3.19 Floodplain

3.19.1 What is a floodplain?

Floodplains are low-lying areas located adjacent to the channel of a river, stream, or other type of water body. These areas are subject to periodic flooding during heavy rains and/or long periods of wet weather. The flood prone area of a stream or river system is twice the height of its maximum bankfull depth. Based on this definition, areas of lower elevation typically are greater in size than in regions of higher elevation.[164] The project study area is located in the Atlantic Coastal Plain of South Carolina, which is the hydrogeologic portion of the state between the fall line that runs approximately from Augusta, Georgia to Cheraw, South Carolina and the coast.[165] In North Carolina, it is located in the North Atlantic Coastal Plain Aquifer System. Rivers within the Atlantic Coastal Plain have been described as generally meandering with broad alluvial valleys.[166] Alluvial valleys are formed when soils, rock, and other particles are carried by water from an area upstream and deposited downstream in the floodplain.[167]

A floodplain provides important functions in the natural environment such as:

- providing temporary storage of flood waters;
- preventing heavy erosion caused by fast moving water;
- providing a vegetative buffer to filter silt and contaminants before entering a water body;
- recharging and protecting groundwater; and
- accommodating the natural movement of streams/channels.

3.19.2 What agencies regulate floodplains?

The National Flood Insurance Program is administered by the Federal Emergency Management Agency (FEMA). The state National Flood Insurance Program Coordinating Offices for South Carolina and North Carolina are the SCDNR and NCDENR, respectively. Through the assistance of FEMA, SCDNR, and NCDENR, counties in the project study area have performed Flood Insurance Studies to identify flood hazards for the purposes of floodplain management and

Key Point

Congress created the National Flood Insurance Program in 1968 to minmize the taxpayer burden caused by escalating flood costs and to reduce such costs in the future by implementing floodplain protection ordinances and flood insurance that place a premium on actual flood related risk.

[164] Dave Rosgen, *Applied River Morphology* (Pagosa Springs: Wildland Hydrology Books, 1996) p. 19.
[165] SCDHEC. *South Carolina Source Water Assessment and Protection Program*, (1999).
[166] D. Shankman and L. Smith, *"*Stream Channelization and Swamp Formation in the U.S. Coastal Plain*" Physical Geology* (2004),Vol. 22: 22-38.
[167] Dictionary.com Website, http://dictionary.reference.com/search?q=alluvium (December 14, 2006).

insurance determinations. Those portions of floodplain areas that are considered jurisdictional wetlands are additionally regulated by Sections 401 and 404 of the *Clean Water Act.*

3.19.3 How were the floodplain boundaries determined for this study?

The National Flood Insurance Program uses Flood Insurance Studies to map zones of flooding risk. These zones are then used to produce Flood Insurance Rate Maps, which can be obtained from FEMA. The limits of floodplains are determined by forecasting the elevation to which flood waters may rise during a 100-year storm event and then overlaying them onto a map showing the existing topography. A 100-year floodplain is the area adjacent to a water body that has a one percent chance of flooding in any given year. A floodway is a river channel or other watercourse and land areas directly adjacent to a water body that must be free from any type of encroachment (obstacle) to allow the discharge of water during a 100-year flood without raising the water levels more than one foot.[168]

FEMA Flood Insurance Rate Maps that were available for the project study area did not differentiate between the floodplains and floodways. All areas within the floodplain were designated as Zone A. Zone A is the flood insurance rate zone that corresponds to 100-year floodplains determined by approximate methods and has a one percent chance of flooding in any given year.[169] Detailed hydraulic analyses are not performed by FEMA for Zone A areas and as such no Base Flood Elevations or depths are shown within this zone.

3.19.4 What floodplains are located within the project study area?

Based upon a review of the floodplain mapping and a GIS analysis of the project study area, approximately seven percent of the land area within the project study area is within a FEMA designated 100-year floodplain. Table 3.69 (pages 3-280 and 3-281) lists the rivers, streams, and wetland areas within Zone A in the vicinity of the proposed alternatives. Figure 3-39 (refer to page 3-179) illustrates the extent of floodplains within the project study area.

