streams have limited contact with adjacent wetlands due to spoil piles left behind during the channelization effort. Restoration and enhancement of these impacted streams for mitigation credits can include reshaping stream channels and replanting native vegetation along a stream buffer. These vegetated areas provide movement corridors for wildlife. They also provide water quality enhancement by filtering pollutants from surface water runoff before in enters the receiving stream as well as providing shade which keeps the water cool, thereby promoting the health of aquatic animal species. Spoil piles can be removed from stream banks and in-stream structures could be installed within the channels to allow streams to overflow into the adjacent riparian wetlands during rain events. The latter stream restoration type is one that must be approached carefully such that flooding of adjacent property owners does not occur.

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

Once the impacts to streams and wetlands have been determined for the Preferred Alternative, coordination with the ACT concerning mitigation will continue and a suitable site(s) will be identified. At that point, a final mitigation plan would be prepared, included in the FEIS, and submitted along with the Section 404 permit application.

3.17 What are the groundwater resources in the project study area and how will they be impacted by the project?

The project study area is located above the Southeastern Coastal Plain Aquifer System, which is comprised of four regional aquifers. The regional aquifer in the project study area has five hydrogeologic units, which are (in descending order) the Surficial Aquifer, Tertiary Sand Aquifer, Black Creek Aquifer, Middendorf Aquifer, and Cape Fear Aquifer.

What is an aquifer?

An aquifer is an underground layer of porous rock or gravel that holds water, like a natural storage tank.

The Surficial, Black Creek, and Middendorf Aquifers are the main groundwater sources in the project study area.[95] The Surficial Aquifer underlies the surface of the land and is very shallow (usually 20 to 60 feet deep). It provides groundwater to individuals throughout the project study area who have private wells. The water quality of the Surficial Aquifer varies greatly, and due to this, detailed studies have not been done to determine its overall water quality. Instead, water quality is determined on a site-specific test for wells using this aquifer. The Surficial Aquifer has groundwater discharge/ recharge areas throughout the project study area. The Black Creek Aquifer overlies and covers the Middendorf Aquifer as they extend east toward the coast. The Black Creek Aquifer is used as a

[95] South Carolina Department of Health and Environmental Control (October 2005), *South Carolina Ambient Groundwater Quality Monitoring Network 2003 Annual Report.*

groundwater source in the majority of the project study area because it is shallower than the Middendorf Aquifer, which makes it more cost effective to develop. The primary use of groundwater withdrawals from the Black Creek Aquifer is as a drinking water source. The Middendorf Aquifer provides groundwater supplies in the upper coastal plain near the Great Pee Dee River in the extreme northwestern portion of the project study area.

The Black Creek Aquifer generally has good to excellent water quality; however, the aquifer consistently has high levels of fluoride. This aquifer has high levels of chloride and sodium near the coast due to the mixing of saltwater with the water in the aquifer. Due to this, the pH levels are usually higher throughout the aquifer, especially closer to the coastline. The discharge/recharge area of this aquifer is located between the Great Pee Dee and Little Pee Dee Rivers in South Carolina, a portion of which is located in the project study area.

There is minimal ion concentration present in the upper coastal plain portion of the Middendorf Aquifer. This is due to the presence of clean quartz sands that have been thoroughly leached over time. Water found in the upper coastal portion is acidic, usually soft, and contains a low amount of dissolved solids. This has been correlated with the proximity of the water to the recharge area. Water in the lower coastal portion is usually highly mineralized, with higher levels of total dissolved solids and pH. This is because the water in the lower coastal portion has been in the aquifer longer and has possibly mixed with more mineralized water from adjacent leaky aquifers. The Middendorf Aquifer has generally good water quality; however, the 2003 results showed high iron contents above USEPA standards in most of the wells sampled. The discharge/recharge area for the Middendorf Aquifer is located between the fault line in Chesterfield County, South Carolina and the Great Pee Dee River, which is north of the project study area.

It is not likely that this project would impact groundwater. The Middendorf Aquifer and Black Creek Aquifer are deep below the surface of the ground, and would not be impacted by construction or reached by pollutants filtering through sediment and rock to reach the aquifers. The Black Creek Aquifer does have recharge/discharge areas throughout the Little Pee Dee River and its associated swamp systems. However, this project would not be constructed in wetlands (which are in essence recharge/discharge areas), so mixing of pollutant runoff into the aquifers at these sites is not likely to occur.

Impacts could occur to the Surficial Aquifer due to its proximity to the surface. During construction, the Surficial Aquifer could be exposed, leading to sediment entering the aquifer. Soluble materials such as petroleum products could be leaked or spilled during construction and enter these exposed areas and may cause contamination. However, best management practices would be in place, so if during construction, groundwater was encountered, a spill prevention control and countermeasures plan would be in place to manage spills and leaks of soluble materials.

While the majority of drinking water in the project study area is supplied through surface waters, induced growth and development in the project study area could increase the amount of groundwater needed for drinking water. Any additional groundwater wells would need to be permitted prior to drilling, and due to the abundant supply of water in the Black Creek Aquifer, it is unlikely that there would be a major drawdown of groundwater resources in the project study area. Three watershed units (03040206-120, -130, -140) are within the Waccamaw Capacity Use Area and are predicted to have development under the No-build Alternative. Any additional groundwater wells would need to be permitted, and be in accordance with the guidelines of the Use Area.

3.18 What are the surface waters in the project study area?

Of the eight drainage basins within South Carolina, the proposed project is located in the Pee Dee River Basin, which is made up of four sub-basins. Most of the project study area is located in the Pee Dee River Sub-basin, with a very small portion located in the Waccamaw/ Atlantic Intercoastal Waterway (AIWW). The Pee Dee River Sub-basin consists of approximately 3,472 miles of streams; while the Waccamaw/ AIWW Sub-basin is composed of approximately 784 miles of streams (refer to Figure 3-37, page 162)[96].

The Pee Dee River Sub-basin contains 27 watershed units, six of which occur within the project study area (refer to Figure 3-37). The Waccamaw/ AIWW Sub-basin contains 11 watershed units, one of which is affected by the project study area (refer to Figure 3-37). A list of the watershed units is located in Table 3.49, page 3-163.

3.18.1 What are the designations of the surface waters?

The majority of the surface waters are designated by the SCDHEC as *freshwater*. Table 3.50, page 3-164, lists some major streams that are located within the project study area. *Freshwater* are surface waters that are suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of SCDHEC. Systems designated as *freshwater* are also suitable for fishing and the survival and propagation of a balanced native aquatic community of fauna and flora, along with industrial and agricultural uses.[97] An asterisk by the word *freshwater* indicates that SCDHEC has set site specific standards for that waterbody. In this case, all of the *freshwater* marked with an asterisk in Table 3.49, page 3-163, refers to a set standard for pH (5.0 to 8.5) and dissolved oxygen (not less than 4.0 mg/l) in the stream.[98]

A few of the surface waters in the project study area are designated as *outstanding resource waters* by the SCDHEC (Table 3.49, page 3-163). Waters are designated as outstanding resources because they

[96] South Carolina Department of Health and Environmental Control, Watershed Management, http://www.scdhec.net/water/shed/peedee.html#basinfacts
[97] *Ibid.*
[98] *Ibid.*

Dillon
Little Pee Dee River (03040204-030)
Little Pee Dee River (03040204-060)
Nichols
Buck Swamp (03040204-050)
Latta
Mullins
Lake Swamp (03040204-080)
Kingston Lake (03040206-130)
Catfish Creek (03040201-150)
Marion
Great Pee Dee River (03040201-120)
Little Pee Dee River (03040204-070)
Aynor
Brunson Swamp (03040204-090)
Little Pee Dee River (03040204-070)

LITTLE PEE DEE RIVER
BUCK SWAMP
BEAVER CREEK
LITTLE REEDY CREEK
CATFISH CANAL
REEDY CREEK
LAKE SWAMP
LOOSING SWAMP
JOINER SWAMP
DAWSEY SWAMP
CHINNERS SWAMP
BRUNSON SWAMP
SPRING SWAMP
BROWNS SWAMP

95 41 57 76 9 917 701 410 38 501 301 319

Legend

- City

SCDHEC Water Quality Stations
- Impaired
- Not Impaired
- NPDES Permitted Site
- Interstate
- Highway

SCDHEC Water Quality Classifications
- Freshwater
- Freshwater - Specific Standard
- Outstanding Resource Waters

- County Boundary
- Watershed Units Not Directly Impacted
- Alternative Construction Limit
- Study Area Boundary

