any new sites discovered during field testing for the Preferred Alternative prior to the Final EIS. No cemeteries located within one mile of the Build Alternatives were found to be eligible to the NRHP as architectural resources. During the archaeological survey for the Preferred Alternative, cemeteries will be evaluated for eligibility to the NRHP as archaeological resources. For more details on cemeteries located within one mile of the Build Alternatives, refer to the *Cultural Resources Technical Memorandum*.

The No-build Alternative and the Build Alternatives would not directly affect any known archaeological resources.

C.6.4 What is the potential for archaeological resources being found in the right-of-way of the Build Alternatives?

An archaeological predictive model was developed for the South Carolina portion of the project study area to determine the potential for archaeological resources being found within the right-of-way of the Build Alternatives. NCDOT determined that the archaeological model would not be used in the North Carolina portion of the project study area due to the proposed project's limited length and cost-effectiveness. Known environmental and cultural attributes typical of the project study area were evaluated according to the different subsistence and mobility patterns of peoples within each prehistoric and historic time period. Environmental variables considered in the model included soil type, the slope of the land, and the presence of water. Additionally, the locations of previously recorded archaeological sites within the project study area were considered in the predictive model. The model ranked each land unit (100 square foot portion of the landscape) with a value of one for lowest probability to a value of 10 for highest probability for finding archaeological resources. Upland sites near surface waters comprise the majority of suitable land surfaces.

Table C.13 shows the amount of acreage and percentage within each Build Alternative that would have areas where a highly probability for archaeological resources may be found. Alternative 3 had the highest amount of acreage where potential archaeological resources could be found. Based on the percentage, 79 percent of the right-of-way for Alternative 3 has a high potential for containing

Table C.13
Archaeological Predictive Model:
High Probability Acreage

Alternative	Acreage	Percent of Alternative
1	993.0	53%
2 (Preferred)	804.9	51%
3	1,297.9	79%

archaeological sites. Alternative 2 had the lowest amount of high probability acreage at 804.9 acres, only comprising 51 percent of the right-of-way of the alternative.

A detailed archaeological resources survey will be completed for the Preferred Alternative prior to the Final EIS. Any sites found during the survey will be determined for eligibility on the NRHP. SHPO will be consulted if any eligible sites are found during the survey. If sites are found that are within the right-of-way of the Preferred Alternative, then mitigation measures will be coordinated between FHWA, NCDOT, N.C. Historic Preservation Office, SCDOT, and SHPO.

C.6.5 What are the potential impacts to historic resources under Section 4(f)?

The No-build Alternative and Alternative 2 would not have any impact on historic resources protected under Section 4(f). Alternative 1 would have a visual impact which might result in a constructive use of Resource 0918, a house located on State Route 18 southwest of Bennettsville, South Carolina, that may potentially be eligible for listing on the NRHP (refer to Figure C-31, page C-74). Alternative 3 would directly impact Resource 78002526, the McLaurin House, located east of Clio, South Carolina on State Route 40 East and is NRHP-listed (refer to Figure C-32, page C-74).

C.7 Hazardous Materials

Would the Build Alternatives impact potentially contaminated sites in the project study area?

GIS data layers were overlaid onto existing maps of the Build Alternatives to locate the 839 sites and determine which hazardous material and waste sites within the project study area could be impacted. In addition, the GIS information was compared to data collected during the field survey and a building inventory of the project study area.

All hazardous material sites within or immediately adjacent to the 400-foot ROW were assumed to be potentially impacted by the Build Alternatives and are discussed below. Potentially impacted sites were researched in environmental databases containing information about hazardous waste and material sites from multiple regulating state and federal agencies, including the USEPA. The Facility Index System (FINDS) database is a comprehensive listing of facilities regulated by USEPA and refers users to the specific database that pertains to the type of site. Table C.14 provides a summary of the identified sites potentially impacted by each Build Alternative. Other sites of potential concern located within a 0.5 mile of the Build Alternatives or farther away were not considered to be impacted. These sites are provided in the *Hazardous Materials Technical Memorandum* for informational purposes.

Table C.14
Hazardous Materials and Waste Sites Potentially Impacted by Alternative

Site	Description	Alt. 1	Alt. 2 (Preferred)	Alt. 3
10078302	Southeastern Carolina Regional Housing Co-op Inc.	X		
10078354	Charlie's Auction and Water System	X	X	X
10078342	Red Bluff Grocery and Grill			X
	Total Potentially Impacted Sites per Alternative	**2**	**1**	**2**

C.7.1 Alternative 1

Alternative 1 would impact the Southeastern Carolina Regional Housing Co-op Inc. in Bennettsville, South Carolina and the Charlie's Auction and Water System in Hamlet, North Carolina. The Southeastern Carolina Regional Co-op Inc. would be located within the proposed ROW and was identified on the FINDS database, which referred to it being listed on the South Carolina Environmental Facility Information System (SC-EFIS). Information from the SC-EFIS database indicated that this site was not releasing harmful material and nothing was revealed during the field survey to indicate that the site was contaminated. No other information regarding potential hazardous materials for this site was found.

Charlie's Auction and Water System

Charlie's Auction and Water System in Hamlet, North Carolina would be located adjacent to the proposed 400-foot ROW. This site was identified on the Integrated Compliance Information System (ICIS) database, which supports enforcement of and compliance by National Pollutant Discharge Elimination Sites (NPDES). A storage building and two aboveground storage tanks (ASTs) are located on the property. No other information was found concerning potential hazardous materials that may be at this location. After a review of the available data, there is nothing to indicate that contamination would be an issue at the site.

C.7.1 Alternative 2

Alternative 2 would potentially impact Charlie's Auction and Water System in Hamlet, North Carolina. The site, described in the previous paragraph, would be located adjacent to the proposed ROW of Alternative 2.

C.7.1 Alternative 3

Alternative 3 would impact the previously described Charlie's Auction and Water System in Hamlet, North Carolina. In addition, Alternative 3 would impact the Red Bluff Grocery and Grill in Clio, South Carolina. This site would be located within the proposed 400-foot ROW of Alternative 3 and was identified on the FINDS database, which referred to it being listed on the SC-EFIS. Currently the site is occupied by a convenience store and grill, which contains a gas pump and three ASTs. No other information concerning potential hazardous materials at the site was found. Nothing in the database review or field visit indicated that this site was releasing hazardous material.

Red Bluff Grocery and Grill

During field surveys, two additional sites were identified that would be within or adjacent to the proposed ROW and may contain potentially hazardous materials. Central Carolina Gas is located north of U.S. Route 74 and east of N.C. State Route 1807 and would be within the ROW of all the Build Alternatives. This site contains numerous ASTs for propane. The status of this site is unknown, but no record of release or other hazardous materials has been reported at this site to date. Smith's Tire Shop would be located adjacent to the ROW for all three Build Alternatives and is located in front of Charlie's Auction and Water System in Hamlet, North Carolina. This site appears to be vacant, and it is unknown whether any potentially hazardous materials may be present.

Prior to construction of the Preferred Alternative, efforts would be made to avoid these properties. Where potentially contaminated sites could not be avoided, detailed studies would be completed at the sites potentially impacted by the Preferred Alternative to accurately characterize the extent of potential soil and/or groundwater contamination. Discovery of contamination would result in the removal and proper disposal of contaminated soil and/or groundwater within the ROW prior to the initiation of construction activities.

C.8 Noise

C.8.1 What are the anticipated noise impacts for the Build Alternatives?

In order to analyze and compare specific categories of noise impacts associated with the three Build Alternatives, contour distances were extrapolated from the TNM model and applied to detailed GIS land use data and structural information for the project study area. This provided the ability to calculate the number and types of structures that fell within the contours associated with each NAC category for each of the Build Alternatives. The two contours of concern are the 66 dBA contour (Category B) and the 71 dBA contour (Category C); no Category A receivers were identified adjacent to the Build Alternatives. The GIS analysis, summarized in Table C.15, provided a more detailed picture as to where impacts are located along the Build Alternatives and are shown on Figure C-33 (refer to page C-82).

Table C.15
Noise Impacts Based on GIS Analysis

Alternatives	Commercial	Residential	Other	Total
Alternative 1				
66 dBA	0	6	0	
71 dBA	0	0	0	
Total	0	6	0	6
Alternative 2				
66 dBA	0	3	0	
71 dBA	0	0	0	
Total	0	3	0	3
Alternative 3				
66 dBA	0	2	0	
71 dBA	0	0	0	
Total	0	2	0	2

Construction Impacts

Areas along the Build Alternatives could be affected by noise generated from various construction activities. The major construction elements of this project are expected to be earth moving, hauling, grading, and paving. General construction noise impacts to individuals living or working near the project would be expected, particularly from noise generated by paving operations and from earth moving equipment. Overall, construction noise impacts are expected to be minimal since construction noise would be relatively short in duration and could be restricted to daytime hours.