3.19.5 What direct impacts would there be to floodplains?

Flood Insurance Rate Maps identifying the 100-year floodplain were used to determine impacts associated with the Build Alternatives. The No-build Alternative was also reviewed as part of the impact analysis. Proposed construction limits for each Build Alternative were used to estimate the

[168] SCDNR. South Carolina flood Mitigation Programs Website. *South Carolina Quick Guide.* http://www.dnr.sc.gov/water/envaff/flood/img/SCQG_2004web.pdf Last accessed January 8, 2007.
[169] Federal Emergency Management Agency. National Flood Insurance Program Website. NFIP Keywords Webpage. http://www.fema.gov/NFIPKeywords/description.jsp?varKeywordID=57 Last accessed January 8, 2007.

Table 3.69
National Flood Insurance Program Regulated Floodplains
Located Within the Project Study Area

Waterway	County	HUC Code (Watershed/ Tributary of)
Guinns Mill Pond/Joes Creek	Richmond	03040204-0100 Little Pee Dee River
Carolina Branch	Dillon/ Marlboro	03040204-0501 Middle Little Pee Dee River
Beaverdam Creek	Dillon/Marlboro	03040204-0502 Middle Little Pee Dee River
Hayes Swamp	Dillon	03040204-0503 Middle Little Pee Dee River
Ropers Mill Branch	Dillon	03040204-0504 Middle Little Pee Dee River
Maple Swamp	Dillon	03040204-0505 Middle Little Pee Dee River
Reedy Creek	Dillon/Marlboro	03040204-0401 Buck Swamp – Little Pee Dee River
Little Reedy Creek	Dillon/Marlboro	03040204-0402 Buck Swamp – Little Pee Dee River
Shoe Heel Creek	Dillon	03040204-0305 Maxton Pond – Little Pee Dee River
Leith Creek	Dillon/ Marlboro	03040204-0203 Leith Creek – Little Pee Dee River
Gum Swamp Creek	Marlboro	03040204-0105 Upper Little Pee Dee River
Beaverdam Creek - Gum Swamp Creek	Marlboro	03040204-0106 Upper Little Pee Dee River
Reedy Branch	Dillon/Marlboro	03040204-0107 Upper Little Pee Dee River
Marks Creek	Richmond	0304201-0305 Lower Pee Dee River
Everetts Lake-Marks Creek	Marlboro/Richmond	03040201-0305 Marks Creek – Pee Dee River
Whortleberry Creek	Marlboro/Richmond	03040201-0306 Marks Creek – Pee Dee River
Whites Creek	Marlboro/ Richmond	03040201-0502 Reedys Branch – Great Pee Dee River

Table 3.69 (cont.)
National Flood Insurance Program Regulated Floodplains Located Within the Project Study Area

Waterway	County	HUC Code (Watershed/ Tributary of)
Phillis Creek	Marlboro	03040201-0503 Reedys Branch – Great Pee Dee River
Huckleberry Branch	Marlboro	03040201-0504 Reedys Branch – Great Pee Dee River
Naked Creek	Marlboro	03040201-0505 Reedys Branch – Great Pee Dee River
Crooked Creek-Lake Wallace	Marlboro/Scotland/Richmond	03040201-0506 Reedys Branch – Great Pee Dee River
Crooked Creek	Marlboro	03040201-0507 Reedys Branch – Great Pee Dee River
Beaverdam Creek	Marlboro	03040201-0510 Reedys Branch – Great Pee Dee River
Upper Muddy Creek	Marlboro	03040201-0801 Three Creeks – Great Pee Dee River
Cottingham Creek	Marlboro	03040201-0803 Three Creeks – Great Pee Dee River
Hagins Prong	Marlboro	03040201-0804 Three Creeks – Great Pee Dee River
Three Creeks	Marlboro	03040201-0805 Three Creeks – Great Pee Dee River
Lower Muddy Creek	Marlboro	03040201-0806 Three Creeks – Great Pee Dee River
Rogers Creek	Marlboro	03040201-0807 Three Creeks – Great Pee Dee River
Tobys Creek	Dillon	03040201-1001 Tobys Creek – Great Pee Dee River
Upper Catfish Canal	Dillon/Marlboro	03040201-1101 Catfish Creek
Smith Swamp	Dillon/Marlboro	03040201-1102 Catfish Creek

impacted area within the floodplain. Table 3.70 lists the floodplain crossings for the Build Alternatives.

