CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

This chapter discusses the consequences of the ten Tier 2 detailed study alternatives (described in Section 2.4.6), the No Build alternative (described in Section 2.1), and the Preferred Alternative (described in Section 2.4.7) on the various social, economic, cultural, and natural aspects of the study area.

Impacts based on broader regional issues, such as land use planning and access to community facilities, are not differentiated between the Tier 2 detailed study alternatives; impacts which are more site-specific to the corridor location, such as wetland areas and effects to potential hazardous materials sites, are provided for each alternative.

It should be noted that those impacts calculated for the ten Tier 2 detailed study alternatives that used prorated corridor-wide impacts to approximate right-of-way impacts were based on metric dimensions and not English, since the project was first designed in metric units. When the project design was changed to English units, the minimum right-of-way width of 100 meters was changed to 320 feet, which would be slightly less than an exact metric-to-English conversion of 328 feet. The corresponding exact metric-to-English conversion of the 300-meter corridor width would be 984 feet, yielding a prorating factor of 328/984 = 0.33 (the same factor as results from taking the 100-meter ROW divided by the 300-meter corridor width). For a 320-foot average right-of-way width and a 1,000-foot wide corridor, the prorating factor would be 320/1,000 = 0.32. Therefore, prorated impacts based on a 320-foot right-of-way would be slightly less. A decision was made that the prorated impacts would not be recalculated using the 320-foot average right-of-way width because: 1) as shown above, the difference in impacts between the

320-foot and 328-foot average right-of-way widths would be minimal; 2) the relative hierarchy of impacts among the 10 Tier 2 detailed study alternatives would still be similar (i.e., high and low impacts would be identified for the same alternatives as previously established); and 3) the impacts reported herein that were calculated using an average 328-foot right-of-way width would be slightly conservative. Therefore, project decisions made based on the 328-foot right-of-way data are still valid, and the impacts were not revised for the 320-foot right-of-way width.

It should also be noted that since the publication of the Draft Environmental Impact Statement (DEIS) in October 1998, the Preferred Alternative (Alternative 21) has been analyzed in greater detail and/or with a greater degree of precision in terms of relocations, noise impacts, stream and wetlands impacts, and protected species impacts. These impacts are based on the detailed preliminary roadway design plans prepared for the Preferred Alternative following publication of the DEIS. The impacts assessed for the Preferred Alternative in the DEIS are also still reported herein, in order to provide a valid basis for comparison with the other Tier 2 detailed study alternatives at a similar level of analysis detail. This will serve to reinforce the selection of Alternative 21 as the Preferred Alternative.

Some impacts have changed due to new information obtained after the publication of the DEIS, rather than as a result of preliminary design-based analyses applied to the Preferred Alternative. Examples would be the identification of additional community facilities or hazardous materials sites within the study area. In cases where revised impacts can be calculated for all ten Tier 2 detailed study alternatives based on the new information, these revised impacts are reported.

4.1 COMPREHENSIVE LAND USE AND TRANSPORTATION PLANNING

Land use impacts resulting from highway construction include physical displacement of or impacts to existing land uses (direct impacts) and impacts to adjacent land uses specifically occurring as a result of the presence of the new highway (secondary impacts).

Many land use impacts are difficult to quantify because of the factors and uncertainties affecting land use decisions. In some instances, these decisions are made by parties other than the landowner (e.g., land condemnation for highway right-of-way); however, most land use decisions are made by the landowner in concert with local jurisdictions (county and municipal governments). These decisions are guided by inclinations of the owners, economic conditions, physical constraints of the land, local land use policies and plans, zoning restrictions, and the issuance of building permits. State or federal governments have no control over these decisions except through regulatory permitting legislation such as the Clean Water Act, which regulates fill in wetlands. State and federal actions such as highway construction may influence land use decisions by altering or improving access to developable lands.

4.1.1 Compatibility with Area Land Use Plans

Land use planning for Cleveland County and the City of Shelby provides valuable guidelines for future development patterns. It is important for the proposed highway facility to be compatible with the needs and desires of residents throughout the study area.

Cleveland County. Any of the Tier 2 detailed study alternatives (including the Preferred Alternative) would be compatible with the 2005 Cleveland County Land Use Plan. Although some of the interchange locations mentioned in Strategy T-A4 vary from the currently planned interchange locations for the Preferred Alternative, the intent of the strategy (i.e., coordinated

planning of development at the interchange areas between Cleveland County and the City of Shelby) is still valid in light of the Preferred Alternative selected.

Under the No Build alternative, there would be no controlled access US 74 facility at Shelby, which would be incompatible with the Cleveland County Land Use Plan.

City of Shelby. Shelby's Land Development Plan Update 1999-2010 states that the city is supportive of a controlled access US 74 Shelby bypass, and expresses interest in control of the commercial growth anticipated in the vicinity of the interchange locations. Thus, any of the Tier 2 detailed study alternatives (including the Preferred Alternative) would be compatible with this plan. The No Build alternative would not be compatible with the city's Land Development Plan Update 1999-2010.

All alternatives (including the Preferred Alternative) would be in keeping with the Unified Development Ordinance, City of Shelby, North Carolina (2001). For the Tier 2 detailed study alternatives, most of the project would be outside Shelby's zoned area. A portion of the Alternative 7, 9, 16, 18, 19, and 21 (Preferred Alternative) corridors would pass through the northern portion of Shelby's extra-territorial jurisdiction (ETJ), an area zoned mainly R-20 (low density residential) that also includes several GB (general business) districts. Public works are permitted in these districts, provided such facilities are "essential to the service of the immediate area" and are "designed and landscaped in such a way as to blend in with the surrounding area". Induced development at interchange locations could result in the expansion of some commercial corridors (see Section 4.16); strict adherence to zoning would enable the city to control

commercial growth within its jurisdiction, as described in the Land Development Plan. The No Build alternative would not alter existing land uses.

Watershed Protection. All of the Tier 2 detailed study alternatives (including the Preferred Alternative) would pass through the watershed protection area, although none would enter the critical area surrounding Shelby's drinking water intake. The NCDOT's "Best Management Practices (BMPs) for the Protection of Surface Waters" will be implemented, as applicable, to reduce potential pollution from non-point source runoff. Any future development along the bypass that is within the watershed would be subject to development regulations (described in Section 3.1.2. Land Use Planning, Watershed Protection). However, the presence of the bypass could accelerate maximum density build-out in the area, which could harm the watershed, even with existing land use restrictions in place.

The No Build alternative would not encroach on watershed protected or critical areas.

4.1.2 Transportation Impacts

Transportation issues relating to the subject project include compatibility of the project with area transportation plans; changes in or impacts to commuter traffic; safety; changes in travel patterns and accessibility; impacts to bicycle and pedestrian traffic and plans; and effects on other modes of transportation in the area.

Compatibility with Area Transportation Plans. Any of the Tier 2 detailed study alternatives (including the Preferred Alternative) would be consistent with the transportation related elements of county and city land use objectives: a four-lane controlled access facility would reduce

congestion on existing area roads, facilitate emergency vehicle travel, and contribute to adequate provision of local and regional transportation. Cleveland County and the City of Shelby have stated in their respective land use plans their preference for a bypass which would improve access to and travel within northern Shelby as well as east-west movement of through traffic. A northern bypass is represented as an important component of Shelby's transportation network in the 1994 Shelby Thoroughfare Plan; a northern bypass is also indicated in the Cleveland County Comprehensive Land Use Plan as an intended future land use.

The No Build alternative would be incompatible with county and city transportation plans.

Commuter Travel. Commuter data from 2000 (see Section 3.1.3 Transportation Planning, Commuter Patterns) indicates that 15,718 persons commuted daily between Cleveland, Rutherford, Gaston, Mecklenburg, and Buncombe counties, traveling to or through Cleveland on an east/west axis. As US 74 provides the most direct route along this axis, it likely that a large proportion of these inter-county commuters use this highway. Based on population distribution and generalized commuter trends, it is also probable that a considerable number of the 29,530 Cleveland residents employed within the county in 2000 resided and worked in areas accessible by US 74. Any of the Tier 2 detailed study alternatives (including the Preferred Alternative) would provide safer, faster travel for these existing commuters; and would also expand the potential employment area for other workers.

Under the No Build alternative, existing US 74 would continue to function as a conveyor of commuters between Cleveland, Rutherford, Gaston, Mecklenburg, and Buncombe counties; however, projected traffic congestion along an unimproved roadway would likely discourage

some commuter travel (especially for the longer trips on US 74), and increase travel time for other commuters.

Safety. Safety is discussed in detail in Section 1.5.6 (Accident Analysis).

Bicyclists and Pedestrians. Although the NCDOT identifies bicycles as legitimate modes of travel, these vehicles, as well as pedestrians, are prohibited from freeways and interstates for reasons of safety. Thus, the Tier 2 detailed study alternatives (including the Preferred Alternative) would not include bike lanes or sidewalks to accommodate bicyclists and pedestrians. However, crossing roads, which would be grade separated from the bypass, could accommodate bicycle and pedestrian traffic. Bridges on crossing roads will be designed in accordance with NCDOT bicycle policy as applicable.

Although a bypass would decrease traffic on existing US 74 and render that facility safer for non-motorized traffic, numerous driveway entrances, truck traffic, and limited right-of-way are likely to discourage development of existing US 74 as a bicycle facility. Currently, there is no indication that there is unusually high bicycle traffic on US 74.

Under the No Build alternative, conditions would worsen for any bicycle and pedestrian travel along existing US 74. The increased traffic projected for an unimproved US 74 would make this highway particularly dangerous and unattractive for non-motorized traffic.

Modal Interrelationships. In general, any of the Tier 2 detailed study alternatives (including the Preferred Alternative) would likely complement other modes of transportation in and near the

study area. Construction of a four-lane controlled access bypass would permit a larger number of persons and businesses to access other major transportation facilities efficiently.

Airports - While none of the Tier 2 detailed study alternatives (including the Preferred Alternative) would create a direct link with the Shelby Municipal Airport, any of these would improve general traffic circulation and lower travel time to the airport for residents and businesses in many parts of the study area. Of greater benefit would be reduced travel time to the Charlotte/Douglas International Airport via US 74, a direct connection between Shelby and the region's main commuter and freight air hub. As traffic volumes on US 74 would be unrelieved by any alternate facility under the No Build alternative, access to Douglas Airport would not be expected to improve.

Rail Service - Each of the Tier 2 detailed study alternatives would physically cross CSX and Norfolk Southern rail lines two or three times. The Preferred Alternative will require two rail crossings, one directly east of Washburn Switch Road and one north of NC 150. Grade separation structures will be required at those two locations.

The study area's two rail lines provide local industries with the option to use rail freight transit. The addition of an improved US 74 facility may provide greater flexibility in the production and distribution of goods, which often rely on more than one mode of transit, depending on the origins and destinations of necessary shipments. The Alternative 1, 3, 7, and 9 interchange at McSwain Road (SR 1322) and the Alternative 13, 15, 16, 18, 19, and 21 (Preferred Alternative) interchange at Washburn Switch Road (SR 1313) could prove particularly convenient for the Washburn Switch Road industrial area.

Under the No Build alternative, rail transit would continue to be a viable alternative for local freight, although the efficiency of the larger distribution network would not improve.

Ports - None of the Tier 2 detailed study alternatives (including the Preferred Alternative) would have a perceptible impact on the Port of Wilmington, nor would the No Build alternative.

Changes in Travel Patterns and Accessibility. Any of the proposed Tier 2 detailed study alternatives (including the Preferred Alternative) would provide fast, safe, efficient, and economical movement of traffic within the study area, in addition to improving access to Asheville and other points west of Shelby. They would improve access to many key destinations, such as schools, hospitals, shopping districts, cultural resources, and employment centers, benefiting residents throughout the community who routinely travel to one or more of those points. The existence of a controlled access bypass and subsequent reduction of congestion on local thoroughfares would also enable emergency and community services, like the police, fire department, sanitation, ambulances, and school buses, to perform more effectively. An improved commuter network would expand employment possibilities within the study area, linking a larger number of prospective employees with a wider selection of jobs. The local economy would also benefit from the increased accessibility of suitable locations for new businesses and other development.

At the same time, the presence of a controlled access bypass would create minor changes in traffic patterns on surrounding streets and thoroughfares. Some roads may be segmented by the new facility, compelling drivers to use alternate routes. The extent to which this would occur cannot be fully determined until the roadway design plans are finalized for the Preferred

Alternative. Wherever possible, the Tier 2 detailed study alternatives (including the Preferred Alternative) have circumvented residential development. Consequently, the new bypass should not have an adverse impact on traffic movement into and out of neighborhoods. Traffic using the main thoroughfares would not compete with traffic accessing the facility, other than at interchanges.

It is likely that individual access to residences or farm property will be disrupted by the new highway in some locations. Wherever the construction of a highway disrupts existing access to a parcel of land, the NCDOT is required to provide access, or to pay damages for loss of access. Access may be provided through the construction of a state road, an access road through a different section of the homeowner's property, or a service road. These methods will be explored more thoroughly during the final design phase of project development.

As a part of a larger plan to improve US 74 (see Section 1.4.1), a controlled access US 74 Shelby Bypass would play an important role in making intra-regional travel in western North Carolina more efficient. Since it is already the most direct route between Charlotte and Asheville, US 74 would become a faster, safer alternative for regional freight transportation, as well as for commuters, tourists, and other travelers if improved. Increased regional use of a US 74 Shelby Bypass would benefit adjacent businesses providing services to motorists and truckers, and could also help develop and promote nearby tourist attractions (see Section 1.3.1).

The No Build alternative would leave travel patterns as they are now. However, accessibility would be adversely affected as congestion continues to mount and the level of service declines.

4.1.3 Land Use Direct Impacts

Direct land use impacts are those sustained by the existing land use features of an area as a result of an action such as highway construction. These impacts include:

1) Physical displacement of an existing land use for right-of-way acquisition, such as:
   - Residences and businesses (discussed in Section 4.2.1)
   - Agricultural uses

2) Impacts to existing land uses adjacent to the new highway, such as:
   - Neighborhoods
   - Businesses (discussed in 4.2.3)
   - Air quality impacts (discussed in Section 4.6)
   - Noise impacts (discussed in Section 4.7)
   - Visual impacts (discussed in Section 4.14)

3) Changes in traffic patterns along roadways accessing the various land uses (discussed in Section 4.1.2 Transportation Impacts, Changes in Travel Patterns and Accessibility)

Agricultural Uses. Any of the Tier 2 detailed study alternatives (including the Preferred Alternative) could result in a broad range of effects to the agricultural community in the study area, including removing lands from production, bisecting farm fields, and closing farm roads. Table 4-1 summarizes the estimated agricultural impacts of the various alternatives. Due to the nature of the information available at this level of study, the extent of effects to individual farming operations for the Preferred Alternative cannot be determined at this time. Impacts to farms, such as elimination of property access and division of active agricultural operations, have been avoided where possible through judicious placement of the proposed roadway within the corridor for the Preferred Alternative during preliminary design. The No Build alternative would not affect study area farming operations.

Table 4-1
AGRICULTURAL LAND USE IMPACTS

Alternative	Agricultural Land Taking (Acres)
1	313.0
3	315.5
7	302.4
9	304.9
13	277.4
15	279.9
16	266.8
18	269.3
19	255.2
21 (Preferred)	257.7

Note: Areas were generated from corridor-wide data, and were prorated to approximate right-of-way impacts. Impacts for the Preferred Alternative are based on the actual right-of-way footprint within the corridor.

Direct Impacts to Neighborhoods. In general, residential land uses would be more sensitive to the proximity of a highway than commercial or industrial uses, since visual and noise factors are often considered in the selection of a home. Therefore, the discussion of land use direct impacts produced by a bypass centers on impacts to the existing residential areas in the study area.

The alternatives were located to circumvent major residential developments in the study area wherever feasible. However, the following neighborhoods, located near proposed roadway corridors, would potentially be subject to noise or visual effects to varying degrees:

Neighborhood	Adjacent Alternative(s)
Ridgefield Road subdivision (off SR 1343)	13, 15, 16, 18
Wellmon Road subdivision (off SR 1005)	1, 3, 7, 9, 13, 15, 16, 18
Williams Creek subdivision (off SR 1005)	1, 3, 7, 9, 13, 15, 16, 18
Carriage Run (off NC 18)	1, 3, 13, 15
Subdivision at Bellview Drive (SR 1859)	1, 3, 13, 15
Subdivisions off SR 1908 between NC 18 and NC 180	1, 3, 7, 9, 13, 15, 16, 18, 19, 21 (Preferred)
Light Oak (off SR 2033)	1, 3, 7, 9, 13, 15, 16, 18, 19, 21 (Preferred)

Potential noise effects in excess of established NCDOT criteria, and potential abatement measures for those effects, are identified in Section 4.7.

Noise and visual impacts would be greatest in neighborhoods that are physically split by the proposed bypass (discussed in Section 4.2.2). Noise and visual impacts could also occur among the scattered clusters of housing along some of the secondary roads in the study area.

Under the No Build alternative, projected increased traffic would not particularly affect visual quality in an area already accustomed to the presence of a highway and its associated vehicles. However, lack of controlled access could result in scattered new commercial development along the rural portions of the facility, particularly as usage increases, adversely affecting visual quality

of neighborhoods and farms in those areas. Additional noise impacts would be expected as traffic along the existing roadway increased.

For discussions of other potential impacts on residential areas, see Sections 4.16 (Indirect and Cumulative Effects), 4.2.1 (Relocations), and 4.2.2 (Community Cohesion).

4.2 SOCIOECONOMIC IMPACTS

4.2.1 Relocations

It is the policy of the North Carolina Department of Transportation (NCDOT) to ensure that comparable replacement housing would be available prior to construction of federally-assisted projects. Furthermore, the North Carolina Board of Transportation has the following three programs to minimize the inconvenience of relocation:

- Relocation Assistance,
- Relocation Moving Payments, and
- Relocation Replacement Housing Payments or Rent Supplement.

With the Relocation Assistance Program, experienced NCDOT staff will be available to assist displacees with information such as availability and prices of homes, apartments, or businesses for sale or rent, and financing or other housing programs. The Relocation Moving Payments Program, in general, provides for payment of actual moving expenses encountered in relocation. Where displacement will require an owner or tenant to purchase or rent property of a higher cost or to lose a favorable financing arrangement (in cases of ownership), the Relocation Replacement Housing Payments or Rent Supplement Program will compensate up to $22,500 to owners who are eligible and qualify, and up to $5,250 to tenants who are eligible and qualify.

The relocation program for the proposed action will be conducted in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), and the North Carolina Relocation Assistance Act (GS-133-5 through 133-18). The program is designed to provide assistance to displaced persons in relocating to a replacement site in which to live or do business. At least one relocation officer is assigned to each highway project for this purpose.

The relocation officer will determine the needs of displaced families, individuals, businesses, non-profit organizations, and farm operations for relocation assistance advisory services without regard to race, color, religion, sex, or national origin. The NCDOT will schedule its work to allow ample time, prior to displacement, for negotiations and possession of replacement housing which meets decent, safe, and sanitary standards. The displacees are given at least a 90-day written notice after NCDOT purchases the property. Relocation of displaced persons will be offered in areas not generally less desirable in regard to public utilities and commercial facilities. Rent and sale prices of replacement housing offered will be within the financial means of the families and individuals displaced, and be reasonably accessible to their places of employment. The relocation officer will also assist owners of displaced businesses, non-profit organizations, and farm operations in searching for and moving to replacement property.

All tenant and owner residential occupants who may be displaced will receive an explanation regarding all available options, such as (1) purchase of replacement housing, (2) rental of replacement housing, either private or public, or (3) moving existing owner-occupant housing to another site (if possible). The relocation officer will also supply information concerning other state or federal programs offering assistance to displaced persons and will provide other advisory

services as needed in order to minimize hardships to displaced persons in adjusting to a new location.