C.8.2 What happens when impacts occur and can impacts be mitigated?

When traffic noise impacts occur, analysis of noise abatement measures must be completed to determine if noise impacts can be mitigated. Methods used to reduce noise levels must be practicable to build, as well as cost effective. Methods cannot be used if they are determined to be unsafe to construct or if the methods are too costly when compared to the benefits.

Due to the rural setting of the project study area, areas of high density development and residential areas were avoided to the extent possible during the development of the Build Alternatives. The avoidance of developed areas has reduced the number of potentially impacted receivers. The following noise abatement measures were evaluated for areas with the highest potential for noise impacts to determine the feasibility and reasonableness of their implementation.

C.8.2.1 No-build Alternative

This noise abatement measure would involve not constructing the project. The No-Build Alternative would have no impacts associated with the construction of I-73. However, this measure would not satisfy the purpose and need for the project.

C.8.2.2 Highway Alignment

Highway alignment selection involves the horizontal or vertical orientation of the proposed project in such a way as to minimize impacts and costs. The selection of Build Alternatives for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For noise abatement, a horizontal alignment selection is primarily a matter of placing the roadway at a sufficient distance from noise sensitive areas. As stated above, this method was used during the development of Build Alternatives and has been implemented throughout the entire process.

C.8.2.3 Traffic System Management Measures

Traffic management measures that limit vehicle type, speed, volume and time of operations are often effective noise abatement measures. However, an interstate facility design is generally not conducive to limiting vehicles' use, type and speed. An interstate consists of a controlled

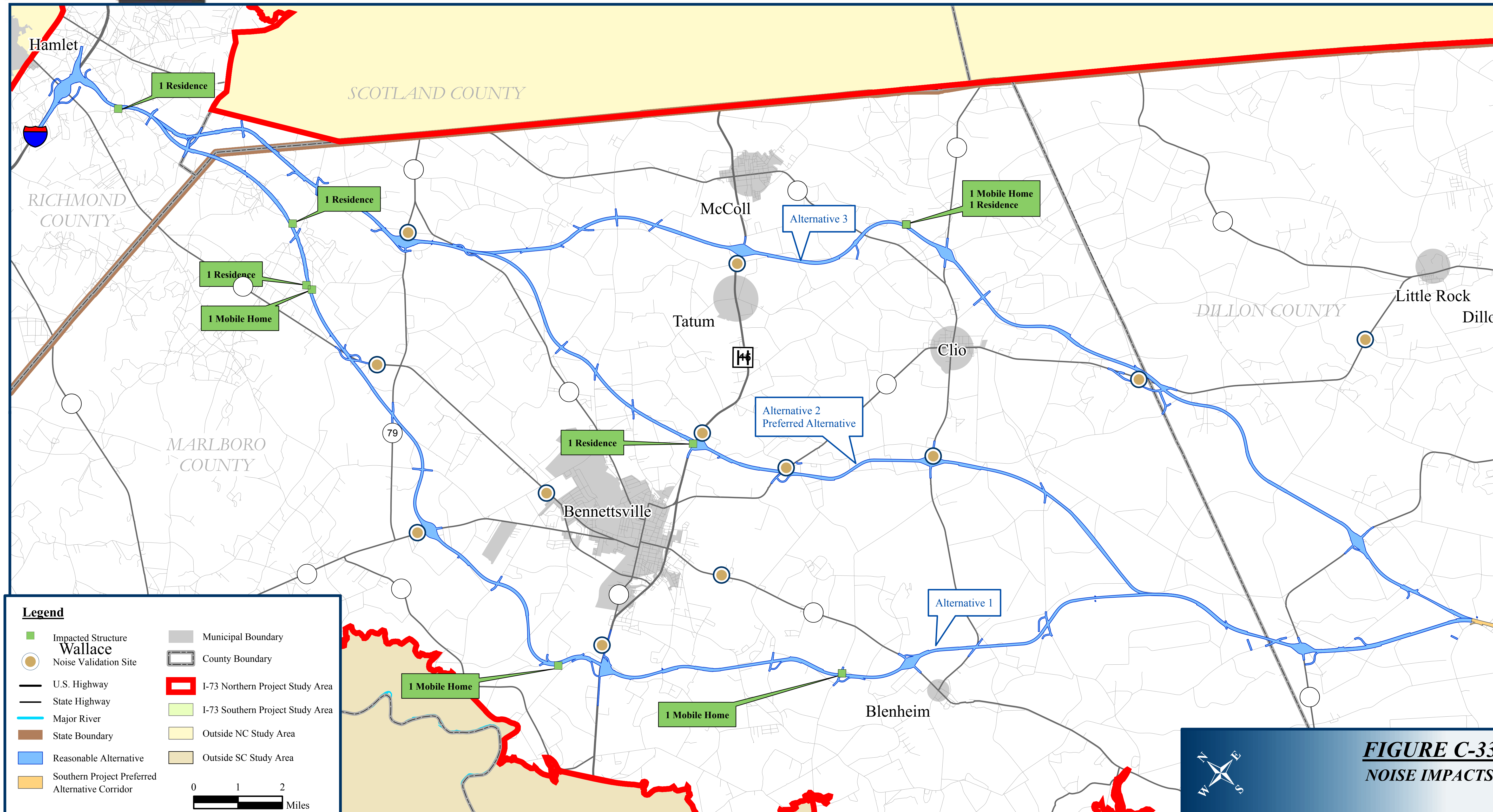

FIGURE C-33
NOISE IMPACTS

access roadway designed to move traffic from point A to point B in a safe and effective manner. Limiting one or all of the above variables not only reduces the effectiveness of the facility, but may also create an unsafe roadway environment. For this project, traffic management measures are not considered appropriate for noise abatement due to their limiting effect on the capacity, level-of-service, and safety of the proposed project.

C.8.2.4 Noise Barriers

Noise barriers involve constructing solid barriers to effectively diffract, absorb, and/or reflect highway traffic noise, which may include earth berms and/or noise walls. The evaluation of the reasonableness and feasibility of noise wall construction is based on many factors, some of which include the following:

- constructability;
- cost;
- height;
- anticipated noise increase/decrease;
- noise reduction obtained;
- number of receptors benefited;
- residents' views;
- land use type; and,
- whether land use changes are expected.

The SCDOT noise abatement criteria states that a noise barrier should cost no more than $25,000 per benefited receptor and NCDOT allows a cost of $35,000 per benefited receptor. In addition, if a noise wall is constructed, the wall cannot be higher than 25 feet based on specifications by SCDOT, NCDOT, and FHWA. A benefited receiver is defined as one that achieves a five dBA reduction in noise, whether that receptor was impacted or not. The SCDOT and NCDOT have both determined that the cost of abatement for isolated receptors compared to the benefits provided is cost prohibited.

Development within the project study area is sparse and the Build Alternatives chosen were located well away from the more highly developed areas, thereby further reducing the number of impacted noise receivers. Noise impacts associated with all of the Build Alternatives consisted of isolated areas of one to two impacted residential structures.

Of the Build Alternatives, only Alternative 1 had an impact density of residential structures high enough to warrant a barrier analysis. A construction cost of $20 a square foot was used for the cost analysis. The cost of the benefited receptors was calculated by dividing the cost of the noise wall by the number of receptors benefited by the wall. Based on preliminary analysis, the noise barrier at this location was found not to be reasonable based on cost per benefited receptor ($53,000 per benefited receiver).

C.9 Air Quality

C.9.1 Would air quality be impacted by the proposed project?

Air quality impacts are not anticipated by the proposed project. In general, the proposed project would improve the flow of heavy truck traffic through this area relieving congestion along existing routes, which would have positive effects on the region's air quality. In addition, both Dillon and Marlboro Counties in South Carolina have entered into Early Action Compacts to set goals for cleaner air. This project also has been included in the both North Carolina and South Carolina's Transportation Infrastructure Programs (STIPs), which are reviewed for air quality compliance. With the Early Action Compacts in place, and standard review of the project as part of the STIPs would increase mobility within this area. In view of the qualitative analysis (see below), the proposed project is not likely to impact air quality in the project study area.

