3.16 What types of Wetlands are found in the project study area?

3.16.1 What are wetlands?

The USACE and USEPA define wetlands 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 typically include swamps, marshes, bogs, and similar areas."[92]

The USACE, through Section 404 of the Clean Water Act, has regulatory authority over waters of the United States, including wetlands. This authority empowers the USACE to identify wetland/upland boundaries and to regulate alterations of jurisdictional wetlands. These boundaries are established in accordance with the methodology in the *1987 Corps of Engineers Wetlands Delineation Manual*.[93] An area must exhibit evidence of wetland vegetation, wetland soil, and wetland hydrology to be considered a wetland.

3.16.2 Why are wetlands important?

Wetlands are specifically protected by law because of the functions and values they provide with respect to:

- Hydrology (e.g., flood control, groundwater recharge and discharge, and dissipation of erosive forces);
- Water quality (e.g., removal of sediments, toxins, and nutrients);
- Food chain support and nutrient cycling (e.g., primary production and nutrient export/utilization);
- Wildlife habitat (e.g., breeding, rearing, and feeding grounds for fish and wildlife species); and,
- Socioeconomics (e.g., recreational, educational, aesthetic, and consumptive uses).

3.16.3 How were wetlands identified for this project?

The following GIS data layers were obtained for the purpose of identifying wetlands within the project study area:

- National Wetland Inventory (NWI) Maps;
- Soil data layers;
- U.S. Geological Survey (USGS) topographic maps;
- GIS data layer of the first and second order streams (obtained from SCDNR);
- 1999 false-color infrared aerial photography; and,
- 2005 false-color infrared aerial photography.

[92] U.S. Army Waterways Experimental Station Environmental Laboratory, *Corps of Engineers Wetlands Delineation Manual* (Washington, D.C.: Department of the Army, U.S. Army Corps of Engineers, 1987) Technical Report Y-87-1; (33 CFR §328.3[b]) and USEPA (40 CFR §230.3[t])
[93] *Ibid.*

Areas must have the following three characteristics to be considered wetlands:

- **Wetland vegetation**
- **Wetland soil type**
- **Wetland hydrology**

The NWI wetland layer was used to define wetlands until the reasonable alternatives were developed. At that point, the wetland boundaries were re-evaluated. For the eight alternatives, NWI mapping was overlain onto the aerial photography and a desktop review was performed using the soil maps, NWI maps, and aerial photography. Questionable areas that were indicated as wetland on the NWI map, but did not exhibit typical wetland signatures on the aerial photography were identified. The USGS topographic maps and the SCDNR stream data layer were used to map second and third order streams within the project study area. Field visits were then performed and the questionable areas were groundtruthed. During the field visit it was noted that some former wetland areas were effectively drained by ditches. Field notes were recorded at these locations and the project wetland map was revised to reflect these changes. Likewise, areas that were identified as upland on the NWI map, but were found to be wetland during the field visits, were revised on the wetland map accordingly. Additional information collected during the field visit included other impacts to wetland communities such as changes in the vegetative communities (i.e., former forested wetlands that have been cut and are currently secondary growth communities) and areas that have been ditched, but still meet the three basic criteria of jurisdictional wetlands.

As discussed in Chapter 2, each NWI wetland type within the project study area was assigned a numerical value between 1 and 10 by the ACT. This value was based on the potential quality of the wetland type. Areas that had been altered were also given a different value based on the wetland type and extent of impact in accordance with the values assigned to wetland types by the ACT members and changes were made to the database accordingly. The values of the wetlands were updated on the mapping when observations from the field visits concluded that the vegetative composition of a wetland had been altered by practices such as conversions to maintained utility corridors or silviculture. Once the updates to the wetland mapping were completed, the CAT used the resulting wetland base map to avoid and minimize impacts as well as quantify impacts. Wetlands and streams identified within the alternatives are indicated on Figure 3-36, page 3-139.

A field delineation will be performed within a 600-foot wide corridor along the Preferred Alternative. Wetland boundaries will be determined using the methodology described in the *1987 Corps of Engineers Wetlands Delineation Manual*, and marked with surveyors flagging labeled "Wetland Boundary". The wetland boundaries will be mapped using sub-meter accuracy Global Positioning System (GPS) equipment and a wetland map for the corridor will be produced. The wetland map and supporting documentation will be submitted to the USACE and a request for a wetland approximation will be provided.

