and planning level surveys have been performed for various classifications of flora and fauna.

Although not currently listed as threatened or endangered, Fort Jackson provides habitat for four rare animal species: Southeastern Myotis (*Myotis austroriparius*), Rafinesque's big-eared Bat (*Plecotus rafinesquii*), Loggerhead Shrike (*Lanius ludovicianus*), and Bachman's sparrow (*Aimphila aestivalis*). These species may be listed in the future if their numbers continue to decline.

Wildlife commonly observed around Semmes Lake includes white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), eastern gray squirrel (*Sciruus carolinensis*), wild turkey (*Melagris gallopavo*), great egret (*Ardea alba),* great blue heron (*Ardea herodias*), black rat snake (*Pantherophis obsoletus*) and bullfrog (*Lithobates catesbeiana*). Common fish species in the watershed include largemouth bass (*Micropterus salmoides*), Green sunfish (*Lepomis cyanellus*), and Mosquitofish (*Gambusia affinis*).

3.7.2. Environmental Consequences

Alternative 1 - No Action

The No Action Alternative would not result in any significant or negative impacts to fish and wildlife. Wildcat Creek would remain in its current state and the lake bed of Semmes Lake would be allowed to continue to naturally revegetate. Fish and wildlife species would naturally recolonize the creek, and historic lake bed.

Alternative 2- Remove Dam Embankment and Road: Provide Stormwater Detention

Construction of Alternative 2 would result in temporary construction related impacts to wildlife. During construction, any wildlife in the area likely would leave, but would be expected to return following construction. Construction of Alternative 2 wound not cause any long-term significant or negative impacts to fish and wildlife. Wildcat Creek would remain in its current state and the lake bed of Semmes Lake would be allowed to naturally revegetate in some areas and be planted with wetland vegetation in

other areas. Downstream of Semmes Lake, additional stormwater detention areas would be constructed. These areas would be planted with native vegetation. Fish and wildlife species would continue to naturally recolonize the creek, wetlands, and historic lake bed.

Alternative 3 - Rebuild the Dam and Road; Dry dam

Construction of Alternative 3 would result in temporary construction related impacts to wildlife. During construction, any wildlife in the area likely would leave, but would be expected to return following construction. Construction of Alternative 3 wound not cause any long-term significant or negative impacts to fish and wildlife. Wildcat Creek would remain in its current state and the lake bed of Semmes Lake would be allowed to continue to naturally revegetate in some areas, and be planted with wetland vegetation in other areas. No stormwater detention areas would be constructed downstream of Semmes Road, which would not lead to the creation of additional habitat for fish and wildlife to utilize. Fish and wildlife species would naturally continue to recolonize the historic lake bed.

Alternative 4 (Preferred Alternative)

Construction of Alternative 4 would result in temporary construction related impacts to wildlife. During construction, any wildlife in the area likely would leave, but would be expected to return following construction. Construction of Alternative 4 would not result in any long-term significant or negative impacts to fish and wildlife. Wildcat Creek would be dammed to restore Semmes Lake. Aquatic vegetation would reestablish in the bed of Semmes Lake and the edges of the lake would be allowed to naturally revegetate in some areas, and maintained as mowed grass in other areas (such as those adjacent to the picnic area). No stormwater detention areas would be constructed downstream of Semmes Road. Some species of fish and wildlife species would naturally recolonize the restored lake and other species of fish appropriate to pond/lake habitats (including sport fish such as largemouth bass, brim, and catfish) may be stocked to help establish self-sustaining populations.

3.8 Vegetation

3.8.1. Affected Environment

Fort Jackson contains a wide variety of vegetative communities ranging from upland hardwood forests to wetlands. Twelve vegetation cover types have been recognized for the purpose of cover type mapping, with at least 30 plant community types and 11 subtypes. The high diversity of plant communities includes the presence of some rare (G1 and G2) plant communities. These include the Sandstone Gravel Longleaf Pine Woodland and the South Carolina Central Longleaf Pine Woodland. The Installation's natural landscape is naturally vegetated except where development has cleared land, creating grassed areas in the cantonment area, along roadways, and on ranges. Over 720 flora species have been identified on Fort Jackson.

Fort Jackson can be classified generally into five primary terrestrial vegetative types: pine, pine/upland hardwood, upland hardwood, bottomland hardwood, and open field. Grassland areas on Fort Jackson include only a small amount in the cantonment area and alongside roads. Forest cover is the dominant vegetative type at Fort Jackson.

There are no significant vegetative resources within the footprint of Semmes Lake. Due to the recent change in condition from lake bed to intermittent dry ground, the footprint of Semmes Lake is covered in a mix of open ground and persistent aquatic plants in some areas and open ground and grass in other areas. Succession to more complex vegetative communities is likely to occur quickly in this area.

3.8.2. Environmental Consequences

Alternative 1 - No Action

The No-Action Alternative would not result in any significant or negative impacts to vegetation. Wildcat Creek would remain in its current state and the lake bed of Semmes Lake would continue to naturally revegetate. Natural vegetation within the floodplain of Wildcat Creek would provide a buffering effect on stormwater during small rain events, which is a minor positive impact of a vegetated floodplain.