Meaningful or reliable estimates of MSAT emissions and effects cannot be determined for the proposed project due to the technical shortcomings of current emission/dispersion models as well as the uncertain science with respect of health effects from MSAT emissions. Even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions for the proposed project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the Build Alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*.[7]

For each Build Alternative the amount of MSATs emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. Because the VMT (refer to Table 2.13, page 2-38) estimated for the Build Alternatives are similar, it is expected there would be no appreciable difference in overall MSAT emissions among the three Build Alternatives. Regardless of the Build Alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs

[7] Clagett and Miller, *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*, http://www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm (May 18, 2007).

that are projected to reduce MSAT emissions by 57 to 87 percent between 2000 to 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the project study area are expected to be lower in the future in virtually all cases.

During the development of the Build Alternatives, areas of high density development, communities, neighborhoods, and residential areas were avoided to the extent possible. However, the Build Alternatives would have the effect of moving some traffic closer to nearby homes and businesses; therefore, there may be localized areas where ambient concentrations of MSATs could be higher under the Build Alternatives than the No-build Alternative.

As discussed above, the magnitude and the duration of the potential increases by the Build Alternatives when compared to the No-build Alternative cannot be accurately quantified due to the inherent deficiencies of current models. In summary, when a highway is widened and as a result, moves closer to receptors, the localized level of MSAT emissions for the Build Alternatives may be higher relative to the No-build Alternative, but this may be offset by increases in speed and reduction of congestion (which are associated with lower MSAT emissions). Additionally, MSATs would be lower in other locations when traffic shifts away. On a regional basis, USEPA's vehicle and fuel regulations, coupled with fleet turnover, may cause substantial reductions over time that, in almost all cases, cause region-wide MSAT levels to be lower than today.

C.9.2 Construction Impacts to Air Quality

Air quality impacts may occur during construction due to the dust and fumes from equipment, earthwork activities, and vehicles accessing the construction site. Air quality impacts may also occur from an increase of vehicle emissions from traffic delays due to construction activities. Construction activities could include staging of construction for interchange locations, delivery of equipment and materials, and longer waiting times at traffic signals.

Best management practices that limit dust generation are described in the *South Carolina Stormwater Management and Sediment Control Handbook For Land Disturbance Activities*[8] and *A Guide To Site Development and Best Management Practices For Stormwater Management and Sediment Control.*[9] These methods include vegetative cover, mulch, spray-on adhesive, calcium chloride application, water sprinkling, stone, tillage, wind barriers, and construction of a temporary graveled entrance/exit to the construction site.

[8] SCDHEC-OCRM, *South Carolina Stormwater Management and Sediment Control Handbook for Land Disturbance Activities* (2003), Appendix E.
[9] SCDHEC-OCRM, *A Guide to Site Development and Best Management Practices for Stormwater Management and Sediment Control*.

In accordance with Section 107.07 of the *South Carolina Highway Department Standard Specifications for Highway Construction,*[10] the contractor would comply with *South Carolina Air Pollution Control Laws, Regulations and Standards*.[11] In addition, for portions of the roadway being built in North Carolina, the contractor would be required to comply with the *North Carolina Air Quality Rules, Policies and Regulations*.[12] The contractor would also comply with county and other local air pollution regulations. Any burning of cleared materials would be conducted in accordance with applicable state and local laws, regulations and ordinances and the regulations of the North Carolina's and South Carolina's State Implementation Plan for air quality, in compliance with South Carolina's Regulation 62.2, *Prohibition of Open Burning* and North Carolina's *Open Burning* Regulation, found in 15A NCAC 02D.1900.

[10] SCDOT, *Standard Specifications for Highway Construction* (2000).
[11] SCDHEC, Bureau of Air Quality Control, *South Carolina Air Pollution Control Laws, Regulations, and Standards.*
[12] NCDENR, Division of Air Quality, *Air Quality Rules, Policies, and Regulations,* http://daq.state.nc.us/rules/rules/ (January 30, 2007).

C.10 Farmlands

C.10.1 How would the No-build Alternative directly impact farmlands?

The No-build Alternative would have no effect on farming operations since existing conditions would remain unchanged.

C.10.2 How would the Build Alternatives directly impact farmlands?

A Farmland Impact Conversion Evaluation was completed for the three Build Alternatives. By totaling the relative value and the corridor assessment value, it was determined that the total threshold, 160 points overall, set by NRCS, was not exceeded by the Build Alternatives in any of the four counties (refer to C.16). The highest total value was 158 points for Alternative 1 in Dillon County. The lowest value was 83.5 points for Alternatives 2 and 3 in Scotland County (refer to Table C.16). Since the 160 threshold was not exceeded for any of the Build Alternatives, mitigation actions that could reduce adverse impacts associated with the Build Alternatives would not be required.

Table C.16
NRCS Farmland Conversion Evaluation
Point Total by Alternative

	Alternative 1	Alternative 2 (Preferred)	Alternative 3
Dillon County	158	154	157
Marlboro County	150	147	150
Richmond County	96	96	95
Scotland County	0	83.5	83.5

Construction of the Build Alternatives would result in the direct conversion of farmland to a transportation facility. Alternative 3 would incur 1,582 acres of impact to prime and statewide important farmland soils, the highest of all Build Alternatives (refer to Table C.17, page C-88). Alternative 2 would have the least amount, 1,506 acres, of prime and statewide important farmland soils directly impacted, (refer to Table C.17, page C-88).

The Build Alternatives may also result in other impacts, such as divided farm parcels. Accessibility to fields or pastureland may be affected if farm buildings or land are separated from the rest of the farming operations by the new interstate facility. If access was affected, the farm operator may experience increased time requirements and expenses in order to conduct normal farming operations. The increased expenses could result from the need of the farm operations to move/transfer equipment, feed, and livestock between the divided parts of the farm.

Table C.17
Direct Impacts to Prime Total and Statewide Important Total Soils by Acres

	Alternative 1	Alternative 2 (Preferred)	Alternative 3
Dillon County	**116**	**265**	**446**
Prime	98	98	247
Statewide Important	18	167	199
Marlboro County	**1,423**	**1,217**	**1,112**
Prime	726	705	711
Statewide Important	697	512	401
Richmond County	**0.24**	**3**	**3**
Prime	0.24	3	3
Statewide Important	0	0	0
Scotland County	**17**	**21**	**21**
Prime	0	0	0
Statewide Important	17	21	21
Alternative Total	**1,556**	**1,506**	**1,582**

Impacts to parcels that would potentially be divided by the Build Alternatives were identified by the following methodology. Given that farm size in the project study area ranges from 1 acre to 1,000 acres or more, it was determined that no parcel would be too small to farm. For every parcel that a Build Alternative traversed, three areas were calculated: the area within the 400-foot corridor and the two remaining areas on either side of the corridor. The area within the 400-foot corridor was calculated as direct impacts and was assumed that the parcels divided could be kept or acquired by a neighboring farm. Even though the farmland may be split, it may not be removed from active production. Maintaining access to farms that would be split or severed by I-73 is an issue that will be further investigated for the Preferred Alternative in the Final EIS.

Alternative 1 would incur the greatest potential impact to farmland via divided parcels (75.2 acres) while Alternative 2 would incur the least amount of impacts via divided parcels (61.2 acres) (refer to Table C.18). In Scotland County, parcels along Alternative 3 may be impacted, but no parcels are being divided.

Overall, farming operations could be directly impacted as a result of the construction of the proposed project. Thirty-four percent of the land in the project study area is currently being farmed, and 0.005 percent of this land or less would be rendered unfarmable, depending on Build Alternative. No farm acreage, besides that acquired for ROW, should be rendered unfarmable and access issues

Table C.18
Divided Farmland Parcels in the Project Study Area by Acres

	Alternative 1	Alternative 2 (Preferred)	Alternative 3
Dillon County	0.2 ac. / 1 parcel	0.2 ac./ 1 parcel	9 ac./ 2 parcels
Marlboro County	73 ac./ 20 parcels	59 ac./ 11 parcels	53 ac./ 10 parcels
Richmond County	2 ac./ 1 parcel	2 ac./ 1 parcel	2 ac./ 1 parcel
Scotland County	--	--	--
Total	75.2 ac./ 22 parcels	61.2 ac./ 13 parcels	64 ac./ 13 parcels
Total Acres in Corridor	2,324	2,081	2,136

to divided parcels will be addressed during the right-of-way acquisition process. The conversion of farmland to ROW due to construction should not cause a significant disruption of agricultural activities in the project study area.