0 2.5 5 7.5 Miles

N E W S

FIGURE 3-37
POTENTIALLY IMPACTED WATERSHED UNITS

Table 3.49
Sub-basins, Watershed Units, and Majors Streams in Project Study Area Crossed by Alternatives
Interstate 73 EIS: I-95 to the Myrtle Beach Region

Sub-basin	Watershed Unit (11 digit Hydrological Unit Code)	Major Stream Names	Water Classification
Pee Dee River Sub-basin	Catfish Creek (03040201-150)	Catfish Canal Tributary	FW
		Smith Swamp	FW*
		Smith Swamp Tributary	FW*
		Stackhouse Creek	FW
	Little Pee Dee River (03040204-030)	Maple Swamp Tributary	FW
		Little Pee Dee River Tributary	FW
		Cypress Branch	FW
	Buck Swamp (03040204-050)	Little Reedy Creek Tributary	FW
		Mill Creek Tributary	FW
		Buck Swamp	FW*
		The Gulley	FW
		Maidendown Swamp	FW*
	Little Pee Dee River (03040204-070)	Back Swamp	ORW
		Little Pee Dee River	ORW
		Dawsey Swamp	ORW
		Tredwell Swamp	ORW
		Reedy Creek	ORW
		Brown Swamp	FW*
	Lake Swamp (03040204-080)	Lake Swamp	FW*
		Black Creek	ORW
		Joiner Swamp Tributary	FW
		Joiner Swamp	FW
		Loosing Swamp	FW
		Mill Branch	FW
	Brunson Swamp (03040204-090)	Chinners Swamp Mill Branch	FW*
		Chinners Swamp	FW*
		Chinners Swamp Tributary	FW*
		Spring Swamp	FW
		Savannah Creek	FW*
		Brunson Swamp	FW
		Palmetto Swamp	FW
Waccamaw/ AIWW Sub-basin	Kingston Lake (03040206-130)	Poplar Swamp Cross Branch	FW

FW—*Freshwaters* that are suitable for primary and secondary contact recreation and as a source for drinking water supply, after conventional treatment, in accordance with SCDHEC. These waters are suitable for fishing, and the survival and propagation of a balanced indigenous aquatic community of fauna and flora. This class is also suitable for industrial and agricultural uses.
FW* — *Freshwaters* that, in addition to the above definition, must have a pH between 5.0 and 8.5 and the dissolved oxygen level cannot be lower than 4.0 mg/l.
ORW—Outstanding resource waters are freshwaters or saltwaters which constitute an outstanding recreational or ecological resource, or those *Freshwaters* suitable as a source for drinking water supply purposed, with treatment levels specified by SCDHEC.[1]

are an outstanding ecological or recreational resource or because they are used as a drinking water source (with applicable treatment levels).[99]

3.18.2 Does drinking water come from these surface waters?

Drinking water sources in the project study area come from both groundwater and surface water sources. The USEPA, on its Safe Drinking Water Information System (SDWIS),[100] lists the main water systems in the project study area, along with the number of people served by the water system, and the source (Table 3.50). The Black Creek and Middendorf Aquifers are used for supplying groundwater to users. There are no sole source aquifers located within the project study area.

Table 3.50
Water Service Providers in the Project Study Area
Interstate 73 EIS: I-95 to the Myrtle Beach Region

Water Service Provider	Primary Water Source	Population (by number) Served	Principal County Served
City of Dillon	Groundwater	7653	Dillon
Town of Lake View	Groundwater	789	Dillon
Town of Latta	Groundwater	2046	Dillon
Trico Water Co	Groundwater	14661	Dillon
Marco Rural Water Co	Groundwater	13451	Marion
City of Marion	Groundwater	7630	Marion
City of Mullins	Groundwater	5826	Marion
Town of Nichols	Groundwater	408	Marion
Bucksport Water Co	Groundwater	10324	Horry
City of Conway	Surface Water	18716	Horry
Conway Rural	Surface Water	8293	Horry
Grand Strand W&SA	Surface Water	85960	Horry
Little River W&SA	Surface Water	15284	Horry
City of Loris	Surface Water	3024	Horry
City of Myrtle Beach	Surface Water	25000	Horry
City of N. Myrtle Beach	Surface Water	25558	Horry
Ocean Lakes Ltd	Surface Water	8072	Horry
Thompkins MHP	Groundwater	45	Horry

3.18.3 What are some common terms associated with water quality?

There are some common terms used when discussing water quality and ways to measure it. Those terms are listed below with a brief explanation as to what they mean.

Point source pollution: A point source is "any discernable, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container,

[99] South Carolina Department of Health and Environmental Control (June 26, 1998), *Water Classifications and Standards* (Regulations 61-68), *Classified Water* (Regulation 61-69), Columbia, SC.
[100] USEPA. Safe Drinking water Information System (January 27, 2006). *List of Water Systems in SDWIS*, http://www.epa.gov/safewater/dwinfo/sc.htm#offices

rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture."[101] Point sources must be permitted to discharge into water bodies under the National Pollution Discharge Elimination System (NPDES).

What is NPDES?

NPDES stands for the National Pollutant Discharge Elimination System. The program was set up by the USEPA by authority under the Clean Water Act to reduce pollution into streams. Any discharge into surface waters (except for personal residences) must have a permit in order to discharge effluent. States are authorized by the USEPA to regulate the NPDES program and permitting process.

Nonpoint source pollution: Nonpoint source pollution comes mainly from stormwater runoff which picks up substances such as excess fertilizers, herbicides and pesticides used on agricultural lands; salts, oil, grease, and heavy metals on roads; heavy metals, sediments, and nutrients from improper timbering or mining practices; and fecal coliform bacteria from leaking septic systems, livestock with direct access to streams, or pet wastes. These substances are deposited into receiving water bodies, either through direct runoff or through stormwater collection systems, so that the source of the pollutant cannot be accurately pinpointed.

Dissolved oxygen (DO): This is a measure of the amount of oxygen dissolved in the water. Aquatic organisms use dissolved oxygen for respiratory function. In general, there must be a minimum level (at least four to five mg/l) of dissolved oxygen in water for the survival of aquatic organisms. The dissolved oxygen level of a stream varies greatly, based on natural occurrences (such as daily and seasonal level cycles).

BOD_5: This acronym stands for the five-day biochemical oxygen demand. It is a measure of the amount of dissolved oxygen that is consumed by decomposing matter in a stream. The test indicates the amount of carbon and nitrogen available to decomposing bacteria for biological breakdown from biological matter (such as leaves, for example) that can be oxidized in the water. Bacterial decomposition of decaying matter raises BOD_5 and lowers the amount of dissolved oxygen in the stream.

Heavy metals: Heavy metals such as cadmium, copper, lead, mercury, nickel, and zinc all occur naturally in the environment and small amounts are needed by most organisms to survive. They are released naturally from the weathering of rocks and soils. However, industrial, agricultural, and other human activities can increase the amount of heavy metals in the environment. Heavy metals are also released into the atmosphere when fossil fuels are burned and deposited onto sediments and fauna. These depositions can flow into streams in stormwater runoff. High levels of heavy metals cause unhealthy conditions in streams by increasing the toxicity levels of the water. High concentrations of heavy metals also reduce dissolved oxygen in streams through oxidation-reduction reactions.

[101] *Clean Water Act, §502(14)*

Fecal coliform bacteria: Coliform bacteria are naturally occurring microorganisms found in the intestinal tracts of all warm-blooded animals (birds and mammals) and are passed out into the environment in fecal matter. Fecal coliform bacteria in surface waters can come from a variety of indirect sources such as stormwater runoff from agricultural or urban areas (i.e. cow manure, animal wastes), leaking septic systems, inadequate sewage treatment facilities, or leaking or overflowing sanitary sewers. Fecal coliform bacteria at low levels are typically not harmful microbes when present in surface waters; however, they do indicate the presence of disease-causing microorganisms.

pH: pH is the amount of hydrogen ion concentration (which is used to determine the acidity) in the water. A scale of 1-14 is used to measure pH with seven being neutral. Substances with a pH greater than seven are considered basic or bases. Substances with a pH lower than seven are considered acidic or acids. Streams with a large amount of organic matter decomposing in the water usually have a low pH and are acidic, while streams with a large amount of nutrients in the water usually have a high pH and are basic.

Turbidity: Turbidity is the measure of the clarity of the water. Increased levels of organic matter, inorganic matter, or microscopic organisms could cause higher turbidity. A higher level of turbidity is an indicator of increased runoff pollution.

