Dillon
Nichols
Mullins
Latta
Marion
Aynor
LITTLE PEE DEE RIVER
LUMBER RIVER
LITTLE PEE DEE RIVER
BUCK SWAMP
MAIDENDOWN SWAMP
REEDY CREEK
LITTLE REEDY CREEK
STACKHOUSE CREEK
CATFISH CANAL
SMITH SWAMP
LITTLE REEDY CREEK
REEDY CREEK
BACK SWAMP
LAKE SWAMP
JOINER SWAMP
LOOSING SWAMP
BUG SWAMP
MAPLE SWAMP
DAWSEY SWAMP
TREDWELL SWAMP
CHINNERS SWAMP
BRUNSON SWAMP
SPRING SWAMP
PALMETTO SWAMP
BROWN SWAMP
95
9
41
57
76
917
701
410
38
501
301
319

Legend

- City
- Rivers and Streams
- Interstate
- Highway
- Preferred Alternative Construction Limit
- NWI Wetlands
- 100 Year FEMA Floodplains
- Study Area Boundary
- Municipal Boundary
- County Boundary

0 2.5 5 7.5 Miles

N E W S

FIGURE 3-29

WETLANDS, STREAMS AND FLOODPLAINS

During the delineation, the boundary between the wetland and upland was marked. The boundaries between different wetland types within the delineated area were not marked. For example, several large wetland areas would have aquatic beds, wooded swamp, and freshwater marsh within the single delineated area. The wetland community that was identified was the dominant wetland community of the whole area. Therefore, although aquatic beds were present in the Preferred Alternative study corridor, they were present within larger, more dominant wetlands and were not identified separately.

Multiple wetland types can often be found in association with each other to form wetland systems. Two major wetland systems found within the project study area are Carolina bays and riparian systems. Found in the Coastal Plain of South Carolina, Carolina bays are generally oval in shape, are oriented roughly northwest to southeast, and are isolated from the surrounding plant communities by a sand ridge. Wetland types in Carolina bays can vary and often include evergreen shrub bogs/pocosins, deciduous shrub swamps, and/or bay forests. Fully functional Carolina bays that were identified as constraints were avoided during the development of the Preferred Alternative. The Preferred Alternative does not impact any intact fully functional Carolina bays. There are remnants of bays within the Preferred Alternative study corridor that have been impacted by various activities such as utility and railroad crossings, and many have been drained or partially drained and converted to pine plantations or agricultural fields.

Riparian wetlands are wetland systems associated with streams and are numerous throughout the project study area. Efforts were made in the development and refinement of the Preferred Alternative to minimize impacts to these systems by crossing on structure and aligning the roadway such that crossings are perpendicular where practicable. These systems can include a variety of wetland types such as hardwood swamps, bottomland hardwoods, aquatic beds, flooded swamps/beaver ponds, and deciduous shrub swamps. Riparian wetland systems within the Preferred Alternative study corridor are predominantly wooded swamps and bottomland hardwoods. Lakes and ponds, such as the ones found in The Gulley and Joiner Swamp, have been constructed in riparian wetland systems within the Preferred Alternative study corridor (refer to Figure 3-29, page 3-147). While these impoundments are not natural, they are considered as jurisdictional wetlands and waters of the United States and provide foraging habitat for ospreys, eagles, and wading birds. Although most riparian systems have been relatively un-impacted, a review of aerial photography reveals that some riparian wetlands within the Preferred Alternative study corridor have been previously impacted by road crossings, utility crossings, and stream channelization. Most of the development typically occurs along the edges of riparian systems because filling them for construction purposes is not practical. Such construction would require permits and mitigation under the Section 404 permitting process. Additionally, placing fill material in the floodplains and floodways associated with the larger streams would require approval from the Federal Emergency Management Agency (FEMA) prior to beginning construction.

The following wetland communities as described by Nelson were identified in the 600-foot wide corridor along the Preferred Alternative:

- Bay forest;
- Bottomland hardwoods;
- Deciduous shrub swamp;

- Freshwater marsh;
- Pine wet flatwoods;
- Ponds and borrow pits;
- Rivers and canals; and,
- Wooded swamp.