Table 3.70
Floodplain Crossings Locations and Impact Areas

Location	Alternative 1	Alternative 2 (Preferred)	Alternative 3	Length of Impact (ft)	Acres of floodplain encroachment
Crooked Creek		X	X	500	4.4
Crooked Creek		X	X	200	0.7
Crooked Creek	X			3350	33.5
Lightwood Knot	X			440	3.0
Beverly Creek		X		300	2.2
Herndon Branch	X			280	3.4
Muddy Creek	X			1250	8.7
Cottingham Creek		X		1160	7.9
Three Creeks	X			1330	9.0
Hagins Prong		X		740	4.8
Reedy Creek			X	930	6.2
Little Reedy Creek	X	X		400	0.4
Little Reedy Creek	X	X		1080	10.6
Little Reedy Creek	X	X		250	1.9
Little Reedy Creek			X	1930	14.0
Total (Crossings)	**8**	**8**	**4**		
Total Impacted Area (acres)	**70.5**	**33.3**	**25.3**		

There are 15 different potential crossings for the Build Alternatives. Alternatives 1 and 2 had the most crossings, which was eight, while Alternative 3 has the least crossings with four. The area of floodplain impacts was totaled for each Build Alternative, and it was found that Alternative 3 would have the least amount of floodplain impacts with 25 acres, while Alternative 1 would have the highest impacts with 70 acres. The No-build Alternative would not have an effect on the floodplains in the project study area.

Engineering analysis of the floodplain impacts were conducted to further avoid and reduce impacts by bridging where possible. The use of bridges reduces wetland disturbance, and minimizes the impact of construction within the floodplain. Some bridge piers would however, have to be placed in regulatory floodways and/or floodplains for the construction of these structures. Furthermore,

where feasible, the proposed crossings were located adjacent to existing road crossings to minimize the impact.

The preliminary level of design for the bridges and culverts did not include detailed hydrology studies at this stage of project development. Additionally, the mapped areas within the project study area are all shown as Zone A, which does not provide base flood elevations. However, floodplain encroachments are not likely to increase the flooding in the area since bridge structures will need to be designed to FEMA standards, which will result in less than a one-foot rise in the base flood elevation. Furthermore, structures would provide the minimum freeboard[170] above the design flood elevation and would not be exceeded by the 100-year storm.

Available FEMA studies were used to comply with Executive Order 11988, *Floodplain Management,* during the alternative analysis. However, during the design phase of the project, a detailed hydrologic study would need to be completed. Bridge and culvert designs must be conducted, as required by 23 CFR 650, Subpart A, *Location and Hydraulic Design of Encroachment on Floodplains*. This analysis would include establishing base flood elevations and adjusting bridge and culvert designs to minimize the risk of flooding upstream to less than one foot, as required by FEMA. Ongoing design efforts and coordination with resource and regulatory agencies will ensure that floodplain impacts are minimized during the design process.

Based on land use modeling, indirect and cumulative impacts to floodplains are anticipated to be minimal, with no anticipated impacts to the Great Pee Dee River floodplain.

3.20 Wild and Scenic Rivers

Wild and Scenic Rivers are rivers and streams that are federally protected under the *Wild and Scenic Rivers Act* for their scenic, recreational, cultural, historic, wildlife, geologic, or other values. Based on the list of Wild and Scenic Rivers maintained by the National Park Service, no rivers or streams in the project study area are designated as Wild or Scenic Rivers.[171]

In addition, the USDA (through the U.S. Forest Service) and the U.S. Department of Interior (through the USFWS, Bureau of Land Management, and National Park Service) created the Nationwide Rivers

[170] Freeboard is "a factor of safety usually expressed in feet above a flood level for purposes of floodplain management. 'Freeboard' tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed." Floodplain Management Association, http://www.floodplain.org/glossary_of_terms.htm (April 23, 2006).