Blackwater system: A blackwater system is a stream or body of water that is slow moving and has a large amount of organic matter derived from plants decomposing in it, which is typical of the swamps in the project study area. When organic matter such as leaves decompose, tannic acid is released, which tints the water and makes it a darker color. Blackwater streams have lower dissolved oxygen concentrations due to the decomposition of organic plant matter. Lower pH levels also occur in blackwater systems due to the presence of tannic acid.

Fecal coliform bacterial levels, pH levels, dissolved oxygen levels, and heavy metal concentrations that do not meet South Carolina and/or USEPA defined standards were the most common reasons of impairments. These impairments can be from either point sources or nonpoint sources.

3.18.4 How is surface water quality evaluated?

Under the Clean Water Act, states are required to record the condition of their surface waters with 305(b) and 303(d) documentation. The 305(b) documentation serves to evaluate the extent to which surface waters are supporting their designated uses for categories such as drinking water supply, aquatic life, recreational use, and fish consumption. The SCDHEC produces Watershed Water Quality Assessments (WWQA) to meet the evaluation of their streams under 305(b). The 2000 WWQA describes the most currently known watershed conditions and trends that are developing based on data collected from various monitoring stations that are located along water bodies throughout the state.

The SCDHEC develops a priority list of water bodies pursuant to Section 303(d) of the Clean Water Act, 40 CFR §130.7, and in compliance with the requirements of the current regulation. These water

bodies are targeted for water quality management action and are listed in the *State of South Carolina Section 303(d) List for 2004*.[102] Water quality monitoring stations that are on the 2004 303(d) List and within the project study area are shown in Table 3.51. These sites are listed based on the water quality at the monitoring stations during the time samples were taken. Since the length of the impaired area around the water quality monitoring station is unidentified, crossings within a five-mile distance from the station were considered impaired for purposes of this document.

Table 3.51
2004 303(d) List of Impaired Streams within Project Study Area
Interstate 73 EIS: I-95 to the Myrtle Beach Region

Stream	Monitoring Station Location	Impairment
Maple Swamp (blackwater system) Unit 03040204-030	PD-030: Maple Swamp at State Route 9; at the confluence of this station on Maple Swamp	-Aquatic life use impairment due to low dissolved oxygen; -Recreational use impairment due to high fecal coliform levels.
Little Pee Dee River Unit 03040204-030	PD-030A: On Little Pee Dee River Below Junction with Maple Swamp; near confluence of Cypress Branch and the Little Pee Dee River.	-Recreational use impairment due to high fecal coliform levels; -Fishing advisory due to high mercury levels.
Buck Swamp (blackwater system) Unit 03040204-050	PD-031: At State Route 33 Crossing, just East of Latta.	-Aquatic life use impairment due to low dissolved oxygen; -Recreational use impairment due to high fecal coliform levels.
Buck Swamp (blackwater system) Unit 03040204-050	PD-349: At State Route 42 Crossing, just North of Mullins before confluence with Little Pee Dee River.	-Aquatic life use impairment due to low dissolved oxygen.
Little Pee Dee River Unit 03040204-070	PD-042: Little Pee Dee River at U.S. Route 501, at Galivants Ferry.	-Aquatic life use impairment due to high copper levels; -Fishing advisory due to high mercury levels.
White Oak Creek (blackwater system, but has abnormally low DO levels) Unit 03040204-070	PD-037: At State Route 31 Crossing.	-Aquatic life use impairment due to low dissolved oxygen; -Recreational use impairment due to high fecal coliform levels.
Chinners Swamp Unit 03040204-090	PD-352: At Gunters Island Road off State Route 99, downstream of where alternative crosses.	-Recreational use impairment due to high fecal coliform levels.
Smith Swamp (blackwater system) Unit 03040201-150	PD-320: At State Route 19 Crossing, 1 mile East of Marion	-Aquatic life use impairment due to low dissolved oxygen; -Recreational use impairment due to high fecal coliform levels
Smith Swamp (blackwater system) Unit 03040201-150	PD-187: At U.S. Route 501 Crossing, 1.9 miles South-Southeast of Marion	-Aquatic life use impairment due to low dissolved oxygen; -Recreational use impairment due to high fecal coliform levels

[102] South Carolina Department of Health and Environmental Control. 2004. *The State of South Carolina's 2004 Integrated Report, Part I: Listing of Impaired Waters* http://www.scdhec.net/water/pubs/303d2004.pdf

A Draft 2006 303(d) List is out for public review and is not yet finalized.[103] It contains the same stations that were listed on the 2004 303(d) List with the following exceptions:

- monitoring stations located on Maple Swamp (PD-030), Little Pee Dee River (PD-030A), Buck Swamp (PD-031), White Oak Creek (PD-037), Chinners Swamp (PD-352), and both stations on Smith Swamp (PD-187 and PD-320) are no longer listed for recreational use impairment due to high fecal coliform levels; and
- the monitoring station located on the Little Pee Dee River at Galivants Ferry (PD-042, now known as station PD-619) is no longer impaired for aquatic life due to high copper concentrations.

Watersheds within South Carolina were classified into one of the four following categories:

- Category I – Watersheds in Need of Restoration. These watersheds do not meet, or face imminent threat of not meeting, clean water and other natural resource goals;
- Category II – Watersheds Meeting Goals, Including Those Needing Action to Sustain Water Quality. These watersheds meet clean water and other natural resource goals and standards and support healthy aquatic systems;
- Category III – Watersheds with Pristine/Sensitive Aquatic Systems Conditions on Lands Administered by Federal, State, or Tribal governments; or
- Category IV – Watersheds with Insufficient Data to Make an Assessment.

3.18.5 What is the surface water quality like in the Pee Dee River Basin and Waccamaw/AIWW Basin?

Water quality sampling results reported for these watershed units were available, to varying extents, from 1998, 2000, 2002, and 2004. Sources for the information used included the SCDHEC WWQA for the Pee Dee Basin for 2000[104] as well as the State of South Carolina Section 303(d) Lists for 1998, 2000, 2002, 2004, and (draft) 2006. The watershed units in this area either drain to the Great Pee Dee, Little Pee Dee, or the Waccamaw Rivers, depending on topography and natural drainage systems in the area.

Eight of the ten stations chosen for analysis of current water conditions within the watersheds are closely associated with known NPDES discharge sites. Not surprisingly, these eight stations have been designated as having impaired waters through the 303(d) process. The one unimpaired station, located within the Lake Swamp watershed, is not associated with a NPDES discharge and is upstream from numerous ditch and tributary crossings. This station is not classified as impaired and for lack of a closer station to the project area, project waters within a five mile radius of this station were considered unimpaired.

[103] South Carolina Department of Health and Environmental Control. 2006. *The State of South Carolina's 2006 Integrated Report, Part I: Listing of Impaired Waters.* http://www.scdhec.net/water/pubs/06_303d.pdf

[104] South Carolina Department of Health and Environmental Control (2000), *Watershed Water Quality Assessment: Pee Dee Basin,* http://www.scdhec.net/eqc/water/pubs/peedee2k1.pdf

Watershed Units which Drain into the Great Pee Dee River

Catfish Creek watershed unit 03040201-150

Catfish Creek watershed unit 03040201-150 (Figure 3-37, page 3-162) is located in portions of Marion and Dillon counties. Major streams in this system are Catfish Canal, Smith Swamp, Stackhouse Creek, and Collins Creek. These streams are located south and southwest of the city of Latta near I-95 and extend toward the City of Marion. Catfish Canal, which receives drainage from Stackhouse Creek, and Collins Creek which receives drainage from Smith Swamp, join to form the headwaters of Catfish Creek, which flows into the Great Pee Dee River. Smith Swamp and Catfish Creek are designated as *Freshwater*s with specific pH and dissolved oxygen standards, while the rest of the streams in the watershed are classified as regular *Freshwater*s.[105]

What are watershed units?
SCDHEC, in cooperation with the United States Geological Survey, have delineated watershed basins based on topographical maps into smaller units so that water resource planning and data collection can be performed in a more systematic and meaningful manner. Each number in a hydrologic unit code (HUC) has a specific meaning.