Alternative 2 - Remove Dam Embankment and Road; Provide Stormwater Detention

Construction of Alternative 2 would not result in any significant or negative impacts to vegetation. Some mature hardwood trees would be removed downstream of Semmes Road to create additional stormwater detention areas. These areas would be replanted with native vegetation. The lake bed of Semmes Lake would be allowed to naturally revegetate in some areas and be planted with native wetland vegetation in other areas. Natural vegetation within the floodplain of Wildcat creek would provide a buffering effect on stormwater during small rain events, which is a minor positive impact of a vegetated floodplain.

Alternative 3 - Rebuild the Dam and Road; Dry dam

Construction of Alternative 3 would not result in any significant or negative impacts to vegetation. The lake bed of Semmes Lake would be allowed to continue to naturally revegetate in some areas, and be planted with wetland vegetation in other areas. Natural vegetation within the floodplain of Wildcat creek would provide a buffering effect on stormwater during small rain events, which is a minor positive impact of a vegetated floodplain.

Alternative 4 (Preferred Alternative)

Construction of Alternative 4 would not result in any significant or negative impacts to vegetation when compared to historic conditions at Semmes Lake. Wildcat Creek would be dammed to restore Semmes Lake. Existing terrestrial vegetation would die out, aquatic vegetation would reestablish in the bed of Semmes Lake and the edges of the lake would be allowed to naturally revegetate. No wetlands would be constructed downstream of Semmes Road.

3.9 Threatened and Endangered Species

3.9.1. Affected Environment

Under Section 7 of the Endangered Species Act (ESA), the Army must ensure that any Army action authorized, funded, or carried out is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of habitats on Fort Jackson. Appendix D contains a list of at-risk, candidate, endangered, and threatened species that have been listed by the USFWS as occurring or possibly occurring in Richland County, SC (lists last updated January 11, 2017) (USFWS 2017). Two federally listed endangered plant species are located on Fort Jackson, along with one endangered animal species; they are: Rough-leaved Loosestrife *(Lysimachia asperulaefolia)* and the Smooth Coneflower *(Echinacea laevigata)* and the Red-cockaded Woodpecker (RCW) (*Picoides borealis)*. However, no threatened or endangered species occur in the immediate vicinity of Semmes Lake. No land within Fort Jackson has been identified as critical habitat for any federally listed endangered or threatened species.

3.9.2. Environmental Consequences

Surveys for endangered species are regularly conducted by Fort Jackson and have revealed no endangered species in the vicinity of Semmes Lake. Habitat for the RCW is absent from the areas that would be impacted by the construction of any action Alternative. Three abandoned Red-cockaded woodpecker cavity trees are located near Semmes Lake. Appropriate habitat for Smooth Coneflower and Rough-leaved Loosestrife could exist within the now exposed bed of Semmes Lake; however, neither of these species have been observed in the area. The nearest population of Smooth Coneflower is approximately 11.5 miles away and the nearest population of Rough-leaved Loosestrife is approximately 9.5 miles away. Though the endangered plants species mentioned above have existed on the base for many years, there is no evidence that they have spread from their single known populations within Fort Jackson to other areas of Fort Jackson.

Alternative 1 - No Action, Alternative 2- Remove Dam Embankment and Road; Provide Stormwater Detention, Alternative 3- Rebuild the Dam and Road; Dry dam, and Alternative 4 (Preferred Alternative)

Due to the lack of habitat and the lack of proximity of known populations to Semmes Lakes, Fort Jackson has determined that neither RCW, Smooth Coneflower, nor Rough-leaved Loosestrife nor appropriate habitat for these species are present with the project area. Three abandoned Red-cockaded woodpecker cavity trees are located near Semmes Lake. These trees will not be impacted by construction of the preferred alternative. Therefore, there will be no effect to listed species from acceptance of the No Action Alternative or construction of any of the action alternatives.

3.10 Air Quality

3.10.1. Affected Environment

This section describes the existing air quality conditions at and surrounding Fort Jackson. Air quality is determined by the type and concentration of pollutants in the atmosphere, the size and topography of the air basin, and local and regional meteorological influences. The significance of a pollutant concentration in a region or geographical area is determined by comparing it to federal and/or state ambient air quality standards. Under the authority of the CAA (42 USC7401-7671q), the EPA has been given the responsibility to establish the primary and secondary National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for pollutants considered harmful to public health and the environment, with an adequate margin of safety.

The EPA developed NAAQS for six “criteria pollutants” to represent the maximum allowable atmospheric concentrations. The six “criteria pollutants” include: particulate matter (measured as both particulate matter [PM10] and, fine particulate matter [PM2.5]), sulfur dioxide (SO2), carbon monoxide (CO), nitrogen oxides (NOX), ozone (O_3), and lead (Pb). Short-term NAAQS (1-, 8-, and 24-hour periods) have been established for pollutants contributing to acute health effects, while long-term NAAQS (annual averages) have been established for pollutants contributing to chronic health effects. Federal regulations designate Air Quality Control Regions (AQCRs) in violation of the NAAQS as nonattainment areas. Federal regulations designate AQCRs with levels below the NAAQS as attainment areas. According to the severity of the pollution problem, nonattainment areas can be categorized as marginal, moderate, serious, severe, or extreme.