3.12.4.1 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*). Aquatic beds are typically found within other wetlands such as where an opening in the canopy of a wooded swamp has occurred, in a slow flowing stream, or along the edge of an open water system like a lake or pond. Because these areas are not a dominant wetland type and are typically found within the boundaries of other wetlands, they were not quantified during the delineation. However, they were quantified based on a review of aerial photography and approximately one acre was found within the Preferred Alternative study corridor.

3.12.4.2 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*), and pond pine (*Pinus serotina*). Shrubs are extremely thick and dominated by sweet-bay, red bay, fetterbush (*Lyonia lucida*), gallberry (*Ilex coriacea*), and highbush blueberry (*Vaccinium corymbosum*). Vines such as bamboo-vine (*Smilax laurifolia*) and other catbriers (*Smilax* spp.) are also common. This description also applies to Carolina bays. Bay forests are found throughout the project study area but appear concentrated southeast of the Little Pee Dee River. GIS analysis indicates that bay forests in the portion of the project study area northwest of the Little Pee Dee River are associated with remnants of Carolina bays, whereas those southeast of the Little Pee Dee River are scattered throughout the project study area. Of the approximately 37,828 acres of bay forests found throughout the project study area, 106.1 acres were delineated within the Preferred Alternative study corridor.

3.12.4.3 Bottomland hardwoods

Bottomland hardwoods are typically associated with floodplains of streams, but may also occur in low areas and along small surface drainages that are temporarily flooded or saturated during the growing season. Flooding or saturation usually occurs in the winter or early spring. Red maple, sweet-gum (*Liquidambar styraciflua*), swamp tupelo, and loblolly pine (*Pinus taeda*) are typical trees species

found in this community. Shrubs including red-bay, wax-myrtle (*Myrica cerifera*), dog-hobble (*Leucothoe axillaris*), and sweet-bay are common within this wetland type. Vines such as yellow jessamine (*Gelsemium sempervirens*), muscadine (*Vitis rotundifolia*), poison-ivy (*Toxicodendron radicans*), and several species of catbrier (*Smilax laurifolia*, S. *glauca*, and *S. rotundifolia*) are abundant. Herbaceous plants such as cinnamon fern (*Osmunda cinnamomea*), netted chain fern (*Woodwardia areolata*), royal fern (*Osmunda regalis*), false nettle (*Boehmeria cylindrica*), lizard's tail (*Saururus cernuus*), jack-in-the-pulpit (*Arisaema triphyllum*), and giant cane (*Arundinaria gigantea*) are common. Bottomland hardwood wetlands are present throughout the project study area; however, they are primarily concentrated northwest of the Little Pee Dee River. GIS analysis indicates that those southeast of the Little Pee Dee River are scattered throughout the project study area rather than being associated with streams. These are likely remnants of larger areas that have been partially drained. Approximately 91,209.5 acres of bottomland hardwood wetlands are present in the project study area. A total of 136.2 acres of bottomland hardwoods were delineated within the Preferred Alternative study corridor.

Bottomland hardwood

3.12.4.4 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 a stable system. In the Preferred Alternative study corridor, deciduous shrub swamps are primarily the result of clear-cutting, which results in a number of root- or stump-sprouts of the more opportunistic tree species such as sweet-gum, red maple, and sweet-bay. Also, short-lived woody species such as black and/or Carolina willow (*Salix nigra*, *S. caroliniana*), button-bush (*Cephalanthus occidentalis*), and elderberry (*Sambucus canadensis*) are able to take advantage of the open canopy. Blackberry (*Rubus argutus*) is almost always present, as well as catbriers (*Smilax* spp.). Marsh dwellers, such as soft rush (*Juncus effusus*) and bulrush (*Scirpus cyperinus*), also occur here, taking advantage of

Deciduous shrub swamp

the (temporarily) open canopy. Deciduous shrub swamp is scattered throughout the project study area. GIS analysis indicates that many of the larger areas of this wetland type appear to be associated with streams, while the smaller areas have no apparent association. While approximately 6,478 acres of deciduous shrub swamp are present in the project study area, 23.6 acres were delineated within the Preferred Alternative study corridor.