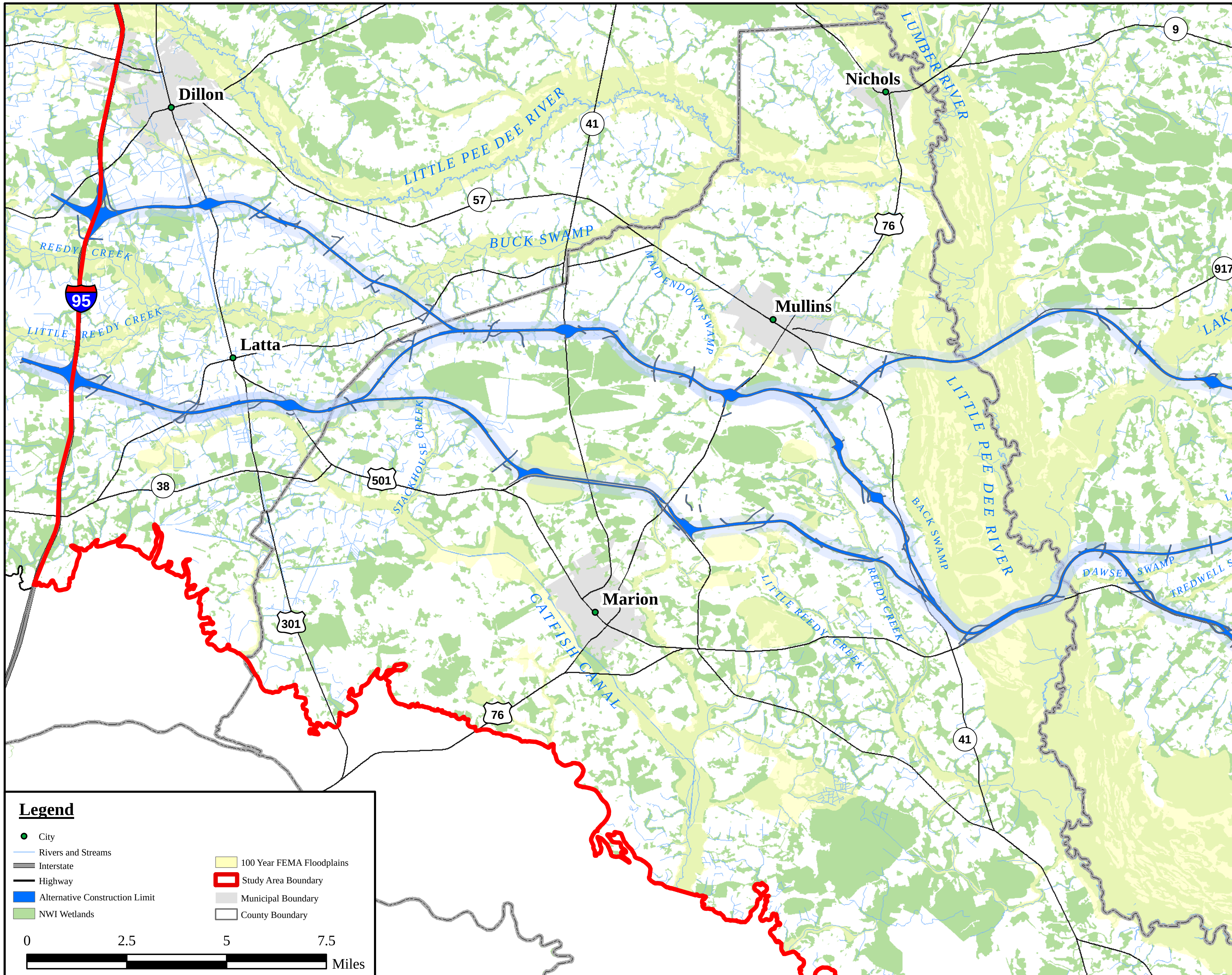

FIGURE 3-36
WETLANDS, STREAMS AND FLOODPLAINS

3.16.4 What wetland types were identified along the alternatives?

Wetlands and waters of the United States were categorized by general types according to various standard classification systems including *The Classification of Wetlands and Deepwater Habitats of the United States.*[94] The types of areas identified along the alternatives are described in the following subsections.

Aquatic beds

Aquatic beds are mostly permanently inundated areas that contain dense mats of vegetation. The vegetation may be rooted in the substrate or free-floating. Typical plant species found in aquatic beds include watermilfoil (*Myriophyllum* spp.), pondweed (*Potamogeton* spp.), bladderworts (*Utricularia* spp.), duckweed (*Lemna* spp.), and water-lily (*Nymphaea odorata*). Fully functional aquatic beds were assigned a value of 10, whereas partially drained systems received a value of 2.

Bay forests

Bay forests are wetlands that have high organic content in their soil and remain saturated or are frequently saturated during the growing season. Loblolly-bay (*Gordonia lasianthus*), sweet-bay (*Magnolia virginiana*), and red-bay (*Persea borbonia*) are the “bay” species typically found in the bay forest. Other species typically found in bay forests include swamp tupelo (*Nyssa sylvatica* var. *biflora*), red maple (*Acer rubrum*), bald-cypress (*Taxodium distichum*), and pond pine (*Pinus serotina*). This description also applies to Carolina bays, which are elliptical depressions that are roughly oriented from southeast to northwest. Fully functional Carolina bays were identified as a constraint and were avoided during alternative development. Fully functional bay forests were assigned a value of 7, whereas partially drained systems received a value of 4.

Bottomland hardwoods

Bottomland hardwoods are typically associated with floodplains of streams, but may also occur in low areas and along small surface drainages and are temporarily flooded or saturated during the growing season. Flooding or saturation usually occurs in the winter or early spring. Typical tree species include hickories (*Carya* spp.), overcup oak (*Quercus lyrata*), water oak (*Quercus nigra*), laurel oak (*Quercus laurifolia*), sweetgum (*Liquidambar styraciflua*), cottonwoods (*Populus* spp.), willows (*Salix* spp.), river birch (*Betula nigra*), and loblolly pine (*Pinus taeda*). Fully functional bottomland hardwoods were assigned a value of 9, whereas partially drained systems received a value of 6.

Bottomland hardwood

[94] Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe (1979), *Classification of Wetlands and Deepwater Habitats of the United States*, prepared for the USDI-FWS. FWS/OBS-79/31, Washington, D.C.

Deciduous shrub swamps

Deciduous shrub swamps are low lying areas dominated by woody vegetation typically less than twenty feet in height. Deciduous shrub swamp habitats are often formed due to some type of disturbance, either natural or man-made. They may be an early successional stage of the forested swamp, or they may be in a stable system. Typical woody plant species include alder (*Alnus serrulata*), button-bush (*Cephalanthus occidentalis*), willows, red maple, and sweetgum. Fully functional deciduous shrub swamps were assigned a value of 5, whereas partially drained systems received a value of 3.

Deciduous shrub swamp

Evergreen shrub bogs/pocosins

Evergreen shrub bogs are commonly referred to as pocosins. They are typically depressions or flat areas that are dominated by evergreen species such as sweet gallberry (*Ilex coriacea*), fetterbush (*Lyonia lucida*), titi (*Cyrilla racemiflora*), sweet-bay, red-bay, and zenobia (*Zenobia pulverulenta*). Fully functional pocosins were assigned a value of 7, whereas partially drained systems received a value of 4.

Hardwood swamp

Hardwood swamps

Hardwood swamps are defined as being associated with floodplains, occurring on low flats, sloughs, oxbows, and in isolated ponds. They may be flooded for several months during the growing season to nearly year round. Typical tree species include water ash (*Fraxinus caroliniana*), red maple, water hickory (*Carya aquatica*), overcup oak, bald cypress, swamp tupelo, sweetgum, sweet-bay, red-bay, and willow oak (*Quercus phellos*). Fully functional hardwood swamps were assigned a value of 9, whereas partially drained systems received a value of 6.

Flooded swamps/beaver ponds

Flooded swamps/beaver ponds generally contain a combination of hardwood swamps and aquatic beds that are a result of beavers altering the flow of perennial streams. These vegetative communities are the same as the previously described hardwood swamps and aquatic beds. Fully functional flooded swamps/beaver ponds were assigned a value of 5, whereas partially drained systems received a value of 3.

Freshwater marsh

Freshwater marshes

Freshwater marshes are defined as areas which are flooded for extended periods during the growing season and are dominated by herbaceous plant species. This includes freshwater tidal marshes, marshes within managed impoundments, and naturally occurring nontidal marshes. Typical plant species include sedges (*Carex* spp.), rushes (*Juncus* spp.), maidencane (*Panicum hemitomon*), arrow-arum (*Peltandra virginica*), smartweeds (*Polygonum* spp.), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria latifolia*), and cattails (*Typha* spp.). Fully functional freshwater marshes were assigned a value of 10, whereas partially drained systems received a value of 7.

Pine savannahs and wet flatwoods

Pine savannahs and wet flatwoods are wetland areas that have a high water table for a period of time during the growing season and are dominated by pine species, including slash pine (*Pinus elliottii*), pond pine, and loblolly pine. Generally no understory is present, or if present, it is very sparse. Typical herbaceous species include *Aristida* spp., toothache grass (*Ctenium aromaticum*), nutrushes (*Scleria* spp.), and beak rushes (*Rhynchospora* spp.). Fully functional pine savannahs and wet flatwoods were assigned a value of 8, whereas partially drained systems received a value of 4.

Pine savannah and wet flatwood

Ponds and borrow pits

Ponds and borrow pits are typically manmade, open water, or freshwater habitats. These water bodies are generally created by excavation activities, or altering stream or surface drainage flow. According to NWI mapping, and for purposes of this project, water bodies less than 20 acres in size fall into this category. Other freshwater systems are often found associated with ponds and borrow pits in the form of fringe wetlands. Fully functional ponds and borrow pits were assigned a value of 8, whereas partially drained systems received a value of 2.