The Moving Expense Payments Program is designed to compensate the displacee for the costs of moving personal property from homes, businesses, non-profit organizations, and farm operations acquired for a highway project. Under the Replacement Program for Owners, NCDOT will participate in reasonable incidental purchase payments for replacement dwellings such as attorney's fees, surveys, appraisals, and other closing costs, and if applicable, make a payment for any increased interest expenses for replacement dwellings.

Reimbursement to owner-occupants for replacement housing payments, increased interest payments, and incidental purchase expenses may not exceed $22,500 (combined total), except under the Last Resort Housing provisions.

A displaced tenant may be eligible to receive a payment, not to exceed $5,250, to rent a replacement dwelling or to make a down payment, including incidental expenses, on the purchase of a replacement dwelling. The down payment is based upon what the State determines is required when the Rent Supplement exceeds $5,250.

It is a policy of the State that no person will be displaced by the NCDOT's federally-assisted construction projects unless and until comparable replacement housing has been offered or provided for each displacee within a reasonable period of time prior to displacement. No relocation payment received will be considered as income for the purposes of the Internal Revenue Code of 1954 or for the purposes of determining eligibility or the extent of eligibility of any person for assistance under the Social Security Act or any other federal law.

Last Resort Housing is a program used when comparable replacement housing is not available or when it is unavailable within the displacee's financial means, and the replacement payment exceeds the federal and state legal limitation. The purpose of the program is to allow broad latitudes in methods of implementation by the State so that decent, safe, and sanitary replacement housing can be provided.

In order to determine whether ample replacement housing would be available in the area, and/or business relocations could be accommodated and would not unreasonably affect the availability of area services, multiple listing services, realtors, and classified advertisements were consulted for information. The following conclusions were drawn from these data.

DEIS ANALYSIS OF TIER 2 DETAILED STUDY ALTERNATIVES

Table 4-2(a) shows the estimated relocations which would be required for each of the Tier 2 detailed study alternatives, based on the level of detail of information available during the preparation of the DEIS. This was the information used in the decision-making process for the selection of the Preferred Alternative. Considering the ten alternatives, there would be 166 to 272 residential relocations, nine to 42 business relocations, and three to five relocations of non-profit organizations. Total relocations for the project could range from 187 to 308. Based on this information, the Preferred Alternative was estimated to have 235 residential relocations, 42 business relocations, and four relocations of non-profit organizations, for a total of 281 relocations.

Table 4-2(a)
ESTIMATED RELOCATIONS FOR TIER 2 DETAILED STUDY ALTERNATIVES

Alternative	Residential				Business		Non-Profit Organizations*	TOTAL
	Owners	Tenants	Total	Minority	Total	Minority		
1	167	35	202	30	9	1	3	214
3	194	25	219	32	25	1	4	248
7	123	43	166	18	17	0	4	187
9	150	33	183	20	33	0	5	221
13	201	54	255	28	16	1	3	274
15	228	44	272	30	32	1	4	308
16	157	62	219	16	24	0	4	247
18	184	52	236	18	40	0	5	281
19	148	70	218	22	26	0	3	247
21 (Preferred)	175	60	235	24	42	0	4	281

Source: NCDOT Relocation Reports for Project R-2707 (see Appendix C.1).

* The Shelby Seventh Day Adventist Church is not included in these totals because it was not in existence at the time when the Tier 2 detailed study alternative functional designs were done and relocations were estimated. This would be a relocation for Alternatives 3, 9, 15, 18, and 21 (Preferred).

Residences. An estimated 123 to 228 families in owner-occupied housing would be subject to relocation by the ten Tier 2 detailed study alternatives. The Preferred Alternative would relocate an estimated 175 owner families based on these data. Overall, 274 decent, safe, and sanitary (DSS) dwellings were available in the study area at the time of that relocation data collection, indicating a generally adequate supply of replacement housing (see Table 4-2(b)). However, there would be potential shortfalls within some individual cost ranges, particularly the $20,000 - $40,000 range, for some Build alternatives. The Preferred Alternative would have essentially owner-occupied housing in all categories.

Table 4-2(b)

REPLACEMENT HOUSING AVAILABILITY
(Tier 2 Detailed Study Alternatives)

Owner-Occupied

Housing Cost Range ($1,000)	NUMBER OF DWELLINGS					
	Minimum		Maximum		Preferred Alternative	Available‡
	In Cost Range	Project-Wide†	In Cost Range	Project-Wide†		
0 - 20	0	0	0	0	0	3
20 - 40	14	14	46	46	35	33
40 - 70	37	37	60	60	59	78
70 - 100	40	46	90	90	46	93
100 & Up	15	26	43	32	35	67
TOTAL	N/A	123	N/A	228	175	274

Tenant-Occupied

Monthly Rent Range ($)	NUMBER OF DWELLINGS					
	Minimum		Maximum		Preferred Alternative	Available‡
	In Cost Range	Project-Wide†	In Cost Range	Project-Wide†		
0 - 150	1	1	2	2	2	0
150 - 250	19	19	33	33	20	15
250 - 400	2	5	38	35	38	19
400 - 600	0	0	0	0	0	3
600 & Up	0	0	0	0	0	1
TOTAL	N/A	25	N/A	70	60	38

† These are data for those of the ten Tier 2 detailed study alternatives having the minimum or maximum total required replacement units; housing requirements within each individual category are not necessarily minimums or maximums.

‡ Housing availability data was obtained during the DEIS phase of the project. These data have changed since that phase.

Source: NCDOT Relocation Reports for Project R-2707 (see Appendix C.1).

In the tenant category, an estimated 25 to 70 families would require relocation by the Tier 2 detailed study alternatives. The Preferred Alternative would relocate an estimated 60 tenant families based on these data. Overall, there were 38 DSS dwellings available as rental replacements at the time of the relocation data collection, indicating a potential for rental housing shortages depending upon the alternative selected. In particular, housing in the $150 - $250 and $250 - $400 rent categories would be in short supply for some Build alternatives (including the Preferred Alternative).

Residential relocations are anticipated to include between 16 and 32 minority families. The Preferred Alternative would include 24 minority families. The minority relocations represent between approximately seven and 15 percent of the total residential relocations (Preferred Alternative would be approximately ten percent), as compared with the study area minority population of approximately 23 percent (per 2000 Census data).

It was determined that Last Resort Housing might be needed, and would be used as necessary for this project. Based on information provided in the Relocation Reports (see Appendix C.1), there would likely be sufficient DSS dwellings overall (274) to accommodate any anticipated owner-occupied residential relocations required for this project; however, the price distribution of the available housing might necessitate implementation of Last Resort Housing. In the tenant category, the apparent shortfall in low to medium rent properties could also result in the need for Last Resort Housing measures. Shortfalls for the Preferred Alternative were primarily in the tenant category. The Relocation Reports indicated that given current housing trends in the area, comparable housing should be available during the relocation period. Public housing and Section 8 housing are available and would be utilized as necessary.

There are no other roadway projects planned in the immediate vicinity of this project that would conceivably affect housing availability.

Businesses. An estimated nine to 42 businesses would be subject to relocation as a result of the proposed project. The Preferred Alternative would include an estimated 42 business relocations. These relocations encompass a wide variety of businesses, including retail trade businesses, service businesses, and manufacturing operations. The Relocation Reports (see Appendix C.1) indicated that there would be no permanent loss of business services as a result of any of the project alternatives. Between zero and one of the business relocations are anticipated to be minority-owned businesses depending upon the Build alternative selected. The Preferred Alternative did not include any minority business relocations.

Any business, commercial or industrial, as required by law would be furnished assistance in finding a replacement building or a site for a replacement building. The law provides that business owners may receive actual reasonable moving expenses in relocating their operations. They may also be entitled to be reimbursed for expense incurred in searching for a replacement location.

Under certain conditions, if owners elect to discontinue business, they would be eligible to receive an amount equal to their average net earnings. This type of payment would be between the limits of $1,000 and $20,000. There is also a Reestablishment Expense for non-residential moves, which businesses are eligible to receive.

Non-Profit Organizations. A total of eight non-profit organizations were identified in the Relocation Reports as being subject to relocation by one or more of the Tier 2 detailed study

alternatives; all of these facilities are churches (note: this excludes Shelby Seventh Day Adventist Church). Between three and five of these non-profit organizations would be displaced by the various alternatives. The Preferred Alternative would relocate four churches. Two of the eight churches relocated by the Tier 2 detailed study alternatives are minority churches; neither of these minority churches would be relocated by the Preferred Alternative.

If necessary, assistance would be provided in helping to locate either a site where replacement buildings could be placed, or actual buildings that might be available. A relocated church group would also be entitled to receive payment for actual reasonable moving expense (between $1,000 and $20,000) for any items classified as personal property.

RELOCATIONS FOR PREFERRED ALTERNATIVE BASED ON PRELIMINARY DESIGN

Table 4-3(a) indicates the relocations identified for the Preferred Alternative based on preliminary roadway design plans prepared for this alternative. As can be seen by comparing the Preferred Alternative data in Tables 4-2(a) and 4-3(a), efforts made during preliminary design resulted in a substantial reduction in anticipated relocations. The preliminary design estimate is more accurate than the DEIS estimate because it is based on a more accurate base mapping; however, the preliminary design data are also subject to change pending further design refinements which may take place during final design.

Table 4-3(a)
ESTIMATED RELOCATIONS FOR PREFERRED ALTERNATIVE

Segment	Residential				Business[a]		Non-Profit Organizations	TOTAL
	Owners	Tenants	Total	Minority	Total	Minority		
TOTAL	121	44	165	23	25	0	2	192

[a] Totals do not include two churches identified in the Relocation Reports as a part of the business relocation totals; those are included in the "Non-Profit Organizations" category.

Source: NCDOT Relocation Reports for Project R-2707 (see Appendix C.2).

Residences. Based on the preliminary roadway design plans, an estimated 121 families in owner-occupied housing would be subject to relocation by the Preferred Alternative. Overall, 212 decent, safe, and sanitary (DSS) dwellings were available in the study area at the time of this relocation data collection, indicating a generally adequate supply of replacement housing (see Table 4-3(b)). However, there would be potential shortfalls within some individual cost ranges, particularly the $40,000 - $70,000 range.

In the tenant category, an estimated 44 families would require relocation for the Preferred Alternative. Overall, there were 67 DSS dwellings available as rental replacements at the time of this relocation data collection, indicating sufficient rental dwellings overall, but a potential for rental housing shortages in the $250 - $400 and $400 - $600 rent categories. Since rental units in higher cost rent categories are not available, rent supplements would not solve this shortage.

Residential relocations are anticipated to include 23 minority families. The minority relocations represent approximately 19 percent of the total residential relocations, as compared with the study area minority population of approximately 23 percent (per 2000 Census data).

Table 4-3(b)

REPLACEMENT HOUSING AVAILABILITY FOR PREFERRED ALTERNATIVE

Owner-Occupied

Housing Cost Range ($1,000)	NUMBER OF DWELLINGS		
	Preferred Alternative*	Available†	Surplus/Shortfall‡
0 - 20	0	25	25
20 - 40	11	4	(7)
40 - 70	54	32	(22)
70 - 100	38	63	25
100 & Up	18	88	70
TOTAL	**121**	**212**	**91**

Tenant-Occupied

Monthly Rent Range ($)	NUMBER OF DWELLINGS		
	Preferred Alternative*	Available†	Surplus/Shortfall‡
0 - 150	0	0	0
150 - 250	0	35	35
250 - 400	35	26	(9)
400 - 600	9	5	(4)
600 & Up	0	1	1
TOTAL	**44**	**67**	**23**

* These are the relocations anticipated for the Preferred Alternative based on the currently proposed right-of-way location; these data may change with later design modifications.

† Housing availability data were obtained during the FEIS phase of the project. These data are subject to change as the local housing market changes.

‡ Numbers in parentheses represent shortfalls in replacement housing in those price ranges.

Source: NCDOT Relocation Reports for Project R-2707 (see Appendix C.2).

Last Resort Housing might be needed, and would be used as necessary for this project. Based on information provided in the Preferred Alternative Relocation Reports (see Appendix C.2), there would likely be sufficient DSS dwellings overall (212) to accommodate any anticipated owner-occupied residential relocations required for this project; however, the price distribution of the available housing might necessitate implementation of Last Resort Housing. In the tenant category, the apparent shortfall in medium- to high-rent properties could result in a need for additional efforts in order to locate rental properties in the higher ranges. The Relocation Reports indicated that given current housing trends in the area, comparable housing will be available during the relocation period. Public housing and Section 8 housing are available and will be utilized as necessary.

Businesses. An estimated 25 businesses would be subject to relocation as a result of the Preferred Alternative (this does not include anticipated church relocations, which were included in the business relocations on the Relocation Reports but have been separated out for this analysis and are discussed under "Non-Profit Organizations"). These relocations encompass a wide variety of businesses, primarily retail trade and service businesses, and small industrial operations. The Relocation Reports (see Appendix C.2) indicated that there would be no permanent loss of business services as a result of this project. The Preferred Alternative does not include any minority business relocations.

Non-Profit Organizations. Two churches would be displaced by the Preferred Alternative (Shelby Seventh Day Adventist Church and Miracle of Deliverance Church of Christ); neither of these was identified as a minority church. A third church, Eskridge Grove Church, has been avoided by the preliminary design, but will be relocated if church members collectively decide in favor of

relocation (see Section 6.2.5 Small Group Informational Meetings, Eskridge Grove Church Coordination).

4.2.2 Community Cohesion

Community cohesion is affected by new freeways at two levels: community-wide and neighborhood. The construction of a facility with controlled access may act like a wall between parts of a community by partitioning related but separate uses. These uses include residences, community shopping centers, recreational areas, schools, and community facilities (see Exhibit 3-5). Freeways can have an even greater impact if they divide an existing residential area. The quantification of these impacts, however, is difficult.

None of the Tier 2 detailed study alternatives (including the Preferred Alternative) is expected to have a serious impact on community-wide cohesion. Much of the land to the north of the proposed bypass is sparsely populated and rural, with scattered subdivisions and individual residences. Although these outlying areas are a stable part of the study area's residential character, their interaction with more complex and cohesive communities to the south is limited; lack of a strong association between these places indicates that the presence of a bypass would not cause an adverse impact. Neighborhoods most likely to experience a sense of separation from Shelby itself as a result of a new freeway would be Light Oak and nearby neighborhoods off Elizabeth Avenue (SR 2052), Oak Grove Road (SR 2033), and Borders Road (SR 2047).

Although residential development generally was avoided by the Tier 2 detailed study alternatives, the following neighborhoods could be split by one or more of the alternatives:

Neighborhood	Alternative(s)
Ridgefield Road subdivision (off SR 1343)	13, 15, 16, 18
Friendship Road (SR 1933)	1, 3, 13, 15
Williams Road (SR 2041)	1, 7, 13, 16, 19

In addition to construction of a grade separation to maintain continued access between a community divided by the proposed highway, mitigation to such neighborhoods could also include provision of pedestrian access via sidewalks integrated into the grade separation and other similar measures. The primary focus of such measures should be the safety of the persons who will be using the facility for pedestrian and/or bicycle access.

Some neighborhoods and smaller clusters of housing may be affected by the increased noise created by the facility where it skirts these areas; this would be mitigated through the construction of noise barriers where determined warranted by NCDOT criteria.

The proposed project is not otherwise anticipated to have an adverse impact on neighborhood traffic movement, although it is anticipated that some crossing roads would be cut off. Neighborhood traffic using the main thoroughfares would not compete with traffic accessing the facility, other than at interchange locations. In some places, individual access to residences or farm property may be disrupted by one or more of the alternatives. As discussed in Section 4.1.2 (Transportation Impacts, Changes in Travel Patterns and Accessibility), the NCDOT is required to restore existing access when this occurs or to pay damages.

4.2.3 Economic Impacts

Areas of economic impact resulting from construction of the subject project include employment, business growth, business relocations (discussed in Section 4.2.1), and county revenue.

Employment. The proposed project would benefit the local economy on a short-term basis through the infusion of additional money into the local/regional area during the construction period. The construction cost of the US 74 Shelby Bypass Preferred Alternative is estimated at approximately $196.3 million (also see Section 2.4.7). It is assumed that some portion of the labor and/or materials to be used in the construction of this project would be obtained from Cleveland County; thus, an increase could be expected in local construction, trade, and service industries for the duration of construction. Estimated construction-related job increases for the Tier 2 detailed study alternatives would be as follows:

ALTERNATIVE	NUMBER OF JOBS	
	On-Site	Off-Site
1	1,646	2,155
3	1,592	2,084
7	1,624	2,126
9	1,569	2,055
13	1,635	2,141
15	1,581	2,070
16	1,613	2,112
18	1,559	2,041
19	1,578	2,067
21 (Preferred)	1,524	1,995

On a long-term basis, the US 74 Shelby Bypass is anticipated to stimulate employment opportunities for area residents due to increased mobility brought about by an improved

transportation system, which creates a larger accessible area for employment prospects (see Section 4.1.2 Transportation Impacts). A bypass could also strengthen local employment through induced development (new commercial and industrial enterprises) in the study area (see Section 4.16 Indirect and Cumulative Effects).

The No Build alternative is not projected to appreciably improve short-term or long-term employment opportunities in the project area. Construction, trade, and services employment would not increase substantially for the short term in the absence of the highway project. Historic commuter and employment data indicate that Cleveland County is dependent upon neighboring counties to supply employment to one-quarter of its working residents. Without the benefits of an improved transportation system to encourage local industries' growth and allow employment opportunities at a greater distance, this situation is not likely to change dramatically in the future.

Business Growth. New commercial enterprises are likely to appear along the proposed bypass at interchange locations due to increased traffic mobility (see 4.16 Indirect and Cumulative Effects). Although this is generally perceived to be a positive impact, it has been observed that this type of trend can result in a slowing in growth of existing businesses and in development of future business along bypassed commercial streets. Also, the resulting development could result in impacts to the natural environment such as loss of forest, farmland, and/or wetlands.

The potential for this outcome along existing US 74 is tempered by the fact that a new location bypass would be intended primarily for through traffic. Induced development near interchanges would be confined, for the most part, to establishments serving the limited needs of passing commuters and travelers. To the degree that a new location bypass would function as an arterial

for local traffic, there may be additional commercial development; but the lack of concentrated residential development to the north of Shelby indicates that there would not be strong demand for larger-scale or more varied retail in the near future. Since many of the businesses along existing US 74 serve primarily local needs, rather than through traffic, the demand for the goods and services available in that area would remain roughly the same with a bypass. While some types of businesses along the existing facility, which do depend on through traffic may relocate to the bypass, the majority of the businesses may benefit from the alleviation of congestion and the improved overall quality of customers' trips within the commercial district.

Tax Revenue. Purchase of property from private landowners for right-of-way for any of the Tier 2 detailed study alternatives would have a double-edged effect on area property tax revenue. Loss of privately-owned land to right-of-way would reduce the amount of taxable property in Cleveland County; however, the anticipated appreciation in land values at interchange locations with local land access would result in increased tax revenues for those parcels of land.

The land required for the bypass would be approximately 1,000 acres, which is 0.33 percent of the total land area of Cleveland County (299,621 acres). Thus, the potential overall effect of the bypass on taxable property should not result in a substantial loss of county revenues. Similarly, an examination of residential relocations (the other major category of taxable property loss) under any of the Tier 2 detailed study alternatives (including the Preferred Alternative) indicated that housing losses in Cleveland County would represent less than one percent of total county housing units. Therefore, loss of tax revenue due to residential relocations is also anticipated to be minimal.

When a new location roadway is built, properties adjacent to interchange locations become more desirable for development than less accessible land. The number of proposed interchange locations with local land access (i.e., excluding directional flyover interchanges) would be roughly indicative of the potential for increased land values. The following shows the number of local land access interchanges proposed for each alternative:

Alternative	**# of Local Access Interchanges**
1	4
3	5
7	4
9	5
13	5
15	6
16	5
18	6
19	5
21 (Preferred)	6

For a detailed discussion of interchange types and locations, see Section 4.14.