[171] NPS, Wild and Scenic Rivers System Website, http://www.nps.gov/rivers/wildriverslist.html#ga_nc_sc (December 5, 2006).

Inventory as directed under Section 5(d) of the *Wild and Scenic Rivers Act.* The Nationwide Rivers Inventory lists rivers that meet the minimum standards for Wild, Scenic, and Recreational Status, and a 1979 Presidential Directive instructs federal agencies to avoid or mitigate adverse effects to streams or rivers listed. The Little Pee Dee River flows through the project study area, and a part of this river is listed on the Nationwide Rivers Inventory. However, the listed portion is located approximately ten miles downstream of the project study area boundary, and would not be impacted by any of the Build Alternatives. [172]

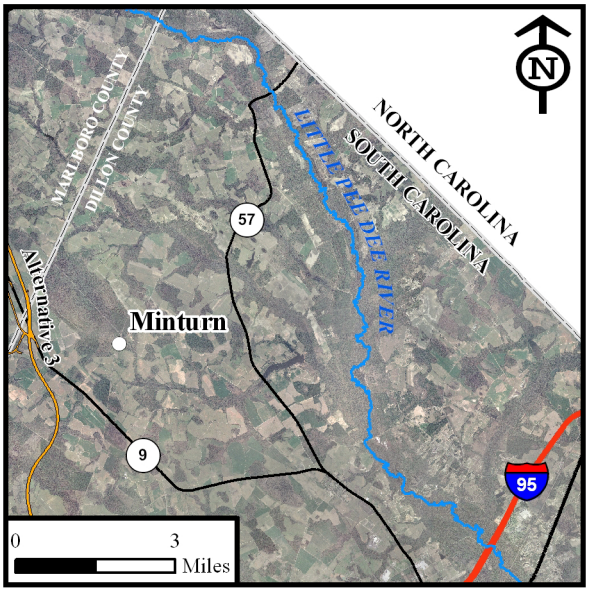

Figure 3-44 State Scenic River in Project Study Area

Rivers in South Carolina may also be protected under the *South Carolina Scenic Rivers Act of 1989* for their scenic, cultural, historic, recreational, botanical, geologic, or wildlife values. The SCDNR's South Carolina Scenic Rivers Program website identified a 48-mile stretch of the Little Pee Dee River from the Marlboro County line through Dillon County to the Marion County line as a State Scenic River (Figure 3-44).[173] While a portion of this designated area is in the project study area, the nearest alternative (Alternative 3) is approximately 0.5 mile west of the river. The proposed project would not cross the Little Pee Dee River; therefore, no State Scenic Rivers would be impacted by any of the Build Alternatives.

3.21 Resources Affected Uniformly

3.21.1 How would coastal resources be affected?

3.21.1.1 Coastal Zone Resources

The *Coastal Zone Management Act of 1972,* as amended, requires that projects within the coastal zone comply, to the maximum extent practicable, with approved state coastal management programs.[174] The *South Carolina Coastal Zone Management Act* gives SCDHEC-OCRM the authority to promote the economic and social welfare of the citizens, while protecting the sensitive

[172] NPS, Rivers, Trails, and Conservation Program Website, http://www.nps.gov/ncrc/programs/rtca/nri/states/sc.html (December 5, 2006).
[173] SCDNR. Little Pee Dee River of Dillon County Website, http://www.dnr.sc.gov/water/envaff/river/scenic/lilpddillion.html (December 5, 2006).
[174] 16 U.S.C. §1456(c).

and fragile areas of the coast. SCDHEC-OCRM has direct permitting authority over development in the critical areas of the coastal zone, which includes coastal waters, tidelands, beaches, and the oceanfront beach/dune system. In addition, SCDHEC-OCRM reviews and certifies all state/federal permit applications and activities, as well as issues state stormwater and sediment reduction permits within the coastal zone counties.[175]

The Coastal Zone is comprised of coastal waters and submerged bottoms seaward to the state's jurisdictional line as well as the lands and waters of the eight coastal counties of South Carolina, which include Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry and Jasper Counties.[176] The project study area does not fall within these eight counties and therefore, the Coastal Zone Management Act would not apply to this project.