A watershed unit number can be read in the following manner:
11- digit HUC: 03040201-150

03 represents the region number
0304 is the sub-region
030402 is the accounting unit
03040201 is the cataloging unit
03040201-150 is the watershed unit

Smith Swamp has two monitoring stations located on it (PD-187 and PD-320), both of which are located close to the City of Marion. Smith Swamp is a blackwater system, which normally has low dissolved oxygen concentrations and pH levels due to the high amount of organic material being decomposed in the stream. The monitoring station located where U.S. Route 501 crosses this stream (PD-187) is non-supportive of aquatic life uses due to high concentrations of copper according to the 2000 WWQA. The monitoring station located where S.C. Route 19 crosses Smith Swamp (PD-320) was fully supportive of aquatic life uses in 2000. Both stations were partially supportive of recreational uses due to high fecal coliform bacteria levels at the sites. The 2004 303(d) List has both sites impaired for aquatic life uses due to low dissolved oxygen levels and impaired for recreational uses due to high levels of fecal coliform bacteria, while the 2006 Draft List only has these stations impaired for aquatic life uses due to low dissolved oxygen levels.

Due to the close proximity of the City of Marion, sources of impairment for this watershed could be from nonpoint sources. These monitoring stations are also located in close proximity to a NPDES discharge site from the City of Marion, which discharges municipal effluent. Catfish

[105] The specific pH (5.0 to 8.5) and dissolved oxygen (no less than 4.0 mg/L) levels set by SCDHEC for streams are the same throughout the watershed units in the project study area

Canal and Stackhouse Creek have no monitoring stations; therefore, the water quality of the streams is unknown at this time.

Two NPDES permitted discharges are located on Catfish Canal. Trico/Fred Hyatt Water Treatment Plant discharges municipal effluent, and Al Williams Enterprises discharges industrial effluent, both into Catfish Canal. Three mines are also in this watershed unit and are regulated by the Nonpoint Source Management Program. The mines are Marion County Bobby Mace Borrow Pit, City of Marion Coleman Mine, and the Bakers Brothers of Gresham, Inc., all of which extract sand and clay. Based on the water quality monitoring information, 2004 303(d) List, and the type of system, dissolved oxygen and pH levels are anticipated to be low throughout the watershed unit in the vicinity of the water quality monitoring stations. Due to the lack of water quality monitoring stations throughout the rest of the watershed unit, the water quality is unknown at this time.

Watershed Units which drain into the Little Pee Dee River

Little Pee Dee River watershed unit 03040204-030

Cypress Branch, Maple Swamp, and the Little Pee Dee River are major streams within the Little Pee Dee River watershed unit 03040204-030. The watershed unit is located in the northeastern portion of the project study area in Dillon County (Figure 3-37, page 3-162). Maple Swamp flows into the Little Pee Dee River near the City of Dillon, while Cypress Branch flows into the Little Pee Dee River just downstream of the confluence of Maple Swamp. This section of the Little Pee Dee River and Cypress Branch are classified as *Freshwater* streams, while Maple Swamp is classified as a *Freshwater* with a specific standard. Maple Swamp is a blackwater system. There is one monitoring station on Maple Swamp (PD-030). According to the WWQA, aquatic life is not supported at the site due to low dissolved oxygen and increased turbidity. Recreational uses are only partially supported at the site due to high levels of fecal coliform bacteria being present. The 2004 303(d) List has the site impaired for the same reasons, while the 2006 Draft List has the site impaired for aquatic life due to low dissolved oxygen levels. According to sampling data gathered from 1999 to 2004 at PD-030, the average levels have been within the standard criteria.

Cypress Branch flows into the Little Pee Dee River downstream of the confluence of Maple Swamp. A monitoring station on the Little Pee Dee River (PD-030A) occurs where Maple Swamp joins just upstream of the confluence with Cypress Branch. The area is also a blackwater system. According to the WWQA, aquatic life and recreational uses were fully supported at this stream site in 2000. The site was listed on the 2004 303(d) List for impaired recreational use due to high fecal coliform bacteria levels. A fish advisory was also in effect for this area due to high mercury levels in 2004 and it is on the 2006 Draft List. Sampling data shows that the average levels over a five-year period between 1999 and 2004 were within the standard criteria.

NPDES discharges do occur north of these monitoring sites, especially around the City of Dillon where industrial and wastewater treatment plants are located. NPDES discharges in this watershed unit include Anvil Knitwear/Dillon Distribution Center and South of the Border which discharge industrial effluent, as well as Trico/Byrd Water Treatment Plant, Trico/Hamer Water Treatment Plant, Dillon/Little Pee Dee Wastewater Treatment Facility , and the City of Dillon, all of which discharge municipal effluent. Under the Nonpoint Source Management Program, the Little Pee Dee State Park Campground, Bass Lake RV Campground, Inc., and Pedro's Campground all discharge into tributaries or the Little Pee Dee River. Bakers Brothers of Gresham, Inc., and Willard Barker Jr. are two sand/clay mines also regulated under the Nonpoint Source Management Program in this watershed unit. Based on the water quality monitoring information, 2004 303(d) List, and the characteristics of the blackwater system, dissolved oxygen and pH levels are anticipated to be low throughout the watershed unit in the area of the impaired stations. The water quality in other areas of the watershed unit is unknown at this time due to the lack of monitoring stations.

Buck Swamp watershed unit 03040204-050

The Buck Swamp watershed unit 03040204-050 is located north and northeast of Latta, running in an easterly direction towards the City of Mullins in Dillon County and in Marion County (Figure 3-37, page 3-162). Reedy Creek and its tributaries form the headwaters of Buck Swamp northwest of Latta. Buck Swamp flows northeast to east towards Mullins and receives drainage from Mill Creek, The Gully, and Maidendown Swamp before ultimately flowing into the Little Pee Dee River northeast of Mullins. All streams in the watershed are classified as *Freshwater*s, with Buck Swamp and Maidendown Swamp having specific standards for dissolved oxygen and pH.

Buck Swamp is a blackwater system. Two monitoring stations are located on Buck Swamp. One of the sites (PD-031) is located just east of Latta, and according to the 2000 WWQA, aquatic life and recreational uses were fully supported. However, it was listed on the 2004 303(d) List for impaired aquatic uses due to the low dissolved oxygen levels and impaired recreational uses due to high fecal coliform bacteria levels. The impairments could be due to NPDES permitted discharge of municipal effluent upstream of this station by the Town of Latta, along with nonpoint source pollution from the town. In addition, AVM Incorporated is an NPDES permitted discharger of industrial effluent into Maidendown Swamp. Sampling data collected from 1999-2004 at this station shows that, on average, dissolved oxygen levels were lower than the standard criteria.

The second monitoring station is located north of Mullins just before Buck Swamp's confluence with the Little Pee Dee River (PD-349). The site was fully supporting aquatic life and recreational uses based on the 2000 WWQA. However, the site was listed on the 2004 303(d) List for impaired aquatic life uses to due low dissolved oxygen levels and is listed for impaired aquatic

life uses and impaired recreational uses on the 2006 Draft List. Sampling data shows that the average levels over a five-year period between 1999 and 2004 were within the standard criteria. Based on the water quality monitoring information, 2004 303(d) List, and the characteristics of the blackwater system, dissolved oxygen and pH levels are anticipated to be low throughout the watershed unit in areas in close proximity to the monitoring stations.

Little Pee Dee River watershed unit 03040204-070

The Little Pee Dee River watershed unit 03040204-070 is located in Marion and Horry counties from Mullins south to Aynor (Figure 3-37, page 3-162).

White Oak Creek is a tributary to Brown Swamp, which flows into the Little Pee Dee River southeast of Mullins. White Oak Creek and Brown Swamp are both blackwater systems and designated as *Freshwater* streams with specific standards for dissolved oxygen and pH.

A monitoring station for White Oak Creek is located at its confluence with Brown Swamp (PD-037). Based on the WWQA, dissolved oxygen levels were abnormally low at this site and the 5-day biochemical oxygen demand was high. Phosphorus levels and turbidity were also high. Aquatic life support uses are only partially supported. The site was on the 2004 303(d) List for low dissolved oxygen levels impairing aquatic life uses and also impaired recreational uses due to high fecal coliform bacterial levels in the water. Sampling data shows that the average levels over a five-year period between 1999 and 2004 were within the standard criteria. The Mullins wastewater treatment plant is located upstream of this monitoring station and could be a source of the impairments due to the NPDES discharges. The City of Mullins could also be contributing to the impairment sources through nonpoint source runoff pollution from the city.

The other streams in the watershed unit, Back Swamp, Dawsey Swamp, Tredwell Swamp, and Reedy Creek all accept drainage from smaller tributaries and flow into the Little Pee Dee River. There are no monitoring stations on any of these streams. All of the waters are classified as outstanding resource waters by the SCDHEC.