3.12.4.5 Freshwater marsh

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 non-tidal marshes. Typical plant species include sedges (*Carex* spp.), rushes (*Juncus* spp.), sugar cane plume-grass (*Erianthus giganteus*), arrow-arum (*Peltandra virginica*), smartweeds (*Polygonum* spp.), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria latifolia*), and cattails (*Typha* spp.). GIS analysis indicates that freshwater marshes are scattered throughout the entire project study area. Many freshwater marshes are associated with utility corridors due to the maintenance activities which prevent the growth of woody species within the utility corridor. Some areas of freshwater marsh are located along streams and, like aquatic beds, are likely located along the margin of the streams. Approximately 618 acres of freshwater marsh is present in the project study area, 3.9 acres of which were delineated within the Preferred Alternative study corridor.

Freshwater marsh

3.12.4.6 Pine wet flatwoods

Pine 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 longleaf pine (*Pinus palustris*), 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.). When wild fires are not suppressed in these areas and where long leaf pines of sufficient maturity are present, these wetlands provide habitat for the federally

Pine wet flatwood

protected red-cockaded woodpecker. Wet flatwoods are scattered throughout the project study area, although the larger areas of these wetlands appear to be located primarily southeast of the Little Pee Dee River based on GIS analysis of the NWI mapping. They are generally found in flat landscapes with poor drainage within the project study area. Previous impacts to this wetland type within the project study area consist of draining and converting for silviculture and agriculture purposes. Irrigation and cattle watering ponds are often excavated in these areas. There are approximately 124,125 acres of pine wet flatwoods within the project study area, 230.8 acres of which were delineated within the Preferred Alternative study corridor.

3.13.4.7 Ponds and borrow pits

Ponds and borrow pits are typically manmade, open water, 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. While approximately 5,626 acres of ponds and borrow pits are found in the project study area, 15.2 acres were delineated within the Preferred Alternative study corridor.

3.12.4.8 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.

Perennial stream

Rivers and canals identified within the Preferred Alternative study corridor include natural meandering and channelized intermittent streams and perennial streams and rivers. Some of the streams include un-named tributaries to Catfish Canal, Mill Creek, The Gulley, Black Creek, Chinners Swamp, Joiner Swamp, Long Branch, Little Pee Dee River, Loosing Swamp, and Little Reedy Creek.

Intermittent and Perennial Streams

Intermittent Streams typically flow for only a portion of the year, while Perennial Streams flow year-round.

During the delineation, and subsequent site visits with the USACE, it was determined that many of the "blue-line" streams indicated on the USGS topographic maps are actually non-jurisdictional upland drainage ditches. Additionally, many of the mapped headwater streams, such as Cross Branch, simply do not exist and could not be located in the field. Conversely, drainage features excavated through wetlands that have

permanent flow and support fish and freshwater mussels function as, and were identified as, streams. An excavated channel through Mose Swamp is a good example of this situation. Most of the streams identified within the Preferred Alternative study corridor have been altered to some degree. There are a total of 3,964,772 linear feet of intermittent stream channels, and 10,066,771 linear feet of perennial stream channels in the project study area based on the SCDNR GIS stream database. During the field delineation, 3,887 linear feet of intermittent stream channels and 10,215 linear feet of perennial stream channels were identified in the Preferred Alternative study corridor.

3.12.4.9 Wooded swamp

Wooded swamps are wetlands associated with black or brown water rivers. They may be flooded for several months during the growing season to nearly year round. The well-formed canopy is dominated by bald cypress (*Taxodium distichum*) and/or pond cypress (*Taxodium ascendens*), and swamp tupelo (*Nyssa sylvatica* var. *biflora*) and/or water tupelo (*Nyssa aquatica*). These tree species have adaptations for growing in water, including swollen and buttressed bases, and, in the case of the *Taxodium* species, "knees." Other common tree species include water ash (*Fraxinus caroliniana*), red maple, water hickory (*Carya aquatica*), overcup oak (*Quercus lyrata*), sweetgum, sweet-bay, red-bay, and willow oak (*Quercus phellos*). Wooded swamps within the project study area are concentrated within the floodplains of streams. In addition, remnants appear in association with impacted Carolina bays or at the headwaters of the streams. There are approximately 102,927 acres present in the project study area. A total of 125.3 acres of wooded swamp were delineated within the Preferred Alternative study corridor.

Wooded swamp

3.12.5 What kind of wetland impacts would occur as a result of the Preferred Alternative?

Wetland impacts associated with the Preferred Alternative 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 construction 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 wetland areas would be re-seeded with native wetland vegetation.