South Carolina represents one of 28 eastern US states under the Clean Air Interstate Rule (CAIR), a program to permanently cap emissions of SO_2 and NOx. CAIR assists South Carolina in meeting and

maintaining NAAQS for ground-level ozone and fine particle pollution (SO_2 and NOx contribute to the formation of fine particles (PM), and NOx contributes to the formation of ground-level ozone).

In 2004, Richland County exceeded the ozone standard and joined the "Early Action Compact" (EAC) with the EPA. This was an option provided by the EPA for areas currently meeting the one-hour ozone standard, like those in South Carolina, to attain the eight-hour ozone standard by December 31, 2007, and obtain cleaner air sooner than federally mandated. This option required an expeditious time line for achieving emissions reductions sooner than expected under the eight-hour ozone implementation rulemaking, while providing "fail-safe" provisions for the area to revert to the traditional SIP process if specific milestones are not met. By signing the EAC, EPA agreed to defer the effective date of the nonattainment designation for the participating area. In 2007, Richland County met all the milestones associated with the EAC and was classified as in attainment for all six criteria pollutants again. Today, the majority of South Carolina is in attainment for air quality.

3.10.2. Environmental Consequences

Alternative 1 - No Action

The No Action Alternative would not result in any significant or negative impacts to air quality.

Alternative 2 - Remove Dam Embankment and Road; Provide Stormwater Detention, Alternative 3 - Rebuild the Dam and Road; Dry dam, and Alternative 4 (Preferred Alternative)

Construction of any action alternative would lead to a short-term and insignificant increase in emissions during construction from the operation of construction equipment. No long-term increases in emissions would occur from construction of any action alternative, as construction equipment would no longer be in use once construction was completed. Best management practices such as reducing fugitive dust emissions, avoiding the unnecessary idling of construction equipment, and maintaining construction equipment in good operating condition would be implemented to reduce impacts to air quality.

3.11 Noise

3.11.1. Affected Environment

Noise is generally defined as undesirable sound. Sound is all around us, becoming noise when it interferes with normal activities such as speech, concentration, or sleep, is intense enough to damage hearing, or is otherwise intrusive. The type and characteristics of the noise, distance between the noise source and the receptor, the receptor sensitivity, and time of day all cause variations in human response. Noise is often generated by human activities that are fundamental to the quality of life, such as construction or vehicular traffic.

Noise associated with military installations is a factor in land use planning both on- and off-Post. Noise emanates from vehicular traffic associated with new facilities and from project sites during construction. Ambient noise (the existing background noise environment) can be generated by a number of noise sources, including mobile sources, such as automobiles and trucks, and stationary sources such as construction sites, machinery, or industrial operations. In addition, there is an existing and variable level of natural ambient noise from sources such as wind, streams and rivers, and wildlife.

Existing sources of noise around Semmes Lake include traffic, noise from residential areas and noise from adjacent community areas.

3.11.2. Environmental Consequences

Alternative 1 - No Action

The No Action Alternative would not result in any significant or negative impacts to noise levels.

Alternative 2- Remove Dam Embankment and Road; Provide Stormwater Detention, Alternative 3 - Rebuild the Dam and Road; Dry dam and Alternative 4 (Preferred Alternative)

Construction of any of the action alternatives would lead to a short-term increase in noise during construction. Best management practices such as limiting work to daylight hours and avoiding the unnecessary idling of construction equipment would be implemented to reduce noise during construction.

3.12 Cultural Resources

3.12.1. Affected Environment

A total of 702 archaeological sites have been identified on Fort Jackson, the majority resulting from timber tract surveys in the late 1980's and early 1990's. There are currently 66 archaeological sites eligible for listing on the National Register of Historic Places (NRHP) with the remaining 636 sites determined ineligible. These sites represent a time period extending back approximately 8000 years to the historic present (1966). There are 27 historic period cemeteries at Fort Jackson. There are no known Traditional Cultural Properties or Sacred Sites on Fort Jackson at this time.

A cultural resources survey was conducted by the South Carolina Institute for Archaeology and Anthropology at Semmes Lake. The field work was done during fall 2016 and a cultural resources site was found within the lake bed. After consulting with interested parties, site 38RD1447 will be managed as "unevaluated" due to partially inaccessible deposits (see SC State Historic Preservation Office 3OCT17 letter). This unevaluated status means the Army will monitor this site for impacts until such time a full evaluation is made.

3.12.2. Environmental Consequences

Alternative 1 - No Action

The No Action Alternative would not affect historic properties or cultural resources.

Alternative 2- Remove Dam Embankment and Road; Provide Stormwater Detention, Alternative 3 - Rebuild the Dam and Road; Dry dam, and Alternative 4 (Preferred Alternative)

None of the action alternatives would have an effect on historic properties or cultural resources as all known cultural sites would be avoided during construction.