The No Build alternative would not be expected to substantially alter taxable property values in the study area.

4.2.4 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low Income Populations, directs all federal agencies to determine whether a proposed action will have

an adverse or disproportionate impact on minority and/or low income populations. It also directs agencies to ensure that representatives of an affected community have every opportunity to provide input regarding the impact of the proposed project.

In compliance with Executive Order 12898, an analysis was completed to determine whether these social groups would receive disproportionately adverse health and/or environmental impacts from the proposed project.

Population Census (year 2000) information for Cleveland County indicates that minority percentage is 23 percent. This percentage is lower than the state average of 28 percent. All Tier 2 detailed study alternatives (including the Preferred Alternative) would be located in the vicinity of the highest population area for such social groups within this county.

Based on the earlier relocation reports, there would be between 16 and 32 minority residential relocations (seven to 15 percent); and between 35 and 67 low-income residential relocations (16 to 31 percent) for the ten Tier 2 detailed study alternatives. Low income is defined as estimated income less than or equal to $15,000 annually. Between four and 101 (eight to 18 percent) of relocated business employees would be minorities.

Based on more recent data generated from the preliminary roadway design plans for the Preferred Alternative, there would be 23 minority residential relocations (14 percent of total relocations) for that alternative; and 0 low income relocations. Eleven percent of employees of businesses relocated by the Preferred Alternative would be minorities (note: since churches were separated from business relocation data, church employees were not counted as employees of relocated businesses). No minority churches would be relocated, unless Eskridge Grove Church members

collectively decide in favor of relocation (see Section 6.2.5 Small Group Informational Meetings, Eskridge Grove Church Coordination).

Section 6.2 lists the public involvement that has taken place during the project. The public workshops and hearings to date include:

- May 9, 1995 - Workshop - Jefferson School, Shelby
- November 30, 1995 -Workshop - Jefferson School, Shelby
- January 19, 1999 – Pre-Hearing Workshop – Cleveland Community College, Shelby
- January 26, 1999 – Corridor Public Hearing - Cleveland Community College, Shelby
- July 27, 2000 -Workshop – Cleveland Community College, Shelby

This project is being implemented in compliance with Executive Order 12898. The project will not cause a disproportionate adverse impact to minority or low-income populations.

4.3 CULTURAL RESOURCES AND SECTION 4(f)

4.3.1 Architectural Resources

The following discusses potential impacts to historic architectural resources as a result of the Tier 2 detailed study alternatives.

Five historic structures in the study area are eligible for the National Register of Historic Places. These properties are the Charles C. Hamrick House, the Burwell Blanton House, the Coleman Blanton Farm, Cleveland County Bridge No. 79 (First Broad River Bridge), and the Hamilton-McBrayer Farm. These properties and their significance are discussed in Section 3.3.1. Exhibit 3-4 shows the relationship of the Tier 2 detailed study alternatives to the historic properties.

Charles C. Hamrick House - The Charles C. Hamrick House is located on the south side of existing US 74 (Dixon Boulevard) near its junction with West Warren Street in Shelby. The house itself is located approximately 33 feet from the southern US 74 right-of-way limit, which also constitutes the northern boundary of the National Register (NR) eligible 2.78-acre tract. There would be no effect on this property for any of the Tier 2 detailed study alternatives (including the Preferred Alternative).

Burwell Blanton House - This property is located on the north side of existing US 74, 0.5 mile east of its junction with Washburn Switch Road (SR 1313), in the vicinity of Shelby. The house itself is located approximately 26 feet from the northern US 74 right-of-way limit. A line of mature plantings, which contribute to the setting, border the property along the front of the house. The house is considered eligible for the National Register (NR) and the eligible boundaries include approximately 2 acres of the current 759-acre tract. There would be no effect on this property for any of the Tier 2 detailed study alternatives (including the Preferred Alternative).

Coleman Blanton Farm - This property, also known as Brushy Creek Dairy Farm, is located on the west side of Chatfield Road (SR 1343), approximately 0.2 km (0.1 mile) south of its junction with Farmville Road (SR 1342), north of Shelby. The National Register-eligible property includes the two current tax parcels, which combined are 72.76 acres. The house itself is located approximately 66 feet to the south of the southernmost edge of the Alternatives 1, 3, 7, and 9 common corridor. This portion of the corridor was widened to encompass potential minor modifications to SR 1343 required in conjunction with the construction of a freeway facility; however, the actual highway location will not encroach upon this historic site, even though the property is partially within the corridor boundaries. Alternatives 1, 3, 7, and 9 would have an

effect on the property, but the effect would not be adverse. There would be no effect for the other Tier 2 detailed study alternatives (including the Preferred Alternative).

Cleveland County Bridge No. 79, First Broad River Bridge - This bridge carries two lanes of eastbound traffic along US 74 at the western city limits of Shelby. The boundaries of the property include only the structure itself and are limited to the footprint of the bridge and its abutments and piers. There would be no effect on this structure for any of the Tier 2 detailed study alternatives (including the Preferred Alternative).

Hamilton-McBrayer Farm – This property is located on the southwest side of US 74, at its junction with Broadway Road (SR 1163), near Mooresboro. The National Register-eligible boundaries mainly follow the existing property boundaries, existing US 74, and Broadway Road right-of-way limits; and include approximately 33 acres. The house itself is located outside of the corridor boundaries of the Tier 2 detailed study alternatives (including the Preferred Alternative); however, the property is partially bounded by a portion of existing US 74 included in Alternatives 13, 15, 16, 18, 19, and 21 (Preferred). These alternatives will have an effect on the property, but the effect will not be adverse, provided that US 74 is widened to the north (away from the property) and a service road is added within the existing right-of-way along US 74 from Broadway Road to provide access to the mobile home park to the west of the property. (Note: due to the fact that the State Historic Preservation Office [HPO] conducted the effects review for this property after the selection of Alternative 21 as the Preferred Alternative, there is no specific identification provided on the effects form that Alternatives 1, 3, 7, and 9 would or would not have caused an effect to this property.)

Appendix A.2 includes the NC HPO September 11, 1997 and October 19, 2000 effects concurrence forms for these five properties.

4.3.2 Archaeological Resources

The following discusses potential impacts to archaeological resources as a result of the Tier 2 detailed study alternatives. An intensive archaeological survey of the preferred alternative was conducted from October 1999 to March 2000. The survey identified 17 archaeological sites, all of which were recommended ineligible for the National Register of Historic Places (NRHP). The North Carolina State Historic Preservation Office (HPO) agreed with this recommendation on March 21, 2001 (see letter in Appendix A.2). Section 4(f) of the Federal-Aid Highway Transportation Act of 1968 (PL-90-495) requires consideration of cultural resources, particularly "preservation in place" of archaeological resources that are eligible for the NRHP. Since none of the archaeological sites is eligible then Section 4(f) does not apply. No further archaeological work is necessary for this project.

4.3.3 Section 4(f) of the Department of Transportation Act

The proposed bypass will not require the use of any park, wildlife refuge, recreational land, or historic site listed in or eligible for the National Register of Historic Places, as defined in Section 4(f) of the 1966 U.S. Department of Transportation Act, as amended.

4.4 COMMUNITY FACILITIES

4.4.1 Schools

Study area schools located closest to Tier 2 detailed study alternative corridors are as follows (See Exhibit 3-5):

School	Nearest Alternative(s)	Distance from Corridor (Feet)
Bethware Elementary	1, 3, 7, 9, 13, 15, 16, 18, 19, 21 (Preferred)	460
Cleveland Community College	1, 3, 7, 9, 13, 15, 16, 18, 19, 21 (Preferred)	3,900
Elizabeth Elementary	1, 3, 7, 9, 13, 15, 16, 18, 19, 21 (Preferred)	4,900

The flyover interchange at the terminus of Alternatives 1, 7, 13, 16, and 19 at the eastern end of the study area would be proximate to Bethware Elementary School; however, as this school is already located near a freeway, the addition of an interchange nearby would not result in an appreciable change in noise levels or visual character. (See Section 4.14 for a more detailed discussion of proposed interchanges). The remaining study area schools are away from the immediate influence of any of the Tier 2 detailed study alternatives (including the Preferred Alternative).

Any of the Tier 2 detailed study alternatives (including the Preferred Alternative) would reduce traffic volumes on existing US 74, allowing safer travel for school buses and other school-related traffic using that route. A bypass would provide an improved route for some school-based traffic.

The No Build alternative would not have a direct impact on any area schools; however, anticipated traffic problems resulting on existing US 74 from the absence of roadway improvements might have a deleterious effect on school-related travel.

4.4.2 Parks and Recreational Facilities

Existing public and private parks are identified in Section 3.4.2 and on Exhibit 3-5. Alternatives 1, 3, 13, and 15 could affect the Challenger Three Golf Course, a privately owned facility on NC 180 near New Prospect Church Road (SR 1908). Otherwise, none of the Tier 2 detailed study alternatives (including the Preferred Alternative) would require the acquisition or alteration of any existing recreation or park land resources. The project would not cross any existing or proposed greenways.

4.4.3 Churches and Cemeteries

As displayed in Table 4-4, a total of 12 churches are located completely or partially within proposed Tier 2 detailed study alternative corridors. Any of the alternatives would potentially impact between five and nine of these churches; the Preferred Alternative corridor would potentially impact seven churches. Potential impacts are not limited to physical relocation of buildings; i.e., churches remaining near proposed interchanges could conceivably be affected by visual and aesthetic changes as a result of induced development (see Sections 4.14 Visual and Aesthetic Impacts and 4.16 Indirect and Cumulative Effects). Overall, study area churches might experience improved access as a result of construction of a bypass.

Table 4-4
POTENTIALLY IMPACTED CHURCHES AND KNOWN CEMETERIES

Church	Location	Alternative(s)
Victory Church †	SR 1319	1, 3, 7, 9
Redemption Deliverance Church	SR 1313	1, 3, 7, 9
Eskridge Grove Church †	SR 1313	13, 15, 16, 18
Eskridge Grove Church	SR 1313	19, 21*
Dover Baptist Church	NC 226	1, 3, 7, 9, 13, 15, 16, 18
Beulahland Church †	SR 1850	19, 21*
North Lafayette Street Church †	SR 1005	1, 3, 7, 9, 13, 15, 16, 18
Hopewell Church †	SR 1925	1, 3, 13, 15
Trinity Pentecostal †	NC 180	7, 9, 16, 18, 19, 21*
Miracle Temple	Light Oak	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
Vineyard Christian Fellowship †	NC 18	7, 9, 16, 18, 19, 21*
Miracle Deliverance Church of Christ †	US 74 East	3, 9, 15, 18, 21*

Cemetery	Location	Alternative(s)
Poston Cemetery	NC 226	19, 21*
Eskridge Grove Church Cemetery	SR 1313	13, 15, 16, 18, 19, 21*
Gardner Family Cemetery	Near First Broad River	1, 3, 7, 9, 13, 15, 16, 18
John Ware Cemetery	US 74 East (near Buffalo Creek)	3, 9, 15, 18, 21*
Unidentified Gravesites	US 74 West	13, 15, 16, 18, 19, 21*

* Preferred Alternative

† This church was identified as a relocation during the Tier 2 detailed study alternative analysis.

Note: Shelby Seventh Day Adventist Church on Hoey Church Road would be a relocation for Alternatives 3, 9, 15, 18, and 21. It is not included in the community facility totals because it was not in existence at the time when the Tier 2 detailed study alternative functional designs were done and relocations were estimated.

Tier 2 detailed study alternative corridors contain five known cemeteries (see Exhibit 3-5); between one and four could be impacted by the various alternatives. There is the potential for grave relocations and/or access impacts for these cemeteries, but exact impacts are not known. The Preferred Alternative corridor contains four known cemeteries. It is anticipated that additional cemeteries may be present within this alternative which have not been identified on current mapping or by area residents due to age and/or lack of physical surface evidence. Any relocation of graves will be done in accordance with state regulations.

The No Build alternative would not have an impact on study area churches or cemeteries.

4.4.4 Fire Protection, Police, and EMS Services

It is not expected that the Tier 2 detailed study alternatives (including the Preferred Alternative) would adversely affect study area fire and rescue operations, except where streets are closed off. Any such street closings will be coordinated with fire, police, and EMS services.

A new facility would likely enable fire and rescue services to respond to emergency situations faster (especially in cases where multiple districts contribute to emergency responses) by providing an efficient new route. It would also remove some traffic from the existing US 74 highway, rendering that roadway improved for accommodation of emergency vehicles.

The No Build alternative would not directly impact study area fire and rescue services; however, traffic delays on an unimproved US 74 highway could contribute to slower emergency response times.

4.4.5 Other Community Facilities and Features

Several facilities on Kemper Road (SR 2063), including some North Carolina Department of Transportation maintenance facilities, the Cleveland Correctional Center, and a Cleveland County school bus garage, could be impacted by any of the Tier 2 detailed study alternatives. Based on the preliminary roadway design plans for the Preferred Alternative, it is anticipated that these impacts would be minimal and would be limited to elimination of a single building on the edge of the NCDOT maintenance yard. Project area hospitals, libraries, and post offices identified in this study would not be adversely affected by any of the Tier 2 detailed study alternatives (including the Preferred Alternative).

Alternatives 7, 9, 16, and 18 could affect the noise levels and aesthetic qualities of Lithia Springs, which derives part of its value from its quiet seclusion (see Exhibit 3-5). Continued access to the spring via Springbrook Drive (SR 1843) (which terminates at the spring) for Alternatives 19 and 21 (Preferred) will be maintained for persons south of the bypass; accessibility to the srping would still be available via a routing along Lithia Springs Road to NC 18 and Botts Road. For persons north of the bypass, accessibility to the springs would not change. Any of the alternatives could impact the spring itself if nearby road grading operations interfere with the underground water table. A study of the impacts to the underground water table due to road grading operations will be undertaken at this location during final design.

4.5 UTILITIES

4.5.1 Electric Power

Duke Power electric power lines would be crossed in several places by any of the Tier 2 detailed study alternatives (including the Preferred Alternative); these impacts are summarized in Table 4-5.

Based on mapping and other information provided by Duke Power, none of the substations or offices identified would be impacted by any of the Tier 2 detailed study alternatives (including the Preferred Alternative). The No Build alternative would not have an effect on electric facilities in the study area.

Table 4-5

IMPACTS TO ELECTRIC FACILITIES

Location	Type of Facility	Alternative(s) Crossing
Sandy Run	500 KV Transmission Line	13, 15, 16, 18, 19, 21*
Beaverdam Creek	100 KV Transmission Line	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1315	Distribution Line	1, 3, 7, 9
Beaverdam Creek to SR 1313	500 KV Transmission Line	13, 15, 16, 18, 19, 21*
NC 226 to SR 1005	500 KV Transmission Line	1, 3, 7, 9
NC 150 North	44 KV Transmission Line	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
East of Buffalo Creek	100 KV Transmission Line	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*

* Preferred Alternative

4.5.2 Water Service

As shown on Exhibit 3-7 and in Table 4-6, proposed Tier 2 detailed study alternative corridors would potentially impact several Cleveland County and City of Shelby water lines. These are primarily 6-inch diameter pipes, but also include some 8-, 10-, 12-, and 16-inch pipes. There are potential impacts to two other Cleveland County water distribution facilities: a 350,000 gallon water tank on Airport Road (SR 1926), which would potentially be impacted by Alternatives 7, 9, 16, 18, 19, and 21 (Preferred Alternative); and a pump station on Borders Road (SR 2047), which lies near all of the alternatives (including the Preferred Alternative). Short-term interruptions to water service could occur during construction, and the potential would exist for relocation or reconfiguration of water distribution facilities crossed by a new location US 74 Bypass. There are no Kings Mountain water lines within or in the vicinity of any US 74 Bypass Tier 2 detailed study alternative corridors.

4.5.3 Sewer Service

As shown in Exhibit 3-8, the Tier 2 detailed study alternatives (including the Preferred Alternative) would cross a 61.0-cm (24-inch) Kings Mountain sewer line. Alternatives 1, 7, 13, 16, and 19 would also impact the Kings Mountain wastewater treatment facility to the south of Moss Lake.

The No Build alternative would not affect any study area sewer facilities.

Table 4-6
IMPACTS TO WATER LINES

Lines Perpendicular to Tier 2 Detailed Study Alternatives

Location	Size of Water Line(s)	Alternative(s)
SR 1162	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1161	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1155	6-inch	13, 15, 16, 18, 19, 21*
SR 1322	6-inch	1, 3, 7, 9
SR 1315	6-inch	13, 15, 16, 18, 19, 21*
SR 1314	6-inch, 12-inch	13, 15, 16, 18, 19, 21*
SR 1313	16-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1341	6-inch	1, 3, 7, 9
SR 1343	6-inch	1, 3, 7, 9, 13, 15, 16, 18
NC 226	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1005	6-inch	1, 3, 7, 9, 13, 15, 16, 18
SR 1840	6-inch	1, 3, 7, 9, 13, 15, 16, 18
SR 1842	8-inch, 6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1844/SR 1908	6-inch	1, 3, 7, 9, 13, 15, 16, 18
SR 1853	6-inch	7, 9, 16, 18, 19, 21*
SR 1927	12-inch	7, 9, 16, 18, 19, 21*
NC 18	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
NC 180	6-inch	1, 3, 13, 15
NC 180	8-inch	7, 9, 16, 18, 19, 21*
SR 1926	12-inch	7, 9, 16, 18, 19, 21*
Crescent Circle	6-inch	7, 9, 16, 18, 19, 21*

* Preferred Alternative

Location	Size of Water Line	Alternative(s)
NC 150	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2068	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
NC 180	8-inch, 12-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2125	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2164	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2052	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2033	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2108	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2063	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2047	8-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2245	6-inch	3, 9, 15, 18, 21*
SR 2244	6-inch	3, 9, 15, 18, 21*
SR 2042	6-inch	1, 7, 13, 16, 19
SR 2041	6-inch	1, 7, 13, 16, 19
SR 2603	6-inch	1, 7, 13, 16, 19

Lines Parallel to Tier 2 Detailed Study Alternatives

Location	Line Size	Parallel Alternative	Length Affected (Feet)
US 74 West	6-inch	1, 3, 7, 9	2,300
US 74 West	6-inch	13, 15, 16, 18, 19, 21*	11,650
US 74 East	6-inch	13, 15, 16, 18, 19, 21*	3,610

4.5.4 Natural Gas

Each of the Tier 2 detailed study alternatives (including the Preferred Alternative) would potentially impact one or more City of Shelby natural gas lines (see Exhibit 3-9). These impacts are listed in Table 4-7. There is also one gas transmission regulator station along US 74 that would be affected; this station would be impacted by Alternatives 13, 15, 16, 18, 19, and 21 (Preferred Alternative).

4.5.5 Communications

Study area communications cables that cross or enter proposed Tier 2 detailed study alternative corridors are shown on Exhibit 3-10 and described in Section 3.5.5. The breakdown of potential impacts by alternative is shown on Table 4-8.