Within the project study area there are numerous hog and poultry concentrated animal feeding operations (CAFOs). During the alternative development process, CAFOs were avoided when possible. However, one CAFO, the Charles and Monnie Perdue Poultry Farm located on State Route 40 east of Clio, would be displaced by Alternative 3. This farm could not be avoided due to the presence of wetlands on both sides of the property, which were avoided during the alternative development process to minimize potential impacts.

C.10.3 What would be the potential indirect and cumulative impacts on farmland?

Impacts from induced development and cumulative impacts were calculated with the use of GIS. Spatial data layers containing acreages of projected growth by Build Alternative (which were determined in the land use study, refer to Land Use, Section C.1, page C-1) were overlaid on the soils data (obtained from the NRCS) within the project study area. The acreages of projected growth that fell within prime farmland or farmland of statewide importance were identified and calculated.

C.10.3.1 How would development that is expected to occur with the No-build Alternative impact farmlands?

Development that would be expected under the No-build Alternative would impact approximately 55 acres of farmlands, including prime farmland and farmland of statewide importance. These impacts would include: in Dillon County, 23 acres of prime farmland and 16 acres of farmland of statewide importance; in Marlboro County, no acres of prime farmland or farmland of statewide importance would be impacted; in Richmond County, 16 acres of prime farmland and no acres of farmland of statewide importance would be impacted; and in Scotland County, no acres of prime farmland or farmland of statewide importance would be impacted (refer to Table C.19). The No-build Alternative was used as a baseline to compare development that was projected as a result of the construction of I-73.

Table C.19
Impacts from Induced Development on Prime and Farmland of Statewide Importance Soils in the Project Study Area by Alternative in Acres

		No-build	Alternative 1	Alternative 2 (Preferred)	Alternative 3
Total Impacts from Induced Development to Farmland		**55**	**799**	**885**	**716**
Dillon County	Prime	23	9	57	49
	Statewide Important	16	12	32	41
Marlboro County	Prime	0	585	614	449
	Statewide Important	0	193	163	158
Richmond County	Prime	16	<1	19	19
	Statewide Important	0	0	0	0
Scotland County	Prime	0	0	0	0
	Statewide Important	0	0	0	0

C.10.3.2 What would be the potential impacts from induced development on farmland by the Build Alternatives?

In addition to the direct conversion of farmland to right-of-way, impacts from development induced by the construction of the project would be anticipated in the project study area. Listed in Table C.19 are acres of impacts from induced development to farmland, based on the land use model. Alternative 2 would have the highest acres of potential impacts from induced development with 885 acres, while Alternative 3 would have the least acres of potential impacts with 716 acres.

C.10.3.3 What would be the potential cumulative impacts on farmland from the Build Alternatives?

Cumulative effects on farmland are caused by the aggregate of past, present and reasonably foreseeable future actions. Cumulative impacts would include development in the project study area that would be expected under the No-build Alternative, development that may result from the project, as well as other development in the project study area that may affect farmlands.The No-build would have 55 acres of impacts to prime and statewide important farmland soils, while Alternatives 1 through 3 would range between 2,353 and 2,446 acres of impacts. This would range from 0.0002 percent (with the No-build Alternative) to 0.009 percent (all Build Alternatives) of the total prime and statewide important farmland soils found in the project study area being impacted (refer to Table C.20).

Table C.20
Cumulative Impacts to Prime and Farmland of Statewide Importance Soils in the Project Study Area by Alternative in Acres

		No-build	Alternative 1	Alternative 2 (Preferred)	Alternative 3
Total Impacts to Farmland		**55**	**2,362.24**	**2,446**	**2,353**
Dillon County	Prime	23	130	178	319
	Statewide Important	16	46	215	256
Marlboro County	Prime	0	1261	1319	1160
	Statewide Important	0	890	675	559
Richmond County	Prime	16	18.24	38	38
	Statewide Important	0	0	0	0
Scotland County	Prime	0	0	0	0
	Statewide Important	0	17	21	21

Sixty-six percent of the land within the project study area has either prime or statewide important soils, and 0.003 percent or less of these soils would be impacted as a result of cumulative development from the Build Alternatives. In addition to projected growth and land use changes, other transportation projects have been constructed, are under construction, or are in the planning stages. These projects would contribute to the cumulative impacts on farmlands.

In 2000, construction of 28.5 miles of S.C. Route 22 from U.S. Route 501 in Conway to U.S. Route 17 in North Myrtle Beach was completed. Also in 2000, approximately 17 miles of I-74 in North Carolina was completed southwest of Hamlet, North Carolina, impacting 50 acres of prime, unique, or statewide important farmland soils. The S.C. Route 22 and U.S. Route 17 projects were both on new location and traversed predominately rural areas, which directly impacted farmlands as well as bisected parcels, which created access problems for some farm owners. The widening of S.C. Route 38 from I-95 to Marion is currently under construction. This project widened an existing route from two to four lanes, which is anticipated to impact approximately 22 of acres prime, unique, or statewide important farmland soils adjacent to the roadway.

Three projects are reasonably foreseeable future actions, but are dependent upon funding that is currently unavailable. The S.C. Route 9/S.C. Route 38 project would widen the existing roadway from two to five lanes in Marlboro County, South Carolina, which would impact farmlands adjacent to the existing facility. The southern portion of I-73 is 44 miles of new location roadway extending from I-95 to Myrtle Beach region through Dillon, Marion, and Horry Counties. The Southern Evacuation Lifeline is approximately 20 miles extending from interchange at U.S. Route 501 and S.C. Route 22 to the vicinity of U.S. Route 17. When these projects are constructed, they would impact farmlands directly by taking farmland out of production and indirectly by bisecting farm parcels. Access issues for farm owners would be addressed in the final planning stages to reduce these types of impacts as much as possible.

C.10.4 How would Federal/USDA farmland programs in the project study area be impacted by the Build Alternatives?

C.10.4.1 Conservation Reserve Program

There are over 1,500 Conservation Reserve Program easements in the project study area (refer to Figure C-34). All of the Build Alternatives would intersect multiple easements, ranging from 10 to 29 easements (refer to Table C.21, page C-94). Alternative 2 would intersect the fewest easements (10), which contain approximately 19 acres of land. The Build Alternative with the most impacts to easements is Alternative 3, which intersects 29 sites containing 45 acres of land. The remainder of the land in the impacted parcels would remain in the program and no mitigation would be required for any of the Build Alternatives.