Clearing and Grubbing

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

Permanent clearing of trees is the dominant impact associated with bridges although minor impacts such as shading and changes in water flow, can also be associated with bridges. Bridge impacts are, therefore, generally assumed to be clearing impacts for the purposes of calculating impacts. Permanent clearing of trees is done to prevent trees from growing under the bridges and potentially damaging the structures. Additional permanent tree clearing would be performed for a width of approximately 30 feet along both sides of the bridge for the same reason. Shrubs and herbaceous species are allowed to revegetate under and adjacent to bridges. This type of impact does not destroy the wetland, but does change the wetland type. For example, if a bridge is constructed through a wooded swamp, a part of the swamp could become a deciduous shrub swamp or a freshwater marsh after the removal of the trees.

3.12.6 How were the potential wetland impacts calculated?

To calculate the potential impacts associated with construction of the Preferred Alternative, the conceptual construction limits were overlain onto the wetland delineation map and the areas of wetlands within the "footprint" of the road were calculated. The conceptual construction limits included: the main lines and associated frontage roads; the proposed interchanges; crossover roads, and other roads necessary to maintain access to property. The current design is conceptual and based on USGS topographic mapping, not surveyed contours. To account for the potential inaccuracy of the mapping, fifteen feet of additional fill was added to the slope limits and the revised slope limits were used to calculate the fill impacts. A 10-foot wide clearing limit was added along the edge of the slope limits to calculate the temporary NPDES clearing impacts. Where streams with adjacent wetlands would be bridged, the proposed bridge lengths and widths were used to estimate the potential permanent clearing impacts associated with bridges.

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

Table 3.45 (refer to page 3-155) provides the wetland types that would be impacted, the type of impact, and the wetland value for the Preferred Alternative. A total of 289 acres would be filled and about 24.2 acres would be cleared. The decrease in the number of acres of impact is due to changes in the design and the more accurate depiction of wetlands boundaries resulting from the delineation. Many of the wetlands that would be impacted 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/or drainage tile systems. These remnant wetlands received lower values as decided in consultation with the ACT. However, wetland systems associated with the perennial streams and rivers that flow through the Preferred Alternative study corridor were considered to be high value wetlands. Based on observations during the wetland delineation, practically all of the wetlands that would be crossed by the Preferred Alternative have been previously impacted. The impacts identified consist of clear cutting of large tracts of trees that creates a temporary habitat change, permanent habitat conversion caused by fire suppression resulting in dense undergrowth in bay forests, the creation of monoculture pine stands in wetlands, drainage ditches that have affected the site hydrology to the point that these areas barely meet the wetland criteria, and fill material from existing roads and development adjacent to the proposed crossings.

Table 3.45
Wetland Impacts in Acres and Wetland Values
Interstate 73 FEIS: I-95 to the Myrtle Beach Region

Wetland Type	Preferred Alternative
Bay Forests	
Clear Impact* (acres)	3.8
Fill Impact (acres)	52.4
Bottomland Hardwoods	
Clear Impact* (acres)	6.1
Fill Impact (acres)	62.8
Deciduous Shrub Swamps	
Clear Impact* (acres)	1.9
Fill Impact (acres)	10.0
Fresh Water Marsh	
Clear Impact* (acres)	0
Fill Impact (acres)	3.2
Wet Flatwoods	
Clear Impact* (acres)	0.1
Fill Impact (acres)	104.8
Ponds & Borrow Pits	
Clear Impact* (acres)	0
Fill Impact (acres)	3.1
Wooded Swamp	
Clear Impact* (acres)	12.3
Fill Impact (acres)	52.5
Total Clear Impact* (acres)	24.2
Total Fill Impact (acres)	288.8
Total Wetland Impact	**313.0**
Wetland Values	
Clear Impacts*	131.9
Fill Impacts	1,378.9
Total Wetland Value	**1,510.8**

Source: THE LPA GROUP INCORPORATED, 2007
* Includes permanent and temporary clearing.

The Preferred Alternative would impact 15 riparian wetland systems, 12 of which would include clearing impacts associated with bridge crossings. The crossings that would occur parallel to existing alignments include Little Reedy Creek, Little Pee Dee River swamp, Lake Swamp, and Joiner Swamp. Crossings on new alignment include two unnamed tributaries to Catfish Canal, The Gulley, Maidendown Swamp, and Loosing Swamp and its unnamed tributary.