Rivers and canals

Perennial streams and rivers are riverine systems that are permanently flooded. In general, however, the open water areas are either unvegetated, or include occasional beds of submerged or floating aquatic plants such as parrot's feather (*Myriophyllum* spp.), alligator weed (*Alternanthera* *philoxeroides*), duckweed, and algae. Intermittent streams are riverine systems that consist of streambeds that are seasonally flooded.

Rivers and canals within the vicinity of the alternatives include meandering and channelized unnamed intermittent streams and their tributaries along with the perennial streams and rivers. Some of the streams include Back Swamp, Brown Swamp, Brunson Swamp, Catfish Canal, Chinners Swamp, Cypress Branch, Dawsey Swamp, Joiner Creek, Lake Swamp, Little Pee Dee River, Loosing Swamp, Maidendown Swamp, Palmetto Swamp, Reedy Creek, Savannah Creek, Smith Swamp, Spring Swamp, Tredwell Swamp, and their tributaries. Natural streams were assigned a value of 8, and artificial canals received a value of 5.

Perennial stream

Savannahs & Wet Meadows

Savannahs & wet meadows are herbaceous areas which are flooded only briefly but which may be saturated for long periods during the growing season. Species include pitcher plants (*Sarracenia* spp.), sundews (*Drosera* spp.), pipeworts (*Eriocaulon* spp.), meadow-beauties (*Rhexia* spp.), orchids, yellow-eyed-grasses (*Xyris* spp.), asters (*Aster* spp.), and goldenrod (*Solidago* spp.). Fully functional savannahs and wet meadows were assigned a value of 10, whereas partially drained systems received a value of 7.

3.16.5 What kind of impacts would occur to wetlands as a result of this project?

Clearing and grubbing is the process of cutting and removing vegetation, including stumps, and then raking the soil to remove roots.

Wetland impacts associated with the project would include the placement of clean fill material into wetlands, temporary clearing of vegetation along the proposed roadway, and permanent clearing and grubbing of vegetation within the limits of the project. The fill material would be required to construct the roadbed and would result in the permanent conversion of the portion of the wetlands to uplands within the construction limits. Temporary clearing of wetlands would be required along the toe of the fill material to allow for maintenance of the required silt fencing which protects the adjacent wetlands from siltation during the construction period. The cleared areas would be allowed to re-vegetate with native wetland vegetation after the side slopes of the road are stable and the silt fencing has been removed.

Permanent clearing of vegetation would be performed where wetlands would be bridged. This would be done to prevent trees from growing under the bridges and potentially damaging the structures. Additional permanent clearing would be performed for a width of approximately 30 feet along both sides of the bridge for the same reason. This type of impact does not destroy the wetland, but does change the wetland type. For example, if a bridge is constructed through a hardwood swamp, the hardwood swamp could become a deciduous shrub swamp or a fresh water marsh after the removal of the trees.

3.16.6 How were the potential wetland impacts calculated?

To calculate the potential impacts associated with each Build Alternative, the conceptual construction limits for each of the alternatives was overlain onto the GIS wetland mapping and the areas of the "footprint" of the road within wetlands were calculated. The conceptual construction limits included: the main lines and associated frontage roads of the alternatives; the proposed interchanges; crossover roads, and other roads necessary to maintain access to property. It was assumed that all wetlands within the footprint would be filled, unless they are located within the 100-year floodplain associated with a stream or river, in which case an approximate bridge length was used to estimate the potential clearing impacts associated with bridges. Upon completion of the hydraulic studies for the Preferred Alternative, appropriately sized pipes or bridges would be installed at wetland crossings to maintain the historic hydrologic connections.

3.16.7 How many acres of wetland would be impacted by the project?

Table 3.46 provides the wetland types that would be impacted, the type of impact, and the wetland value for each alternative. As indicated in Table 3.46 on page 3-145, Alternative 3 would have the least amount of total wetland impacts, with Alternatives 1, 5, and 6 having basically the next lowest total wetland impacts. Alternatives 6 and 3 rank 1st and 2nd, respectively, in lowest wetland values. Many of the wetlands that would be impacted by the Build Alternatives consist of remnants of what were historically larger wetlands that have been reduced in size by the installation of drainage ditches in or near the wetlands, and drainage tile systems. These remnant wetlands received lower values as decided in consultation with the ACT. However, wetland systems associated with the larger streams and rivers that flow through the project study area were considered to be higher value wetlands.

Although wetlands are distributed all along the alternative alignments, there are wetland crossings on some of the alternatives that appear to account for the higher impact totals. All of the alternatives would cross Back Swamp and the Little Pee Dee River swamp. However, Alternatives 3 and 6 would have lower impacts to these systems than the others, which would result in less impacts to these high value hardwood swamp systems than at the U.S. Route 501 crossing of these same systems. A portion of the U.S. Route 501 crossing would be constructed on the existing alignment, however the increase in impacts would be the result of the curve in I-73 at Back Swamp that is required to get onto the existing U.S. Route 501 alignment, and the shift off of U.S. Route 501 through the swamp to avoid impacts to the Galivants Ferry Historic District.

Table 3.46
Potential Wetland Impacts in Acres and Wetland Values
Interstate73: I-95 to the Myrtle Beach Region

Wetland Type	Alternatives							
	1	2	3	4	5	6	7	8
Aquatic Beds								
Bridge Impact								
Fill Impact				0.3			0.3	
Bay Forests								
Bridge Impact	1.7		0.1	2.0		0.1	0.3	1.7
Fill Impact	63.4	52.9	49.5	71.5	49.3	53.1	57.4	67.1
Bottomland Hardwoods								
Bridge Impact	1.4	8.0	0.2	1.3	0.2	8.2	0.1	9.4
Fill Impact	50.3	53.0	34.6	44.6	44.4	43.3	38.8	58.9
Deciduous Shrub Swamps								
Bridge Impact		6.2	1.1			7.2		6.2
Fill Impact	4.1	6.0	14.5	8.1	3.0	17.5	7.0	7.1
Evergreen Shrub Bogs/Pocosins								
Bridge Impact		0.3		0.2		0.3	0.2	0.3
Fill Impact	44.3	37.9	34.2	57.6	42.6	29.5	55.9	39.5
Flooded Swamp/ Beaver Ponds								
Bridge Impact	1.8	1.8	1.8	0.2	1.8	1.8	0.2	1.8
Fill Impact	5.5	5.5	2.2	2.8	5.5	2.2	2.8	5.5
Hardwood Swamp								
Bridge Impact	33.3	34.0	26.8	33.2	32.5	27.8	32.4	34.8
Fill Impact	167.9	151.7	171.2	176.1	177.0	145.9	185.2	142.7
Pine Savannas & Wet Flatwoods								
Bridge Impact				0.2			0.2	
Fill Impact	18.5	58.8	37.3	66.1	33.5	62.5	81.2	43.8
Ponds & Borrow Pits								
Bridge Impact	3.2	2.2		3.2	2.2		2.2	3.2
Fill Impact	18.8	20.5	8.2	18.8	17.3	11.3	17.3	22.0
Rivers & Canals								
Bridge Impact	2.5	2.5	2.4	2.5	2.5	2.4	2.5	2.5
Fill Impact								
Savannas & Wet Meadows								
Bridge Impact	0.9	0.9		0.9	0.9		0.9	0.9
Fill Impact		0.3	0.3	7.2	0.3		7.1	0.3
Total Bridge Impact	44.8	57.0	32.3	43.9	40.1	47.8	39.2	61.8
Total Fill Impact	372.8	386.6	351.8	453.2	372.9	365.3	453.0	386.8
Total Wetland Impact	**417.6**	**443.6**	**384.1**	**497.1**	**413.0**	**413.1**	**492.2**	**448.6**
Wetland Values								
Bridge Impacts	363.5	460.9	257.6	365.4	334.7	375.9	336.4	490.7
Fill Impacts	2,556.0	2,408.5	2,228.5	2,847.0	2,481.4	2,212.5	2,769.3	2,486.1
Total Wetland Value	**2,919.4**	**2,869.4**	**2,486.1**	**3,212.4**	**2,816.1**	**2,341.4**	**3,105.8**	**2,777.7**