4.6 AIR QUALITY IMPACTS

This section contains the results of a microscale air quality analysis for the US 74 Shelby Bypass project. Due to the relatively low traffic volumes on the proposed project, a single "worst case" intersection was modeled to represent the impacts of the project. Information concerning the air quality analysis is presented in the following memoranda, which are on file at the North Carolina Department of Transportation and contain additional information on the computer modeling performed in the analysis; these are appended by reference and summarized below:

Table 4-7
IMPACTS TO NATURAL GAS LINES

Lines Perpendicular to Tier 2 Detailed Study Alternatives

Location	Line Size	Alternative(s)
SR 1161	4-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1316	6-inch	13, 15, 16, 18, 19, 21*
SR 1315	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1314	4-inch	13, 15, 16, 18, 19, 21*
SR 1313	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
NC 226	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1005	4-inch	19, 21*

Location	Line Size	Alternative(s)
NC 18 N	4-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1925	4-inch	1, 3, 13, 15
NC 180	6-inch	7, 9, 16, 18, 19, 21*
SR 1926	4-inch	7, 9, 16, 18, 19, 21*
NC 150	4-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2052/ SR 2033	4-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2047	4-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
Buffalo Creek/ SR 2128	6-inch	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2238	4-inch	3, 9, 15, 18, 21*

Lines Parallel to Tier 2 Detailed Study Alternatives

Location	Line Size	Parallel Alternative	Length Affected (Feet)
US 74 W from SR 1161 to SR 1316	6-inch	13, 15, 16, 18, 19, 21*	2,950
US 74 W from SR 1155 to Debby Dr.	4-inch	13, 15, 16, 18, 19, 21*	330

* Preferred Alternative

Table 4-8
IMPACTS TO MAJOR COMMUNICATIONS FACILITIES

Lines Perpendicular to Tier 2 Detailed Study Alternatives

Location†	Cable Type(s)	Alternative(s)
SR 1161	Aerial fiber optic, Buried copper	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 1161	Underground conduit	13, 15, 16, 18, 19, 21*
NC 226 N	Aerial fiber optic, Aerial copper	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
NC 18 N	Aerial fiber optic Aerial and buried copper	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
NC 150 N	Aerial fiber optic	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2068	Proposed aerial fiber optic, Proposed aerial copper	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2052	Buried copper	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2033	Buried copper	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
SR 2047	Aerial fiber optic	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
US 74 W	Aerial fiber optic	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
US 74 W	Aerial copper	3, 9, 15, 18, 21*
US 74 W	Buried fiber optic (AT&T)	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*

Lines Parallel to Tier 2 Detailed Study Alternatives

Location†	Cable Type	Parallel Alternative	Length Affected (Feet)
US 74 West	Buried fiber optic	1, 3, 7, 9	2,300
US 74 West	Buried fiber optic	13, 15, 16, 18, 19, 21*	8,530
US 74 West	Aerial fiber optic	13, 15, 16, 18, 19, 21*	3,080
US 74 West	Aerial copper	13, 15, 16, 18, 19, 21*	3,080

† For a more specific description of cable locations, see Section 3.5.5, or refer to Exhibit 3-9.

* Preferred Alternative

- Air Quality Technical Memorandum, De Leuw, Cather and Company (now Parsons Transportation Group), December 1996.
- Air Quality Technical Memorandum Addendum, Parsons Transportation Group, Inc., August 2001.

An air quality analysis was performed for all of the Tier 2 detailed study alternatives using the then current design year 2020 traffic data (per January 6, 1995 memo). An updated analysis was performed for the Preferred Alternative using the year 2025 traffic generated specifically for that alternative (per July 31, 2000 memorandum). Both analyses are discussed below.

The bypass is projected to handle traffic volumes of up to 33,300 vehicles per day, with approximately 3,330 vehicles during rush hours for the year 2020. The traffic projections for the bypass for the year 2025 showed volumes as high as 30,900 (approximately 3,090 during rush hours). The introduction of this level of traffic to an area creates the potential for adverse levels of automobile-generated pollution, particularly carbon monoxide (CO). The purposes of this air quality analysis are to show the effect of the project in meeting Federal and State regulations and to inform the public of the impact of the proposed project on ambient air quality.

This project is located in Cleveland County, which has been determined to be in compliance with the National Ambient Air Quality Standards. 40 CFR Parts 51 and 93 is not applicable because the proposed project is located in an attainment area. This project is not anticipated to create any adverse effects on the air quality of this attainment area.

4.6.1 Future Carbon Monoxide Concentrations

The CAL3QHC modeling was done for the peak one-hour traffic conditions for both analyses. The National Ambient Air Quality Standards (NAAQS) cover both a one-hour and an eight-hour averaging time. Background CO concentrations are added to the local concentrations to get the total CO concentration at a given receptor. The North Carolina Department of Environment and National Resources suggests background concentrations of 1.8 parts per million (ppm) for one-hour and 1.1 ppm for eight-hour averaging times.

Both analyses were performed for locations where worst-case pollution concentrations were expected to occur, at the edges of the rights-of-way as close as possible to the "worst-case" intersection. The intersection selected for both analyses was located at NC 18 and the eastbound off-ramp terminus of the proposed project. For the earlier analysis, the traffic data used were generic to all Tier 2 detailed study alternatives, so the results of the analysis were applicable to all Tier 2 detailed study alternatives (including the Preferred Alternative). The year 2025 Preferred Alternative analysis Table 4-9 provides a summary of worst-case future year CO concentrations for these receptors. As shown in Table 4-9, the carbon monoxide concentrations for the receptors decreased from 2020 to 2025, presumably due to decreases in several of the link traffic volumes that comprise the model input. It should be noted that none of the CO concentrations in either analysis exceeded nine ppm.

Table 4-9

SUMMARY OF CO CONCENTRATIONS

LOCATION	FUTURE YEAR CARBON MONOXIDE CONCENTRATIONS (PPM) – ONE-HOUR	
	Year 2020 Generic Analysis *	Year 2025 Preferred Alternative Analysis
Receptor 1 - NC 18 and Bypass Terminus	3.6	3.3
Receptor 2 - NC 18 and Bypass Terminus	4.1	3.4

* Analysis for all Tier 2 detailed study alternatives, based on generic year 2020 traffic.

4.6.2 Future Emissions of Other Pollutants

Automotive emissions of hydrocarbons (HC) and nitrogen oxide (NO) are expected to decrease in the future due to the continued installation and maintenance of pollution-control devices on new cars. However, regarding area-wide emissions, these technological improvements may be offset by the increasing number of cars on the transportation facilities of the area. Because emissions of HC and NO are typical of large urban areas, there is no reason to suspect that traffic on the project will cause air quality standards for HC and NO to be exceeded. Additionally, future decreases in area wide HC and NO automotive emissions may help lower ambient ozone and nitrogen dioxide levels.

Because emissions of particulate matter and sulfur dioxide from cars are very low, there is no reason to suspect that traffic on the proposed facility will cause air quality standards for particulate matter and sulfur dioxide to be exceeded.

Since the overall lead content of gasoline is now zero grams/gallon in North Carolina, traffic on the proposed US 74 Shelby Bypass would not cause the NAAQS for lead to be exceeded.

4.7 NOISE IMPACTS

A Noise Technical Memorandum (September 1997) for this project, on file at the North Carolina Department of Transportation, provides additional information on the noise levels and increases anticipated for the receptors identified for each Tier 2 detailed study alternative during the DEIS phase of the project; this analysis used year 2000 traffic data (per January 6, 1995 memorandum). A Design Noise Report (June 2007) provides additional information on the impacts expected for the Preferred Alternative, based on the preliminary roadway design plans for this alternative and the year 2025 traffic data (per July 31, 2000 memorandum). Summaries of the two different analyses are presented separately herein. This is due to the fact that data from the two analyses cannot be compared in a meaningful way to draw conclusions about LEDPA selection because: a) the roadway design plans used were at different levels of detail; b) projected traffic data are for different future years; and c) two different types of modeling software were used for the analyses. It is helpful, however, to examine the relationship between the results.

4.7.1 Future Noise Levels for Tier 2 Detailed Study Alternatives

Analysis Methodology. The procedure used to predict future noise levels along the Tier 2 detailed study alternatives in the DEIS was the Noise Barrier Cost Reduction (BCR) Procedure as found in STAMINA/OPTIMA 2.0. The BCR procedure is based on the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108). The input into this model includes traffic volumes and speeds, topography, receptor location and height, and barrier location and height (if applicable).

The Tier 2 detailed study alternatives noise analysis was based on functional design, with corridor conceptual centerlines. The proposed typical roadway section was assumed to be consistent throughout the length of the project. The typical roadway section used for analysis included a

four-lane highway with 12-foot shoulders and a 70-foot wide median. (Note: the median width for this project was later reduced to 46 feet. Given the degree of accuracy of the mapping used for this noise analysis, this change would either cause the results to be slightly conservative or would not have an appreciable effect, so no adjustment is needed.) Due to the unavailability of detailed data, no natural barriers were included in the analysis; however, both roadway and receptor elevations were incorporated into the model to give more realistic predictions. The traffic volumes used in future noise level calculations were the predicted peak-hour volumes for the future year 2020 or LOS C volumes, whichever were lower. This would represent the worst case noise conditions for the project.

The modeling was performed in order to determine both the number of receptors which would be exposed to noise levels approaching or exceeding the FHWA noise abatement criteria and the number of receptors predicted to experience a substantial noise level increase (the criterion at the time that the Tier 2 detailed study alternative noise analysis was performed was: 15 dBA or greater for receptors with existing noise levels less than or equal to 50 dBA; 10 dBA or greater for receptors with existing noise levels greater than 50 dBA). NCDOT guidelines consider 66 dBA for residential receptors and 71 dBA for commercial receptors as levels approaching FHWA noise abatement criteria. The general approach was to model receptor locations at distances of 25, 50, 100, 200, 400, 800, and 1,600 feet on both sides along the length of the roadway. The result was a grid of modeled receptor points along the project which could be used to calculate noise levels for the actual identified receptors.

Analysis Results. Table 4-10(a) lists the number of receptors in each activity category expected to approach or exceed the FHWA noise abatement criteria.

Table 4-10(a)

NUMBER OF RECEPTORS APPROACHING OR EXCEEDING FHWA NOISE ABATEMENT CRITERIA * (Tier 2 Detailed Study Alternatives)

TIER 2 DETAILED STUDY ALTERNATIVE	NUMBER OF RECEPTORS					
	ACTIVITY CATEGORY					
	A	B	C	D	E	Total
1		73	1			74
3		61	2			63
7		66	2			68
9		54	3			57
13		99				99
15		87	1			88
16		92	1			93
18		80	2			82
19		93	2			95
21 (Preferred)		81	3			84

* NCDOT guidelines consider 66 dBA for residential areas and 71 dBA for commercial areas as levels approaching FHWA noise abatement criteria.

The exterior traffic noise level increase summary is shown in Table 4-10(b) for the Tier 2 detailed study alternatives. All of the alternatives have some receptors that will experience substantial increases in noise levels. The maximum expected noise level increases were as high as 27 dBA over existing noise levels for some receptors.

Table 4-10(c) summarizes all noise impacts expected for the Tier 2 detailed study alternatives (including the Preferred Alternative).

Table 4-10(b)

TRAFFIC NOISE LEVEL INCREASE SUMMARY
(TIER 2 DETAILED STUDY ALTERNATIVES)

Alt. No.	NUMBER OF RECEPTORS EXPERIENCING NOISE INCREASES (NOISE LEVEL IN dBA)													Substantial Noise Level Increase (1)
	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25+	
1	176	79	89	61	61	38	55	45	30	17	13	5	4	150
3	184	78	116	72	69	33	49	38	22	8	3	2	2	100
7	157	46	40	46	52	40	44	38	29	23	13	5	5	149
9	165	45	67	57	60	35	38	31	21	14	3	2	3	99
13	186	84	89	53	49	36	56	37	30	17	15	7	5	141
15	194	83	116	64	57	31	50	30	22	8	5	4	3	91
16	167	51	40	38	40	38	45	30	29	23	15	7	6	140
18	175	50	67	49	48	33	39	23	21	14	5	4	4	90
19	177	52	39	40	33	28	38	31	29	24	12	8	4	131
21*	185	51	66	51	41	23	32	24	21	15	2	5	2	81

(1) Criterion is 15 dBA or more for receptors with existing noise levels of 50 dBA or less, or 10 dBA or more for receptors with existing noise levels greater than 50 dBA. This is the criterion that was in effect at the time of the noise analysis.

* Preferred Alternative

Table 4-10(c)

SUMMARY OF NOISE IMPACTS
(Tier 2 Detailed Study Alternatives)

TIER 2 DETAILED STUDY ALTERNATIVE	NUMBER OF RECEPTORS			
	Exceeding at Least One Criterion		Exceeding Both Criteria **	Total Impacted Receptors
	Approaching or Exceeding 67/72 dBA	With Noise Increase ≥ 10/15 dBA *		
1	74	150	36	188
3	63	100	22	141
7	68	149	33	184
9	57	99	19	137
13	99	141	35	205
15	88	91	21	158
16	93	140	32	201
18	82	90	18	154
19	95	131	32	194
21 (Preferred)	84	81	18	147

* Based on the noise increase criteria in place at the time of the noise analysis.
** These receptors are also included in the "Exceeding At Least One Criterion" category totals.

Abatement Measures. In NCDOT highway projects, traffic noise abatement must be considered when either of the following two conditions exist:

A. The predicted design year noise levels approach or exceed those values shown for the appropriate activity category of the FHWA Noise Abatement Criteria.

   Please note: NCDOT has defined approach values as being 1 dBA less than those in the FHWA Noise Abatement Criteria table and, the design year is 20 years after start of construction.

B. The predicted design year noise levels substantially exceed existing noise levels as defined below:

Existing (Leq(h))	Increase
less than or equal to 50 dBA	greater than or equal to 15 dBA
greater than 50 dBA	greater than or equal to 10 dBA

Note: This criterion has changed since the analysis of the Tier 2 detailed study alternatives.

Abatement measures, such as earth berms, noise walls, and depressed roadway segments, are intended to reflect or absorb highway traffic noise to reduce noise to acceptable levels. These measures are very expensive to develop and are generally considered reasonable only if 1) they effectively reduce the noise level (5 dBA or more reduction), and 2) cost less than $25,000 per effectively protected receptor to construct (note: This is the criterion that was in effect at the time of the Tier 2 detailed study alternatives analysis).

Additional noise abatement measures can include:

- Traffic management measures (e.g., traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations);
- Alteration of horizontal and vertical alignments;
- Landscaping (also for aesthetic purposes);
- Acquisition of real property or interests therein to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise; and
- Noise insulation of public use or nonprofit institutional structures.

Feasibility and Reasonableness - Several factors, including benefits, cost of abatement, and overall social, economic, and environmental effects, are examined to determine both the feasibility and reasonableness of constructing a noise abatement device.

FEASIBILITY - Feasibility deals primarily with engineering considerations. The following items are considered in order to determine feasibility:

1) Can a barrier be built given the topography of the location?

2) Are other noise sources present in the area?

3) Can noise reduction (insertion loss) provided by the barrier be a minimum of 5 dBA, but preferably 8 dBA or more, for design receptors (first row receptors)?

4) Are driveway access or drainage openings required in the barrier? Unless special conditions exist and effective abatement can be provided, it is not considered feasible to provide abatement on non-controlled or partial access control facilities.

5) Will the barrier compromise safety or restrict sight distances?

REASONABLENESS - Reasonableness is a more subjective criterion and shows that common sense and good judgment were used in arriving at a decision. A determination of reasonableness includes the following:

1) Barrier cost - Is the abatement measure cost effective? Cost effective is defined as $25,000 (construction cost) per effectively protected (5 dBA or more reduction) receptor (note: this is the criterion that was in effect at the time of the Tier 2 detailed study alternatives analysis).

2) Barrier height - Is the exposed height of the wall a maximum of approximately 25 feet?

3) Barrier scale relationship - Where is the wall located in relationship to the receptor? It generally is not reasonable to provide abatement unless the receptor is located a distance of four times the height of the wall or more from the proposed wall. Noise walls have a dominant visual effect on receptors in close proximity to the wall.

4) Difference between existing and future noise levels - Will the barrier reduce the existing noise levels and design year noise levels by at least 3 dBA? Since the 3 dBA noise reduction is a barely perceptible change, lesser noise reduction would not even be noticed.

5) Opinions of the impacted residents - Do the benefitted receptors (those that receive a 5 dBA or more reduction by the construction of the abatement measure) support construction of a barrier? Opinions concerning noise mitigation are sometimes offered at public participation activities, and are considered along with whatever other concerns are raised by local citizens.

6) Commercial areas - Are the impacted receptors businesses? Do they prefer to be visible to users of the transportation facility?

7) Isolated receptors - Are the receptors isolated?

8) Clear recovery zone - Will the noise barrier be located beyond the clear recovery zone or be incorporated into safety devices?

The above listing is not intended to be all-encompassing. Rather, it is intended to indicate some of the factors considered in determining the feasibility and reasonableness of proposed abatement measures.

Noise Walls - According to NCDOT Noise Abatement Guidelines, noise abatement (i.e., noise walls or berms) will be considered when either the predicted future year noise levels exceed FHWA criteria or the predicted future year noise levels substantially exceed existing noise levels.

A preliminary review of potential noise wall locations was conducted for all receptors predicted to approach or exceed the noise abatement criteria or to experience a substantial noise increase. Most impacted receptors were excluded from noise barrier analysis due to the unreasonableness of constructing noise walls in many locations. In many cases, receptors were isolated and provision of a noise barrier would not be cost effective. Also, particularly along US 74, commercial businesses would be blocked from view if noise walls were constructed. This general review

eliminated many sites from consideration for noise abatement. However, seven sites passed the initial reasonable/feasible screening process and a preliminary noise barrier review was conducted at these locations.

Seven barrier locations were established during the DEIS for the Tier 2 detailed study alternatives and are indicated on Exhibit 3-11(a). The length, cost, and number of receptors experiencing noise reduction for each barrier are shown in Table 4-11.

Population densities within the study area are generally highest at roadway interchanges and overpass locations. Cost-effective noise wall design in these areas is difficult because a substantial amount of noise may be generated from access ramps and crossroads which cannot be shielded with barriers along the proposed freeway. Grade separations complicate barrier design in areas where impacts occur on both sides of the proposed project because effective parallel barriers are difficult to construct.

Vegetative Barriers - Vegetation, if it is high enough, wide enough, and dense enough that it cannot be seen through, can decrease highway traffic noise. Studies have shown that a 200-foot width of dense vegetation can reduce noise levels by ten dBA. However, it is often impractical to plant this quantity of vegetation to achieve such reductions. In areas of impacted receptors where abatement measures have been considered and found not to be reasonable, a vegetative barrier can be considered for psychological and aesthetic screening.

Table 4-11

NOISE BARRIER COST EFFECTIVENESS
(Tier 2 Detailed Study Alternatives)

Barrier Number	Alternative(s)	Length (ft)	Cost	Number of Receptors	Cost/ Receptor
1	1, 7, 13, 16, 19	1,424	$189,390	8	$23,674
2	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	2,992	$398,900	32	$12,466
3	7, 9, 16, 18, 19, 21*	4,131	$550,632	24	$22,943
4	1, 3, 13, 15	1,083	$141,079	13	$10,852
5	1, 3, 13, 15	3,825	$498,480	23	$21,673
6	7, 9, 16, 18	1,690	$219,660	11	$19,969
7	13, 15, 16, 18, 19, 21*	2,395	$312,085	13	$24,007

* Preferred Alternative

Notes: 1) All receptors identified for the noise walls are residences.
2) Heights of the noise walls would vary due to the need to provide noise attenuation for multiple receptors.
3) The noise level reduction for each noise wall would vary among the different receptors.

Earthen Berms - Earthen berms may be effective in reducing noise impacts in many areas, especially where parallel barriers may be necessary to protect impacted areas on both sides of the proposed roadway. Earthen berms generally provide more noise attenuation for less cost than other barrier materials, but are limited by right-of-way and other engineering considerations.

Noise Barrier Construction - It is the policy of NCDOT that the type of material used in construction of noise abatement measures be an engineering decision based on economics, effectiveness, and to a limited degree, visual impact. Visual impact considerations will assure that

the proposed barrier meets a basic aesthetic level and a basic durability level such that excessive deterioration or corrosion will not occur.

It is also a part of this policy to have traditional highway resources pay for the required noise abatement. Should a local jurisdiction request that a material be used for the noise barrier that is more costly than that proposed by NCDOT, the requesting body must assume 100 percent of the additional cost.

If a local jurisdiction insists on the provision of a noise abatement measure deemed feasible but not reasonable by NCDOT, a noise barrier may be installed, provided the locality is willing to assume 100 percent of the cost of the abatement measure, including but not limited to preliminary engineering, construction, maintenance, and that NCDOT's material, design and construction specifications are met.