The Little Pee Dee River has a monitoring station in this watershed unit, near U.S. Route 501 at Galivants Ferry (PD-042 now PD-619 on the 2006 303(d) Draft List). The site was listed as an outstanding resource water in the WWQA, however, it was non-supportive of aquatic life uses due to high concentrations of copper. The monitoring station site was also listed on the 303(d) list for 2004 due to the high copper concentrations which prevented aquatic life support uses as well as being under a fish consumption advisory due to the high concentrations of mercury. The 2006 Draft List has this site under a fish consumption advisory due to high levels of mercury. According to sampling data over the five-year period from 1999 to 2004, pH was slightly below and copper was in excess of the standard criteria.

NPDES dischargers in this watershed unit include the Locust Tree Development, APAC-Carolina, Incorporated, (Raines Plant), and B & M Aquaculture Farms which discharge industrial effluent.

The Marion County/Centenary Sewer System also discharges municipal effluent into this watershed. Seven mines exist in the watershed unit according to the WWQA, all of which are regulated under the Nonpoint Source Management Program. These mines include Baker Brothers of Gresham, Incorporated, APAC-Carolina, Incorporated, Carolina Sand, Incorporated, Weaver Company, Incorporated (Cannon Spring and Johnston Mines), G&C Incorporated, Cavu Incorporated, and Submit Incorporated. These mines extract sand, clay, and limestone. While most of the watershed unit contains outstanding resources, these waters are impaired for aquatic life and under a fish consumption advisory. Based on the information from the water quality monitoring sites, aquatic life impairments would be expected due to high copper levels and low dissolved levels in the watershed unit, especially in close proximity to the monitoring stations.

Lake Swamp watershed unit 03040204-080

The Lake Swamp watershed unit 03040204-080 is located east and northeast of Aynor in Horry County (Figure 3-37, page 3-162). Black Creek flows into the Little Pee Dee River and is considered an outstanding resource water. Reedy Branch, Joiner Creek (or Swamp) and Loosing Swamp all drain into Lake Swamp and are classified as *Freshwater*s in the 2000 WWQA. Lake Swamp, a blackwater system, is designated as *Freshwater* with specific standards for dissolved oxygen and pH.

Lake Swamp has one monitoring station located downstream from its confluence with Loosing Swamp (PD-176) and aquatic life and recreational uses were fully supported at this site in 2000, according to the WWQA. No other monitoring sites occur on the other stream sites; however, the aforementioned station occurs downstream from the confluences of all the tributaries to Lake Swamp. According to sampling data from 1999 to 2004, on average, all sampling data were within the standard criteria.

The City of Loris wastewater treatment plant discharges municipal effluent under the NPDES system into a tributary of Lake Swamp. One sprayfield, owned by the Grand Strand Water and Sewer Authority, exists under the Nonpoint Source Management Program, at Green Sea Floyds High School. Black Creek Mine is also in this watershed and is regulated by the Nonpoint Source Management Program for sand mining. The water quality at the monitoring station was not impaired; however, this station is located in a relatively pristine area of the watershed unit. Due to the lack of other monitoring stations, it is unknown whether the rest of the watershed unit is unimpaired.

Brunson Swamp watershed unit 03040204-090

Brunson Swamp watershed unit 03040204-090 is located southeast of Aynor in Horry County (Figure 3-37, page 3-162). There are three tributaries to Brunson Swamp: Chinners Swamp (which includes Mill Branch and Savannah Creek), Spring Swamp, and Palmetto Swamp. Brunson Swamp then drains into the Little Pee Dee River. All the streams in the watershed are designated as *Freshwater*s.

Chinners Swamp accepts drainage from Mill Branch and Savannah Creek before flowing into Brunson Swamp. Two monitoring stations are located along Chinners Swamp. One site is located just downstream of the confluence of Chinners Swamp and Mill Branch, near Aynor. Based on the 2000 WWQA, aquatic life and recreational uses are fully supported at this site. Downstream of this site prior to the confluence of Chinners and Brunson Swamps is where monitoring station PD-352 is located. According to sampling data from 1999 to 2004, on average, all sampling data were within the standard criteria except chromium. Aquatic life uses are fully supported at the site according to the 2000 WWQA, but recreational uses are only partially supported due to high fecal coliform bacteria levels in the stream. The site was also listed as impaired for the same reason on the 2004 303(d) List. However, the site is no longer listed for recreational use impairment on the 2006 Draft List.

There are no monitoring stations for Spring Swamp, Palmetto Swamp, or Brunson Swamp. Therefore, the water quality of the streams is unknown.

NPDES discharges occur in this watershed unit, mainly around the Town of Aynor, which is west of Chinners Swamp. The Grand Strand Water and Sewer Authority/Aynor wastewater treatment plant discharges municipal effluent while the Corner Cupboard discharges industrial effluent. Nonpoint source pollution runoff also is possible from Aynor. Based on the information from the water quality monitoring information, some areas of the watershed unit are impaired for recreational uses due to high fecal coliform levels; other areas of the watershed unit may be impaired, due to the lack of information, it is unknown at this time.

The Pee Dee River Sub-basin was given a Category I rating (watershed in need of restoration) under the Unified Watershed Assessment because 31 percent of its assessed waters were impaired. This watershed was designated as Priority One in the Watershed Restoration Priorities for fiscal year 1999-2000.

Watershed Units which drain into the Waccamaw River/AIWW

Kingston Lake watershed unit 03040206-130

Kingston Lake watershed unit 03040206-130 is located northwest of Conway in Horry County (Figure 3-37, page 3-162). Maple Swamp receives drainage from Poplar Swamp and Horse Creek before flowing into the Kingston Lake watershed prior to draining into the Waccamaw River. Maple Swamp, Poplar Swamp, and Horse Creek are classified as *Freshwater*s. The water quality of these streams is currently unknown because no monitoring stations exist on

them; the nearest station is located at Kingston Lake. The Chiquolas Spinners/ Conway Plant discharges industrial effluent under the NPDES. Thompkins & Associates mines limestone under the Nonpoint Source Management Program.

The Waccamaw River/AIWW Sub-basin was given a Category I rating (watershed in need of restoration) by the Unified Watershed Assessment because 87% of the assessed waters were impaired. The Waccamaw/ AIWW Sub-basin was also designated as Priority One in the Watershed Restoration Priorities for fiscal year 1999-2000.

3.18.7 How would these watersheds be impacted by the proposed project?

Water quality impacts could result due to pollutant buildup in new areas of the project study area from the increase in traffic volumes. Inorganic materials, volatile compounds (from petroleum products), dust from vehicle brakes and exhaust, and heavy metals can build-up on roadways and runoff into streams and wetlands due to rain.

In addition, water quality impacts could occur during normal operation and maintenance of the roadway from spraying of herbicides or use of paint and other materials. Best management practices would be used for maintenance of the road and the use of herbicides in the right-of-way. The implementation of best management practices would ensure that these maintenance activities would not have an impact to water quality in the project study area.

3.18.8 How much pollutant would runoff into streams in the project study area as a result of the alternatives?

An analysis was done using the FHWA's "Constituents of Highway Runoff" to estimate the amount of pollutant that would enter streams after a twenty-day buildup period, assuming there were no structures such as retention basins or ditches to filter sediment.[106] The volume of traffic and the estimated length for each alternative within a watershed unit was used to calculate the pollutant load for one point per watershed unit. Standard equations were used to calculate the constituents in the pollutant load, which were developed based on studies completed on a rural interstate highway in Pennsylvania. In general, more pollutant would drain into streams that are in urbanized areas rather than those located in rural areas. This is due to the amount of vegetation along the sides of roadways that would filter pollutant prior to it draining into a stream. The results of this model and the constituent listing[107] are shown in Table 3.52, page 3-176. While this is a general model for constituent loading into streams without filtering or retention structures, a more detailed analysis of pollutant runoff will be done for the Preferred Alternative.

Based on the calculated estimates from the model, Alternative 1 would have the lowest amount of pollutants discharged after a twenty-day build up period, while Alternative 7 would have the highest.

[106] FHWA, 1981. FHWA/RD-81/042: "Constituents of Highway Runoff". Washington, D.C., 1981

[107] Using the model's equations, the sum of the constituents does not equal the amount of total solids for each alternative.