Crossings of two high quality riparian wetland systems would occur, one at the Little Pee Dee and the other at Lake Swamp. The Little Pee Dee River would be crossed immediately adjacent to the existing S.C. Route 917, which would reduce wetland impacts and avoid further habitat fragmentation of the riparian wetland system. Lake Swamp would be crossed immediately adjacent to existing Road S-26-23 (Nichols Highway), which would also reduce wetland impacts and avoid further habitat fragmentation.

As mentioned earlier, most of the impacts associated with the Preferred Alternative 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 slightly impacted bottomland hardwoods and wooded swamps, which were assigned high wetland values, and would result in the greatest loss of wetland functions.

3.12.8 What other impacts could occur from construction?

False-color infrared aerial photography (2006) was acquired from SCDNR for the defined Preferred Alternative study corridor. GIS data layers, including soil survey data, topographic mapping and NWI mapping was used to evaluate the presence of sufficient uplands within a one-mile wide corridor centered on the Preferred Alternative for acquiring fill material. These materials, along with the 2006 aerial photography, were reviewed and the NWI wetland boundaries were updated for use in borrow pit evaluations.

Initial review of this material determined that available remote data gave a good general overview of the area but needed to be supplemented to determine the presence of potential upland borrow sites. Therefore, site visits were conducted in February 2007 to confirm the presence or absence of potential upland borrow sites. Much of the Preferred Alternative corridor had been extensively surveyed during the wetland delineation phase and, therefore, the site visits concentrated on those areas within one-half mile of the centerline but outside of the Preferred Alternative corridor. Developed uplands were not included in the site visits but may be an additional source of borrow material as well.

There are significant amounts of high quality wetlands associated with the Little Pee Dee River and Lake Swamp systems within and adjacent to the Preferred Alternative study corridor. These wetlands should not be used for sources of borrow materials if sufficient uplands are not available. Based on a review of the soil maps, there are also extensive acreages that are mapped with hydric soils along the Preferred Alternative. However, many of these areas have been effectively drained by ditching and, therefore, appear to be suitable as a source for borrow materials. It should be noted that these areas may still contain low areas with wetland characteristics. Potential borrow sites in these areas should be evaluated for wetlands on a site-by-site basis. Other areas that are currently used as agricultural fields and/or pastures also occur throughout the Preferred Alternative study corridor. Most of these areas also appear to be suitable as upland borrow area sites. Table 3.46 (refer to page 3-157) includes a breakdown of the potentially suitable borrow pit areas by current land use.

Upon completion of this analysis, it was concluded that sufficient upland areas that could be utilized for borrow activities are present in close proximity to the Preferred Alternative alignment. Therefore, it appears that impacts to wetlands due to the borrowing activities could be avoided. 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*).

Table 3.46
Potential Borrow Pit Areas by Land Use Type
Interstate 73 FEIS: I-95 to the Myrtle Beach Region

Land Use	Acres
Cropland/Pasture	11,070
Deciduous Upland Forest	76
Evergreen Upland Forest	20
Mixed Upland Forest	87
Orchard/Grove/Vineyard Total	5
Sandy Area	11
Scrub Shrub Rangeland	258
Upland Planted Pine	4,670
Total	**16,197**

3.12.9 What kind and how much impact 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 that the stream drains. Stream channels that would be completely spanned by bridging were not considered to be impacted. Perennial streams that would be completely spanned are Little Reedy Creek, The Gulley, Maidendown Swamp, Back Swamp, Black Creek, and Lake Swamp. The Little Pee Dee River would be bridged, however due to its width, the entire channel would not be spanned and pilings would be required in the stream channel. The proposed bridge lengths used for calculating impacts to streams are based on a preliminary hydraulic study utilizing existing USGS topographic data. For smaller streams where bridges may not be warranted, appropriately sized pipes or box culverts would be installed for the road crossings. The use of pipes or culverts and the final bridge lengths would be determined after performing detailed hydraulic studies during the final design phase and would be dependent on several factors, such as watershed size, and the presence of FEMA regulated floodplains and floodways.

The installation of pipes or box culverts would require stream channel modification and could affect aquatic species movement. Where practicable, stream channels could be relocated outside of the fill limits of the roadway and then 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. Additionally, pipe and culvert bottoms would be recessed below the bottom of the stream channels to help maintain movement of aquatic species through the structure.