In an effort to prevent future noise impacts on currently undeveloped lands, NCDOT will use the following criteria:

A. The "Date of Public Knowledge" of the location of a proposed highway project will be the approval date of CEs, FONSIs, RODs, or the Design Public Hearing, whichever comes later. After this date, the Federal/State governments are no longer responsible for providing noise abatement measures for new development for which building permits are issued within the noise impact area of the proposed highway project (note: This was the criterion that was in effect at the time of the Tier 2 detailed study alternatives analysis).

B. For development occurring after this public knowledge date, it is the responsibility of the local governing bodies to ensure that noise compatible designs are utilized.

C. The date for determining when undeveloped land is "...planned, designed, and programmed..." for development will be the issuance of a building permit for an individual site.

The maximum extent of the 72 and 67 dBA noise level contours are 171 and 246 feet, respectively, from the center of the proposed roadway. This information should assist local authorities in exercising land use control over the remaining undeveloped lands adjacent to the roadway within the local jurisdiction. For example, with the proper information on noise, the local authorities can prevent development of incompatible activities and land uses with the predicted noise levels of an adjacent highway.

4.7.2 Design Noise Analysis for Preferred Alternative

Analysis Methodology. The procedure used to predict future noise levels for the Preferred Alternative was the Traffic Noise Model (TNM) 2.5. The TNM model procedure is based on new FHWA highway traffic noise prediction policy, and has essentially replaced STAMINA/OPTIMA as the accepted FHWA highway noise analysis methodology. The input into TNM includes traffic volumes, vehicle speeds, topography, receptor location and height, and barrier location and height (if applicable). The recommended typical roadway section used for analysis included a four-lane divided highway with 12-foot shoulders and a 46-foot wide median. It should be noted that preliminary design plans were available for use in this noise analysis at this more advanced stage of the project. Both roadway and receptor elevations as well as major natural terrain features were incorporated into the model to provide more realistic results. The traffic volumes used in the future noise level calculations were the predicted peak-hour volumes for the design year 2025 (per 7/31/00 memorandum). This would represent the worst-case noise conditions for the project.

The TNM model was utilized in order to determine the number of land uses (by type) that would be impacted during the peak hour of the year 2025. As with the DEIS analysis, a land use is considered

to be impacted when exposed to noise levels approaching or exceeding the FHWA noise abatement criteria and/or predicted to sustain a substantial noise increase.

The maximum extent of the 72 and 67 dBA noise level contours for the Preferred Alternative analysis are 220.7 and 345.0 feet, respectively, from the center of the proposed roadway.

It should be noted that the noise level and noise barrier cost effectiveness criteria presented in Section 4.7.1 are also applicable to this analysis, with the following exceptions:

- The "substantial noise increase" criteria have changed (as noted in Table 4-12(b), below).
- The "Date of Public Knowledge" of the location of a proposed highway project will be the approval date of the Record of Decision (ROD), or the Design Public Hearing, whichever comes later.
- Cost-effective noise attenuation is defined by NCDOT as $35,000 or less per benefited (i.e., 5 dBA or more reduction) receptor. An additional $500 per average decibel increase in predicted exterior noise levels of impacted receptors of an area is used as an adjustment factor.

Analysis Results. Table 4-12(a) lists the number of receptors in each activity category expected to approach or exceed the FHWA noise abatement criteria. The exterior traffic noise level increase summary is shown in Table 4-12(b) for the project alternatives. All of the alternatives have some receptors that will experience substantial increase in noise levels. Table 4-12(c) summarizes all noise impacts expected for the project alternatives (including the Preferred Alternative).

Table 4-12(a)

NUMBER OF RECEPTORS APPROACHING OR EXCEEDING FHWA NOISE ABATEMENT CRITERIA * (Preferred Alternative)

NUMBER OF RECEPTORS					
ACTIVITY CATEGORY					
A	B	C	D	E	Total
	31	3			34

* NCDOT guidelines consider 66 dBA for residential areas and 71 dBA for commercial areas as levels approaching FHWA noise abatement criteria.

Table 4-12(b)

TRAFFIC NOISE LEVEL INCREASE SUMMARY (Preferred Alternative)

RECEPTOR EXTERIOR NOISE LEVEL INCREASES							Substantial Noise Level Increase [1]
<=0	>0 to <5	5 to <10	10 to <15	15 to <20	20 to <25	>=25	
2	10	28	28	35	8	0	49

[1] For this analysis, "Substantial Noise Level Increase" is defined as:

Existing Noise Levels in Leq(h)	Increase in dBA from Existing Noise Levels to Future Noise Levels
>= 55	>= 10
54	>= 11
53	>= 12
52	>= 13
51	>= 14
<= 50	>= 15

Table 4-12(c)
SUMMARY OF NOISE IMPACTS
(Preferred Alternative)

NUMBER OF RECEPTORS			
Exceeding at Least One Criterion			
Approaching or Exceeding 67/72 dBA	With Noise Increase ≥ 10/15 dBA *	Exceeding Both Criteria **	Total Impacted Receptors
34	49	15	68

* Based on the noise increase criteria shown in Table 4-12(b).

** These receptors are also included in the "Exceeding At Least One Criterion" category totals.

Abatement Measures. The 68 affected receptors were examined to determine how those receptors might be optimally grouped into noise barrier locations that could result in reasonably sized barriers and thus, the lowest per-receptor cost. Fourteen of the receptors are isolated and did not effectively fit into any clusters and were dismissed as barrier candidates. Twelve receptors are located along existing US 74. According to NCDOT noise policy sound barriers are only considered for new construction or reconstruction of highways. Therefore, abatement measures for receptors along existing US 74 were only considered for areas that will be adjacent to new or reconstructed portions of US 74. Eleven impacted receptors are located along high volume crossing roads that are major noise sources. Barriers for these receptors along US 74 would not achieve the required 5-dB reduction and therefore are not feasible.

The seven barrier locations established for the remaining 31 affected receptors are indicated on Exhibit 3-11(b). The length, cost, and number of receptors experiencing noise reduction for each barrier are shown in Table 4-13. Two noise barriers, Barrier A and Barrier G, met NCDOT

standards for abatement. Barrier A would abate noise for four impacted residences at a cost of $170,100, while Barrier G would abate noise for thirteen residences at a cost of $570,150.

Table 4-13

NOISE BARRIER COST EFFECTIVENESS
(Preferred Alternative)

Barrier ID	# of Impacted Receivers	Minimum Barrier Length (feet)	Area of Barrier (sf)	Barrier Cost	Cost per Receiver	Number of Benefiting Receivers Required to Be Cost Effective
A	4	810	11,340	$170,100	$42,525	5
B	4	1,680	23,520	$352,800	$88,200	10
C	2	810	10,930	$163,950	$81,975	5
D*	3	1,700	42,500	$637,500	$212,500	18
E	2	1,250	18,100	$271,500	$135,750	8
F*	3	1,080	23,760	$356,400	$118,800	10
G	13	2,190	38,010	$570,150	$43,858	16

* Required insertion loss (5 dBA) was not achieved at one receptor in Area D and two receptors in Area F.

Notes: 1 - Assumed barrier cost = $15/SF
2 - Number of benefited receptors required to be cost effective based on NCDOT limit of $35,000 per residence.

If conditions substantially changed during final design, additional abatement measures might be reconsidered. A final decision on the installation of abatement measures will be made upon completion of the project design and the public involvement process.

It should be noted that since the Preferred Alternative noise analysis performed with the newer TNM noise program takes both horizontal and vertical alignment into account, it is most likely more accurate. The number of impacted receptors resulting from the TNM modeling of the Preferred Alternative declined over the earlier STAMINA/OPTIMA results (despite the fact that

the traffic volumes used for the Preferred Alternative analysis are year 2025 rather than year 2020, and are generally slightly higher), presumably because the preliminary design is more accurate and is aimed at avoiding development to the greatest extent possible. More accurate modeling of the other nine Tier 2 detailed study alternatives using TNM would most likely result in reductions in noise impacts for all of the Tier 2 detailed study alternatives, but the hierarchy should remain roughly the same.

4.7.3 No Build Alternative

The traffic noise impacts of the No Build alternative were also considered. The effect of future traffic on noise levels along US 74 would barely be noticeable. In most cases, Level of Service C is considered to be the loudest traffic condition. Currently, US 74 operates at Level of Service C or worse for long periods of time over the length of the project area. Noise levels, therefore, during the period of LOS C traffic flow are a worst case condition. While the No Build scenario might alter the time of day at which LOS C occurs, the noise levels would not be noticeably worse than existing conditions.

Noise abatement along US 74 under the No Build alternative would not be feasible. The numerous access points for local traffic would require openings in the barrier which would severely reduce its effectiveness. An ineffective barrier then becomes an economically infeasible abatement measure. Additionally, noise barriers along US 74 could reduce safety and visibility at many access points.

4.8 HAZARDOUS MATERIALS SITES/UNDERGROUND STORAGE TANKS

Table 4-14 provides a summary of the numbers of sites potentially affected by each Tier 2 detailed study alternative. Table 4-15 summarizes the alternative or alternatives that may be involved with each hazardous material site identified in the field reconnaissance (see Section 3.8). Table 3-15 (see Section 3.9) provides a general qualitative indication of the potential for problems resulting from encroachment on any site in terms of the previous history of that site.

The Kings Mountain Landfill has a very high potential for hazardous materials, since the facility was operational during an era of few restraints on materials disposal. Located along the northern edge of the corridor for Alternatives 1, 7, 13, 16, and 19, this site would be avoided if at all possible.

Table 4-14
SUMMARY OF AFFECTED HAZARDOUS MATERIALS SITES

ALTERNATIVE	NUMBER OF HAZARDOUS MATERIALS SITES			
	USTs	Junkyards	Landfills	Total
1	3	3	1	7
3	5	3	0	8
7	3	2	1	6
9	5	2	0	7
13	3	3	2	8
15	5	3	1	9
16	3	2	2	7
18	5	2	1	8
19	3	2	2	7
21 (Preferred)	5	2	1	8

Table 4-15

AFFECTED POTENTIAL HAZARDOUS MATERIALS SITES/USTS

SITE # [1]	TYPE OF FACILITY[2]	ALTERNATIVE(S)
1	Gasoline station/convenience store	13, 15, 16, 18, 19, 21*
2	Gasoline station/convenience store	13, 15, 16, 18, 19, 21*
21	Gasoline station	3, 9, 15, 18, 21*
22	Gasoline station	3, 9, 15, 18, 21*
23	Gasoline station/service garage	1, 3, 7, 9
24	Gasoline station/convenience store	1, 3, 7, 9
25	Gasoline station	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
26	Kings Mountain Landfill	1, 7, 13, 16, 19
28	Auto Junk Yard	1, 3, 13, 15
29	Auto Junk Yard	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*
30	Landfill	13, 15, 16, 18, 19, 21*
31	Auto Junk Yard	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*

* Preferred Alternative

[1] See Exhibit 3-12 for location.
[2] See Table 3-15 for additional information about each facility and its status.

In general, new roadway construction typically avoids USTs and/or landfill involvement because of potential environmental liabilities for proper cleanup and remediation if contamination exists. The preliminary roadway design for the Preferred Alternative avoids as many of the indicated sites as possible. However, should the Preferred Alternative impact any hazardous material site or UST, a Preliminary Site Assessment will be performed prior to right-of-way acquisition to determine the existence and/or extent of any contamination. These assessments will also be used by the NCDOT to estimate the associated clean-up costs.

The No Build alternative would result in no impacts to the identified hazardous materials sites.

4.9 TOPOGRAPHY, SOILS, AND GEOLOGY

4.9.1 Topography

The effect of any of the Tier 2 detailed study alternatives (including the Preferred Alternative) on study area topography would vary with the amount of earthwork required, as would certain costs of highway construction. The existing topography of the study area, which is gently rolling to moderately steep, is typical of the Piedmont region of North Carolina. It is anticipated that moderately large areas of cut and fill would be required to construct the Preferred Alternative. The vertical alignment (or grade) for the Preferred Alternative would be designed both to minimize the amount of earthwork necessary, and to create greater proportions of cut to fill, avoiding the necessity of obtaining additional fill materials from other sources. The No Build alternative will not have an effect on study area topography.

4.9.2 Soils

Overall, study area soils have low shrink-swell potential, and are therefore generally well-suited to highway construction. Some major study area soil series (including Cecil, Pacolet, Appling, Bethlehem, and Saw) are susceptible to erosion hazard when vegetation or other ground cover is disturbed. An extensive Erosion and Maintenance Plan, to be implemented by the Contractor throughout construction of this project, is a requirement of the NCDOT Standard Specifications for Roads and Structures.

4.9.3 Geology

Without specific detailed information on site geologic features, the potential effect of the bypass on geology cannot be discussed in detail. However, the general characteristics of the study area geology raise some basic considerations as to the effect of geology on the proposed highway. The grading of a road bed in the side of a slope can, in some circumstances, seriously undermine that slope's stability, causing rocks and sediments to shift. In such a case, erosion of soils downslope of the road could affect its structural integrity, and rocks falling from above could pose a hazard to drivers. Where road construction diverts or otherwise alters groundwater flow, seepage of water through different channels in underground rock could also cause changes in rocks and minerals that could lead to drainage problems or destabilization. The Preferred Alternative will be designed to prevent destabilization of roadway slopes and to maintain existing drainage patterns.

4.10 PRIME, IMPORTANT, AND UNIQUE FARMLAND IMPACTS

This project was coordinated with the US Natural Resources Conservation Service (NRCS), as required by the Farmland Protection Policy Act. A Farmland Conversion Impact Rating For

Corridor Type Projects (SCS-CPA-106) could not be completed by NRCS due to lack of soil information (Mr. Phillip Tant, NRCS, letter, 8/23/96; see Appendix A.2).

Due to the relatively small scale and generalized level of detail of NRCS soil mapping, farmland takings estimated from those maps would be very approximate. Therefore, farmland takings which were calculated previously for the Preferred Alternative and other Tier 2 detailed study alternatives using prorated corridor impacts to approximate right-of-way impacts are sufficiently accurate for the purposes of this study to be retained. Table 4-16 indicates these prime and state and locally important farmland estimates; there are no areas of unique farmland in the study area. Exhibit 4-1 indicates prime and important farmlands within the Tier 2 detailed study alternative corridors. If applicable, during final design efforts will be made to minimize impacts to farmlands to the fullest extent practicable. Where possible, farm fields will be crossed along property boundaries to avoid bisecting farm operations.

4.11 MINERAL RESOURCES

Descriptions of mines within the study area are presented in Section 3.11. Of these sites, three are located within Tier 2 detailed study alternative corridors. The Buffalo Valley Mine, on US 74 east of Shelby, would be affected by construction of Alternatives 3, 9, 15, 18, and 21 (Preferred); the First Broad River Mine and the Metcalf Road Pit, north of Shelby between Metcalf Road (SR 1850) and North Lafayette Street (SR 1005), would be affected by Alternatives 1, 3, 7, and 9. However, as the First Broad River Mine is inactive and has an expired mining permit, effects to this site would have little or no impact on local mineral production.

Table 4-16

ESTIMATED SPECIAL STATUS FARMLAND IMPACTS (ACRES)

ALTERNATIVE	Prime *	State & Locally Important*	Total Prime & Important
1	414	326	740
3	395	322	717
7	401	305	706
9	382	301	683
13	356	273	629
15	337	269	606
16	343	252	595
18	324	248	572
19	317	272	589
21 (Preferred)	298	268	566

* Includes soils which qualify for this farmland status only if they are drained.
Note: Impacts shown are approximated right-of-way impacts based on prorated corridor values.

4.12 NATURAL RESOURCES

This section provides a summary of project impacts relating to natural resources within the study area. Section 3.12 lists related project documents concerning natural resources which are on file at the North Carolina Department of Transportation.

4.12.1 Plant Communities

Potential impacts to plant communities resulting from highway construction reflect the difficulty in avoiding these systems, which are relatively abundant in and around the study area. Table 4-17(a) summarizes the coverage by plant communities within each of the Tier 2 detailed study alternatives on a corridor-wide basis. Table 4-17(b) indicates these data as prorated for right-of-way impacts.

4.12.2 Wildlife

The effects of new location highway development on wildlife can be characterized as: 1) habitat fragmentation; 2) direct mortality; 3) direct habitat loss; 4) displacement and avoidance; and 5) problems associated with human development.

One obvious measure to minimize unavoidable fragmentation effects of highways to wildlife is to provide crossings. Wildlife crossings may effectively reduce impacts to wildlife populations, reduce mortality due to vehicles, and reduce corresponding hazards to human life and property. Wildlife crossings would take advantage of current wildlife movement corridors to maximize their potential efficacy. Openness factors would be calculated for underpasses so that target species are not repelled. General designs for wildlife passage include overpasses, underpasses, viaducts, expanded bridges, upland culverts, and/or fencing. Other measures, such as habitat conservation, may offset the direct loss of habitat as well as the indirect effects of fragmentation and noise/edge effects for area-sensitive species. Monitoring is also a critical element of any plan for mitigation of highway impacts to wildlife.

Table 4-17(a)
PLANT COMMUNITY IMPACTS - CORRIDOR-WIDE IMPACTS*

ALTERNATIVE	PLANT COMMUNITY IMPACTS (ACRES)							
	Forest Land					AG	UD	SUC
	HW	PP	PHW	MF	Total			
1	537.6	66.5	356.0	94.3	1,054.4	939.2	484.8	165.7
3	508.7	48.0	307.4	84.1	948.2	989.3	639.6	160.1
7	512.9	84.7	339.9	91.8	1,029.3	907.4	471.5	150.5
9	484.0	66.2	291.3	81.6	923.1	957.5	626.3	144.9
13	569.4	82.2	396.0	95.0	1,142.6	1,003.7	641.7	132.7
15	540.5	63.7	347.4	84.8	1,036.4	1,083.8	796.5	127.1
16	544.7	100.4	379.9	92.5	1,117.5	1,001.9	628.4	117.5
18	515.8	81.9	331.3	82.3	1,011.3	1,052.0	783.2	111.9
19	520.7	104.5	334.2	61.4	1,020.8	867.9	564.4	58.9
21 (Preferred)	491.8	86.0	285.6	51.2	914.6	918.0	719.2	53.3

Key: HW - Hardwood Forest; PP - Pine Plantation; PHW - Pine/Hardwood Forest; MF - Mesic Forest; AG - Agricultural; UD - Urban/Disturbed Areas; SUC - Successional Land

* Impacts shown are for the entire corridor widths; impacts from right-of-way would be less.

Table 4-17(b)
PLANT COMMUNITY IMPACTS - PRORATED RIGHT-OF-WAY IMPACTS*

ALTERNATIVE	PLANT COMMUNITY IMPACTS (ACRES)							
	Forest Land					AG	UD	SUC
	HW	PP	PHW	MF	Total			
1	179.1	22.2	118.7	31.4	351.4	313.0	161.6	55.3
3	161.8	16.0	97.7	27.4	302.9	315.5	169.5	49.3
7	170.9	28.3	113.4	30.5	343.1	302.4	157.2	50.2
9	153.6	22.1	92.4	26.5	294.6	304.9	165.1	44.2
13	158.7	25.0	112.7	21.8	318.2	277.4	180.6	34.0
15	141.4	18.8	91.7	17.8	269.7	279.9	188.5	28.0
16	150.5	31.1	107.4	20.9	309.9	266.8	176.2	28.9
18	133.2	24.9	86.4	16.9	261.4	269.3	184.1	22.9
19	164.8	33.7	110.7	16.4	325.6	255.2	166.5	19.5
21 (Preferred)	147.5	27.5	89.7	12.4	277.1	257.7	174.4	13.5

Key: HW - Hardwood Forest
PP - Pine Plantation
PHW - Pine/Hardwood Forest
MF - Mesic Forest
AG - Agricultural
UD - Urban/Disturbed Areas
SUC - Successional Land

* Impacts shown are approximated right-of-way impacts based on prorated corridor values.