Table 3.52
Pollutant Discharge by Pounds in Year 2030
Interstate 73 EIS: I-95 to the Myrtle Beach Region

	No-build	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8
Total Solids	**3047**	**3060**	**3207**	**3231**	**3553**	**3089**	**3222**	**3382**	**3361**
Suspended Solids	435	437	475	664	670	461	646	611	531
Total Organic Carbon	115	118	125	159	166	122	156	153	137
Chemical Oxygen Demand	277	277	291	289	318	280	288	303	303
Total Nitrogen	7	7	7	7	7	7	7	7	7
Total Kjeldahl Nitrogen	19	19	20	17	18	19	17	18	20
Total Phosphorus	3	2	2	4	4	2	4	4	3
Lead	1	1	1	1	1	1	1	1	1
Zinc	1	0	1	1	1	1	1	1	1
Iron	19	19	20	29	29	20	28	26	23
Chloride*	458	457	480	467	513	464	466	493	498
Other Heavy Metals†	-	-	-	-	-	-	-	-	-

†No detectable levels of Copper, Cadmium, Chromium, and Mercury were found to accumulate over a 20-day period based on the model.

* The equation is based on an interstate in a northern area where salts and deicers are used for roadways, unlike the proposed project which more than likely will never have any road salt or deicing materials spread on it. It is likely this number is greater than the actual amount of chloride due to the basis of the model.

Alternatives 2, 3, and 6 would have the same estimated amount, while Alternatives 4 and 5 would be estimated to have approximately the same amount of total solids. In terms of constituents, no alternatives would result in detectable levels of copper, cadmium, chromium, or mercury being deposited into streams. As for nutrient build up, Total Nitrogen and Total Kjeldahl Nitrogen would be similar among all alternatives, while Alternatives 3, 4, 6, and 7 would result in more total phosphorus running off into streams. Lead and Zinc runoff from the roadway would be similar among all alternatives, while Alternatives 1 and 8 would have the least amount of Iron running off into streams. The Chemical Oxygen Demand in streams as a result of pollutant runoff would be the least for Alternative 1, while Alternative 7 would result in the highest levels of Chemical Oxygen Demand. The Total Organic Carbon in the streams from pollutant runoff would be the least in Alternative 1, while Alternative 3 would result in the largest amount into streams.

All ditches and canals that were jurisdictionally linked to waters of the United States were included in this analysis and counted as crossings. Ditches and canals will be verified for linkage to jurisdictional waters during the wetland delineation of the Preferred Alternative. Most all direct stream crossings are of streams, with very few being crossings of ditches.

How would the alternatives impact water quality?

No-Build Alternative

The No-build Alternative would result in no additional pollutants entering in at listed stream crossings of this project. However, traffic volumes would be expected to increase on other roadways in the project study area over time, and pollutant loading would occur into different portions of the watershed units, depending on the locations of stream crossings. The pollutant runoff model was used to estimate the pollutant load that would enter stream crossing on U.S. Route 501 in 2030 without the project. (This is assuming that the pollutants are not being filtered through grass, sediment basins, or other stormwater treatment structures). The model estimated that the amount of pollutants washing off of U.S. Route 501 into streams was roughly equal to the amounts of Alternatives 1 and 5. The watershed units in the project study area are natural blackwater systems, with low dissolved oxygen levels and pH, most of which have impaired water quality monitoring stations except the station located at the Lake Swamp watershed unit. These systems would continue to have low dissolved oxygen levels and pH due to their natural conditions, irregardless of pollutant runoff into the streams.

Cumulatively, the No-build Alternative would result in additional stream impacts throughout the aforementioned watershed units except the Lake Swamp watershed unit (03040204-080), along with the following additional watershed units listed below. The stream impacts for the No-build Alternative were based on projected land use growth and the establishment of the inland port in Marion County.

Pee Dee River Watershed Unit 03040201-120 - The No-build Alternative would have 33 *Freshwater* stream impacts in this watershed unit, mainly due to the inland port.

Catfish Creek Watershed Unit 03040201-150 - With the addition of growth projected in the No-build Alternative, nine *Freshwater* streams would be impacted due to development.

Pee Dee River Watershed Unit 03040201-170 - The Waccamaw National Wildlife Refuge is located in a portion of this watershed unit, and would be federally protected from development. The No-build Alternative would result in additional development which would impact two *Freshwater* streams in this watershed unit.

Bull Creek is within this watershed and a major source of drinking water, provided by the Grand Strand Water and Sewer Authority. It is used as drinking water for the City of Conway, the Town of Little River, and additional rural and contracted users.[108] As development increases throughout the eastern portion of the project study area, greater demand for water service would be anticipated.

[108] Grand Strand Water and Sewer Authority. Water page, .http://www.gswsa.com/ext/index.asp?main=water Last accessed May 9, 2006.

Little Pee Dee River Watershed Unit 03040204-030 - The No-build Alternative would impact three additional *Freshwater* streams in the watershed unit.

Buck Swamp Watershed Unit 03040204-050 - The No-build Alternative would result in one stream crossing in the watershed unit, which is classified as a *Freshwater* stream.

Little Pee Dee River Watershed Unit 03040204-070 - The No-build Alternative would result in additional impacts to 12 *Freshwater* streams, four *Freshwater* streams with specific standards, and one stream classified as an outstanding resource water in the watershed unit**.**

Brunson Swamp Watershed Unit 03040204-090 - The No-build Alternative would impact an additional six *Freshwater* streams and 12 *Freshwater* streams with specific standards.

Waccamaw River Watershed Unit 03040206-120 - Three water quality monitoring stations in this unit (CSTL-553, CSTL-554, and CSTL-555) are listed as impaired on the 2004 303(d) List due to a fish consumption advisory for high mercury levels. One NPDES permitted facility, one landfill, and four mines are located in this watershed. The No-build Alternative would be projected to impact 33 *Freshwater* streams (or ditches).

Kingston Lake Watershed Unit 03040206-130 - The No-build Alternative is predicted to have an additional 42 streams impacted by future growth and development.

Waccamaw River Watershed Unit 03040206-140 - There are six impaired monitoring stations that are listed on the 2004 303(d) list, five of which (Stations CSTL-556, CSTL-558, MD-136, MD-144, and MD-145) are listed due to high levels of mercury resulting in a fish consumption advisory, and the other station (PD-638) which is listed as impaired for aquatic life due to its macroinvertebrate community. TMDL programs are in place for the Atlantic Intracoastal Waterway, and for the area around station MD-136 on the Waccamaw River. There are nine NPDES permitted facilities, two landfills, and eleven mines in this watershed unit. The Waccamaw National Wildlife Refuge is located in a portion of this watershed unit, and would be federally protected from development. The No-build Alternative predicts that development would impact two *Freshwater* streams

Alternative 1

Alternative 1 would cross 60 streams in five watershed units, including Catfish Creek (-150), Buck Swamp (-050), Little Pee Dee River (-070), Lake Swamp (-080), and Brunson Swamp (-090). The Buck Swamp watershed unit would have the most crossings at 27, while the Alternative would not impact the Little Pee Dee River (-030) or Kingston Lake (-130) watershed units. (Table 3.53). Ten outstanding resource waters and 14 *Freshwater*s with specific standards would be crossed.

Alternative 1 would cross impaired sites for aquatic life twice, at Station PD-042 and Station PD-349, and it would cross an impaired site for recreational use once (Table 3.54, page 3-180). The

Table 3.53
Stream Crossings by Alternative
Interstate 73 EIS: I-95 to the Myrtle Beach Region

			Number of Stream Crossings							
			Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8
Water Quality Classification	Freshwater		36	38	49	22	38	46	24	36
	Freshwater with Specific Standards		14	15	5	14	8	15	8	21
	Outstanding Resource Waters		10	10	4	9	10	4	9	10
Watershed	Great Pee Dee River 03040201	Catfish Creek 150	9	0	9	17	9	0	17	0
	Little Pee Dee River 03040204	Little Pee Dee River 030	0	8	0	0	0	8	0	8
		Buck Swamp 050	27	35	27	5	27	35	5	35
		Little Pee Dee River 070	10	10	2	9	10	2	9	10
		Lake Swamp 080	1	7	17	1	7	17	7	1
		Brunson Swamp 090	13	2	2	13	2	2	2	13
	Waccamaw River / AIWW 03040206	Kingston Lake 130	0	1	1	0	1	1	1	0
		Total	60	63	58	45	56	65	41	67

Table 3.54
Impaired Stream Crossings* by Alternative
Interstate 73 EIS: I-95 to the Myrtle Beach Region