Based on the results of the wetland delineation, many of the smaller streams within the Preferred Alternative study corridor 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 Joiner Swamp and Loosing Swamp. However, some 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 the Preferred Alternative would have 12 bridges over streams and their associated floodplain wetlands.

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. Based on the results of the delineation, the Preferred Alternative would impact 13 intermittent streams (705 linear feet) and nine perennial streams (3,155 linear feet). There will be a total of 22 stream crossings and 3,805 linear feet impacted based on the conceptual design and the results of the field delineation.

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.

3.12.10 What indirect impacts to wetlands and streams could 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 land along the Preferred Alternative. 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 site plans are available and no delineations have been performed, stream impacts are reported as the number of potential stream crossings instead of linear feet. Table 3.47 (refer to page 3-159) provides the results of the analysis. This analysis is based on estimated impacts to tracts identified by the land use models and does not take into consideration any avoidance or minimization requirements 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 Preferred Alternative would occur at the edges of previously disturbed wetlands and generally would not contribute to the loss of wetlands along the higher value riparian wetland systems such as 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. 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.

The models indicate that development would be scattered along the Preferred Alternative and would be heavier near Dillon, Latta, Mullins, Marion, Aynor, and between Conway and S.C. Route 22. Concentrations of development would also potentially occur along U.S. Route 76 between Marion and Mullins with some development along U.S. Route 501 from Marion to Latta. Concentrations of development would be denser around the S.C. Route 22/U.S. Route 701 interchange.

Table 3.47
Potential Indirect Wetland Acres and Stream Impacts
Interstate73 FEIS: I-95 to the Myrtle Beach Region

WETLAND TYPE	No-build Alternative Impact (acres)	Preferred Alternative Impact (acres)
Aquatic Beds	1.0	1.2
Bay Forests	45.0	62.6
Bottomland Hardwoods	17.0	20.7
Deciduous Shrub Swamps	2.0	2.1
Evergreen Shrub Bogs/Pocosins	20.0	21.6
Flooded Swamp /Beaver Ponds	0	0.1
Freshwater Marsh	1.0	0.4
Lakes	1.0	0.1
Pine Wet Flatwoods	4.0	5.6
Ponds & Borrow Pits	47.0	57.9
Savannahs & Wet Meadows	8.0	11.3
Unvegetated Tidal Flats	1.0	0.8
Wooded Swamp	75.0	88.0
Total Wetland Impact	**222.0**	**272.4**
STREAM TYPE	**No-build Alternative Impact (linear feet)**	**Preferred Alternative Impact (linear feet)**
Intermittent	22	25
Perennial	11	16
Total Stream Crossings	**33**	**41**

Source: THE LPA GROUP INCORPORATED, 2006.

3.12.11 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, which contains a wide variety of wetland types. However, they can be grouped as Carolina bays, riparian wetlands, pocosins, pine savannahs and wet flatwoods, and 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. Partially drained bays would be crossed by the Preferred Alternative; however, intact bays were avoided in the development of the alternative.

Wetland systems such as Carolina bays can vary in size and wetland types. Many of the bays within the study area have been drained or partially drained and converted to pine plantations or agricultural fields. The site of the proposed development 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 development. Additionally, the study area for the northern segment of I-73 contains both intact and drained or partially drained Carolina bays. It is anticipated that altered bays, such as Ellerbe Bay in the southern study area and Catfish Bay in the

northern study area, will continue to be used for agricultural, silvicultural, and development purposes. Some bays have been used as wetland mitigation sites and the potential for future use of others as mitigation exists.

Riparian wetland systems are numerous throughout the project study area and efforts were made in the development and refinement of the Preferred Alternative 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 bald eagles, ospreys, and wading birds. 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 for agricultural and silvicultural purposes. Most of the development associated with these systems occurs along the edges and there is little likelihood of filling them for construction purposes, which 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 for the southern I-73 segment. The Preferred Alternative would not impact pocosin wetlands. 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 indicates that there is approximately 41,717 acres of pine savannah and wet flatwoods within the study area. The Preferred Alternative would not impact pine savannahs but would impact 104.8 acres of pine wet flatwoods. Previous impacts to this wetland type within the project study area consist of draining and converting for silviculture and agriculture purposes, and housing developments. Irrigation and cattle watering ponds are often excavated in these areas. Continued conversion of these wetlands to uplands could be expected.