Source: THE LPA GROUP INCORPORATED, 2006

Alternatives 4 and 7, which rank last with the highest wetland impacts and impacted wetland values, both would follow a portion of the U.S. Route 501, located east of Marion. A previously impacted Carolina bay is situated on the west side of the bypass and a partially drained bay forest wetland is situated on the east side of the bypass. Because of the poor quality of these wetlands, they received low wetland values, however there is a substantial impact acreage associated with these systems. Alternatives 4 and 7 would not only impact these large wetlands, but would also cross Back Swamp and the Little Pee Dee swamp at U.S. Route 501.

Each of the Build Alternatives would cross high quality riparian wetland systems; however two significant systems that would be crossed by some of the alternatives are Buck Swamp and Lake Swamp. Buck Swamp would be crossed on new alignment by Alternatives 2, 6, and 8. However, these alternatives rank 5th, 3rd, and 6th, respectively, in wetland impacts, with only five acres between Alternatives 2 and 8, and 5th, 1st, and 3rd in wetland values. Although the impacts associated with the Buck Swamp crossing do not significantly increase the total wetland impacts for these alternatives, Buck Swamp is listed on the 303(d) list as an impaired waterbody and avoiding the crossing of this system would help minimize or avoid further degradation of the system. Although this crossing of the wetland system would be bridged, the opinion of the resource agencies suggested avoiding this crossing as it would contribute to habitat fragmentation.

Lake Swamp would be crossed on new alignment by Alternatives 2, 3, and 6. This crossing would be situated downstream of the existing S-23, and because the proposed new crossing would not be perpendicular to the wetland system, impacts associated with this crossing would increase wetland impacts for these alignments. This crossing would be on new alignment due to a shift in the alignment to avoid impacts to the community of Ketchuptown and a historic structure within it. As with the crossing of Buck Swamp on new alignment, the resource agencies have indicated that the crossing on new alignment would contribute to habitat fragmentation of this riparian wetland system.

All of the Build Alternatives would have impacts to wetlands. However, several alternatives can be grouped together based the similar potential impact acreage. For example, for the increase in impacts from Alternative 3 (the lowest impacts) to the next group of alternatives with lower impacts (Alternatives 5, 6, and 1, respectively), there is a range of impacts of approximately 8 percent. The next group of alternatives with similar impacts (Alternatives 2 and 8) would have a range of approximately 10 percent, and the two alternatives with the highest potential wetland impacts (Alternatives 7 and 4, respectively) would be approximately 10 percent apart. Overall, there is an approximately 30 percent difference in the wetland impacts between the lowest, Alternative 3, and the highest, Alternative 4.

As mentioned earlier, most of the impacts associated with the Build Alternatives would be to remnants of larger wetlands that have been previously impacted either by ditching or have been converted to managed timberland. Although these wetlands have been impacted and still meet the basic criteria for jurisdictional wetlands, many of the important functions that wetlands provide, such as flood storage and water quality functions have been diminished. The riparian wetland systems associated with streams that would be impacted consist of fully functional bottomland hardwoods and hardwood swamps, which were assigned the higher wetland values, and would result in the greatest loss of wetland functions. All of the alternatives would cross riparian wetland systems. As previously mentioned the Little Pee Dee River swamp, and Back Swamp would be impacted by all of the alternatives.

Alternative 1 would impact 12 riparian wetland systems, eight of which would include bridge impacts. Little Reedy Creek, Dawsey Swamp, Tredwell Swamp, Brunson Swamp, and Spring Swamp would be crossed at existing crossings which would minimize impacts, particularly habitat fragmentation. Two unnamed tributaries to Catfish Canal, The Gulley, Maidendown Swamp, Back Swamp, and Mill Branch would be constructed on new alignment and would contribute to habitat fragmentation. The Little Pee Dee River swamp crossing would be constructed partially on existing and new alignment.

Alternative 2 would impact 10 riparian wetland systems, eight of which would include bridge impacts. Cypress Branch and Loosing Swamp impacts would occur at existing crossings. Old Mill Creek, an unnamed tributary to the Little Pee Dee River, Buck Swamp, Back Swamp, and Dawsey Swamp would all be crossed on new alignment. The Little Pee Dee River swamp crossing would be constructed partially on existing and new alignment.

Alternative 3 would impact 9 riparian wetland systems, five of which would include bridge impacts. The crossings that would occur at existing alignments include Little Reedy Creek, and the Little Pee Dee River swamp. Crossings on new alignment include two unnamed tributaries to Catfish Canal, The Gulley, Maidendown Swamp, Lake Swamp, and Joiner Swamp.

Alternative 4 would impact 13 riparian systems, seven of which would include bridge impacts. The crossings that would occur at existing crossings include Little Reedy Creek, Smith Swamp, Reedy Creek, Dawsey Swamp, Tredwell Swamp, and Spring Swamp. Two unnamed tributaries to Catfish Canal, Stackhouse Creek, Back Swamp, and Mill Branch crossings would be on new alignment. The Little Pee Dee River swamp crossing would be constructed partially on existing and new alignment.

Alternative 5 would impact nine riparian systems with four of these crossings involving bridge impacts. Impacts to Little Reedy Creek and Loosing Swamp would occur at existing crossings. Two unnamed tributaries to Catfish Canal, The Gulley, Maidendown Swamp, Back Swamp, and Dawsey Swamp crossings would be on new alignment. Impacts to the Little Pee Dee River swamp would be constructed partially on existing and new alignment.

Alternative 6 would impact 10 riparian systems, seven of which would include bridge impacts. Impacts to Cypress Branch and the Little Pee Dee River swamp would occur at existing crossings. Impacts to Old Mill Creek, an unnamed tributary to the Little Pee Dee River, Buck Swamp, The Gulley, Maidendown Swamp, Back Swamp, Lake Swamp, and Joiner Swamp would occur on new alignment.