3.13 Hazardous Materials and Hazardous Waste Management.

3.13.1. Affected Environment

For purposes of this EA, hazardous materials are those regulated under federal, state, Department of Defense, and Army regulations. Hazardous materials are required to be handled, managed, treated, or stored properly by trained personnel under the following regulations: Occupational Safety and Health Administration (OSHA) Hazardous Communication, 29 CFR 1900.1200 and 29 CFR 1926.59; and Department of Transportation Hazardous Materials, 49 CFR 172.101; EPA, 40 CFR 260, *et seq*.

The Installation is required to track annually the amount of hazardous materials used on the Installation and report to the regulatory agencies. Fort Jackson no longer has a permitted on-Post Hazardous Waste

storage facility. Fort Jackson is a RCRA Large Quantity Generator of hazardous waste and operates under permit number SC 3210020449, which was issued February 2010 and expires March 2020. Facility inspections are conducted each year by South Carolina Department of Health and Environmental Control (SCDHEC) and every four to five years by the EPA.

Military operations have been on-going at Fort Jackson for over 90 years. During that time the industrial operations have grown in support of the training programs. Former industrial activities generated wastes, which were stored, treated or disposed of at the Post according to standard practices at that time. As a result, there are multiple contaminated soil and/or groundwater sites on Fort Jackson. No contaminates are known to exist and no evidence of contaminates is present within the footprint of or vicinity of Semmes Lake.

3.13.2. Environmental Consequences

Alternative 1 - No Action

There are no known hazardous waste or hazardous material sites within the immediate vicinity of Semmes Lake. The No Action alternative would not result in any hazardous or toxic waste being created.

Alternative 2- Remove Dam Embankment and Road; Provide Stormwater Detention, Alternative 3 - Rebuild the Dam and Road; Dry dam, and Alternative 4 (Preferred Alternative)

There are no known hazardous waste or hazardous material sites within the immediate vicinity of Semmes Lake. As is typical with large rehabilitation projects, on-site hazardous materials will be present to support equipment operations. The majority of those materials will be in the form of petroleum-based fuels, oils, and lubricants. These materials will be handled and stored in accordance with all applicable state and federal laws and no negative environmental impacts resulting from these materials are expected as a result of construction. Best management practices, such as keeping equipment in good operating condition, properly storing and handling fuels, and cleaning leaks and spills immediately, would be implemented to reduce the risk of spills or other means of contamination during construction.

3.14. Environmental Justice and Socioeconomic Condition

3.14.1 Affected Environment

Semmes Lake and its tailwaters pass through or are adjacent to 4 census block groups (450790115012, 450790115011, 450790116031, and 450790115021) (Figure 3.1). Key demographic measures for these census block groups are given in Table 3.3. The total population from the US Census Bureau's American Community Survey (ACS) within these census block groups is 8776. The percent minority within the analyzed census block groups ranges from a low of 30% to a high of 58% (Table 3.3). The mean percent minority of the five census block groups is 48%. The percent low income within the analyzed census block groups ranges from a low of 0% to a high of 41% (Table 3.3). The mean percent below the poverty level within the census block groups of interest is 25%.

Table 3.3. Demographic data for census tracts near Semmes Lake.

Blockgroup ID:	450790115012	450790115011	450790116031	450790115021
State:	SC	SC	SC	SC
Total Population (ACS):	909	1861	4192	1814
Supplementary Demographic Index:	9% (16%ile)	16% (52%ile)	12% (28%ile)	18% (57%ile)
% minority:	55% (71%ile)	58% (73%ile)	30% (52%ile)	48% (67%ile)
% low income:	0% (0%ile)	41% (64%ile)	19% (28%ile)	40% (63%ile)
% linguistic isolation:	0% (44%ile)	0% (44%ile)	0% (44%ile)	0% (44%ile)
% less than high school:	0% (3%ile)	0% (3%ile)	1% (7%ile)	4% (21%ile)
% under age 5:	0% (3%ile)	0% (3%ile)	5% (37%ile)	14% (95%ile)
% over age 64:	0% (0%ile)	0% (0%ile)	13% (56%ile)	1% (1%ile)
Demographic Index:	28% (46%ile)	49% (73%ile)	25% (40%ile)	44% (68%ile

All data is taken from the USEPA's environmental justice mapping and screening EJSCREEN. Definitions of table metrics are available online at: https://www.epa.gov/ejscreen/overview-demographic-indicators-ejscreen