Several stream crossings would afford opportunities for wildlife passage on this project, due to the fact that the proposed structures at these locations are larger than needed for basic hydraulic requirements. Table 4-18 indicates potential available wildlife passage areas for this project.

Table 4-18
POTENTIAL WILDLIFE PASSAGE AREAS

Stream	Proposed Structure	Approximate Horizontal Clearance (feet)		Approximate Vertical Clearance (ft)
		West Side	East Side	
Beaverdam Creek	New location dual span bridge*	25	25	10
Brushy Creek	New location dual span bridge	15	20-25**	10
First Broad River	New location dual span bridge	20	20	20
Buffalo Creek	Construction of parallel bridge structure next to existing bridge structure	10	10	15

* Beaverdam Creek does not require a bridge structure from a hydraulic standpoint. Bridging of this site was agreed upon by the Merger Team in part to reduce wetland impacts, and in part to provide wildlife passage.

** This area includes an existing soil road.

Short-term displacement of local wildlife populations will occur during initial construction of the facility. Most local species are accustomed to man-made disturbances and are expected to move back into the construction area.

4.12.3 Water Resources

This section provides a summary of project impacts relating to water resources information within the study area.

Surface Waters. Table 4-19(a) indicates the numbers of stream crossings anticipated for the Tier 2 detailed study alternatives based on information gathered during the DEIS phase of the project.

The total number of stream crossings anticipated for each alternative gives a generalized indication of the potential for effects to water quality, although water quality is dependent on a number of factors. None of the alternatives (including the Preferred Alternative) would totally avoid waterway crossings within the study area.

Table 4-19(a)
STREAM CROSSINGS FOR TIER 2 DETAILED STUDY ALTERNATIVES

Alternative	Total Stream Crossings
1	38
3	36
7	36
9	34
13	38
15	36
16	36
18	34
19	37
21 (Preferred)	35

Note: Individual sites are identified in Table 4-23(a) as "Surface Waters".

Stream Delineation for Preferred Alternative. For the stream delineation for the Preferred Alternative, any area which appeared as a stream feature on USGS quads or county soils mapping was investigated as a possible stream channel. Potential streams identified in the field but not found on available mapping were also evaluated to determine presence or absence of stream function. Potential streams were evaluated for the presence or absence of an established bed and bank, substrate, presence or absence of vegetation within the channel, and perennial or intermittent hydrology.

Based on the stream delineations described above, the Preferred Alternative will intercept 22 perennial stream channels and 38 intermittent stream channels (see Exhibit 4-2), as listed in Table 4-19(b). Streams and their impacts are listed individually in Table D-2 in Appendix D.

Table 4-19(c) indicates the total stream channel lengths impacted by the Preferred Alternative, both within the entire corridor, and the actual impacted based on the preliminary roadway design plans.

The stream channels for the Preferred Alternative were classified using the Natural Stream Channel Classification System (Rosgen, 1996). For this project, the classification effort was a Level 1 classification, consisting of a general description of the type of channels present without detailed measurements. This system uses several criteria for classification: 1) number of channels associated with a stream; 2) slope; 3) width to depth ratio; 4) entrenchment ratio; 5) sinuosity; and 6) bed material. Based on the first five of these criteria, one of eight channel types is assigned to the reach of a stream. Each channel type is described briefly below.

A" type streams are steeply sloped, relatively deep and narrow, highly entrenched channels with low sinuosity. "A" type channels are characterized by step pools and few meanders.

"B" type streams are moderately sloped, relatively wide and shallow, moderately entrenched channels with low to moderate sinuosity. "B" type channels are characterized by step pools and some meanders.

"C" type streams are gently sloped, relatively wide and shallow, slightly entrenched channels with moderate to high sinuosity. "C" type channels are characterized by riffles and pools and well-defined meanders.

"D" type streams are braided with multiple channels (threads), moderately sloped, and are wide and shallow. "D" type channels are characterized by multiple channels, and depending on slope, are dominated either by step-pool or riffle-pool sequences.

Table 4-19(b)

NUMBER OF STREAM CHANNELS INTERCEPTED BY PREFERRED ALTERNATIVE

Stream Name	NUMBER OF STREAM CHANNELS							
	WITHIN PREFERRED ALTERNATIVE CORRIDOR				IMPACTED[a]			
	Main Stream[b]	Perennial Tributaries	Intermittent Tributaries	Total	Main Stream[b]	Perennial Tributaries	Intermittent Tributaries	Total
Sandy Run Creek[c]	0	1	1	2	0	1	1	2
Beaverdam Creek	1	13	15	29	0[d]	5	1	6
Brushy Creek	1	3	7	11	0[d]	2	4	6
First Broad River	1	8	16	25	0[d]	6	5	11
Hickory Creek	1	4	6	11	1	3	1	5
Kings Mountain Reservoir/Moss Lake	0	1	16	17	0	0	3	3
Buffalo Creek	1	11	19	31	0[d]	5	12	17
Potts Creek	0	0	13	13	0	0	11	11
Beason Creek	0	0	2	2	0	0	0	0
TOTAL	6	41	96	143	1	22	38	61

[a] Intercepted by the preliminary design construction limits.

[b] Perennial crossings.

[c] Although identified during the Preferred Alternative stream delineations, Streams 1-1 and 1-2 are outside of the western project limits and were therefore not included in this total.

[d] No impact due to bridging.

Table 4-19(c)

STREAM IMPACTS FOR THE PREFERRED ALTERNATIVE

CATEGORY OF IMPACT	CORRIDOR-WIDE [a]	PROPOSED RIGHT-OF-WAY LIMIT IMPACTS [b]	PROPOSED CONSTRUCTION LIMIT IMPACTS [b]
Perennial Streams	63,420 feet	12,347 feet	9,148 feet
Intermittent Streams	51,636 feet	11,707 feet	9,241 feet
TOTAL Streams	115,056 feet	24,054 feet	18,389 feet
Length to be Mitigated [c]	N/A	21,940 feet	16,786 feet

[a] Portion of stream within Preferred Alternative corridor; some or all of stream may be outside of construction limits and would therefore not be impacted.

[b] Based on NEPA/404 Concurrence Point #4 discussions.

[c] Represents the quantity of impact to be mitigated, not the quantity of mitigation to be provided. Mandated mitigation ratios may require that a greater quantity of the resource be provided as a replacement. These totals are based on a May 15, 2001 Steve Lund (US ACOE) email and minutes of a June 13, 2001 field meeting with Steve Lund.

"DA" type streams are highly interconnected, very gently sloped channel systems associated with broad unconfined valleys with well-developed floodplains. "DA" channels are characteristic of these broad flat valleys, or river deltas with multiple stable channels through marshes.

"E" type streams are gently to moderately sloped, relatively deep and narrow slightly entrenched channels with high sinuosity. "E" type channels are characterized by riffle-pool sequences and well-defined meanders.

"F" type streams are gently sloped, relatively wide and shallow, highly entrenched channels with moderate sinuosity. "F" type channels are characterized by the lack of a developed floodplain, a meandering channel, and terraces consisting of abandoned floodplains.

"G" type streams are moderately to gently sloped, relatively deep and narrow, highly entrenched, moderately to highly sinuous channels. "G" type channels are characterized by the lack of a developed floodplain, a meandering channel, and terraces consisting of abandoned floodplains.

Based on these criteria, six channel types were identified within the Preferred Alternative corridor: A, B, C, E, F, and G. The G, A, F and B type channels are the most frequently occurring types. The terrain is highly dissected in some areas, with the streams flowing in the bottom of ravines that range from ten feet to more than 30 feet deep. Other areas are broad rolling hills and wide valleys. The sinuosity of many of the smaller streams within the incised ravines was often greater than the sinuosity of the ravine, indicative of a stream in the process of returning to equilibrium conditions.

The high incidence of G and F type channels indicates that these streams are probably not currently stable and are likely undergoing excessive down-cutting and bank erosion. The study area is within an area that has been impacted in the past by deforestation and agricultural practices, and is currently undergoing urbanization in sections. All of these factors contribute to increased runoff and flashiness of the streams which increases erosive forces on the channels.

The E type channels may be stable in this region but are vulnerable to disturbance, and easily destabilized. The non-entrenched C type channels, such as Sandy Run Creek and some unnamed tributaries to the First Broad River, tend to be larger in size than the entrenched features and tend to exhibit more natural channel geometry.

Stream relocations are required for the Preferred Alternative (see "Stream Modifications" section, below). Coordination with the US Fish and Wildlife Service (USFWS) and the NC Wildlife Resources Commission (NCWRC) will be in accordance with mandates expressed in the Fish and Wildlife Coordination Act [72 Stat. 563, as amended; 16 USC 661 et seq. (1976)].

Floodplains, Floodways, and Stream Modifications. This section provides a summary of project impacts relating to the floodplains and floodways within the study area. A Hydraulic Technical Memorandum for this project on file at the North Carolina Department of Transportation describes the analysis methodology and results in greater detail.

Proposed Drainage Structures - Exhibit 4-2 shows the location of the proposed drainage structures for the subject project. Table 4-20(a) indicates the anticipated bridge crossings for each Tier 2 detailed study alternative, based on studies performed during the DEIS. Table 4-20(b) indicates the proposed major culverts for each Tier 2 detailed study alternative; a "major" culvert is defined as a 60-inch or larger pipe or correspondingly sized box culvert. These structure sizes were based on generalized planning-level data.

Table 4-20(a)

SUMMARY OF BRIDGE WATERWAY CROSSINGS FOR TIER 2 DETAILED STUDY ALTERNATIVES

SITE #	ALTERNATIVE	WATERWAY	DRAINAGE AREA (sq. mi.)	CALCULATED BRIDGE LENGTH (feet)	NOTES
B1A	1, 3, 7, 9	Brushy Creek/Little Creek	20	200	
B2	13, 15, 16, 18	Brushy Creek	21	240	
B3	19, 21*	Brushy Creek	26	295	
B4	19, 21*	First Broad River	227	315	
B5	1, 3, 7, 9	First Broad River	227	295	
B6	1, 7, 13, 16, 19	Buffalo Creek	116	275	
EB7	3, 9, 15, 18, 21*	Buffalo Creek	116	315	1, 2, 3
EB8	3, 9, 15, 18, 21*	Buffalo Creek	116	315	1, 2, 3
B7A	1, 7, 13, 16, 19	Muddy Fork Creek	45	205	

* Preferred Alternative

1 – Initial investigations during functional design for the ten Tier 2 detailed study alternatives indicated that the existing hydraulic opening would be adequate. This issue was investigated further during preliminary design for the Preferred Alternative; those investigations are reflected in Table 4-21(a).

2 – Bridge length indicated is the current bridge length.

3 – Bridge would require widening to accommodate additional lanes, service roads, etc.

Table 4-20(b)

SUMMARY OF MAJOR CULVERTS FOR TIER 2 DETAILED STUDY ALTERNATIVES

SITE #	ALTERNATIVE	WATERWAY	DRAINAGE AREA (mi^2)	CULVERT LENGTH, SIZE, & TYPE	
				Length and Size	Type
C1	1, 3, 7, 9	Sandy Run Creek Trib.	0.640	200' - 10' x 7'	RCBC
EC1	13, 15, 16, 18, 19, 21*	Sandy Run Creek Trib.	1.158	118' - 2 - 8' x 8' (1)	RCBC
C4	1, 3, 7, 9	Unnamed Creek	0.300	204' - 8' x 6'	RCBC
C5	1, 3, 7, 9	Beaverdam Creek	1.180	200' - 3 - 8' x 7' (2)	RCBC
C6	1, 3, 7, 9	Unnamed Creek	0.160	204' - 72" Ø	RCP
C7	1, 3, 7, 9	Unnamed Creek	0.080	208' - 60" Ø	RCP
C8	13, 15, 16, 18, 19, 21*	Unnamed Creek	0.160	206' - 66" Ø	RCP
C9	13, 15, 16, 18, 19, 21*	Beaverdam Creek	4.070	196' - 3 - 9' x 8' (2)	RCBC
C10	13, 15, 16, 18, 19, 21*	Unnamed Creek	0.100	182' - 60" Ø	RCP
C11	13, 15, 16, 18, 19, 21*	Unnamed Creek	0.070	208' - 60" Ø	RCP
C12	13, 15, 16, 18, 19, 21*	Unnamed Creek	0.750	200' - 2 - 7' x 7'	RCBC
C14	13, 15, 16, 18	Unnamed Creek	0.167	204' - 72" Ø	RCP
C15	19, 21*	Unnamed Creek	0.103	206' - 66" Ø	RCP
C16	13, 15, 16, 18	Brushy Creek Trib.	3.720	196' - 3 - 9' x 8'	RCBC
C16A	1, 3, 7, 9	Brushy Creek Trib.	2.023	196' - 2 - 9' x 8'	RCBC
C16B	1, 3, 7, 9	Brushy Creek Trib.	2.123	196' - 2 - 9' x 8'	RCBC
C17	13, 15, 16, 18	Unnamed Creek	0.236	200' - 7' x 7'	RCBC
C18	19, 21*	Unnamed Creek	0.063	208' - 60" Ø	RCP
C19	19, 21*	Unnamed Creek	0.119	206' - 66" Ø	RCP
C20	19, 21*	Unnamed Creek	0.144	206' - 66" Ø	RCP
C21	19, 21*	Unnamed Creek	0.428	200' - 8' x 7'	RCBC
C22	19, 21*	Unnamed Creek	0.084	208' - 60" Ø	RCP
C23	1, 3, 13, 15	Unnamed Creek	0.090	208' - 60" Ø	RCP
C24	7, 9, 16, 18	Unnamed Creek	0.097	206' - 66" Ø	RCP
C25	7, 9, 16, 18	Unnamed Creek	0.275	204' - 7' x 6'	RCBC
C26	1, 3, 13, 15	Unnamed Creek	0.210	204' - 6' x 6'	RCBC
C27	7, 9, 16, 18	Unnamed Creek	0.836	200' - 7' x 7'	RCBC
C28	1, 3, 13, 15	Unnamed Creek	0.010	208' - 60" Ø	RCP
C29	19, 21*	Unnamed Creek	0.173	204' - 72" Ø	RCP
C30	7, 9, 16, 18, 19, 21*	Hickory Creek Trib.	0.641	196' - 9' x 8'	RCBC
C31	1, 3, 13, 15	Unnamed Creek	0.337	200' - 7' x 7'	RCBC
C32	1, 3, 13, 15	Unnamed Creek	0.148	204' - 72" Ø	RCP
C33	1, 3, 13, 15	Unnamed Creek	0.108	204' - 72" Ø	RCP
C34	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	Unnamed Creek	0.080	208' - 60" Ø	RCP
C35	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	Unnamed Creek	0.136	204' - 72" Ø	RCP
C36	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	Unnamed Creek	0.120	208' - 60" Ø	RCP
C38	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	Unnamed Creek	0.222	204' - 7' x 6'	RCBC
C40	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	Unnamed Creek	1.161	200' - 2 - 7' x 7'	RCBC

Table 4-20(b)

SUMMARY OF MAJOR CULVERTS FOR TIER 2 DETAILED STUDY ALTERNATIVES

SITE #	ALTERNATIVE	WATERWAY	DRAINAGE AREA (mi^2)	CULVERT LENGTH, SIZE, & TYPE	
				Length and Size	Type
C41	1, 7, 13, 16, 19	Unnamed Creek	0.244	204' - 3 - 9' x 6'	RCBC
C42	1, 7, 13, 16, 19	Unnamed Creek	1.200	200' - 3 - 9' x 7'	RCBC
C44	3, 9, 15, 18, 21*	Unnamed Creek	0.347	200' - 7' x 7'	RCBC
C45A	1, 7, 13, 16, 19	Potts Creek	11.754	253' - 3 - 11' x 11'	RCBC

RCBC = reinforced concrete box culvert

Ø = diameter

Notes: - These data are subject to change based on future design.
- Major culverts are defined in this study as those 60 inches and larger.

(1) Represents existing culvert; length given is length needed to extend the culvert for roadway widening.

(2) Site identified during Tier 2 detailed alternative studies for possible bridging due to presence of adjacent wetlands.

Bridge and culvert sizes for the Preferred Alternative, based on the preliminary design roadway plans, are shown on Table 4-21(a) and (b), respectively. Investigations of the existing drainage structures on US 74 at Buffalo Creek indicated these structures are apparently not quite adequately sized to handle the anticipated design flows.

The No Build alternative drainage structures are those currently in existence along US 74; modification of these structures is not anticipated, except as would relate to routine maintenance (see Table 3-19 for a listing of these structures).

Floodplains - Encroachment on the 100-year floodplains of several study area streams is anticipated as a result of this project. Executive Order 11988 "Floodplain Management" prohibits floodplain infringements when uneconomic, hazardous, or incompatible land use of floodplains results. Any action within the limits of the floodplain that would involve a critical interruption of a necessary transportation facility, a substantial flood risk, or a sizeable adverse impact on the natural values of the floodplain would be considered as such an encroachment.

The impacts of the encroachment of drainage structures on the 100-year floodplain were assessed for this project through the use of hydraulic design techniques described in 23 CFR 650, Subpart A "Location and Hydraulic Design of Encroachment on Floodplains". Structures were sized to ensure that no increases to the extent and level of flood hazard risk would result from such encroachments. Therefore, none of the Tier 2 detailed study alternatives (including the Preferred Alternative) are anticipated to result in uneconomic, hazardous, or incompatible uses of any of the study area floodplains.

Table 4-21(a)

SUMMARY OF BRIDGE WATERWAY CROSSINGS FOR PREFERRED ALTERNATIVE (BASED ON PRELIMINARY DESIGN)

SITE # *	WATERWAY	DIRECTION	DRAINAGE AREA (sq. mi.)	SIZE OF STRUCTURE	
				Length (feet)	Width (feet)
B8 **	Beaverdam Creek	Eastbound	4	130	50
		Westbound	4	130	50
B3	Brushy Creek	Eastbound	24	339	50
		Westbound	24	339	50
B4	First Broad River	Eastbound	221	265	38
		Westbound	221	265	38
EB7	Buffalo Creek	Eastbound	116	363	50
EB8	Buffalo Creek	Westbound	116	363	50

* Refers to location on Exhibit 4-2.

** Also identified as Culvert Site C9 in the Tier 2 detailed study alternatives studies (see Table 4-20[b]). The culvert shown in Table 4-20(b) would be adequate hydraulically, based on the functional roadway design plans and the 1997 Hydraulic Technical Memorandum; however, bridging is now recommended as part of the avoidance and minimization measures established during NEPA/404 Concurrence Point #4.

Table 4-21(b)

SUMMARY OF MAJOR CULVERTS FOR PREFERRED ALTERNATIVE (BASED ON PRELIMINARY DESIGN)

SITE #	WATERWAY	DRAINAGE AREA (sq. mi.)	CULVERT LENGTH, SIZE AND TYPE	
			Length and Size	Type
EC1	Sandy Run Creek Tributary	1.3	40' - 2 - 8' x 8' (1)	RCBC
C12	Unnamed Creek	0.8	320' - 2 - 7' x 7'	RCBC
C19	Unnamed Creek	0.1	340' - 60" Ø	RCP
C20	Unnamed Creek	0.1	260' - 60" Ø	CSP
C21	Unnamed Creek	0.4	360' - 7' x 7'	RCBC
C29	Unnamed Creek	0.1	400' - 60" Ø	RCP
C30	Hickory Creek Tributary	0.5	220' - 7' x 7'	RCBC
C38	Unnamed Creek	0.3	300' - 7' x 7'	RCBC
C40	Unnamed Creek	0.6	390' - 2 - 6' x 6'	RCBC
C44	Unnamed Creek	0.4	290' - 7' x 7'	RCBC

RCBC = reinforced concrete box culvert
RCP = reinforced concrete pipe
CSP = corrugated steel pipe
Ø = diameter

Notes:

- Major culverts are defined in this study as those 60 inches and larger.
- Culvert Sites C8, C10, C11, C15, C18, C22, C34, C35, and C36, which were included on Table 4-20(b), will also still require drainage structures. However, those are now anticipated to be smaller than 60-inch, based on preliminary roadway design plans. Therefore, they are not included on this table.
- Culvert Site C9 (shown on Table 4-20(b)), which was identified during the functional design for the ten Tier 2 detailed study alternatives, is now proposed as a bridge as a result of NEPA/404 Concurrence Point #4 avoidance and minimization discussions (see Table 4-21(a)). From a hydraulic standpoint, it would at a minimum require a 210' - 3 - 9' x 9' RCBC.