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 project study area and are scattered throughout the project study area. The Preferred Alternative would not impact this wetland type. However, conversion to uplands could continue to occur within the project study area.

Previously constructed road projects have contributed to cumulative stream and wetland impacts in the project study area. The construction of S.C. Route 22 resulted in a total of 110.5 acres of impacts to wetlands, and widening along S.C. Route 38 resulted in a total of 10.9 acres of impacts to wetlands, 491 linear feet of perennial stream impacts and 480 linear feet of intermittent stream impacts. According to the Draft EIS, the construction of the 37-mile long northern portion of I-73 would impact approximately 114.3 acres of wetlands, 3,555 linear feet of perennial streams and 6,507 linear feet of intermittent streams. Environmental documentation for the construction of the widening along S.C. Route 9/S.C. Route 38 in Marlboro County has not been completed; therefore, potential wetland and stream impacts are not known at this time. However, it is anticipated to contribute to cumulative wetland and stream impacts within the project study area.

Each of the aforementioned projects involved or will involve the use of federal funding; therefore, NEPA documentation was or will be prepared for each project. Section 404 permits were or will be obtained where required, and wetland mitigation was or will be provided to compensate for stream and wetland impacts. It is anticipated that the required alternative analysis for these projects would minimize impacts to the wetland systems within the project study area.

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 through regulation of wetland impacts identified within the project study area and required mitigation of these impacts.

3.12.12 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 *Clean Water Act* (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.

FHWA 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. 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.

3.12.13 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 and streams located within the Preferred Alternative study corridor, total avoidance of wetlands and streams was not possible. Many riparian wetland systems associated with streams extend across the Preferred Alternative study corridor, such as the Little Pee Dee River and Lake Swamp. As described earlier, efforts were made to produce accurate wetland maps 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, to cross the lower valued wetland systems.

After the CAT developed the initial routes, 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 wetland 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.

Six shifts were made to segments along the initial Preferred Alternative alignment that resulted in an approximate 144 acres of impact reduction. One shift that was made to avoid impacts pushed the alignment into a previously impacted portion of Little Sister Bay. This shift resulted in an increase of 24 acres of wetland impacts to a segment of the Preferred Alternative located west of Mullins. Another alignment shift was made to avoid impacts to residences along S.C. Route 917, south of the Little Pee Dee River crossing. This shift moved the alignment to the west of Hannah Bay and resulted in an 18-acre increase in wetland impacts.

Upon completion of the wetland delineation, the alignment was evaluated to determine how wetland impacts could be minimized. Where possible, and where consistent with engineering standards and FHWA and SCDOT requirements, design modifications were incorporated to further reduce impacts. Design modifications included shifts in the alignment to reduce wetland impacts, however, in one instance the shift to avoid another constraint increased the impacts. Two alignment shifts were made west and south of Mullins to avoid impacts to an FRPP easement. One of the shifts located just south of U.S. Route 76, west of Mullins, resulted in an increase of approximately 26 acres of wetland impacts by pushing the alignment

further into Little Sister Bay, and the other shift located further south of U.S. Route 76 resulted in a decrease of approximately 0.5 acre to Back Swamp. An alignment shift was also made at the Lake Swamp crossing that involved situating the new crossing immediately adjacent to existing S-26-23 (Nichols Highway) which resulted in a reduction of approximately four acres in wetland impacts.

Where practicable, 2:1 side slopes were used that reduced the roadway footprint through wetlands and other sensitive areas and thus reduced the impacts. A preliminary hydraulic study using USGS topographic data was completed for the Preferred Alternative to establish the need for, and lengths of, bridges at perennial stream crossings, including swamps. Detailed hydraulic studies will be performed during the final roadway design phase to determine bridge lengths at higher quality wetland systems such as those associated with the Little Pee Dee River and Lake Swamp, which could reduce wetland impacts. Properly sized pipes and culverts, as determined by the final hydraulic 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 and existing causeways 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 reseeded with native species to deter colonization by invasive species. The hydrologic functions of the wetland would not be diminished. Currently there are 12 bridges that would cross streams with riparian wetlands where impacts would be minimized. Each wetland crossing where a bridge is warranted 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 reseeded. 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.