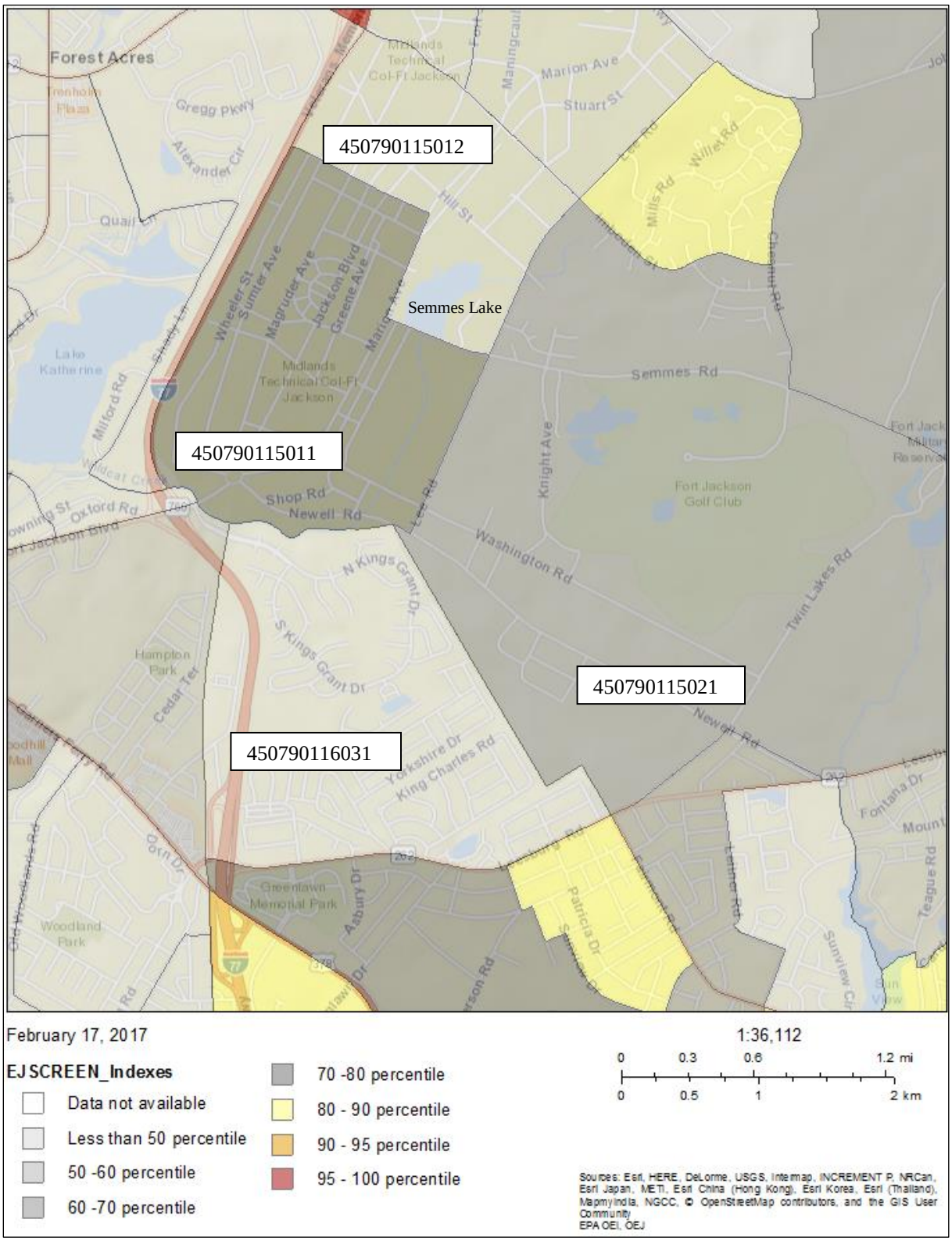


Figure 3.1 – Map of Semmes Lake showing EJ Screen Indexes for census block groups adjacent to and immediately downstream of the lakes.

3.14.2. Environmental Consequences

Alternative 1 - No Action

The No Action Alternative would not result in any disproportionately high and adverse effects on low income or minority populations. Selection of the No Action Alternative could have an impact on socioeconomic conditions if flood maps are changed to reflect the lost stormwater detention that Semmes Lake historically provided.

Alternative 2- Remove Dam Embankment and Road; Provide Stormwater Detention, Alternative 3- Rebuild the Dam and Road; Dry dam, and Alternative 4 (Preferred Alternative)

According to Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, each federal agency must conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, national origin, or income level. Agencies must assess whether disproportionately high and adverse effects would be imposed on minority or low-income areas by federal actions. In addition, Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks, requires Federal agencies to assess the environmental health and safety risk of their actions on children.

The area of impact from all action alternatives does not contain disproportionate populations of minority, juvenile, elderly, or low-income communities when compared to the surrounding area. The construction area is entirely within the boundaries of Fort Jackson.

Alternatives 2, 3, and 4 are not designed to create a benefit for any group or individual. There are no indications that construction of any action alternative would be contrary to the goals of Executive Order 12898, or would create disproportionately high and adverse human health or environmental impacts on minority or low-income populations of the surrounding community. Implementation of the proposed project would cause no significant adverse environmental impacts to any of the residents in the area regardless of race, national origin, or level of income of residents. In all, Fort Jackson has determined that in the absence of adverse impacts to human health, environmental health risks, and safety risk, construction of Alternatives 2, 3, or 4 would have no significant or disproportional negative impacts to any communities, including environmental justice communities or children. Schools/childcare facilities and hospitals are not disproportionately located near Semmes Lake.