(1) Represents existing culvert location; length given is length needed to extend the existing culvert.

The impact on flood hazard zones of future induced development due to the proposed project was also reviewed. At the current time, the project is envisioned as a controlled access freeway with interchanges only at major road crossings; these interchange locations would be the most likely areas for future development. Directional Bypass terminus interchanges would not be configured to accommodate any type of development and so were not considered. One of the proposed interchanges for the Preferred Alternative (Peachtree Road [SR 1162]) would be in a floodplain area and might require development restrictions due to the presence of potential flood hazard; however, it should be noted that other areas along existing US 74 already include pre-existing residential and commercial development within floodplain areas, so future restrictions would depend upon whether or not the city or county exercised floodplain zoning controls. None of the other proposed interchanges would be proximate to flood hazard areas.

Floodways - None of the floodplain crossings for the Tier 2 detailed study alternatives (including the Preferred Alternative) would impact any FEMA-regulated floodways.

Stream Modifications - In general, stream modifications are required in areas where the new roadway location disrupts the path of a crossing stream. To ensure that existing natural drainage patterns are maintained, the stream channel modification must provide conveyance similar to the original channel.

Stream bed modifications may include realignment, channelization, and rip-rap for major and minor crossings. The type of modifications required would be determined by the roadway alignment and elevation, watershed and floodplain size, and extent of natural channelization (i.e., single vs. multiple channel).

Two stream relocations were identified for the Preferred Alternative based on the preliminary roadway design for this alternative:

- A stream relocation will be required for the tributary of Buffalo Creek between SR 2063 and the Light Oak community. An approximately 1,100-foot segment of this stream will require relocation, most likely to the east of its existing location.
- A stream relocation will be required just to the west of Lithia Springs Road for a tributary of the First Broad River. This relocation is approximately 950 feet in length and will be to the north of the existing stream bed.

Another study area waterway having the potential for channelization/realignment would be the First Broad River. Due to the preponderance of oxbows along the portion of the river to the north of Shelby, the preliminary alternatives analyses focused on the viability of various corridor crossings of the oxbows, in some detail. These studies included a preliminary examination of soil stability for roadway construction in one of the oxbows and identification of engineering and environmental factors affecting the proposed preliminary alternatives. The Tier 2 detailed study alternatives in this area are based, in part, on an identified need to either: a) avoid the oxbows *and* parallel stream segment involvement; or b) pass through the middle of an oxbow and as nearly perpendicular to the natural channel crossing as possible. Since all of the Tier 2 alternatives (including the Preferred Alternative) were designed to meet those criteria, it is not anticipated channel modifications will be required at the First Broad River for the Preferred Alternative.

Required stream modifications would be made in consultation with the US Army Corps of Engineers, US Fish and Wildlife Service, and the Department of Environment and Natural Resources, Division of Water Quality Division and NC Wildlife Resources Commission.

Water Quality. Water quality impacts for surface waters and groundwater, including wastewater discharger effects, are summarized below.

Surface Waters – Resident aquatic species may be temporarily displaced during construction activities; however, anticipated impacts are expected to be minor and temporary. Measures to maximize sediment and erosion control during construction in project area streams and adjacent floodplain wetlands will be implemented to protect water quality for aquatic organisms.

Streams which are crossed by the highway corridor will be temporarily and locally impacted by road construction. The primary sources of long-term water quality degradation in the project area are industrial waste discharge, municipal waste discharge, and non-point source discharge from agricultural practices. Long-term impacts to streams as a result of road construction are expected to be negligible.

The waters directly west of Moss Lake (also known as Kings Mountain Reservoir) that are within the corridors for the Tier 2 detailed study alternatives (including the Preferred Alternative corridor) are adjacent to the WQCA watershed area; however, the watershed critical area will be avoided. The WS-III CA waters within these corridors are protected as a water supply for Kings Mountain and Shelby. WS-III rules state that "construction of new roads and bridges should minimize built upon area, divert stormwater away from surface water supply waters as much as possible, and employ best management practices to minimize water quality impacts." The NC 150 interchange locations for all of the Tier 2 detailed study alternatives (including the Preferred Alternative) would be within approximately 0.5 mile of the WQCA. Due to stringent prohibitions

on future development in the WQCA, any development along NC 150 would be limited to areas along NC 150 to the west of the WQCA.

The First Broad River is also a water supply source, and is crossed by all of the Tier 2 detailed study alternatives upstream of the City of Shelby water intake. Its water classification is WS-IV CA, indicating that Sedimentation Pollution Control Act Design Standards in Sensitive Waters will also be employed on the First Broad River and any of its upstream tributaries which are crossed by the Preferred Alternative.

The NCDOT document, Best Management Practices for Protection of Surface Waters, specifies best management practices which will be used to protect surface waters potentially affected by transportation projects. Temporary construction impacts due to erosion and sedimentation will be minimized through implementation of a stringent erosion control schedule and use of best management practices. The contractor will be required to follow contract specifications pertaining to erosion control measures (as outlined in 23 CFR 650, Subpart B and Article 107-13) entitled Control of Erosion, Siltation, and Pollution (NCDOT, Specifications for Roads and Structures). These measures include the following, as applicable:

Use of dikes, berms, silt basins, and other containment measures to control runoff during construction. Regular maintenance and inspection of these structures is recommended to insure effectiveness.

Elimination of construction staging areas in floodplains or adjacent to streams and tributaries will help reduce the potential for petroleum contamination or discharges of other hazardous materials into receiving waters.

Rapid re-seeding of disturbed sites helps alleviate sediment loadings and reduce runoff. Increased runoff from new highway surfaces can be partially mitigated by providing for grassed road shoulders and limited use of ditching.

Careful management and use of herbicides, pesticides, de-icing compounds, or other chemical constituents will minimize potential negative impacts on water quality. Roadside maintenance crews should be well versed in the use of these chemicals.

Avoid direct discharges into streams whenever feasible. Runoff effluent should be allowed to filter through roadside vegetation in order to remove contaminants and to minimize runoff velocities.

Wastewater - None of the 8 National Pollution Discharge Elimination System (NPDES) individual permit sites or 29 general permit sites located within the study area (see Section 3.12.3) would be substantially impacted by any of the Tier 2 detailed study alternatives (including the Preferred Alternative). Table 4-22 indicates the locations of the more proximate (i.e., within 1.0 mile) sites relative to the nearest alternatives. The primary concern in terms of proximity of NPDES sites to the alternatives would be the cumulative effects of roadway runoff in addition to the currently discharged pollutants at the NPDES site; either pollutants discharged from a site sufficiently upstream of the proposed highway or roadway runoff flowing toward an NPDES site sufficiently downstream of the proposed highway are likely to be diluted enough to not result in excessive pollutant concentration.

Table 4-22
NPDES PERMIT SITES PROXIMATE TO TIER 2 DETAILED STUDY ALTERNATIVES †

Site ID on Exhibit 3-14	Permit Number (DWQ)	Permit Number (EPA)	Facility	Alternative(s)	Discharger Location Relative to Alternative(s)
1	---	NCG170071	Artee Wrapspun	13, 15, 16, 18, 19, 21*	Within corridor
3	NCG050132	NCG050132	Azdel, Inc.	1, 3, 7, 9	0.5 mile U
4	NCG030091	NCG030091	Baldor Electric Company (Reliance)	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.2 mile U
5	NCG020095	NCG020095	Buffalo Valley Mine	3, 9, 15, 18, 21*	Within corridor
6	NCG080700	NCG080700	City of Shelby Vehicle Maintenance Facility	19, 21*	1.0 mile D
13	NCG140134	NCG140134	Dedmon's Transit Concrete Mix	19, 21*	1.0 mile D
15	---	NCG170178	Doran Mills, LLC	19, 21*	1.0 mile D
18	---	NCG040261	Glaize Components	13, 15, 16, 18	0.5 mile D
				19, 21*	0.2 mile D
21	NCG080778	NCG080778	Republic Services of NC, LLC	7, 9, 16, 18	0.4 mile D
22	NCG550065	NCG550065	Roger Dixon Residence	1, 3, 13, 15	0.2 mile D
				7, 9, 16, 18, 19, 21*	0.2 mile U
25	NCG500121	NCG500121	Shelby Yarn Company	19, 21*	0.7 mile D
29	NCG140340	NCG140340	Wellington Hamrick	7, 9, 16, 18	0.8 mile D
A	NC0027197	NC0027197	City of Shelby WTP	19, 21*	1.0 mile D
C	NC0020737	NC0020737	Pilot Creek WWTP (Kings Mountain)	1, 7, 13, 16, 19	0.5 mile D
				3, 9, 15, 18, 21*	0.1 mile D
D	NC0004685	NCG070015	PPG Industries Fiber Glass Products	1, 3, 7, 9	0.6 mile D
F	NC0005061	NCG050170	Smurfit - Stone Container Enterprises	1, 3, 7, 9	Within corridor
G	NC0042293	NC0042293	Specialty Lighting	1, 3, 7, 9	0.4 mile D
				13, 15, 16, 18, 19, 21*	0.2 mile U

† Proximity is determined by distance upstream or downstream along receiving water, not by actual location of discharger site relative to alternative(s).

* Preferred Alternative D = Downstream U = Upstream

Stormwater runoff or toxic spills from the proposed bypass could exacerbate the water pollution effects in the vicinity of the NPDES sites identified above, however, the location of the roadway would be designed to minimize the effect of runoff on adjacent surface waters.

The No Build alternative is located less than one mile from Site C (site is upstream) and Site 20 (site is downstream). The remaining sites would be far enough away to minimize the possibility of excessive pollutant concentrations. As with the Tier 2 detailed study alternatives, pollutant concerns would increase in the case of a toxic spill on existing US 74.

Groundwater Resources - The proposed project is expected to produce minimal impacts to groundwater resources. Private wells not immediately involved in the project right-of-way are not likely to sustain serious impact.

4.13 JURISDICTIONAL ISSUES

4.13.1 Wetlands and Surface Waters

DEIS Studies. The proposed facility will impact existing jurisdictional areas. Jurisdictional areas estimated for the Tier 2 detailed study alternatives during the DEIS are shown on a site-by-site basis in Table 4-23(a); these were prorated to approximate actual takings based on right-of-way rather than corridor-wide areas (which were indicated in Table 3-21). The total jurisdictional impacts within each of the Tier 2 detailed study alternatives (including the Preferred Alternative), based on the sites listed on Table 4-23(a), are quantified in Table 4-23(b) and are shown on Exhibit 3-13.

Table 4-23(a)

PROJECTED IMPACTS TO SURFACE WATER / WETLAND SITES FOR TIER 2 DETAILED STUDY ALTERNATIVES

SITE #	STREAM NAME (1)	TYPE OF SITE			ALTERNATIVE(S)	IMPACTED AREA OF SITE (4) (acres)
		Wetland	POW (2)	Surface Waters (3)		
1	UT of Sandy Run			X	1, 3, 7, 9	0.124
2	UT of Beaverdam Creek			X	1, 3, 7, 9	0.279
3	UT of Beaverdam Creek			X	1, 3, 7, 9	0.148
3W **	UT of Beaverdam Creek	X			1, 3, 7, 9	0.321
4	UT of Beaverdam Creek			X	1, 3, 7, 9	0.025
5	UT of Beaverdam Creek			X	1, 3, 7, 9	0.057
5P	UT of Beaverdam Creek		X		1, 3, 7, 9	0.346
6	UT of Beaverdam Creek			X	1, 3, 7, 9	0.057
7	UT of Brushy Creek			X	1, 3, 7, 9	0.025
8	Brushy Creek			X	1, 3, 7, 9	0.279
9	UT of Brushy Creek			X	13, 15, 16, 18	0.190
9A	UT of Brushy Creek			X	1, 3, 7, 9	0.044
9B	UT of Brushy Creek			X	1, 3, 7, 9	0.077
10	First Broad River			X	1, 3, 7, 9, 13, 15, 16, 18	0.934
11	UT of First Broad River			X	1, 3, 7, 9	0.264
12	UT of First Broad River			X	1, 3, 7, 9, 13, 15, 16, 18	0.025
13	UT of First Broad River			X	1, 3, 7, 9, 13, 15, 16, 18	0.025
14	UT of First Broad River			X	1, 3, 7, 9, 13, 15, 16, 18	0.057
14P	UT of First Broad River		X		1, 3, 7, 9, 13, 15, 16, 18	0.452
15	UT of First Broad River			X	1, 3, 13, 15	0.783
16	UT of Long Creek			X	1, 3, 13, 15	0.007
17	UT of Long Creek			X	1, 3, 13, 15	0.002
18	UT of Long Creek			X	1, 3, 13, 15	0.032
19	UT of Long Creek			X	1, 3, 13, 15	0.017
19P	UT of Long Creek		X		1, 3, 13, 15	0.907
20	UT of Long Creek			X	1, 3, 13, 15	0.007
21	UT of Kings Mountain Reservoir			X	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.017
22	UT of Kings Mountain Reservoir			X	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.007
23	UT of Kings Mountain Reservoir			X	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.017
25	UT of Buffalo Creek			X	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.116
26	UT of Buffalo Creek			X	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.042
26P	UT of Buffalo Creek		X		1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.403
27	UT of Buffalo Creek			X	3, 9, 15, 18, 21*	0.082
28	Buffalo Creek			X	1, 7, 13, 16, 19	0.180

Table 4-23(a)

PROJECTED IMPACTS TO SURFACE WATER / WETLAND SITES FOR TIER 2 DETAILED STUDY ALTERNATIVES

SITE #	STREAM NAME (1)	TYPE OF SITE			ALTERNATIVE(S)	IMPACTED AREA OF SITE (4) (acres)
		Wetland	POW (2)	Surface Waters (3)		
28W	Buffalo Creek	X			1, 7, 13, 16, 19	0.526
29	UT of Buffalo Creek			X	1, 7, 13, 16, 19	0.477
30	Buffalo Creek			X	1, 7, 13, 16, 19	0.452
31	UT of Sandy Run			X	13, 15, 16, 18, 19, 21*	0.101
35	UT of Beaverdam Creek			X	13, 15, 16, 18, 19, 21*	0.032
36	UT of Beaverdam Creek			X	13, 15, 16, 18, 19, 21*	0.067
37	Beaverdam Creek			X	13, 15, 16, 18, 19, 21*	0.190
37W **	Beaverdam Creek	X			13, 15, 16, 18, 19, 21*	2.365
38	UT of Beaverdam Creek			X	13, 15, 16, 18, 19, 21*	0.148
39	UT of Beaverdam Creek			X	13, 15, 16, 18, 19, 21*	0.017
40	UT of Little Creek			X	13, 15, 16, 18	0.049
41	Brushy Creek			X	19, 21*	0.304
42	Brushy Creek			X	19, 21*	0.551
43	UT of Brushy Creek			X	19, 21*	0.205
44	First Broad River			X	19, 21*	0.413
45	UT of First Broad River			X	19, 21*	0.032
46	UT of First Broad River			X	19, 21*	0.032
46P	UT of First Broad River		X		19, 21*	0.363
47	UT of First Broad River			X	19, 21*	0.042
48	UT of First Broad River			X	19, 21*	0.025
49	UT of First Broad River			X	19, 21*	0.025
49P	UT of First Broad River		X		19, 21*	0.106
50	UT of Hickory Creek			X	7, 9, 16, 18, 19, 21*	0.032
50P	UT of Hickory Creek		X		7, 9, 16, 18, 19, 21*	0.106
51	UT of Hickory Creek			X	7, 9, 16, 18, 19, 21*	0.057
52	UT of Hickory Creek			X	7, 9, 16, 18, 19, 21*	0.032
52P	UT of Hickory Creek		X		7, 9, 16, 18, 19, 21*	0.734
53	UT of Kings Mountain Reservoir			X	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.007
54	UT of Buffalo Creek			X	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.017
55	UT of Buffalo Creek			X	1, 3, 7, 9, 13, 15, 16, 18, 19, 21*	0.025
58	UT of Buffalo Creek			X	3, 9, 15, 18, 21*	0.124
60	UT of Buffalo Creek			X	3, 9, 15, 18, 21*	0.025
61	Buffalo Creek			X	3, 9, 15, 18, 21*	0.205
62	UT of Buffalo Creek			X	3, 9, 15, 18, 21*	0.005

Table 4-23(a)

PROJECTED IMPACTS TO SURFACE WATER / WETLAND SITES FOR TIER 2 DETAILED STUDY ALTERNATIVES

SITE #	STREAM NAME (1)	TYPE OF SITE			ALTERNATIVE(S)	IMPACTED AREA OF SITE (4) (acres)
		Wetland	POW (2)	Surface Waters (3)		
63	UT of Potts Creek			X	3, 9, 15, 18, 21*	0.005
64	UT of Potts Creek			X	3, 9, 15, 18, 21*	0.002
82	Brushy Creek			X	13, 15, 16, 18	0.437
83	UT of First Broad River			X	7, 9, 16, 18	0.106
84	UT of Beaverdam Creek			X	13, 15, 16, 18, 19, 21*	0.017
85	UT of First Broad River			X	13, 15, 16, 18	0.049
86	First Broad River			X	19, 21*	0.289
87	UT of Potts Creek			X	1, 7, 13, 16, 19	0.049
88	UT of Potts Creek			X	1, 7, 13, 16, 19	0.017
89	UT of Potts Creek			X	1, 7, 13, 16, 19	0.007
89P	UT of Potts Creek		X		1, 7, 13, 16, 19	0.329
90	UT of Potts Creek			X	1, 7, 13, 16, 19	0.032
91	Muddy Fork			X	1, 7, 13, 16, 19	0.264
92	Potts Creek			X	1, 7, 13, 16, 19	0.173

(1) UT = Unnamed tributary
(2) POW = Palustrine Open Water (ponds and impoundments) (current terminology is PUB)
(3) Stream crossing
(4) Area of site is prorated to approximate right-of-way impacts.

* Preferred Alternative.
** If a part of the Preferred Alternative, site would be considered for bridging.

Note: See Tables 4-20(a) and 4-20(b) for the bridges and culverts proposed for the major waterway crossings for the DEIS analysis.

Table 4-23(b)

SUMMARY OF SURFACE WATER/WETLAND IMPACTS BY TIER 2 DETAILED STUDY ALTERNATIVE

ALTERNATIVE	SURFACE WATER/WETLAND IMPACTS[1]			
	Wetlands[2] (acres)	POW[3] (acres)	Surface Waters[4] (acres)	Bridged Wetlands (acres)
1	0.53	2.44	5.16	0.32
3	0.00	2.11	3.94	0.32
7	0.53	2.36	4.50	0.32
9	0.00	2.03	3.28	0.32
13	0.53	2.09	5.13	2.37
15	0.00	1.76	3.92	2.37
16	0.53	2.02	4.47	2.37
18	0.00	1.69	3.26	2.37
19	0.53	2.04	4.50	2.37
21 (Preferred)	0.00	1.71	3.28	2.37

[1] Data was generated from corridor-wide data, and is prorated to approximate right-of-way impacts.
[2] This would currently be considered as mitigable impact. Data reflect bridging of either of two Beaverdam Creek wetland sites identified on the project (Sites 3W and 37W). [3] Palustrine Open Water (ponds and impoundments; current terminology is PUB).
[4] Stream crossings.