3.21.1.2 Coastal Barrier Resources

Under the *Coastal Barrier Resource Act of 1982*, agencies are prohibited from using federal funds that would impact undeveloped coastal barrier units in the Coastal Barrier Resource System. No coastal barriers exist in the project study area; therefore the project would have no impact on coastal barriers.

3.21.2 How would energy be consumed by the project?

Transportation accounts for 28 percent of both direct and indirect energy consumption in the United States.[177] Vehicles traveling on roadways directly consume energy, while construction and maintenance of a facility indirectly consumes energy. Energy used during construction is typically a large, one-time energy expenditure and vehicle operation and maintenance facility are smaller, long-term energy impacts.

3.21.2.1 Energy consumption during construction

Construction of the Preferred Alternative would require an initial use of energy and resources that would not be used if the project were not built. In general, the amount of expended energy during construction would be a function of construction cost. The primary categories of energy consumption during construction are the following:

- excavation of rock and soil, and the transport and compaction of roadway embankment materials;

[175] SCDHEC Website, http://www.scdhec.gov/environment/ocrm/regs/enforcement.htm, (December 5, 2006).
[176] SCDHEC Website, http://www.scdhec.net/environment/ocrm/ (December 5, 2006).
[177] Department of Energy, Energy Information Administration, http://www.eia.doe.gov/neic/brochure/infocard01.htm (May 25, 2007).

- manufacture, transport, and utilization of various construction materials (aggregate, concrete, street, etc.); and,
- manufacture, transport and installation of various manufactured items (guard rail, signs, lighting, etc.).

Construction of the proposed project would consume energy resources for a short time; however, the savings would be realized over the life of the facility, which would become more evident closer to the design year. Completion of the facility would more than compensate for the energy lost during construction by increasing the efficiency of vehicles traveling through the project study area.

3.21.2.2 Energy consumption during the operation of the facility

Additional energy will be expended throughout the operational life of a transportation facility, mostly for vehicular travel in the form of fuel. Other lesser, but accumulative, energy uses include tires, oil, and miscellaneous vehicular maintenance items. Energy consumption due to travel would be directly proportional to how many vehicles use the facility.

Roadway maintenance would require an ongoing expenditure of energy in the form of maintenance materials and the fuel required for roadway, bridge, and drainage repairs. Energy consumption for maintenance would be relatively constant and independent of facility usage.

3.21.2.3 Energy conservation potential of the project

Energy conservation would come from one or more of the following factors:

- reduced vehicle-miles of travel;
- more efficient vehicle operation speeds;
- reduced accident potential;
- reduced construction effort; and/or,
- reduced traffic volume on existing area roadways.

3.21.2.4 Estimated statewide energy consumption savings with the Build Alternatives

The energy consumption savings for the project were derived from the results of the I-73 travel demand model. The model calculated the vehicle-miles of travel (VMT) for categories such as work, non-work, truck and statewide for the no-build and proposed alternatives. Using these categories and by comparing change in VMT for each alternative to the No-Build Alternative, the percent change in VMT for motorists throughout the project study area was estimated for

each alternative. Using this percent change in VMT, an estimate of how much energy would be saved by the proposed project was determined by converting the changes to time and gasoline savings system wide. Alternative 1 is projected to have an overall energy consumption savings of 13 percent, while Alternatives 2 and 3 would result in 15 percent reduction in energy consumption compared to the No Build Alternative.

3.22 Permits

What Permits would be necessary to construct the proposed project?