3.15. Aesthetics, Recreation

3.15.1. Affected Environment

Historically, recreational opportunities were available on the Semmes Lake and the area was frequently used by residents of Fort Jackson and visitors to the installation. A small park is adjacent to the western side of Semmes Lake and a community for soldiers is located on the eastern side of the Lake. Since the Semmes Lake dam breached, the lake bed has been intermittently wet/dry. Vegetation has grown in the footprint of the Lake resulting in a dramatic change aesthetically. Wildcat Creek generally flows down the center of the exposed lakebed.

3.15.2. Environmental Consequences

Alternative 1 - No Action

Selection of the No Action Alternative would leave Semmes Lake in its current state. Natural revegetation of the area would continue. To some, this could be considered as a negative impact to the aesthetics of the park and adjacent communities, as views of water, such as lakes, are generally highly valued.

Alternative 2- Remove Dam Embankment and Road; Provide Stormwater Detention

Construction of Alternative 2 would create a series of wetlands in the area and remove what is left of Semmes Dam and the road bed. This alternative would provide more aesthetic benefits to the park and surrounding communities than the No Action Alternative. Natural revegetation of the area would continue and some standing water would be present. To some, this could be considered as a negative impact to the aesthetics of the park and adjacent communities, as views of water, such as lakes, are generally highly valued. This alternative would also have a long-term negative impact to recreation by leading to a loss of fishing and other water based recreational opportunities for soldiers and their families.

Alternative 3 - Rebuild the Dam and Road; Dry dam

Alternative 3 would create a series of wetlands and stormwater detention areas in the footprint of Semmes Lake. This alternative would provide more aesthetic benefits to the park and surrounding communities than the No Action Alternative. Natural revegetation of the area would continue and some standing water would be present. To some, this could be considered as a negative impact to the aesthetics of the park and adjacent communities, as views of water, such as lakes, are generally highly valued. This alternative would also have a long-term negative impact to recreation by leading to a loss of fishing and other water based recreational opportunities for soldiers and their families.

Alternative 4 (Preferred Alternative)

Alternative 4 would restore the aesthetics of the area to pre-flood conditions. Construction of this alternative would also restore fishing and other water-based recreational opportunities for soldiers and their families at the lake.

3.16. Maintenance

3.16.1. Affected Environment

All alternatives would require some type of maintenance. General maintenance requirements for each alternative are discussed below.

3.16.2. Environmental Consequences

Alternative 1 - No Action

Selection of the No Action Alternative would not result in an increase in maintenance activities at Semmes Lake. Selection of the No Action Alternative would result in Semmes Lake being left in its current state

Alternative 2- Remove Dam Embankment and Road; Provide Stormwater Detention

Maintenance for this alternative would include required maintenance to the storm water detention structures, particularly after storm events, management of vegetation on the earthen dikes, and likely mosquito abatement. Maintenance would include vegetation management and control of vegetation

on the earthen dikes that create the detention areas. Roots from large shrubs and trees would weaken the integrity of the earthen embankments and would be periodically removed. As the total length of berms is much longer than the length of the dry [Alternative 3] or wet [Alternative 4] dams this alternative would require the most maintenance and management of vegetation of the 4 alternatives. Any over washing of the berms, during high flow events, would require repairs to the structures. Debris and sediment would also need to be periodically removed from the stormwater detention areas. Measures to control mosquitos would likely include spraying for adult mosquitos and/or treatment of standing water for larval mosquitos.

Alternative 3 - Rebuild the Dam and Road; Dry dam

Maintenance for this alternative would include required maintenance to the dry dam, particularly after storm events, periodic maintenance and inspections, and management of vegetation on the dry dam, and likely mosquito abatement. Maintenance will require vegetation management on the earthen dam. Roots from large shrubs and trees would weaken the integrity of the earthen embankments of the dry dam and would be periodically removed. Additionally, any debris in the control structure or spillway would need to be periodically removed. Measures to control mosquitos would likely include spraying for adult mosquitos and/or treatment of standing water for larval mosquitos.

Alternative 4 (Preferred Alternative)

Maintenance for this alternative would include periodic maintenance and inspection. The labyrinth weir and spillway would need periodic debris removal but, no other maintenance after storm events would be required. Maintenance will require vegetation management on the dam. Roots from large shrubs and trees would weaken the integrity of the dam and would be periodically removed. This alternative would require the least maintenance of the considered alternatives. Additionally application of additional mosquito control measures to the area is not anticipated with this alternative, as the amount of stagnant water would be minimal and the presence of fish and other aquatic life that eat mosquito larva would further control mosquito populations.

3.17. Best Management Practices and Mitigation Measures

In order to reduce environmental impacts, best management practices and mitigation measures will be used during construction of any Action Alternative. These measures are outlined in Table 3.4.