Alternative 7 would impact 10 riparian systems, five of which would include bridge impacts. Impacts to Little Reedy Creek, Smith Swamp, Reedy Creek, and Loosing Swamp would occur at existing crossings. Two unnamed tributaries to Catfish Canal, Stackhouse Creek, Back Swamp, and Dawsey Swamp would be impacted on new location. Impacts to the Little Pee Dee River swamp would occur partially on existing and new alignment.

Alternative 8 would impact 13 riparian systems, 10 of which would involve bridge impacts. Cypress Branch, Dawsey Swamp, Tredwell Swamp, Brunson Swamp, and Spring Swamp would be crossed at existing roadways. An unnamed tributary to the Little Pee Dee River, Old Mill Creek, Buck Swamp, The Gulley, Maidendown Swamp, Back Swamp, and Mill Branch would be crossed on new alignment. Impacts to the Little Pee Dee River swamp would occur partially on existing and new alignment.

3.16.8 What kind of impacts would occur in streams as a result of this project?

Impacts to streams would vary depending on the size of the channel and the size of the watershed. Impacts to large streams and rivers with a regulated floodway would generally be minimal as these channels are typically bridged. In many cases, the entire channel could be spanned, however, for wide rivers, such as the Little Pee Dee River, bridge pilings might be required within the channel. For smaller streams where bridges may not be warranted, appropriately sized pipes or box culverts may be installed for the road crossings. The use of pipes or culverts, and bridge lengths is determined by performing hydraulic studies and dependent on several factors, such as watershed size, the presence of FEMA regulated floodplains and floodways.

What are intermittent and perennial streams?

<u>Intermittent streams</u> typically flow for only a portion of the year, while <u>perennial streams</u> flow year-round.

3.16.9 How much stream impact would result from the project?

Impacts to streams are measured in terms of the length of the stream that would be affected, measured along the centerline of the stream and reported as linear feet of impact. As with the wetland impact calculations, the length of the stream sections that lay within the conceptual construction limits were measured along the centerline of the channel. Table 3.47, page 3-149, provides the estimated number of perennial and intermittent streams crossed and the linear footage of impacts streams for each alternative.

As indicated in Table 3.47, page 3-149, Alternative 7 would have the least impacts to first and second order streams followed by Alternatives 4 and 5, respectively. Alternatives 1, 2, and 3 have the next lowest impacts with basically the same impact. Alternatives 6 and 8 would have the highest stream impacts.

Table 3.47
Potential Stream Impacts
Interstate73: I-95 to the Myrtle Beach Region

	Alternatives							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Perennial Streams								
Number of Crossings	52	54	48	35	49	53	32	57
Linear Feet	17,285	16,188	15,443	12,306	15,076	16,557	10,098	18,396
Intermittent Streams								
Number of Crossings	8	8	10	10	7	11	9	9
Linear Feet	1,852	3,060	3,770	4,761	3,060	3,770	5,969	1,852
Total Number of Crossings	**60**	**62**	**58**	**45**	**56**	**64**	**41**	**66**
Total Stream Impact	**19,137**	**19,249**	**19,213**	**17,068**	**18,137**	**20,327**	**16,068**	**20,247**

Source: THE LPA GROUP INCORPORATED, 2006.

Streams with regulated floodplains and floodways would be bridged and it is anticipated that modifications would be minimal. Modifications such as the installation of coffer dams in stream channels in order to construct footings for bridge pilings might be required. However, these modifications would be temporary and would be removed upon completion of the bridge construction.

What are First and Second Order Streams?

First order streams are headwater streams with no tributaries.
Second order streams are formed by the confluence of two or more first order streams.

First and second order streams located between the Little Pee Dee River and S-22 generally flow in a westerly direction and eventually flow into the river. Streams between the Little Pee Dee River and I-95 generally flow east or west into the river or into Buck Swamp. Because the alternatives are oriented roughly in a northwest to southeasterly direction, stream impacts would be unavoidable. Based on a review of aerial photography, USGS topographic maps, and limited ground truthing, many of the smaller streams within the project study area have been channelized and straightened. Some have been impacted to the point that the historical connection to their floodplains and adjacent wetlands has been severely altered, such as portions of Catfish Canal. However, many streams, including those referred to in the previous discussion of riparian wetland systems, remain intact.

Based on the preliminary data available, it is anticipated that Alternatives 1 and 3 would have a minimum of 12 bridges, Alternative 3 and 7 would have 9 bridges, Alternatives 4 and 6 would have 14 bridges, Alternative 5 would have 7 bridges, and Alternative 8 would have 17 bridges associated with stream

3.16.10 What indirect impacts to wetlands and streams would occur as the result of the project?

Based on a review of the projected land use maps generated by the land use models, indirect impacts to wetlands and streams could occur as the result of development of currently vacant lands along the Build Alternatives. Similarly, indirect impacts associated with the No-build Alternative could also occur according to the models. The areas of projected development were brought into the I-73 base mapping and potential impacts to streams and wetlands were calculated. Because these are projected developments and no siteplans are available, stream impacts are reported as the number of potential stream impacts instead of linear feet. Table 3.48 on page 3-150 provides the results of the analysis.

As shown in Table 3.48, page 3-150, Alternative 4 would have the least indirect wetland impacts, followed by Alternatives 3, 1, 2, 6, 7, 8, and 5, respectively. However, the indirect impacts associated with the Build Alternatives are basically the same as there is only an approximately 11-acre difference between the Alternative 4, the lowest, and Alternative 5, the highest. Alternative 4 would have the least number of stream impacts with Alternative 1 following with the next lowest impact. Alternatives 3 and 7 would have the third lowest number of stream impacts followed by Alternatives 2, 6, and 8 having the fourth lowest number of impacts. Alternative 5 would have the highest potential stream impacts. This ranking of alternatives is based on estimated impacts to tracts identified by the land use models and does not take into consideration any avoidance or minimization requirements that would be required for obtaining Section 404 permits and Section 401 water quality certifications prior to construction on the sites.

Based on a review of aerial photography and the land use projections, indirect wetland impacts associated with the alternatives would occur at the edges of previously disturbed wetlands and generally would not contribute to the loss of wetlands along the high value riparian wetland systems such as Buck Swamp, Lake Swamp, and the Little Pee Dee River swamp. Development could occur along the edges of these systems that might affect their water quality. Riparian wetland systems could be impacted by the construction of road crossings to access developable lands. Development encroaching into the edges of these systems could affect their water quality. It is not anticipated that indirect impacts would occur to intact Carolina bays within the project study area due to the availability of other suitable development sites and the high level of protection provided by regulatory agencies. However, current definitions of jurisdictional wetlands may leave “isolated” Carolina bays unprotected by state and federal regulations.

The amount of anticipated indirect impacts to wetlands would be relatively consistent among the Build Alternatives with only an approximate 11 percent difference between the lowest and highest impacts. The models indicate that development would be scattered along the alternatives and heavier near Dillon, Latta, Mullins, Marion, Aynor, and between Conway and S.C. Route 22. For all of the Build Alternatives, concentrations of development would potentially occur along U.S. Route 76 between Marion and Mullins with some development along U.S. Route 501 from Marion to Latta. For Alternative 1, most of the development in the southern portion of the project would occur between S.C. Route 22 and Conway; however, for the rest of the Build Alternatives, concentrations would be denser around the S.C. Route 22/U.S. Route 701 interchange.