3.22.1 Section 404 of the Clean Water Act

The USACE is authorized under Section 404 of the Clean Water Act to issue permits for the placement of dredged or fill material in waters of the United States, including jurisdictional wetlands. Jurisdictional wetlands within the Preferred Alternative will be delineated according to the *1987 Corps of Engineers Wetlands Delineation Manual*.[178] Impacts to waters of the United States and jurisdictional wetlands will be quantified and will require USACE authorization under Section 404. The South Carolina portion of I-73 would be permitted through the Charleston District of the USACE and the North Carolina portion would be permitted through the Wilmington District.

3.22.2 Section 401 Water Quality

Project applications for state and federal permits that would result in a discharge to wetlands and waters of the United States must obtain a Section 401 Water Quality Certification from SCDHEC in South Carolina and the NCDENR Division of Water Quality (DWQ) in North Carolina. Certification involves a review of the proposed project and analysis of its potential impact to water quality. This review is performed to ensure that any discharge into jurisdictional areas is in accordance with State water quality standards.

3.22.3 Section 402 of the Clean Water Act

Section 402 of the *Clean Water Act* (1972) authorizes the USEPA to issue NPDES permits for the discharge of pollutants into waters of the United States. This authority was transferred to SCDHEC in South Carolina and NCDENR in North Carolina. Regulations implemented by SCDHEC and NCDENR are intended to reduce the adverse effects of stormwater and sediment run-off. The

[178] U.S. Army Engineer Waterways Experiment Station Environmental Laboratory, *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1 (1987).

regulations require completion of a site plan illustrating controls designed to reduce stormwater runoff and minimize sediment erosion. 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 (SWPPP) 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.

3.22.4 Construction in State Navigable Waters

Article 14, Section 4 of the S.C. Constitution, 49-1-10 1976 Code of Laws of S.C., requires a permit for dredging or construction in state designated navigable waters. State navigable waters are defined as "waters which are navigable, have been navigable, or can be made navigable by removal of incidental obstructions by rafts of lumber or timber or by small pleasure or sport fishing boats. These waters are below the mean high water line in tidally influenced areas or below the ordinary high water mark in nontidal areas." When a Section 404/401 permit is required, a separate navigable waters permit application is not required as the Section 404/401 application serves as the state navigable water permit application. The Little Pee Dee River and Crooked Creek are the only state navigable waters located within the study area. The Little Pee Dee River is designated as navigable from it's confluence with Gum Swamp, east of Bennettsville, southeastward to the study area boundary and beyond. The portion of the Creek that is designated as state navigable extends from it's confluence with Quick Creek, north of Bennettsville, to its confluence with the Pee Dee River. Alternative 1 would be the only alternative that would require a State Navigable Water permit from SCDHEC.

3.22.5 Stormwater Management and Sediment Reduction Act of 1991

The *Stormwater and Sediment Reduction Act of 1991* applies to any land disturbing activity over two acres. Regulations implemented by SCDHEC are intended to reduce the adverse effects of stormwater and sediment run-off. The regulations require completion of a site plan illustrating controls designed to reduce stormwater runoff and minimize sediment erosion. To obtain a permit, the application must be sealed by a Professional Engineer and be approved by SCDHEC.

3.23 Short-term Uses Versus Long-term Productivity

The potential impacts of the proposed project must be weighed against the need for the interstate facility. Although potential adverse impacts may occur, the implementation of various mitigation measures would limit the extent of impacts that are deemed unavoidable. The local short-term impacts would be primarily associated with site preparation and construction of the interstate facility. Many of the potential impacts would only occur during construction and would be considered short-term, including run-off from site preparation and construction areas. Other potential impacts such as permanent changes to the existing land use, loss of wetlands, loss of farmlands, and loss of habitat would be considered long-term. These impacts are discussed in detail throughout this chapter. As discussed previously, the proposed project would provide long-term enhancement of opportunities for economic development, improved access for tourism, increased safety on existing roads, and provide a transportation system linkage (refer to Chapter One, Section 1.4).