Table 3.4. Best Management Practices (BMP) and Mitigation Measures

Resource	Impact	BMP and Mitigation Measures
Climate	Greenhouse gas emission	To reduce greenhouse gas emissions, the following BMPs will be utilized: reducing fugitive dust emissions, avoiding the unnecessary idling of construction equipment, and maintaining construction equipment in good operating condition.
Physiography, Geology, Topography, and Soils	Soil erosion during construction	To reduce soil erosion, the following BMPs will be utilized as needed: silt fencing and/or other control devices, mulching, removing sediment from pavement, temporary seeding, minimizing exposed soil during construction, and other applicable erosion control practices. All erosion control and sedimentation control measures must be in place prior to land disturbance. Thereafter, all controls will be maintained and functioning until the area is permanently stabilized. Materials used for erosion control [hay bales, straw, etc.] will be certified as weed free from the supplier. Weekly inspections will be performed to safeguard against failures. Once the project is initiated, it will be carried out expeditiously to minimize the period of disturbance. Upon project completion, all disturbed areas will be

		permanently stabilized with vegetative cover, riprap, or other erosion control methods. Where vegetation is removed, supplemental plantings will be installed following completion of the project. Such plantings will consist of appropriate native species.
Surface Water and Stormwater	Increased turbidity and sedimentation during construction	To reduce stormwater velocity, the following BMPs will be utilized as needed: limiting the amount of area disturbed at a time, staging and/or phasing of the construction sequence, installing sediment basins and sediment traps, diverting off-site flow around the construction site, and controlling the drainage patterns within the construction site. To reduce stormwater velocity, the following BMPs will be utilized as needed: surface roughening along slopes, sediment basins and traps, level spreaders, erosion control blankets, turf reinforcement mats, riprap, and staging and/or phasing of the construction sequence. All stormwater controls will be inspected on a weekly basis.
Air Quality	Emissions during construction	To reduce impacts to air quality, the following BMPs will be utilized: reducing fugitive dust emissions by taking the following measures; avoiding the unnecessary idling of construction equipment, imposing a strict slow speed limit for vehicular traffic in the construction site, wetting areas to reduce dust, and maintaining construction equipment in good operating condition.
Noise	Noise during construction	To reduce noise, the following BMPs will be utilized: limiting work to daylight hours and avoiding the unnecessary idling of construction equipment.
Hazardous Materials and Hazardous Waste Management	Waste during construction	To reduce Hazardous Materials and Hazardous Waste, the following BMPs will be utilized: keeping equipment in good operating condition, properly storing and handling fuels, and cleaning leaks and spills immediately. Measures will be taken to prevent POL products, trash, debris etc. from entering adjacent areas, wetlands and surface waters.
Cultural Resources	Erosion, wave action once water pool level is re-established	To protect the site known as 38RD1447, Ft. Jackson will complete a site protection project in the vicinity of the berm prior to the water level returning to full pool level. The project may include installing a geo-fabric, rip rap or other methods suitable for protection/stabilization. After full pool level is established this site shall be periodically monitored for impacts.

4. Cumulative Impacts

Cumulative impacts are defined in the Council on Environmental Quality (CEQ) regulation (40 CFR § 1508.7) as:

> *"…the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time."*

There are two known future projects within the Wildcat Creek watershed. Fort Jackson is currently evaluating alternatives to replace Upper Legion Lake and Lower Legion Dike, which were also damaged during the October 2015 flooding event. An EA has been released for public and agency review and comment. It is expected that the selected alternative from that analysis will not result in any loss of stormwater detention when compared to pre-flood (October 2015) conditions. Fort Jackson is also currently designing a new privatized army lodging hotel and associated parking for near term construction. A drawing giving an overview of the project can be found in Appendix E. An assessment of this action is provided in the Final Environmental Assessment for Implementation of the Privatization of Army Lodging Program at Fort Jackson, South Carolina, 2012. Construction of the hotel would lead to an increase in the amount of impervious surfaces and stormwater runoff within the Wildcat Creek watershed. However, measures to mitigate these increases, such as storage of stormwater, are planned to ensure that no net increase in stormwater runoff occurs.

The impacts of the preferred alternative for Semmes Lake, when considered along with present and future actions, are cumulatively insignificant because all impacts from the preferred alternatives are minor, temporary, construction related impacts and known present and future actions in the Wildcat Creek watershed are expected to be minor and largely construction related. The hotel development within the watershed will not negatively impact or increase storm water runoff and replacing Semmes Lake is also expected not to increase runoff. No additional development within the Wildcat Creek watershed is known at this time. Areas outside the drainage area of Semmes Lake, especially in the City of Columbia, are growing. If development trends in these areas continue and the amount of impermeable surfaces increases, the adequate stormwater detention provided by the preferred alternative would have a positive benefit to areas downstream of Semmes Lake. The overall lack of impacts associated with the preferred alternative, as documented here, demonstrates both the benign nature and limited impacts of this project. No significant negative impacts would occur from implementation of the preferred alternative. Restoration of positive impacts to recreation, aesthetics, erosion prevention, water resources, and stormwater detention would occur with construction of the preferred alternative. Any impacts associated with the preferred alternative, when added to other past, present, and reasonably foreseeable future actions, are collectively insignificant as the preferred alternative would return Semmes Lake to pre-storm conditions.