Table 3.48
Potential Indirect Wetland Acres and Stream Impacts
Interstate73: I-95 to the Myrtle Beach Region

Wetland Type	Alternatives							
	1	2	3	4	5	6	7	8
Aquatic Beds	1.3	1.2	1.2	1.5	1.2	1.2	1.2	1.3
Bay Forests	59.3	58.1	62.6	60.3	63.7	62.6	63.7	63.5
Bottomland Hardwoods	20.7	21.4	20.7	20.7	21.4	20.6	19.6	20.6
Deciduous Shrub Swamps	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Evergreen Shrub Bogs/Pocosins	24.0	21.6	21.6	23.4	21.6	21.6	21.6	23.3
Flooded Swamp /Beaver Ponds	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Freshwater Marsh	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Hardwood Swamp	89.1	91.7	88.0	88.2	92.2	93.4	91.8	91.9
Lakes	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Pine Savannahs & Wet Flatwoods	5.6	5.1	5.6	5.6	5.6	5.6	5.6	5.6
Ponds & Borrow Pits	58.5	61.6	57.9	57.7	61.0	59.3	59.8	58.9
Savannahs & Wet Meadows	12.5	12.2	11.3	11.0	12.4	11.1	12.3	12.2
Unvegetated Tidal Flats	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Total Wetland Impact	**274.5**	**276.4**	**272.4**	**271.9**	**282.6**	**278.9**	**279.1**	**280.8**
Stream Type								
Intermittent	24	26	25	24	26	26	26	26
Perennial	15	16	16	14	17	16	15	16
Total Stream Crossings	**39**	**42**	**41**	**38**	**43**	**42**	**41**	**42**

Source: THE LPA GROUP INCORPORATED, 2006.

crossings. As previously mentioned in the wetland impacts discussion, bridge impacts are the least damaging method for crossing the streams.

All jurisdictional streams will be identified and mapped during the wetland delineation for the Preferred Alternative. Hydrologic studies would be performed for the Preferred Alternative to determine where the use of pipes or box culverts would be appropriate. The installation of pipes or box culverts would require water body modification and could affect aquatic species movement. Where practicable, stream channels could be relocated outside of the fill limits of the roadway and cross pipes and culverts could be placed perpendicular to the roadway to reduce the length of pipe or culvert required. This would not only be a cost effective measure from a construction standpoint, but would also reduce the distance that aquatic species would have to travel through the structures.

A review of aerial photography and NWI mapping was performed to determine the presence of sufficient uplands along alternatives for potential borrow pit locations. A corridor extending approximately one-half mile along both sides of the centerline of each Build Alternative was examined. Three areas along the alternatives were identified where suitable uplands were not located immediately adjacent to the alternatives. These areas consisted of the interchange at I-95 for Alternatives 2, 6, and 8, where constraints such a wetlands and the Bethea Historic District are located; the portion of Alternatives 4 and 7 located east of Marion, on existing U.S. Route 501, where a Carolina bay and bay forest wetlands are present on both sides of the alternative; and all alternative crossings of Back Swamp and the Little Pee Dee River. However, potentially suitable uplands were observed on the mapping in the close proximity to these locations where fill materials could be excavated and hauled to the construction site.

A more detailed screening will be performed for the Preferred Alternative and segments with adequate upland borrow areas will be indicated. Wetland areas that should not be used for borrow areas will also be indicated. If enough upland areas are not available for any given segment, the wetlands that have been altered or have lower functions and values will be identified. Wetland delineations would be performed at the borrow pit sites and potential impacts to federally listed species and cultural resources would be evaluated prior to beginning excavation, in accordance with the SCDOT Engineering Directive (EDM – *Borrow Pit Location and Monitoring*).

3.16.11 What would cumulative impacts be to wetlands and streams in the project study area?

Cumulative impacts to wetlands and streams could occur in the project study area. The I-73 study area contains a wide variety of wetland types. However, they can be grouped as Carolina bays, riparian wetlands, pocosins, pine savannahs and wet flatwoods, and pine savannahs and wet meadows. Carolina bays have been identified as important natural resources and many intact bays and impacted bays are located in the project study area. Drained bays would be crossed by many of the I-73 Build Alternatives; however, intact bays were avoided in the development of alternatives for the project.

Wetland systems in Carolina bays can vary and often include evergreen shrub bogs/pocosins, deciduous shrub swamps, and bay forests. Some of the bays within the study area have been impacted by utility crossings and many have been drained and converted to pine plantations or agricultural fields. The site of the proposed Inland Port for example, located northwest of Marion, would be constructed in Ellerbe Bay, which has been severely altered and much of it is now planted in pine. According to the NWI maps, remnant wetlands remain in the vicinity and a review of aerial photography indicates that riparian wetland systems are present within the proposed boundaries of the Port. It is anticipated that altered bays, such as Ellerbe Bay, will continue to be used for agricultural, silvicultural, and development purposes. Some have been used as mitigation sites and the potential for future use of others as mitigation exists. However, future development in intact Carolina bays is not likely due to the heightened regulatory awareness of the often unique habitat bays provide.

Riparian wetlands are numerous throughout the project study area and efforts were made in the development of the alternatives to minimize impacts to these systems by crossing on structure where practicable. These wetland systems include a variety of wetland types such as hardwood swamps, bottomland hardwoods aquatic beds, flooded swamps/beaver ponds, and deciduous shrub swamps. Evergreen shrub bogs/pocosin wetlands are often found at the headwaters of these riparian systems. Lakes that have been constructed within these systems, while not natural occurrences, do provide foraging habitat for ospreys and wading birds. Although they have been relatively un-impacted, a review of aerial photography reveals that riparian wetlands within the study area have been previously impacted by road crossings, utility crossings, stream channelization, impoundments, and logging activities. The most severe impacts to the riparian wetlands have occurred near the headwaters of these systems where it appears that the land has been drained and cleared to the banks of channelized streams. Most of the development associated with these systems occurs along the edges and likelihood of filling them for construction purposes is not practicable, and would require permits and mitigation under the Section 404 permitting process. However, the construction of additional road crossings in the future for access to developable land is a possibility and impacts to the edges of the systems may occur.

Evergreen shrub bogs/pocosin wetlands (pocosins), characterized by the presence of evergreen shrub species in flat areas and depressions, are found throughout the study area. A GIS analysis of the NWI maps indicates that there is approximately 15,270 acres of pocosin in the study area. The I-73 project is anticipated to impact between 30 and 55 acres of pocosin wetlands depending on the alternative that is selected. Many of these wetlands are found near the headwaters of streams and in Carolina bays. As previously mentioned, the headwaters of streams and many Carolina bays within the study area have been drained and converted for other uses such as silviculture and agriculture. Generally these wetlands contain a deep mucky soil that is unsuitable for construction without extensive excavation and back-filling with suitable material to build upon; however the continued draining of pocosins for silviculture and agriculture purposes could occur.