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8
PD-187 Aquatic Life Impairment/ DO				X			X	
PD-187 Recreational Use Impairment/ FC				X			X	
PD-320 Aquatic Life Impairment/ DO				X			X	
PD-320 Recreational Use Impairment/ FC				X			X	
PD-030 Aquatic Life Impairment/ DO		X				X		X
PD-030 Recreational Use Impairment/ FC		X				X		X
PD-030A Fish Consumption Advisory/ Hg		X				X		X
PD-030A Recreational Use Impairment/ FC		X				X		X
PD-037 Aquatic Life Impairment/ DO			X			X		
PD-037 Recreational Use Impairment/ FC			X			X		
PD-042 Aquatic Life Impairment/ Cu	X	X		X	X		X	X
PD-352 Recreational Use Impairment/ FC	X			X				X
PD-349 Aquatic Life Impairment/ DO	X	X	X		X	X		X

DO – Dissolved Oxygen
FC – Fecal Coliform
Hg – Mercury
Cu – Copper

* Crossing is within 5 miles of impaired site; List is based on 2004 303(d) List of impaired stations.

contributing factor at station PD-352 for impaired recreational use is high fecal coliform levels. The roadway is not expected to contribute to direct increases in fecal coliform levels in streams, based on the pollutant runoff model. Alternative 1 would cross 0.52 miles upstream of station PD-042, which is impaired for aquatic life due to high copper levels in the stream. According to the pollutant runoff model, no detectable amounts of copper would be entering into streams as a result of runoff from the roadway. Therefore, the roadway is not expected to contribute to direct increases in copper levels, nor should it contribute to further impairment in the streams. Alternative 1 would also cross within a five-mile distance of PD-349, which is impaired for aquatic life use 4.6 miles upstream of the station. Pollutants could flow into stream in this area, increasing the nutrient and organic carbon levels, and further reducing the levels of dissolved oxygen.

In terms of indirect impacts, Alternative 1 would be expected to have two impacts to outstanding resource waters, five impacts to *Freshwater* streams with specific standards, and 24 impacts to *Freshwater* streams due to induced development (Table 3.55). These impacts would be spread among five different watershed units, and be in addition to the stream impacts from the No-build Alternative.

Table 3.55
Streams Impacted by Predicted Development in the Project Study Area
Interstate 73 EIS: I-95 to the Myrtle Beach Region

		No-Build	Alt. 1	Alt.2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8
Great Pee Dee River 03040201	Pee Dee River 120	33FW								
	Catfish Creek 150	9FW	9FW	6FW	8FW	10FW	9FW	4FW	10FW	6FW
	Pee Dee River 170	2FW								
Little Pee Dee River 03040204	Little Pee Dee River 030	3FW	7FW	8FW	3FW	7FW	4FW	5FW	3FW	6FW
	Buck Swamp 050	1FW	8FW	12FW	5FW	5FW	9FW	9FW	2FW	11FW
	Little Pee Dee River 070	12FW 4FW* 1ORW	2ORW	1ORW		1ORW				1ORW
	Brunson Swamp 090	6FW 12FW*	5FW*	5FW*	5FW*	5FW*	5FW*	5FW*	5FW*	5FW*
Waccamaw River/ AIWW 03040206	Waccamaw River 120	33FW								
	Kingston Lake 130	42FW		4FW	3FW		4FW	4FW	4FW	4FW
	Waccamaw River 140	2FW								

FW – *Freshwater*
FW*- *Freshwater* with specific standards set by SCDHEC
ORW- Outstanding Resource Waters

Alternative 2

Alternative 2 would cross 63 streams in six different watershed units, including Little Pee Dee River (-030), Buck Swamp (-050), Little Pee Dee River (-070), Lake Swamp (-080), Brunson Swamp (-090), and Kingston Lake (-130). The most stream crossings would be in the Buck Swamp watershed unit at 35 (Table 3.53, page 3-179). This alternative would not cross the Catfish Creek watershed unit. There would be 10 stream crossings of outstanding resource waters and 15 crossings of *Freshwater*s with specific standards.

Alternative 2 would cross four impaired sites, two of which (PD-030 and PD-030A) are impaired for recreational use due to high fecal coliform levels (Table 3.54, page 3-180). Based on the pollutant runoff model, direct increases to fecal coliform levels would not be as a result of runoff from the roadway. Therefore, Alternative 2 is not likely to contribute to further impairment of Stations PD-030 and PD-030A for fecal coliform levels. Alternative 2 would also cross within five miles of Stations PD-030 and PD-349, which are impaired for aquatic life use due to low dissolved oxygen levels. The water quality at PD-030 may be further degraded as a result of the project given that any project-related pollutants would be entering the streams 1.24 miles upstream. Station PD-349 is located 4.6 miles downstream of the stream crossing; however, as stated in the prior paragraph, and nutrients and organic runoff from the project could further impact the water quality at this station. In addition, Alternative 2 would cross near Station PD-042, which is impaired for aquatic life due to high levels of copper, and Station PD-030A, which is under a fish consumption advisory due to high levels of mercury. Based on the pollutant runoff model, neither copper nor mercury was being discharged at detectable levels. Alternative 2 should not contribute to increased levels of these metals, or cause further impairments at the stations.

Alternative 2 would have indirect impacts to streams in six different watershed units (Table 3.55, page 3-181) due to projected induced development based on the land use model. Stream impacts would be to one outstanding resource water, five *Freshwater*s with specific standards, and 30 *Freshwater* streams.

Alternative 3

Alternative 3 would cross 58 streams in six different watershed units, including Catfish Creek (-150), Buck Swamp (-050), Little Pee Dee River (-070), Lake Swamp (-080), Brunson Swamp (-090), and Kingston Lake (-130). The most crossings would occur in the Buck Swamp watershed unit, while the second highest number of crossings would occur in the Lake Swamp watershed unit (Table 3.53, page 3-177). The Little Pee Dee River watershed unit (-030) would not be crossed by this alternative. The alternative would result in the lowest number of crossings of outstanding resource waters (four) and only five crossings of *Freshwater*s with specific standards.

Alternative 3 would cross within a five-mile distance of two impaired sites (Table 3.54, page 3-180). While Station PD-037 is impaired for both aquatic life and recreational uses, the station is upstream of where Alternative 3 crosses, and is not likely to further contribute to the impairment at the monitoring station. Alternative 3 would also cross within 4.6 miles upstream of Station PD-349, which is impaired

for aquatic life use due to low dissolved oxygen. Based on the pollutant runoff model, it is likely that nutrients could runoff into the crossing which may contribute to lower dissolved oxygen levels in the naturally blackwater stream.

Due to predicted induced development based on the land use model, Alternative 3 would indirectly impact streams in five different watershed units (Table 3.55, page 3-181). It is expected that five *Freshwater*s with specific standards and 19 *Freshwater*s would be impacted, in addition to the stream impacts from the No-build Alternative.

Alternative 4

Alternative 4 would cross 45 streams in five different watershed units, including Catfish Creek (-150), Buck Swamp (-050), Little Pee Dee River (-070), Lake Swamp (-080), and Brunson Swamp (-090) (Table 3.53, page 3-179). This alternative would not cross Little Pee Dee River (-030) or the Kingston Lake (-130) watershed units. The most crossings of an individual watershed unit would occur in the Catfish Creek watershed unit, with 17. Alternative 4 would cross nine outstanding resource waters and14 *Freshwater*s with specific standards.

Alternative 4 would cross within a five-mile distance of four impaired sites (Table 3.54, page 3-180). Stations PD-187, PD-320, and PD-352 are impaired for recreational use due to high fecal coliform levels. Based on the pollutant runoff model, it is not likely that direct increases to fecal coliform levels would be caused by the roadway. Alternative 4 would cross within a mile upstream of Station PD-042, which is impaired for aquatic life use due to high levels of copper. Detectable levels of copper are not likely to be from the runoff from the roadway, based on the pollutant runoff model. Therefore, it is not likely that runoff would contribute to or further impair this station due to high copper levels. Alternative 4 would also cross within 2.5 to 4 miles of Stations PD-187 and PD-320, both of which are impaired for aquatic life due to low dissolved oxygen levels. Runoff of nutrients is possible from the crossing, and may cause further impairment to water quality at these stations.

Alternative 4 would indirectly impact streams in five watershed units due to induced growth (Table 3.55, page 3-181). One impact to an outstanding resource water, five impacts to *Freshwater*s with specific standards, and 22 impacts to *Freshwater* would be expected based on the land use model, in addition to the stream impacts from the No-build Alternative.