5. Public Involvement and Coordination

The CEQ regulations require that agencies “(a) make diligent efforts to involve the public in preparing and implementing their NEPA procedures and (b) Provide public notice of NEPA-related hearings, public meetings, and the availability of environmental documents so as to inform those persons and agencies who may be interested or affected.” (40 CFR 1506.6(a) and (b)). As such, this document has been coordinated with Federal, State, and local government agencies having jurisdictional responsibilities, or otherwise having an interest in the project; Native American Tribes; Local Home Owners Associations; media outlets; and the members of the public. All comments received during the comment period are included in Appendix F of the Final EA and responses to comments will be incorporated into the Final EA. In addition to required coordination, a public meeting was held on December 14, 2016 to inform the public of alternatives being considered for the rehabilitation of Semmes Lake. A summary of comments received from this meeting is included in Appendix G.

6. Conclusion

This EA evaluates the potential effects on the natural and human environment from the proposed rehabilitation of Semmes Lake. The EA examines the proposed action (preferred alternative), other viable alternatives, and a No Action Alternative. This EA evaluates potential long- and short-term effects on Land Use, Climate, Physiography, Geology, Topography, and Soils, Surface Water and Storm Water, Ground Water, Floodplains and Wetlands, Fish and Wildlife, Vegetation, Threatened and Endangered Species, Air Quality, Noise, Cultural Resources, Hazardous Materials & Hazardous Waste Management, Environmental Justice and Socioeconomic Conditions, Aesthetics and Recreation, and Cumulative Impacts.

Based on the foregoing, the proposed action (the preferred alternative) will not result in a significant effect on the quality of the human environment. Additionally, the implementation of best management practices and related mitigation measures (see section 3.16) will help to ensure that the minor negative effects to the individual factors discussed above are further minimized to the extent practicable. Therefore, an Environmental Impact Statement will not be required. If this conclusion is confirmed following circulation of this EA and consideration of comments, A Finding of No Significant Impact would be signed. Fort Jackson selected the preferred alternative for Semmes Lake by considering the following criteria (Table 6.1):

- Does the alternative meet dam safety standards (where applicable)?
- Does the alternative restore historic stormwater storage functions?
- Does the alternative have no significant impacts to environmental resources?
- Does the alternative cause no impacts and/or minimize impacts to the floodplain?
- Does the alternative provides recreational opportunity and aesthetic value for the community and visitors?
- Does the alternative minimize maintenance requirements?

Table 6.1 - Summary of Each Alternative's Ability to Meet Selection Criteria

Criterion	No Action	Alternative 2	Alternative 3	Alternative 4 (Preferred Alternative)
Does the alternative meet dam safety standards	Meets Criteria*	Meets Criteria*	Meets Criteria	Meets Criteria
Does the alternative restore historic stormwater storage functions	Does Not Meet Criteria	Meets Criteria	Meets Criteria	Meets Criteria
Does the alternative have no significant impacts to environmental resources	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria
Does the alternative cause no or minimize impacts to the floodplain	Does Not Meet Criteria	Meets Criteria	Meets Criteria	Meets Criteria
Does the alternative provides recreational opportunity and aesthetic value for the community and visitors	Does Not Meet Criteria	Does Not Meet Criteria	Does Not Meet Criteria	Meets Criteria
Does the alternative minimize maintenance requirements**	Meets Criteria	Does Not Meet Criteria	Does Not Meet Criteria	Meets Criteria

*Does not involve construction or maintenance of a dam so dam safety standards are not applicable.
**Information on maintenance requirements for each alternative is included in section 3.16.

7. References

Federal Emergency Management Agency
2017. FEMA Flood Map Service Center. https://msc.fema.gov/portal/search#searchresultsanchor. Search conducted February 7, 2017.

National Weather Service
2015. Historic rainfall and flooding October 2015. http://www.weather.gov/cae/HistoricFloodingOct2015.html. Search conducted February 7, 2017

U.S. Department of Agriculture.
2016. *Web Soil Survey.* http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm. Search conducted February 7, 2017.

U.S. Environmental Protection Agency
2016. What Climate Change means for South Carolina. https://www3.epa.gov/climatechange/Downloads/impacts-adaptation/climate-change-SC.pdf. Accessed October 25, 2016.

U.S. Environmental Protection Agency
2016. EJScreen. https://ejscreen.epa.gov/mapper/. Search conducted January 19, 2017.

U.S. Environmental Protection Agency
2016. EnviroMapper. http://www.epa.gov/emefdata/em4ef.home. Search conducted January 19, 2017.

U.S. Fish and Wildlife Service
2017A *Online-Wetlands Mapper*. http://www.fws.gov/wetlands/Data/Mapper.html. Search conducted January 07, 2017.

U.S. Fish Wildlife Service South Carolina Field Office
2016. Endangered, Candidate and At-Risk Species County Listings. http://www.fws.gov/charleston/EndangeredSpecies_County.html. Accessed February 7, 2017.