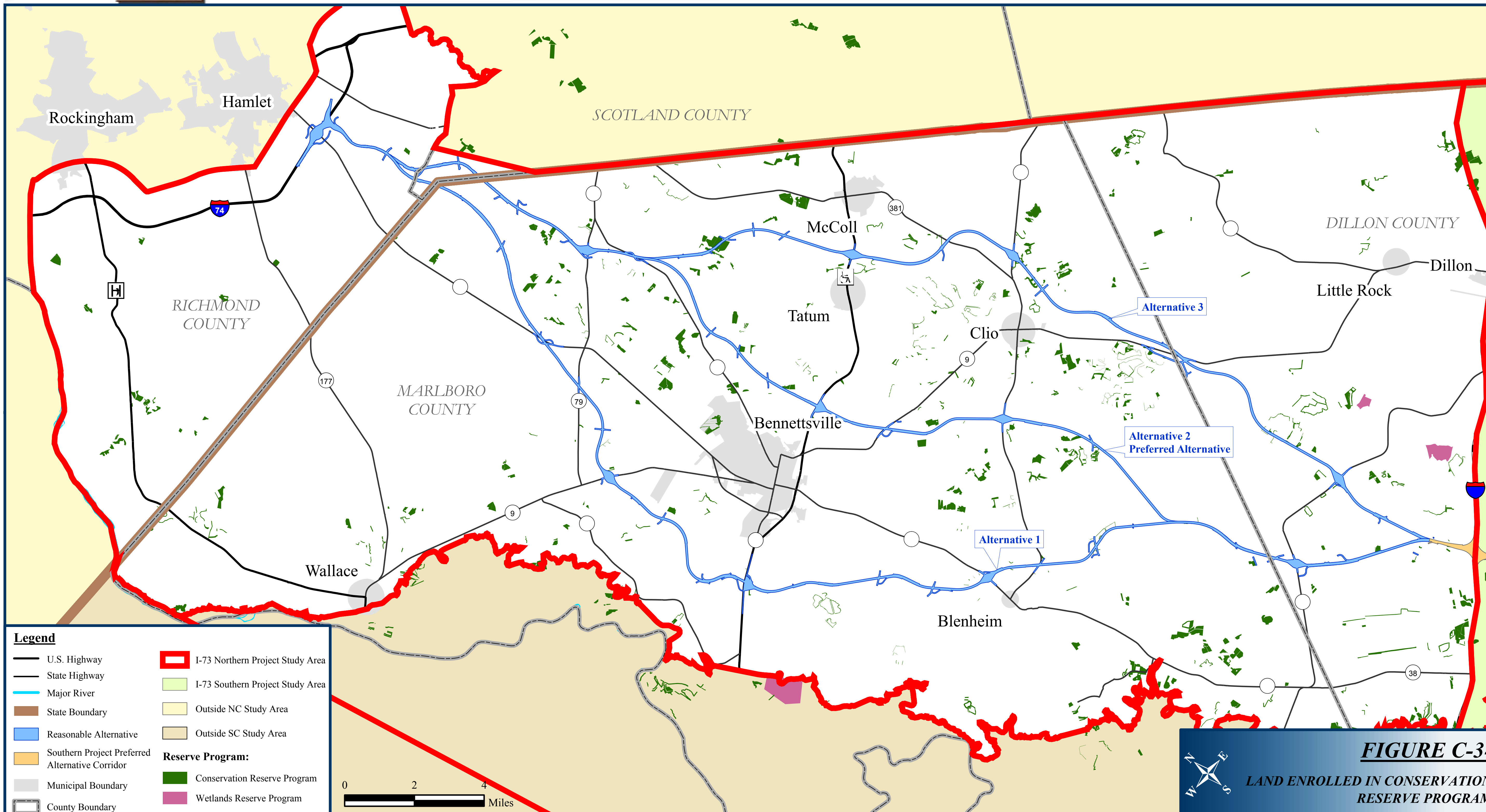

FIGURE C-34

LAND ENROLLED IN CONSERVATION RESERVE PROGRAM

Table C.21
Impacts to Land in the Conservation Reserve Program

	Alternative 1	Alternative 2 (Preferred)	Alternative 3
Dillon County	2	2	6
Marlboro County	21	8	23
Richmond County	0	0	0
Scotland County	0	0	0
Total Number of Sites	**23**	**10**	**29**
Total Acres	**22**	**19**	**45**

C.10.4.2 Farm and Ranch Lands Protection Program

Even though there is enrolled land in the Farm and Ranchland Protection Program within the project study area, no Farm and Ranchland Protection Program easements would be impacted by the Build Alternatives.

C.10.4.3 Wetlands Reserve Program

Although there is land enrolled in the Wetland Reserve Program within the project study area, no easements would be impacted by any of the three Build Alternatives.

C.11 Uplands

How would upland communities be impacted?

Each Build Alternative would impact forested upland communities as well as agricultural and developed lands. The majority of the upland impacts for each Build Alternative would occur to agricultural and developed lands. Analysis of the GAP data indicates that Alternative 1 would have the highest impacts to developed land followed by Alternative 3, and then Alternative 2 with the least impact (refer to Table C.22, page C-95). Alternative 3 would have the highest impacts to agricultural land followed by Alternative 1, and then Alternative 2 with the least impact. The portion of forested uplands that would potentially be impacted would range from 30 to 42 percent of the total upland impacts for the Build Alternatives (refer to Section C.1, Land Use, page C-1 and Section C.10, Farmlands, page C-87).

Impacts to forested upland communities would consist of clearing and grubbing of vegetation within the construction limits in preparation of construction of the road. Excavation and/or the placement of fill material would occur to construct the road bed. Table C.23 provides the potential forested upland community impacts by community type that would result from the construction of each Build Alternative.

Table C.22
Potential Agricultural and Developed Land Impacts in Acres

	Alternatives		
	1	2 (Preferred)	3
Agricultural Land	937.9	828.5	1,055.5
Developed Land	267.2	217.0	234.9
TOTAL IMPACT	**1,205.1**	**1,045.5**	**1,290.4**

Source: THE LPA GROUP INCORPORATED, 2007

As indicated in Table C.23, the total impacts to forested uplands would range from 552.4 acres for Alternative 3 to 755.0 acres for Alternative 2. Alternatives 1 and 2 have similar forested upland impact totals, with approximately 8.4 acres of impacts difference, while Alternative 3 would have the least amount of impact.

Table C.23
Potential Natural Forested Upland Community Impacts in Acres

	Alternatives		
FOREST TYPE	1	2 (Preferred)	3
Oak-Hickory Forest	124.9	77.1	80.9
Pine Flatwoods	36.5	28.8	0
Pine-Scrub Oak	111.8	146.4	144.2
Timberlands	473.4	502.7	327.3
TOTAL FOREST IMPACT	**746.6**	**755.0**	**552.4**

Source: THE LPA GROUP INCORPORATED, 2007

Upland forested community impacts would result in the removal of wildlife habitat as discussed in Section C.16, page C-122. Of the forested uplands that would be impacted, the oak-hickory forest would support the most wildlife diversity due to the presence of mast producing plant species, on which animal species such as turkey, squirrels, and white tailed deer feed. Alternative 1 would have the most impacts to oak-hickory forests while Alternative 2 would have the least.

Pine flatwoods typically have a dense understory and provide cover and browse for white tailed deer. These areas also provide nesting and forage habitat for a variety of perching bird species. Alternative 1 would have the greatest impact to pine flatwoods, followed by Alternative 2, and then Alternative 3, which would have the least impact.

Pine-scrub oak forests are typically the least diverse of the upland habitats from a wildlife standpoint, however Pickering's morning-glory, savannah campylopus (a moss), sandhills gaillardia, soft milk-pea, showy milk wort, twisted-leaf goldenrod, and southern hognose snake, all North Carolina or South Carolina state listed species, occur in this habitat type. None of the federally listed species occur in pine-scrub oak communities. Alternative 2 would have the most impacts to pine-scrub oak forests while Alternative 1 would have the least impacts to this community type.

The largest portion of the upland forest impacts would occur to timberlands, or managed pines, which typically have relatively low wildlife diversity when compared to the other upland types that would be impacted. In addition, these forested areas are frequently disturbed by logging operations during which wildlife is displaced to adjoining upland communities. Timberlands provide foraging habitat for red-cockaded woodpeckers. However, these forests generally are harvested before they reach maturity, which is required for suitable red-cockaded woodpecker nest colonies. Impacts to timberlands would be essentially the same for Alternatives 2 (502.7 acres) and 1 (473.4 acres), while the lowest impact to would occur on Alternative 3 (327.3 acres).

Indirect and cumulative impacts to upland habitats as it relates to wildlife habitat can be found in Section C.16, page C-122.

C.12 Wetlands

C.12.1 What kind of impacts would occur in wetlands as a result of the proposed project?

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 reseeded with native wetland vegetation after the side slopes of the road are stable and the silt fencing has been removed.

Permanent clearing of trees 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. Trees would be removed for a width of approximately 30 feet along both sides of each bridge. The areas would be maintained to prevent trees from growing there. 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, the wooded swamp could become a deciduous shrub swamp or a fresh water marsh after the removal of the trees.

C.12.2 How many acres of wetlands would be impacted by the proposed project?

To calculate the potential impacts associated with each Build Alternative, the conceptual construction limits for each was overlain onto the 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, the proposed interchanges, crossover roads, and other roads necessary to maintain access to properties. 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. Upon completion of the hydraulic studies for the Preferred Alternative, appropriately sized pipes, box culverts, or bridges would be installed at wetland crossings to maintain the historic hydrologic connections.

Wetlands are distributed throughout the project study area (refer to Figure C-35) and each Build Alternative would impact wetlands. Table C.24 (refer to page C-99) provides the wetland types that would be impacted, the type of impact, and the wetland value for each Build Alternative. As indicated in Table C.24 (refer to page C-99), Alternative 2 and Alternative 3 would have essentially the same amount of wetland impact. Alternative 1 would have the highest wetland impact, while Alternative 2 would have approximately two acres less than Alternative 3.

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. These previously impacted wetlands received lower values as decided in consultation with the ACT (refer to Chapter 2). However, riparian wetland systems associated with the larger streams that flow through the project study area were considered to be higher value wetlands. Alternative 3 would have the lowest wetland value (729.3), Alternative 2 would have a wetland value of 768.1, and Alternative 1 would have the highest wetland value (1,205.2).