Temporary haul road through wetland

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.

Wetland six months after temporary haul road removed

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*.

Wetland 11 months after temporary haul road removed

3.12.14 How will compensation be determined for the wetland and stream impacts?

Wetland mitigation was discussed at several ACT meetings and additional meetings were conducted to discuss mitigation. The importance of in-kind mitigation and mitigation within the same watershed was emphasized. It has been agreed upon by the SCDOT and the USACE Charleston District that one Section 404 permit will be obtained for I-73 in South Carolina, therefore, one mitigation plan would be prepared for both projects.

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.

The ACT has agreed that the USACE mitigation SOP would provide a method for assuring that adequate mitigation would be provided for wetland and stream impacts associated with the construction of I-73. At the recommendation of the members of ACT it was agreed that wetland and stream mitigation impacts will be calculated for each 11-digit Hydrologic Unite Code (HUC) in which the impacts occur. The SOP will then be used to calculate the required mitigation credits for the wetland and stream impacts in each group. 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. It was also agreed that the balance of available Sandy Island Mitigation Bank credits will be used for the I-73 project.

As previously mentioned, a wetland delineation was completed for the Preferred Alternative for the southern portion of I-73 and has been submitted to the USACE. After numerous field reviews and meetings, USACE approval is anticipated. Upon completion and approval of the field delineation for the northern portion of I-73, the SOP guidance will be applied to the impacts and the number of required wetland and stream mitigation credits will be calculated.

Conceptual Mitigation Plan

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 of their small size (five to ten 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 associated with the high quality riparian wetland systems would be considered as suitable for mitigation purposes.

As previously mentioned, Carolina bays are wetland systems that can consist of various wetland types, including those that would be impacted by I-73. Therefore, this could be considered in-kind mitigation. 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 200-acre 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/or the removal of roads from the wetlands that are evident on the aerial photographs.

Many of the streams within the study area have been channelized and do not have vegetated buffers. These stream reaches are generally associated with agricultural operations. Additionally, many of the channelized streams have limited contact with adjacent wetlands due to spoil piles left behind during the channelization effort. Restoration and enhancement of these impacted streams for mitigation credits can include reshaping stream channels and replanting native vegetation along a stream buffer. These vegetated areas provide movement corridors for wildlife. They also provide water quality enhancement by filtering pollutants from surface water runoff before it enters the receiving stream as well as providing shade which keeps the water cool, thereby promoting the health of aquatic animal species. Spoil piles can be removed from stream

banks and in-stream structures could be installed within the channels to allow streams to overflow into the adjacent riparian wetlands during rain events. The latter stream restoration type is one that must be approached carefully such that flooding of adjacent property owners does not occur.

Another avenue for obtaining wetland and stream mitigation would be to provide monetary support to property acquisitions and habitat restoration for specific properties being sought along the Little Pee Dee River in Marion County. Members of the ACT indicated that sites such as this as mitigation that provides important habitat for wildlife and has an opportunity for wetland restoration, has good potential for acceptance by the agencies.

Because suitable mitigation for the I-73 wetland and stream impacts has not been identified to date, SCDOT has proposed that a mitigation fund be established which would be held in escrow until such time as suitable mitigation has been identified. This would allow for the issuance of a conditional Section 404 permit for the project. The mitigation fund would be used for the sole purpose of providing wetland and stream mitigation credit for the I-73 projects. The total amount to be deposited in the fund would be determined by multiplying the required wetland and stream mitigation credits, as determined by the SOP worksheets, by the currently accepted cost per credit. The mitigation fund would be made immediately available for the acquisition, restoration, and/or enhancement of mitigation site(s) proposed by SCDOT or an advisory board consisting of representatives from resource and regulatory agencies, and approved by the District Engineer and SCDHEC. Solicitation of input from private conservation groups such as the Audubon Society and The Nature Conservancy would also be a source of potential mitigation sites. Mitigation sites that would provide substantial enhancement and restoration components would be sought. A Memorandum of Agreement (MOA) is currently being drafted that provides the guidelines as to how the fund would be established and administered.

Once the type of mitigation that will be used has been determined, a final mitigation plan or a mitigation MOA will be submitted along with a permit application for unavoidable wetland and stream impacts.