Alternative 5

Alternative 5 would cross 56 streams over six watershed units, including Catfish Creek (-150), Buck Swamp (-050), Little Pee Dee River (-070), Lake Swamp (-080), Brunson Swamp (-090), and Kingston Lake (-130). The Buck Swamp watershed unit would have the most crossings at 27 (Table 3.53, page 3-179). This alternative would not cross the Little Pee Dee River (-030) watershed unit. In addition, the alternative would cross 10 outstanding resource waters and eight *Freshwater*s with specific standards.

Alternative 5 would cross within a five-mile distance of two impaired stations, both of which are impaired for aquatic life (Table 3.54, page 3-180). Alternative 5 would cross within a mile downstream

of Station PD-042, which is impaired due to its high levels of copper. Based on the pollutant runoff model, copper was not present in detectable levels to runoff into streams. Therefore, this crossing is not likely to further contribute to the high levels of copper at this monitoring station. Station PD-349, which is impaired due to low dissolved oxygen levels, would be located 4.6 miles downstream of the nearest crossing. Based on the pollutant runoff model, nutrients could wash into streams which may contribute to lowering dissolved oxygen levels further.

Indirect impacts would occur due to induced growth from Alternative 5 in five different watershed units (Table 3.55, page 3-181). Based on land use model projections, five *Freshwater* streams with specific standards and 26 *Freshwater* streams would be impacted due to induced development, in addition to the No-build Alternative.

Alternative 6

Alternative 6 would cross 65 streams over six different watershed units including Little Pee Dee River (-030), Buck Swamp (-050), Little Pee Dee River (-070), Lake Swamp (-080), Brunson Swamp (-090), and Kingston Lake (-130). This alternative does not cross Catfish Creek (-150) watershed unit (Table 3.53, page 3-179). The Buck Swamp watershed unit would have the most crossings at 36. This alternative would cross four outstanding resource waters and 15 *Freshwater*s with specific standards.

Alternative 6 would cross within a five-mile distance of four impaired stations (Table 3.54, page 3-180). Stations PD-030, PD-030A, and PD-037 are all impaired for recreational use due to high fecal coliform levels. Alternative 6 should not result in a direct increase of fecal coliform levels, based on the pollutant runoff model. Station PD-037 is impaired for aquatic life use due to low dissolved oxygen levels. However, Station PD-037 is located upstream of where the alternative is crossing; therefore, due to the stream direction flow, the roadway is not likely to further decrease the dissolved oxygen levels at this station. Alternative 6 would also cross 4.6 miles upstream of Station PD-349, and 1.24 miles upstream of Station PD-030, both of which are impaired for aquatic life due to low dissolved oxygen levels. The pollutant runoff model estimates that constituents such as nutrients would runoff into the stream, which could further lower the dissolved oxygen levels of the stream at the impaired stations. Alternative 6 would also cross over a mile away from Station PD-030A, which has a fish consumption advisory due to high levels of mercury. The pollutant runoff model estimated that no detectable amounts of mercury would result as runoff from the roadway. Therefore, the crossing is not likely to further contribute to the high mercury levels at this station.

Alternative 6 would indirectly impact streams in five different watershed units due to induced growth (Table 3.55, page 3-181). Five *Freshwater* streams with specific standards and 22 *Freshwater* streams are anticipated to be impacted based on projections from the land use model.

Alternative 7

Alternative 7 would cross a total of 41 streams over five watershed units, including Catfish Creek (-150), Buck Swamp (-050), Little Pee Dee River (-070), Lake Swamp (-080), Brunson Swamp (-090) with the most crossings occurring in the Catfish Creek watershed unit (Table 3.53, page 3-179).

Eight *Freshwater*s with specific standards and nine outstanding resource waters, would be crossed by this alternative.

Alternative 7 would cross within a five-mile distance of two impaired sites (PD-187 and PD-320), both of which are located on Smith Swamp (Table 3.54, page 3-180). The sites are impaired for recreational use due to high fecal coliform levels and are impaired for aquatic life use due to low dissolved oxygen levels. Based on the pollutant runoff model, the crossing, while upstream, is not likely to directly increase the amount of fecal coliform at these stations. The pollutant runoff model does estimate a certain amount of nutrients loading into the stream crossing, which may lower dissolved oxygen levels even further in this naturally blackwater system. However, due to the distance of these stations from the crossing being between 2.5 and 4 miles, dilution of these nutrients is likely over the distance and should not further contribute to the low dissolved oxygen levels at these sites.

Alternative 7 would indirectly impact five different watershed units due to induced growth, based on projections from the land use model (Table 3.55, page 3-181). Indirect impacts are expected to occur to five *Freshwater* streams with specific standards and 19 *Freshwater* streams, in addition to the impacts projected to occur under the No-build Alternative.

Alternative 8

Alternative 8 would cross 67 streams over five watershed units, and have the highest number of stream crossings (Table 3.53, page 3-179). Most crossings would occur in the Buck Swamp watershed unit (36 crossings). In addition, this alternative would cross 21 *Freshwater*s with specific standards, and 10 outstanding resource waters.

Alternative 8 would cross within a five-mile distance of five impaired sites (Table 3.54, page 3-180). Three sites, Stations PD-030, PD-030A, and PD-352, are all impaired for recreational use due to high fecal coliform levels. Based on the pollutant runoff model, fecal coliform levels are not likely to directly increase as a result of the roadway. Stations PD-030 and PD-349 are impaired for aquatic life use due to low dissolved oxygen levels. While the pollutant runoff does contain some nutrients, it is not anticipated that water quality at PD-030 would be further degraded as a result of the project given that any project related pollutants would be entering the streams 1.24 miles upstream and either utilized by aquatic organisms or diluted before passing through the station. Station PD-349 is located 4.6 miles downstream of the stream crossing; however, as stated in the prior paragraph, due to the distance of the crossing from the impaired station, any pollutant entering the stream would likely be used by aquatic organisms or become diluted prior to reaching the monitoring station, and would have minimal impact to the natural blackwater system. Alternative 8 would also cross within a five-mile distance of Stations PD-042, which is impaired for aquatic life due to high copper concentrations, and PD-030A, which has a fish consumption advisory due to high mercury levels. Based on the pollutant runoff model, copper and mercury were not found to occur in the runoff from roadways; therefore, it is not likely that the roadway would further contribute to the impairments of high levels of copper and mercury at these stations.

Indirect impacts would occur to six different watershed units as a result of induced growth from Alternative 8. Stream impacts are anticipated to occur to one outstanding resource water, five *Freshwater* streams with specific standards, and 27 *Freshwater* streams due to development projected by the land use model.

The number of ditches and streams were counted per alternative, since most of the projected growth is due to occur in upland areas that are drained by ditches. All alternatives had at least twice the number of ditches being crossed when compared to streams.

3.18.9 What best management practices and measures would be used to minimize the amount of runoff pollution into streams?

This project would be located in mainly rural areas, so the roadway design would consist of grassy swales and vegetated slopes on the sides of the pavement which would filter pollutants from the runoff. The runoff would be collected in grassy ditches, and as it moves through the ditches it would continue to be filtered prior to entering streams. Retention ponds would be in place in some areas to allow pollutants to settle prior to entering streams. These best management practices, along with those found in the SCDOT and FHWA guidelines,[109] would be used during design and construction to minimize the amount of runoff pollution from streams.

This project was designed to minimize impacts to wetlands in the project study area (for more information, please see the Wetlands Section, 3.16). Wetlands provide a natural function of filtering pollutants from waters before they enter stream systems. By preserving wetlands, additional areas of filtration would be in place for highway runoff prior to it entering streams.

The feasibility of using a closed drainage system where runoff would be piped from bridges was analyzed for the project. The four largest bridges among the alternatives (Lake Swamp crossing, Buck Swamp crossing, and both Little Pee Dee River crossings) were used for analysis. It was determined that the bridges are flat, without much arcing, and have low points within the structures. Since the drainage system would be closed, regular routine maintenance would be required to clean out the drainage system structures and ensure they are working properly. The amount of pollutant estimated from the pollutant runoff model was for the entire length of the project, approximately 44 to 48 miles depending on alternative. The pollutant load on bridges would be a small fraction of what was estimated for the entire length of the roadway. The pollutant washing off bridges would enter into streams untreated if closed drainage systems were not installed. Due to the cost and maintenance of the closed drainage systems, along with the complex design of the systems so that they would drain, it can be concluded that closed drainage systems would not be cost-effective.

[109] South Carolina Highway Department Standard Specifications for Highway Construction.