As mentioned earlier, many 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

FIGURE C-35
WETLANDS, STREAMS, AND FLOODPLAINS

Table C.24
Potential Wetland Impacts in Acres and Wetland Values

Wetland Type	Build Alternatives			Total Acres Present in the Project Study Area
	1	2 (Pref.)	3	
Aquatic Beds (Total)	**0**	**0.1**	**0**	**102**
Clear/Bridge Impact	0	0	0	
Fill Impact	0	0.1	0	
Bay Forests (Total)	**30.1**	**10.4**	**8.7**	**20,372**
Clear/Bridge Impact	0	0	0	
Fill Impact	30.1	10.4	8.7	
Bottomland Hardwoods (Total)	**8.7**	**5.2**	**0.8**	**5,415**
Clear/Bridge Impact	0	0	0	
Fill Impact	8.7	5.2	0.8	
Deciduous Shrub Swamps (Total)	**3.8**	**8.0**	**3.2**	**2,491**
Clear/Bridge Impact	0	0	0	
Fill Impact	3.8	8.0	3.2	
Evergreen Shrub Bogs/Pocosins (Total)	**10.6**	**5.2**	**23.6**	**6,766**
Clear/Bridge Impact	0	0	0	
Fill Impact	10.6	5.2	23.6	
Freshwater Marsh (Total)	**0**	**4.8**	**0**	**564**
Clear/Bridge Impact	0	0	0	
Fill Impact	0	4.8	0	
Pine Savannahs & Wet Flatwoods (Total)	**0**	**0.4**	**12.4**	**10,824**
Clear/Bridge Impact	0	0	0	
Fill Impact	0	0.4	12.4	
Ponds & Borrow Pits (Total)	**2.6**	**4.9**	**3.6**	**2,097**
Clear/Bridge Impact	0	0	0	
Fill Impact	2.6	4.9	3.6	
Savannahs & Wet Meadows (Total)	**1.7**	**1.6**	**2.5**	**1,551**
Clear/Bridge Impact	0	0	0	
Fill Impact	1.7	1.6	2.5	
Wooded Swamp (Total)	**110.2**	**73.7**	**61.1**	**48,017**
Clear/Bridge Impact	5.8	7.3	1.6	
Fill Impact	104.4	66.4	59.5	
Total Wetland Impact	**167.7**	**114.3**	**116.0**	**98,199**
Total Clear/Bridge Impact	5.8	7.3	1.6	
Total Fill Impact	161.9	107.0	114.4	
Wetland Values				**N/A**
Total Wetland Value Impact	**1,205.2**	**768.1**	**729.3**	
Clear/Bridge Impact	47.6	31.9	14.7	
Fill Impact	1,157.6	736.2	714.6	

Source: THE LPA GROUP INCORPORATED, 2007 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. Many of these wetlands are remnants of Carolina bays that have been converted to managed pine stands or are under partial cultivation for agricultural crops. The riparian wetland systems associated with streams that would be impacted consist of fully functional bottomland hardwoods and hardwood swamps, which were assigned high wetland values, and would result in the greatest loss of wetland functions.

The use of bridges at these major riparian crossings would help minimize wetland and stream impacts. Alternative 3 would have fewer crossings of major riparian systems than the other Build Alternatives. The four major riparian wetland systems crossed by Alternative 3 are Little Reedy Creek, Reedy Creek, Marsnip Branch, and Crooked Creek. One crossing is located at a section of Reedy Creek that would be approximately 1,500 feet wide. The other three crossings are approximately 900 feet or less wide. Impacts associated with these crossings would total approximately 27 acres, 1.6 acres of which would be bridge impacts.

Alternative 2 would cross six major riparian wetland systems including Little Reedy Creek, an unnamed tributary to Little Reedy Creek, Hagins Prong, Cottingham Creek, Beverly Creek, and Crooked Creek. The Hagins Prong crossing is located at a relatively wide section of this riparian system, at approximately 2,100 feet wide. The remainder of the crossings are approximately 900 feet or less wide. Riparian system impacts associated with Alternative 2 would be approximately 39 acres, 7.3 acres of which would be bridge impacts.

Alternative 1 would cross seven riparian systems including Little Reedy Creek, an unnamed tributary to Little Reedy Creek, Three Creeks, Muddy Creek, Crooked Creek, Herndon Branch, and Lightwood Knot Creek. Three of the crossings are located at relatively wide sections of the riparian systems with the crossing of Crooked Creek being approximately 3,300 wide, Three Creeks approximately 2,100 feet wide, and Muddy Creek approximately 1,500 feet wide. The rest of the crossings are approximately 600 feet or less wide. Riparian system impacts due to the construction of Alternative 1 would be approximately 64 acres, 5.8 acres of which would be bridge impacts.

What other wetland impacts could occur from construction?

A review of aerial photography and NWI mapping was performed to determine the presence of sufficient uplands along the Build Alternatives for potential borrow pit locations. A corridor extending at least 2,500 feet wide along each Build Alternative was examined. All developed areas were eliminated from consideration, as well as all wetlands and surface waters surrounding each Build Alternative. Generally, each alternative was surrounded by sufficient undeveloped uplands, such as timberlands and agricultural fields, to provide adequate borrow material within the 2,500-foot wide corridor. Each Build Alternative crosses significant stream drainages such as Crooked

Creek, Hagins Prong, Beverly Creek, and Little Reedy Creek where there are no potential areas for borrow material immediately adjacent to the corridor. In addition, several relatively unimpacted Carolina bays are located throughout the project study area and are to be avoided by road construction. This eliminates them from consideration as available acreage for borrow material. However, potentially suitable uplands were observed in close proximity to these locations and fill material could be hauled to the construction site. Other constraints identified along the alternatives that could affect the availability of borrow sites include: Alternative 1 passes near the Marlboro County Airport, the Appin historic district located west of Bennettsville, and Hilson Bay, all of which affect access to potential sites for borrow material; Alternative 2 also passes near Hilson Bay and several unnamed bays, and the community of Bingham; and, Alternative 3 passes near Indigo Bay, Donohoe Bay, Newton Bay, several unnamed bays, and the town of Tatum.

A more detailed screening will be performed within a one-mile wide corridor along the Preferred Alternative and segments with adequate upland borrow areas will be indicated on mapping. 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. Borrow activities will be done in accordance with the SCDOT Engineering Directive (EDM – *Borrow Pit Location and Monitoring*). This requires that wetland delineations will be performed at the borrow pit sites and potential impacts to federally listed species and cultural resources will be evaluated prior to beginning excavation.

C.12.3 What kind of and how much impact would occur in streams as a result of this project?

The degree of stream impacts due to roadway crossings is dependant on its location of the crossing within the watershed and the width of the roadway. Impacts to smaller streams located at higher elevations of the watershed, nearer the headwaters, would consist of the installation of pipes or culverts to channel the water under the road. Whether a pipe or a culvert is used depends upon the size of the channel being crossed and the size of the watershed it drains. Unlike bridge crossings, pipe and culvert crossings prevent sunlight penetration, can affect flow and velocity characteristics, can prevent fish passage when improperly designed/installed, and prevent accumulation of food sources in the form of detritus due to scouring effects. In some instances streams may be relocated in order to provide a perpendicular crossing which would reduce the length of streams that would be impacted by pipes or culverts that the stream would flow through.

Wide streams that are typically located at lower elevations in the watershed, closer to rivers, are typically bridged, as dictated by the presence of a floodplain and/or floodway. Therefore, impacts to large streams with regulated floodways would generally be minimized. In many cases, the entire channel could be spanned by the bridge and no impacts would occur to the stream channel. However, for wide braided streams such as the Alternative 1 crossing of Crooked Creek and Three Creeks, bridge pilings might be required within the channels. For smaller streams where bridges may not be warranted, appropriately sized pipes or box culverts may be installed for the road crossings to prevent a restriction of flow. The use of pipes, culverts, and/or bridges is determined by the results of hydraulic studies performed during the final design. The type of structure used is dependent on factors such as watershed size and the presence of FEMA regulated floodplains and floodways.

Twelve perennial streams that have major riparian wetland systems associated with them would be crossed by the Build Alternatives. However, these streams have been previously impacted by road crossings, utility line crossings, railroad crossings and ponds. Table C.25 provides a listing of the streams and the type and number of previous impacts to the main channel of each stream.