Pine savannahs and wet flatwoods generally occur in flat, poorly drained areas and are found throughout the study area. When wild fires are not suppressed in these areas and where long leaf pines of sufficient maturity are present, they provide habitat for the federally protected red-cockaded woodpecker. GIS analysis of the NWI maps indicate that there is approximately 41,717 acres of pine savannah and wet flatwoods within the study area and the I-73 project would impact between 18 and 81 acres of this habitat. Previous impacts to this wetland type within the study area consist of draining and converting for silviculture and agriculture purposes, and housing developments. Often times irrigation and cattle watering ponds are excavated in these areas. Because these systems are typically saturated to the surface and rarely inundated, the excavation of drainage ditches can sufficiently convert them to uplands, depending on the soil types that are present. Continued conversion of these wetlands to uplands could be expected.

Pine savannahs and wet meadows are typically found in the outer coastal plain of South Carolina and are some of the rarer wetland types found in the project study area. When wild fires are not suppressed in these areas, the edges of these wetlands provide habitat for federally protected species such as American chaffseed and state species of concern such as Venus flytrap. GIS analysis of NWI maps indicates that approximately 5,109 acres of pine savannahs and wet meadows occur in the study area and they are scattered throughout. The I-73 project would impact between 0.3-acre and 7.1 acres of this wetland type. As with pine savannahs and wet flatwoods, these wetlands are typically saturated to the surface and the excavation of drainage ditches can sufficiently convert them to uplands for development purposes. Because of the relative ease with which these wetlands can be drained, conversion to uplands could continue to occur within the project study area.

The No-build Alternative would have substantial impacts to wetlands. The total wetland impacts anticipated to occur due to development by the year 2030 is approximately 222 acres. It is also anticipated that 33 stream crossings, 22 intermittent and 11 perennial, would occur. These impacts were estimated based on the results of the land use model predictions. The wetland impacts anticipated include approximately 1-acre of aquatic bed, 45 acres of bay forest, 17 acres of bottomland hardwoods, 2 acres of deciduous shrub swamps, 20 acres of evergreen shrub bog/pocosin, 1-acre of freshwater marsh, 75 acres of hardwood swamp, 1-acre of lakes, 4 acres of pine savannahs and wet flatwoods, 47 acres of ponds and borrow pits, 8 acres pf savannahs and wet meadows, and 1-acre of unvegetated tidal flats.

Although cumulative impacts to wetlands and streams within the project study area could occur, the Section 404 permit and the Section 401 water quality certification process would afford protection of the wetland systems and regulation of wetland impacts identified within the project study area.

3.16.12 What is mitigation?

Mitigation has been defined in NEPA regulations to include efforts which: a) avoid; b) minimize; c) rectify; d) reduce or eliminate; or e) compensate for adverse impacts to the environment (40 CFR 1508.20 [a-e]). Section 404(b) (1) Guidelines of the CWA and Executive Order 11990 stress avoidance and minimization as primary considerations for protection of wetlands. Practicable alternatives analysis must be fully evaluated before compensatory mitigation can be discussed.

Federal Highway Administration policy stresses that all practicable measures should be taken to avoid and minimize impacts to wetlands which will be affected by federally funded highway construction. A sequencing (step-down) procedure is recommended in the event that avoidance is impossible. This step-down procedure includes wetland impact avoidance, minimization, and finally, compensation.

Compensation traditionally takes three basic forms: restoration, preservation, and creation, or can be a combination of the three. Restoration is the return of functions and values to a wetland that have been lost because of alteration of the natural vegetation, soil, and/or hydrology. Preservation refers to the protection without disturbance of existing wetlands that are particularly valuable. Creation is the making of wetlands from non-wetlands. Restoration and preservation are the preferred forms of mitigation due to the uncertainty of the success of wetland creation.

3.16.13 What was done to avoid and minimize wetland and stream impacts?

Due to the linear nature of the project and the large areas of wetlands located within the project study area, total avoidance of wetlands and streams was not possible. Many riparian wetland systems associated with streams extend across the study area, such as the Little Pee Dee River, Lake Swamp, and Buck Swamp. As described earlier, efforts were made to produce wetland maps with wetlands accurately depicted and to identify high value wetlands. Intact Carolina bays were identified from aerial photography and were designated as constraints on the GIS data layer which insured that they would be avoided. Values were assigned to the wetland types within the study area and the wetland data layer was given an overall weighted value of 40 percent, which forced the CAT to avoid wetlands where possible and when avoidance was not possible, it crossed the lower valued wetland systems.

After the CAT developed the initial routes that were suitable for construction (based on potential impacts), the routes were further refined to avoid wetland impacts. A field review was conducted during which the ACT members were given the opportunity to view the wetlands that would potentially be impacted within the corridors and provide comments. Centerlines were established and wetland impacts were calculated within 400-foot wide corridors that represented approximated construction limits. Requests for corridor modifications from the ACT were investigated that would further avoid wetlands impacts. These corridors and segments of corridors were presented at the ACT meetings for discussion. Votes were conducted and segments with high impacts, primarily higher wetland impacts, were removed from further consideration or refined corridor alternatives that resulted in a reduction of impacts were discussed and substituted for higher impact corridors.

Five corridor segment shifts were made to portions of Alternative 1 during the process that resulted in a reduction of approximately 132 acres of wetland impacts. Impacts on Alternative 2 were reduced by approximately 80 acres with three alignment shifts. Six shifts were made to segments along Alternatives 3 and 5 that resulted in an approximate 144 acres of impact reduction for each. The shift of 4 segments along Alternative 4 resulted in a 24-acre reduction. Three segment shifts along Alternative 6 resulted in an approximately 80-acre impact reduction. Alternative 7 wetland impacts were reduced by 60 acres after four segments were shifted. And two segment shifts reduced Alternative 8 impacts by approximately 44 acres.

In a couple of instances, shifts were made to avoid community impacts that resulted in slightly higher impacts such as an increase of 24 acres of wetland impacts to a segment located west of Mullins that ultimately affected the total wetland impacts for Alternatives 1, 2, 3, 5, 6, and 8. In order to avoid potential impacts to Carolina bays located near U.S. Route 501 at Back Swamp and Little Pee Dee River crossing, the alignment was shifted onto the existing U.S. Route 501. This increased wetland impacts by approximately 19 acres. This modification affected Alternatives 1, 2, 4, 5, 7, and 8. Although the shift increased the impacts, in addition to avoiding the Carolina bays, it lessened the potential for habitat fragmentation at Back Swamp and a portion of the Little Pee Dee River swamp by placing I-73 in the median of U.S. Route 501.