Table C.25
Existing Stream/Riparian Wetland Crossings

	IMPACT TYPE				
	Road Crossings	Utility Crossings	Railroad Crossings	Ponds/Lakes	TOTAL
Beverly Creek	6	0	0	2	**8**
Cottingham Creek	6	0	1	2	**9**
Crooked Creek	18	2	0	7	**27**
Hagins Prong	9	0	0	0	**9**
Herndon Branch	8	0	0	0	**8**
Lightwood Knot Creek	5	1	0	2	**8**
Little Reedy Creek	4	0	0	0	**4**
Little Reedy Creek Tributary	3	0	0	0	**3**
Marsnip Branch	1	0	0	0	**1**
Muddy Creek	6	3	0	0	**9**
Reedy Creek	7	0	0	0	**7**
Three Creeks	3	2	0	1	**6**

Source: The LPA Group Incorporated, 2007

Many of the tributaries to the streams that make up the watershed also have similar impacts. The Build Alternatives would not cross any mainline channel more than once; therefore, I-73 would add one additional road crossing to the main channel of these streams.

For Section 404 and Section 401 permitting purposes, impacts to streams are measured in terms of the length along the centerline of the stream that would be affected. They are 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. Table C.26 provides the estimated number of perennial and intermittent streams crossed and the linear footage of impacts streams for each Build Alternative. Stream crossings that would have a pipe or culvert installed would represent a more severe impact to streams than would bridges that span larger streams.

Table C.26
Potential Stream Impacts

	Build Alternatives			Total Linear Feet Present in Project Study Area
	1	2 (Preferred)	3	
Perennial Streams				
Number of Crossings	6	10	6	
Linear Feet	1,666	3,778	3,555	2,564,336
Intermittent Streams				
Number of Crossings	9	14	17	
Linear Feet	2,900	4,365	6,507	4,731,797
Total Number of Crossings	**15**	**24**	**24**	
Total Stream Impact	**4,566**	**8,143**	**10,062**	**7,296,133**

Source: THE LPA GROUP INCORPORATED, 2007.

As indicated in Table C.26, Alternative 1 would have the least impacts to intermittent and perennial streams followed by Alternatives 2 and 3, respectively. Streams with regulated floodplains and floodways would be bridged and it is anticipated that modifications to these channels would be minimal. Temporary modifications such as the installation of coffer dams in stream channels in order to construct footings for bridge pilings might be required in the braided streams. However, since these modifications would be temporary and would be removed upon completion of the bridge construction, minimal impacts would occur.

Based on an analysis of preliminary data available, it is anticipated that Alternative 1 would have a minimum of five bridges. These are planned at Little Reedy Creek, a Little Reedy Creek tributary, Three Creeks, Muddy Creek, and Crooked Creek. Alternative 2 would have four bridges including Little Reedy Creek, a Little Reedy Creek tributary, Hagins Prong, and Cottingham Creek. Alternatives

3 would have two bridges, one at Little Reedy Creek and the other at Reedy Creek. Alternative 1 would have more bridges than the other Build Alternatives because it crosses streams at a lower elevation in the watershed. 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 and the results will be reported in the Final EIS. Hydrologic studies would be performed for the Preferred Alternative to determine where the use of bridges, 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. Additionally, pipe and culvert bottoms would be recessed below the bottom of the perennial stream channels to help maintain movement of aquatic species through the structure.

C.12.4 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 were estimated that could result from 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 analyzed using the I-73 base mapping. Potential impacts to streams and wetlands were estimated. 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 impacts instead of in linear feet. Table C.27 provides the results of the analysis. This analysis is based on projected 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, so in that sense would be a worst-case analysis.

The No-build Alternative would have minimal indirect impacts to wetlands and streams as indicated in Table C.27. Of the Build Alternatives, Alternative 1 would have the least amount of indirect wetland impacts. Potential indirect wetland impacts are essentially the same for Alternatives 2 and 3. However, there would be less than five acres separating the lowest impact (Alternative 1) from the highest impact (Alternative 2). Potential indirect stream impacts for the Build Alternatives are

Table C.27
Potential Indirect Wetland Acres and Stream Impacts

	Alternatives			
	No-build	1	2 (Preferred)	3
WETLAND TYPE				
Bay Forests	0	0.1	0.2	0.3
Bottomland Hardwoods	2.4	2.4	5.2	5.2
Evergreen Shrub Bog/Pocosin	0	0	0.1	0
Pine Savannahs & Wet Flatwoods	0.1	0.2	1.6	1.5
Savannah & Wet Meadow	0	0	0.1	0.1
Wooded Swamp	0.6	4.9	2.5	2.5
Total Wetland Impact	**3.1**	**7.6**	**9.7**	**9.6**
STREAM TYPE				
Intermittent	0	27	22	23
Perennial	1	1	1	1
Total Stream Crossings	**1**	**28**	**23**	**24**

Source: THE LPA GROUP INCORPORATED, 2007.

essentially the same with Alternative 2 having the least number of stream impacts followed by Alternatives 3 and 1, respectively. The majority of the potential indirect stream impacts are anticipated to occur to intermittent streams.

Based on a review of aerial photography and the land use projections, indirect wetland impacts associated with the Build Alternatives would not occur within the higher value riparian wetland systems described earlier, but would be adjacent to and in close proximity to them. Development along the edges of these systems could affect their water quality over time. It is not anticipated that induced development impacts would occur to intact Carolina bays within the project study area due to the availability of other suitable development sites, the effort needed to drain these sites to make them developable, and the high level of protection provided by regulatory agencies.

The results of the land use models show that some of the projected development for the Build Alternatives would occur in Blenheim, Bennettsville, Clio, McColl, and along S.C. Route 9 and S.C. Route 177 North, north of Bennettsville. Projected development outside of the town limits would be clustered around the proposed interchanges and would occur predominantly in agricultural fields and forested uplands. Wetland impacts would typically occur at the edge of wetlands. The projected development associated with the No-build Alternative would generally be in the vicinity of I-95 in the southern portion of the project study area and I-74 in North Carolina. Based on a review of aerial photography overlain with the projected development, it is anticipated that impacts to wetlands as the result of projected growth would be predominantly wetland habitat degradation, not direct loss or fragmentation of habitat.

C.12.5 What would cumulative impacts be to wetlands and streams in the project study area?

Cumulative impacts to wetlands and streams, such as loss and degradation of quality, could occur in the project study area, which contains a wide variety of wetland types. A GIS analysis of the wetlands indicated on the NWI maps within the project study area was performed to determine the magnitude of the potential wetland impacts compared with the total amount of each wetland type found in the study area. For the purposes of this analysis, the projected impacts were added to the direct impacts associated with each of the Build Alternatives. The results of this analysis are presented in Table C.28.

Table C.28
Potential Cumulative I-73 Wetland Impacts Relative to Project Study Area Wetlands (in Acres)

	Build Alternatives			Project Study Area Total
	1	2 (Preferred)	3	
WETLAND TYPE				
Aquatic Beds	0	0.1	0	102
Bay Forests	30.2	10.6	9.0	20,372
Bottomland Hardwoods	11.1	10.4	6.0	5,415
Deciduous Shrub Swamps	3.8	8.0	3.2	2,491
Evergreen Shrub Bogs/Pocosins	10.6	5.3	23.6	6,766
Freshwater Marsh	0	4.8	0	564
Pine Savannahs & Wet Flatwoods	0.2	2.0	13.9	10,824
Ponds & Borrow Pits	2.6	4.9	3.6	2,097
Savannahs & Wet Meadows	1.7	1.7	2.6	1,551
Wooded Swamp	115.1	76.2	63.6	48,017
TOTAL	**175.3**	**124.0**	**125.5**	**98,199**

Source: THE LPA GROUP INCORPORATED, 2007.

The purpose of Table C.28 is to put into context the acreage of impacts associated with each of the Build Alternatives relative to the overall resource type present within the study area. None of the wetland types would be substantially diminished by the project in this context. However, there would be a decrease in acreage for all these listed wetland types.

Previously constructed road projects have contributed to cumulative stream and wetland impacts in the project study area. The construction of 17 miles of I-74 in North Carolina resulted in approximately 16 acres of wetland and 2,895 linear feet of stream impacts. Other constructed projects such as 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 10.92 acres of impacts 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 44-mile long southern portion of I-73 would impact approximately 384.1 acres of wetlands, 15,443 linear feet of perennial streams and 3,770 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.

A planned privately operated military training facility that could contribute to cumulative impacts to wetland and streams would be located near the town of Wallace in the northwestern portion of the I-73 North project study area. Approximately 1,800 acres of a 3,100-acre tract would be developed. The tract appears to include White Creek and several of its unnamed tributaries. A review of NWI maps and aerial photography indicates that riparian wetland systems primarily consisting of hardwood swamps occur along the onsite streams. Site development plans are not available for analysis of potential impacts.

Although cumulative impacts to wetlands and streams are anticipated, all public and private development projects that would impact greater than 0.1-acre of wetlands and/or greater than 100 linear feet of stream would require a Section 404 permit and a USACE approved mitigation plan to compensate for the impacts prior to beginning construction. Additionally, projects that disturb greater than one acre of land require an NPDES permit, also referred to as a Land Disturbance Permit. The permit is obtained through SCDHEC in South Carolina and the NCDENR Division of Land Resources, Land Quality Section in North Carolina. The NPDES permit requires that measures to contain/pre-treat stormwater runoff prior to discharging into receiving waters be implemented and requires that a Stormwater Pollution Prevention Plan be developed for the project which would minimize potential impacts during construction. For projects constructed in any region of South Carolina or in a coastal county in North Carolina that disturb greater than five acres of land, the development and approval of permanent water quality BMPs and a signed maintenance agreement to insure continued water quality protection are required.

C.12.6 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 stresses 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 impact avoidance, minimization, and finally, compensation for unavoidable impacts.

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/or 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.

C.12.7 What was done to avoid and minimize wetland and stream impacts?

C.12.7.1 Avoidance

Due to the linear nature of the project and the large areas of wetlands and streams located within the project study area, total avoidance of wetlands and streams was not possible for the Build Alternatives. Many riparian wetland systems associated with streams extend across the study corridor, such as Crooked Creek and Marks Creek. As described earlier, efforts were made to avoid wetland and stream impacts.

After the initial corridors were developed, those that were suitable for further consideration (based on potential impacts) 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. A second field review was conducted with representatives of North Carolina state and federal resource and regulatory agencies, NCDOT, and FHWA in the North Carolina portion of the study area and comments were solicited from them.

Centerlines were established and wetland impacts were calculated within construction limits obtained from the conceptual designs of the Build Alternatives. Requests for corridor modifications from the ACT and North Carolina participants were investigated that would further avoid wetland and stream impacts. A major concern identified by the federal and North Carolina state resource and regulatory agencies was the potential impact to Marks Creek that a western interchange with I-74 could cause. Alignment shifts, crossover segments, and design modifications were presented at the ACT meetings for discussion. Agreement was reached on these and other modifications that resulted in a reduction of impacts.

Once three reasonable Build Alternatives were identified, the alignments were additionally modified and evaluated to reduce environmental impacts. Shifts to avoid community or cultural resource impacts sometimes resulted in reduced wetland and/or stream impacts. Two changes that were made to Alternative 1 resulted in a reduction of impacts. An alignment shift at the Oakley Plantation reduced wetland impacts by approximately 3.2 acres and the rerouting of I-73 to utilize the eastern interchange with I-74 reduced wetland impacts by 37 acres and reduced stream impacts by 2,190 linear feet.

The elimination of the western interchange with I-74 also affected Alternative 2. It resulted in a reduction of 44 acres of wetland impact and 2,391 linear feet of stream impact. An alignment shift was made to avoid impacts to the Minturn community that also reduced wetland impacts for Alternative 2 by 15.2 acres. Another modification that was made to Alternative 2 consisted of connecting it to Alternative 3 east of Crooked Creek, thereby eliminating the crossing of Lightwood Knot Creek and changing the Crooked Creek crossing to a location where the riparian wetland crossing is substantially narrower. This resulted in a 15.5-acre reduction in wetland impacts.

A shift was made on Alternative 3 to avoid impacts to the Alford Plantation that resulted in a reduction in wetland impacts of approximately 11.6 acres.

Upon completion of the wetland delineation within a 600-foot wide study corridor for the Preferred Alternative, the alignment would be evaluated to determine how wetland impacts could be further avoided and minimized.

C.12.7.2 Minimization

Where possible, and where consistent with engineering standards and FHWA and SCDOT requirements, design modifications would be incorporated to further reduce 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 would reduce the impact footprint through wetlands and other sensitive areas and thus reduce the impacts. Detailed hydraulic studies would be performed during the final roadway design phase to determine the appropriate bridge lengths at stream crossings with higher quality wetland systems and floodplains, which would minimize 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 causeways through wetlands to maintain sheet flow through riparian wetlands during high water events.

Where appropriate, wetland impacts would be minimized by crossing wetlands with bridges. Each wetland crossing, where a bridge is warranted, would be evaluated on an individual basis to determine the most practical method for constructing bridges. This would be evaluated depending on the type and amount of wetlands to be impacted and the length, type, and geometry of the structure to be built. 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 a riparian seed mix of native species to reduce the risk of habitat degradation by colonization by invasive species. The hydrologic functions of the wetland would not be diminished.

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

Temporary haul road through wetland

Wetland 6 months after temporary haul road removed

Wetland 11 months after temporary haul road removed

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 wetlands. Upon completion of the bridge, the haul road(s) would be removed and the natural grade of the wetland restored and re-seeded with an herbaceous wetland vegetation seed mix. 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.


Silt fencing and seeding of side slopes

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 required by the NPDES permit. Other best management practices would be required of the contractor to ensure compliance with the policies of *23 CFR 650B.*

C.12.8 How will compensation be determined for wetland and stream impacts?

The USACE has established guidance for calculating mitigation 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). Mitigation credits are calculated for proposed impacts. 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 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.

There was early discussion with the ACT of not using the SOP for calculating required mitigation credits due to the magnitude of the impacts associated with the project. However, it was agreed by the members of the ACT that the SOP would provide a method for assuring that adequate mitigation would be provided. On February 22, 2007, the ACT voted in agreement to quantify the wetland and stream mitigation by watershed and apply the SOP for each watershed.

After the wetland and stream boundary delineations have been approved by the USACE for the Preferred Alternative, the area of impact would be calculated for each wetland type identified. Field data collected for each wetland would be used to evaluate the condition of each wetland and stream being impacted and the SOP worksheets would be completed to determine the number of mitigation credits that would be required for the project.

It is anticipated that one Section 404 permit would be obtained for both I-73 projects in South Carolina and one mitigation plan would be prepared for those impacts. The NCDOT would prepare the permit application package and mitigation for the North Carolina portion of the project. Wetland mitigation was discussed at several ACT meetings and the importance of in-kind mitigation and mitigation within the same watershed was emphasized. Discussions have continued concerning the use of riparian systems as well as “landscape scale” mitigation with linked upland/riparian systems.

This type of mitigation would involve the acquisition of a single large tract of land that provides stream and wetland restoration and enhancement opportunities. It would also include the preservation of upland habitat acreages beyond the 50- to 100-foot wide upland buffer generally provided in a mitigation plan. This large scale mitigation approach provides preservation of adjacent upland habitats that are important to some reptile and amphibians that utilize uplands as well as wetlands during their life cycle. A tract such as this could be purchased and management responsibilities could be turned over to the appropriate entity. The use of commercial wetland mitigation banks was brought up during early mitigation discussions and it was suggested that they be used only as a last resort.

A review of aerial photography, USGS topographic maps, and limited field visits, indicates 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 are previously impacted 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 given top priority as wetland mitigation sites. However, large wetland areas and those associated with the high quality riparian wetland systems would be considered to be suitable for mitigation purposes.

C.12.8.1 Wetlands

There are several Carolina bays within the I-73 North and South study areas 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 1,300 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 200 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 in the context of the regulatory concerns for isolated wetlands.

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 along the Little Pee Dee River, ranging from small 200-acre parcels located within existing Heritage Trust preserves to over 1,000-acre parcels could be purchased. Enhancement for these sites could be in the form of upland buffers and/or the removal of roads in the wetlands.

C.12.8.2 Streams

As previously mentioned, many of the streams within the study area have been channelized and are located in agricultural fields where they have no vegetated buffers. 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 utilizing natural stream design techniques and replanting native vegetation to create a stream buffer. These vegetated areas are important because they provide movement corridors for wildlife and provide water quality enhancement. The vegetation filters pollutants from surface water runoff before it enters the receiving stream as well as provides shade which keeps the water cool, thereby promoting the health of aquatic animal species that are not tolerant of high water temperatures. Spoil piles can be removed from stream banks and in-stream structures could be installed within the channels to raise the elevation of deeply incised channels which would allow streams to overflow into the adjacent riparian wetlands during rain events. This would not only restore or enhance wetland hydrology, but it would also restore the flood force attenuation and flood storage functions to the wetland. 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 that has been discussed at ACT meetings would be to provide monetary support for property acquisitions and habitat restoration for properties with natural areas that have the opportunities for preservation, enhancement or restoration. Members of the ACT indicated that the use of those type sites has good potential