Once the wetland delineation has been completed, where possible, and where consistent with engineering standards and FHWA and SCDOT requirements, consideration will be given to design modifications to further reduce potential impacts. Design modifications may include slight shifts in the alignment away from wetlands and the use of 2:1 side slopes where practicable. The use of 2:1 side slopes reduces the impact footprint through wetlands and other sensitive areas and thus reduces the impacts. It is anticipated that the hydrologic studies would indicate the size for bridges through some of the higher quality wetland systems such as those associated with the Little Pee Dee River, which would minimize wetland impacts. Properly sized pipes and culverts, as determined by the hydrologic study, would be installed under the roadway to maintain the historic hydrologic connections of wetlands and prevent the drainage or excessive flooding of jurisdictional areas. Additional cross pipes and culverts could be installed in new causeway through wetlands to maintain sheet flow through riparian wetlands during high water events.

Wetland impacts would be minimized where wetlands would be crossed by bridges. Although the vegetation would be cleared within the construction limits and there would be temporary impacts to the hydrologic function and soil of the affected wetland, permanent impacts to bridged wetlands would be minimal. Permanent impacts would result from the decrease of vegetation beneath the bridge. Upon completion of the bridges, the temporary means of access would be removed and the area allowed to re-vegetate naturally. The hydrologic functions of the wetland would not be diminished. Each wetland crossing would be evaluated on an individual basis to determine the most practical method for constructing bridges, depending on the type and amount of wetlands to be impacted and the length, type, and geometry of the structure to be built.

Typical construction techniques considered as possible options for building bridges over wetlands are:

- Construction on existing grade;
- Temporary haul roads;
- Timber mats or barges;
- Temporary trestles; and,
- Top-down construction.

Construction on existing grade would be done in wetlands where the soil is stable enough to support construction equipment loads bearing directly on the ground surface. Typically, this method would be utilized in wetlands that are not saturated or inundated during a majority of the year. Temporary haul road(s) would be constructed parallel to a proposed structure in wetlands containing soils incapable of supporting heavy construction equipment without permanent damage to the wetland. Upon completion of the bridge, the haul road(s) would be removed and the natural grade of the wetland restored and allowed to re-vegetate naturally. The use of timber mats or barges for constructing bridges in wetlands is similar in concept, and in resulting impacts, to using haul roads. This technique could be used in wetlands where standing water or saturated soil conditions would not support heavy construction equipment or temporary haul roads. The temporary trestle would be constructed adjacent to the proposed bridge location. The structure would be constructed on driven piles, either steel or timber, and a superstructure of steel girders and timber mats. The temporary trestle would act as a work platform and haul road for materials and impacts would consist of temporary clearing of vegetation under the trestle.

Top-down construction technique would utilize components of the bridge already under construction to either support a temporary platform for building new spans or to serve as the work platform itself. The previously built substructure would support the temporary working platform, allowing piles to be driven for the next span. Simultaneously, the permanent structure's bridge deck would be formed and poured for the previous span, behind the work platform.

A variation of the top-down construction technique would use the previously built bridge deck as the working platform construction of the substructure and superstructure of subsequent bridge spans would be performed from the completed, permanent structure. Top-down construction would cause the least amount of temporary impact as no fill material or temporary structures would be required since the work would be performed from the permanent structure.

Efforts to minimize wetland impacts would also be incorporated in the construction phase of the project. Construction activities would be confined within the permitted limits to prevent the unnecessary disturbance of adjacent wetland areas. During construction, potential temporary impacts to wetlands would be minimized by implementing sediment and erosion control measures to include seeding of side slopes, silt fences, and sediment basins, as appropriate. Other best management practices would be required of the contractor to ensure compliance with the policies of *23 CFR 650B.*

3.16.14 How will the wetland and stream impacts be compensated?

Upon completion of the roadway design for the Preferred Alternative, the total wetland and stream impacts within the construction limits would be calculated. The USACE has established guidance for calculating the number of impact credits that would be needed to compensate for unavoidable wetland and stream impacts. This guidance is contained in the Charleston District Compensatory Mitigation Guidelines (or Standard Operating Procedures). The number of mitigation credits required is based on several factors such as the type of wetland being impacted, the condition of the area to be impacted, the type of impact that will occur, and the duration of the impact (permanent vs. temporary).

The Standard Operating Procedures (SOP) also contains guidance for calculating the number of mitigation credits that a proposed mitigation site will generate. The number of credits received for a mitigation site is determined by several factors such as the net improvement to the area for proposed restoration or enhancement; the wetland type, existing condition, and the degree of threat to the area proposed for preservation; and the vegetation establishment (planted vs. natural re-vegetation) and the soil type present for the area proposed creation sites. The proximity of the mitigation site to the impact site, the type of protection the site will receive, and whether the mitigation wetland is the same type as the impacted wetland are considered regardless of the mitigation type that is proposed.

Conceptual Mitigation Plan

Wetland mitigation was discussed at several ACT meetings and the importance of in-kind mitigation and mitigation within the same watershed was emphasized. There has been discussion of not using the SOP for calculating required mitigation credits due to the magnitude of the impacts associated with the project. However, the USACE offered to provide assistance with working through the mitigation worksheets. Additional discussions revolved around the use of riparian systems as well as landscape scale mitigation with linked upland/riparian systems and possibly isolated wetland systems, such as Carolina bays. The use of commercial wetland mitigation banks was brought up during the discussions and it was suggested that they be used only as a last resort.

Based on a review of aerial photography, USGS topographic maps, and limited field visits, there are many opportunities for restoration mitigation for both wetland and stream impacts within and adjacent to the project study area. Many of the wetlands within the study area consist of remnants of larger wetlands that have been drained or partially drained for agricultural or timber production purposes. Because their small size (5 to 10 acres) and the fact that they are isolated from wildlife movement corridors by agricultural fields, these areas would not necessarily be considered ideal wetland mitigation sites. However, large wetland areas and associated with the high quality riparian wetland systems would be considered as suitable for mitigation purposes.

There are several Carolina bays within the study area that appear to have a hydrologic connection to waters of the United States that could be used for wetland mitigation. Some of these bays, ranging in size from approximately 100 acres to 450 acres, appear to be intact and could be purchased and dedicated as preservation mitigation. The inclusion of the upland sand rim and other adjacent uplands would provide enhancement for the preserved wetland systems. Other Carolina bays are present that range in size from approximately 500 acres to 1,000 acres and have been impacted primarily by drainage and conversion to other uses. They could be restored for mitigation credit. Based on reviews of the aerial photography, restoration for these bays could range from simply filling drainage ditches and restoring the hydrology where soils and vegetation are already present, to restoring the hydrology by removing drainage tiles, blocking ditches, and planting the site with wetland vegetation. The issue of blocking drainage, thus "isolating" these wetlands from the surface water system, would need to be addressed.

The potential for large areas of preservation, enhancement, and restoration are available along the Little Pee Dee River, the Great Pee Dee River and other previously mentioned riparian wetland systems within the study area. Tracts of land adjacent to Heritage Trust Preserves along the Little Pee Dee River, ranging from small 200-acre out-parcels located within the existing preserves to over 1,000-acre parcels could be purchased and incorporated into the existing Heritage Preserves. Enhancement for these sites could be in the form of including upland buffers and the removal of roads that are evident on the aerial photographs, from the wetlands.

Many of the streams within the study area have been channelized and have no vegetated buffers. These stream reaches are generally associated with agricultural operations. Additional, many of the channelized