Study area wetlands identified during the DEIS are concentrated within riparian fringes of streams. Three sites were identified during this stage of the project. Beaverdam Creek (Site #37) and an unnamed tributary to Buffalo Creek (Site #28) both involve surface water systems bordered by palustrine wetlands. The Beaverdam Creek crossing would be impacted by Alternatives 13, 15, 16, 18, 19, and 21 (Preferred) and would include approximately 2.56 acres

of fill in wetlands (including surface waters). The unnamed tributary to Buffalo Creek crossing would be impacted by Alternatives 1, 7, 13, 16, and 19 and would include approximately 0.71 acre of fill in wetlands (including surface waters). The third wetland identified, associated with an unnamed tributary of Beaverdam Creek (Site #3), would be impacted by Alternatives 1, 3, 7, and 9; this would include approximately 0.47 acre of wetlands (including surface waters).

Wetland Delineation for Preferred Alternative Corridor. Jurisdictional wetlands within the Preferred Alternative corridor are primarily palustrine in nature, as defined in Cowardin et al. (1979) and as identified on NWI mapping. Wetland systems vary in vegetative composition depending on hydrological regime and site specific disturbances. Wetlands within the Preferred Alternative corridor have been disturbed and altered to some extent such that special modifiers denoting particular disturbance factors were not utilized in this classification scheme, except where necessary to differentiate communities. Four wetland types were identified within the Preferred Alternative corridor: palustrine emergent; palustrine forested; palustrine scrub-shrub; and palustrine unconsolidated bottom:

> *Palustrine Emergent (PEM)* – These areas are identified as jurisdictional areas vegetated with emergent vegetation that is present for most of the growing season and are palustrine in nature. Two types of palustrine emergent wetlands exist within the project study area; PEM1 is characterized as having persistent vegetation, while PEM2 is characterized as having nonpersistent vegetation. Typical vegetation within this wetland type varies throughout the project study area but is generally limited to erect, rooted, herbaceous hydrophytes (excluding mosses and lichens) including soft rush (*Juncus effusus*), microstegium (*Microstegium vimineum*), cattail (*Typha latifolia*), Virginia bugleweed (*Lycopus virginicus*), and various sedges (*Carex sp*). These wetlands are generally small in size, with persistent vegetation and hydrologic regimes ranging from seasonally to semi-permanently flooded.
>
> *Palustrine Forested (PFO)* – These areas are identified as forested jurisdictional wetlands which are palustrine in nature. Typical vegetation found within this type of wetland consists of red maple (*Acer rubrum*), chinese privet (*Ligustrum sinense*), black willow (*Salix nigra*), tag alder (*Alnus serrulata*), and ironwood (*Carpinus caroliniana*). One

type of palustrine forested area dominates the project study area, PFO1, which is characterized as deciduous hardwood communities. These forested wetlands are primarily found in floodplain areas associated with Beaverdam and Brushy Creek.

Palustrine Scrub-Shrub (PSS) – These areas are identified as jurisdictional wetlands that are palustrine in nature and dominated by woody vegetation less than 20 feet in height. One general wetland forest type is present, PSS1, which is characterized as deciduous communities. Typical vegetation found within this type of wetland consists of red maple, river birch (*Betula nigra*), giant cane (*Arundinaria gigantea*), black willow, and tag alder. Hydrologic regimes exhibited in these areas range from saturated to semi-permanently flooded. Because these areas are quickly revegetated, they can still receive and process upland runoff and stream floodwaters, which relates to high values for sediment stabilization, sediment/toxicant retention, nutrient removal/transformation, and flood flow alteration. However, wildlife values are generally considered low due to the density of the shrub vegetation and the lack of canopy and understory structure.

Palustrine Unconsolidated Bottom (PUB) – These areas are identified as jurisdictional wetlands that are palustrine in nature and typically consist of excavated borrow pits or impoundments with unknown bottom textures. Vegetation within these areas is generally limited to an herbaceous fringe. Hydrologic regimes within this wetland type are generally permanently flooded. These wetlands provide little function due to their small size, limited distribution, and lack of continuity with other wetland communities. These wetlands may provide higher water quality enhancement functions if they occupy a landscape position to intercept large amounts of upland runoff and act as retention ponds.

Exhibit 4-3 shows the delineated wetland sites for the Preferred Alternative. Table 4-24(a) lists characteristics for each individual wetland system located within the Preferred Alternative corridor. Table 4-24(b) indicates the overall jurisdictional wetland impacts for the Preferred Alternative, both within the entire corridor and the actual impacted areas based on the preliminary roadway design plans.

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Table 4-24(a)
WETLAND SYSTEMS WITHIN THE PREFERRED ALTERNATIVE CORRIDOR

Number	Wetland Type [a]	WETLAND SIZE [b] (acres)	Riverine / Non-Riverine	SCORE		Relative Function	Relative Value	Wetland Quality
				ESI	DWQ			
1	PSS1	0.23	NR	9.3	16	Low	Low	Low
2 A, B, C, D	PFO1	0.02	R	11.3	17	Low	Low	Low
3 A, B	PEM1	0.12	R	11.0	58	Low	High	Medium
4	PEM1	0.13	R	20.3	31	Medium	Medium	Medium
5 A, B, C, D	PFO1	0.50	NR	12.4	32	Low	Medium	Low
6 A, B	PFO1	0.49	NR	12.4	32	Low	Medium	Low
7 C	PSS1	0.27	R	16.6	22	Low	Low	Low
8 A, B	PSS1	1.20	R	21.6	47	Medium	Medium	Medium
9	PFO1	0.08	R	18.8	20	Low	Low	Low
10	PEM1	0.03	R	12.7	13	Low	Low	Medium
11	PFO1	0.01	R	9.6	13	Low	Low	Low
12 A, B, C, D, E, F, G	PEM1	0.67	R	19.4	13	Low	Low	Low
13	PFO1	0.13	R	21.5	28	Medium	Medium	Medium
14 A, B	PFO1	0.06	R	12.2	15	Low	Low	Low
15 A, B	PFO1	0.38	R	18.6	37	Low	Medium	Medium
16	PFO1	0.29	R	21.2	41	Medium	Medium	Medium
17	PFO1	0.13	R	17.1	29	Low	Medium	Low
18 A, B	PEM1	0.01	R	8.0	13	Low	Low	Medium
19 A, B, C, D	PSS1	0.10	R	20.5	40	Medium	Medium	Medium
20	PFO1	0.19	R	16.8	34	Low	Medium	Low
21	PFO1	0.03	R	9.6	19	Low	Low	Low
22 A, B	PSS1	2.05	NR	13.3	13	Low	Low	Low
23	PEM2	0.05	R	9.3	20	Low	Low	Low
24	PFO1	0.02	NR	16.1	27	Low	Medium	Low
25 A, B, C, D, E	PFO1	0.05	R	9.2	23	Low	Low	Low
26 A, B	PFO1	0.03	R	18.3	27	Low	Medium	Low
27 A, B	PFO1	0.05	R	8.2	15	Low	Low	Low
28	PFO1	0.02	R	13.9	19	Low	Low	Low
29 A, B	PFO1	0.01	R	15.6	12	Low	Low	Low
30	PEM1	0.05	R	12.0	27	Low	Medium	Medium
31 A, B, C	PEM1	0.03	R	11.3	21	Low	Low	Low
32 A, B, C. D	PFO1	1.22	R	20.9	32	Medium	Medium	Medium
33	PFO1	0.42	R	20.9	28	Medium	Medium	Medium
34 A, B, C, D	PFO1	0.10	R	12.2	19	Low	Low	Low
35 A, B, C	PFO1	0.09	R	21.5	23	Medium	Low	Low
36	PEM1	0.11	R	11.3	28	Low	Medium	Low
37	PFO1	0.17	R	15.7	19	Low	Low	Low
38	PFO1	0.20	R	21.4	34	Medium	Medium	Medium
39	PFO1	1.56	R	26.8	24	Medium	Low	Medium

Table 4-24(a)
WETLAND SYSTEMS WITHIN THE PREFERRED ALTERNATIVE CORRIDOR

Number	Wetland Type [a]	WETLAND SIZE [b] (acres)	Riverine / Non-Riverine	SCORE		Relative Function	Relative Value	Wetland Quality
				ESI	DWQ			
40	PFO1	0.02	R	13.3	28	Low	Medium	Low
41	PFO1	0.92	R	26.0	32	Medium	Medium	Medium
42	PSS1	0.04	R	14.3	19	Low	Low	Low
43	PFO1	0.02	R	8.9	19	Low	Low	Low
44	PFO1	0.01	R	9.6	24	Low	Low	Low
45	PSS1	0.04	R	17.1	24	Low	Low	Low
46 A, B	PFO1	0.06	R	14.6	19	Low	Low	Low
47 A, B, C, D	PFO1	0.06	R	6.4	24	Low	Low	Low
48 A, B	PFO1	0.08	NR	15.0	20	Low	Low	Low
49	PFO1	0.04	NR	15.0	20	Low	Low	Low
50	PFO1	0.01	R	15.4	24	Low	Low	Low
51 A, B	PFO1	0.18	R	15.4	24	Low	Low	Medium
52	PFO1	0.09	R	15.4	24	Low	Low	Low
53	PEM1	0.24	R	9.2	38	Low	Medium	Low
54 A, B	PFO1	0.02	R	14.3	29	Low	Medium	Low
55	PEM2	0.02	NR	5.7	18	Low	Low	Low
56 A, B	PSS1	0.01	R	15.2	29	Low	Medium	Low
57 A, B	PFO1	0.04	R	14.2	28	Low	Medium	Low
58 A, B	PSS1	0.62	R	22.3	28	Medium	Medium	Medium
59	PFO1	0.01	R	12.4	28	Low	Medium	Medium
60	PFO1	0.03	R	12.4	28	Low	Medium	Low
61 A, B, C	PFO1	0.05	R	8.3	28	Low	Medium	Low
62	PFO1	0.04	R	12.4	28	Low	Medium	Low
63	PFO1	0.08	R	14.1	33	Low	Medium	Low
64	PFO1	0.01	R	14.1	33	Low	Medium	Low
65	PSS1	0.04	R	13.4	28	Low	Medium	Low
66	PFO1	0.02	R	12.1	33	Low	Medium	Low
67	PFO1	0.05	R	12.1	33	Low	Medium	Low
68	PFO1	0.02	R	12.1	33	Low	Medium	Low
69 A, B	PEM2	0.02	NR	5.6	17	Low	Low	Low
70	PFO1	0.05	R	10.9	28	Low	Medium	Low

Note: Location for each system is shown on Exhibit 4-3.

[a] Wetland types are as follows:
PEM1 = Palustrine, emergent, persistent
PEM2 = Palustrine, emergent, nonpersistent
PFO1 = Palustrine forested, broad-leaved deciduous
PSS1 = Palustrine scrub-shrub, broad-leaved deciduous

[b] Area of portion of wetland system within Preferred Alternative corridor; some or all of area may be outside of construction limits and would therefore not be impacted.

Table 4-24(b)

JURISDICTIONAL WETLAND IMPACTS FOR THE PREFERRED ALTERNATIVE [a]

CATEGORY OF WETLAND IMPACT	CORRIDOR-WIDE AREA (acres) [b]	PROPOSED RIGHT-OF-WAY LIMIT IMPACT AREA (acres)	PROPOSED CONSTRUCTION LIMIT IMPACT AREA (acres)
PSS1	4.600	1.340	1.160
PFO1	8.160	1.514	0.999
PEM1	1.366	0.216	0.214
PEM2 [a]	0.090	0.050	0.020
TOTAL [a]	14.216	3.120	2.393
Mitigable	N/A	3.070	2.373

[a] Impacts include wetlands proposed for bridging.
[b] Area of portion of wetland system within Preferred Alternative corridor; some or all of area may be outside of construction limits and would therefore not be impacted.

The wetlands for the Preferred Alternative were identified in the field using strict delineation methods and preliminary design plans, in lieu of the generalized determination method and prorating of corridor-wide impacts to approximate right-of-way width used for the ten Tier 2 detailed study alternatives. Therefore, the Preferred Alternative delineation yielded different results than the determination; the delineation yielded 3.070 acres of mitigable impact within the proposed project right-of-way limits rather than zero acres (see Exhibit 4-3), and an additional 0.050 acre bridged in conjunction with the hydraulically required bridging at Brushy Creek. Construction limit impacts were also computed for the wetlands, which included 2.373 acres of impacted wetlands and 0.020 acre of bridged wetlands at Brushy Creek. No wetlands savings were realized through the bridging of Beaverdam Creek, due to the fact that the actual delineated wetlands location and size was somewhat different than the site determined during the DEIS investigations. It is understood that delineation, being the more detailed approach, often results in

the identification of a greater amount of wetlands than does a determination. Determinations typically result in the identification of larger wetland systems adjacent to streams, but tend to overlook smaller and/or more isolated wetlands. Since the overall corridor-wide delineation total was 14.216 acres, only 22 percent of the wetlands within the corridor are actually impacted, although the minimum required right-of-way width would occupy at least one-third of the corridor. This relatively low wetland taking is indicative of successful avoidance and minimization techniques, and the Preferred Alternative remains competitive in terms of wetlands takings.

Two methods were used to assess wetland value and function for the wetlands within the Preferred Alternative corridor:

- The NC Department of Environment and Natural Resources Division of Water Quality (DWQ) method, which uses the Guidance for Rating the Values of Wetlands in North Carolina: Fourth Version (DEHNR [now DENR] 1995), rates wetlands according to six functional attributes: water storage, bank/shoreline stabilization, pollutant removal, wildlife habitat, aquatic life value, and recreational/educational value. For this study, scores of 50 or higher indicated high value; 26 to 50 were medium value; and 25 or lower was low value.

- Environmental Services, Inc. (ESI), an environmental consulting firm, designed a system of functional analysis based on hydrologic, biogeochemical, plant habitat, and animal habitat factors. For the purposes of this study, scores of 31.0 or higher indicated high function; 20.0 to 30.9 indicated medium function; and 19.9 or lower indicated low function.

These ratings for each wetland area identified within the Preferred Alternative corridor are indicated in Table 4-24(a). This table also provides a wetland quality rating for each site, which represents a composite of the DWQ and ESI scores and professional judgment and expertise. The data indicate there are no wetland systems within the project study area that exhibit high function

or high value. Wetlands with intact vegetation, in suburban and/or large agricultural areas, and associated with streams generally exhibited medium DWQ value and low functional scores. Wetlands that are small in size and not associated with streams generally exhibited low function and low value, except for wetlands 5 A-D and 6 A and B (which each scored a medium value).

Wetlands receiving medium scores in both function and value were generally larger wetland systems (>0.10 acre) and were associated with streams.

Most of the remaining wetlands exhibit low function and value. These systems generally are associated with streams, however these wetlands are small in size, with no apparent connection to surrounding wetlands and are isolated from urban areas, limiting their pollutant removal value. These wetlands are generally depressional areas along streams with very little intact vegetation. Most of these wetlands have been highly disturbed by cattle traveling to and from the associated streams.

Permits. The National Environmental Policy Act of 1969 (NEPA) prescribes coordination and cooperation among agencies and with the public. The Act requires agencies, such as the Federal Highway Administration (FHWA), to solicit the participation of other Federal agencies having jurisdiction by law and to make a diligent effort to involve the public in the NEPA decision making process. NEPA further emphasizes integrating the requirements of NEPA with other planning and environmental review procedures required by law.

Other environmental statutes mirror this component. One such statute is the Clean Water Act of 1977 (CWA). Under Section 404 of the CWA, any action encroaching into waters of the United States requires a permit from the U. S. Army Corps of Engineers (COE). The CWA requires the COE to conduct a public interest review before deciding whether to issue a permit. The permitting decision is based on an evaluation of impacts and whether the proposal is in the interest of the public. The comments and cooperation of other Federal and state environmental regulatory agencies and the public are an integral part of this review process.

In May 1997, the FHWA, the North Carolina Department of Transportation (NCDOT), and the COE Wilmington District recognized the importance of early and continued coordination and implemented An Interagency Agreement Integrating Section 404/NEPA. The "merger agreement" established procedures for integrating the Section 404 permitting process into the NEPA transportation planning and design process. Under the terms of the agreement, a project team representing Federal and state environmental regulatory and resource agencies having an interest in the project is assembled for projects requiring an environmental impact statement (EIS) or an Individual Section 404 Permit. The project team reviews, discusses and reaches consensus at four major decision-making points in the NEPA process: 1) the project purpose and need, 2) the alternatives identified for detailed study, 3) the selection of the "least environmentally damaging practicable alternative (LEDPA)", and 4) the fulfillment of the requirements of "avoidance" in compliance with Section 404 (b)(1) Guidelines. (A copy of the merger agreement is provided in Appendix A.2.)

Although the planning, environmental and engineering studies for the proposed US 74 Shelby Bypass were initiated prior to the procedures set forth in the merger agreement, the NCDOT and

FHWA invited Federal and state environmental regulatory and resource agencies to participate in the NEPA process. A Steering/Interagency Committee was formed to assist in determining the purpose of and need for the project, in developing preliminary study alternatives and in selecting the alternatives for detailed study. (For a list of participants, see Section 6.1.2). The FHWA, the NCDOT and the COE determined the merger agreement would be implemented for the proposed bypass at Concurrence Points #3 and #4.

Following the publication of the DEIS, the NCDOT submitted a Section 404 permit application and scheduled a corridor public hearing to solicit comment on the proposed action. The COE issued a Public Notice to allow for concurrent review. The NCDOT, the FHWA and the COE considered the comments received on the DEIS and from the Public Notice and the corridor public hearing when the LEDPA or Preferred Alternative was selected.

Section 401 of the Clean Water Act requires each state to certify that state water quality standards will not be violated for activities which: 1) involve issuance of a federal permit or license; or 2) require discharges to "waters of the United States". A Section 401 Water Quality Certification from the NCDENR, Division of Water Quality (DWQ) will be required for the proposed project. General 401 certification may be available for minor impacts.

Avoidance and Minimization. Total avoidance of all wetlands on this project is not feasible; the distribution of stream systems and associated wetland areas throughout the study area would preclude totally avoiding all wetlands. The Preferred Alternative is designed to avoid the maximum amount of wetlands practicable.

On January 17, 2001, the NEPA/404 Merger Team convened to discuss avoidance and minimization measures for the Preferred Alternative (then Concurrence Point #4 of the NEPA/404 Merger Process). The agencies included at this meeting were the US Fish and Wildlife Service (USFWS), the COE, the DWQ and the NCDENR Wildlife Resources Commission (WRC). Concurrence meeting discussions centered on avoidance and minimization of impacts to wetlands, streams, and dwarf-flowered heartleaf colonies. As a result of this meeting, minimization was achieved, in part, by bridging the wetland (Wetland Site #23) associated with Brushy Creek (Stream 3-9). Table D-1 summarizes all of the wetland (and other) avoidance/minimization measures examined in conjunction with Concurrence Point #4.

Restricting clearance of vegetation to construction limits can also serve to preserve some wetland areas. Conservative use of culverts and sensitive placement of drainage structures will minimize further degradation of water quality and reduce adverse impacts on aquatic habitat viability of streams and tributaries.

Mitigation. Mitigation will be accomplished in accordance with Section 404(b)(1) Guidelines of the CWA (40 CFR 230), FHWA mitigation procedures (61 FR 117, 30553-30559), mitigation policy mandates articulated in the COE/Environmental Protection Agency (EPA) Memorandum of Agreement (MOA; Page and Wilcher 1990), and Executive Order 11990 (42 FR 26961 [1977]).

Mitigation will be provided for unavoidable wetland losses. The NCDOT Best Management Practices for Protection of Surface Waters will be used as applicable. Elimination of staging areas in lowland sites, careful containment of oil, gasoline and other hazardous materials near creeks and tributaries, reduced canopy removal in or near floodplain systems, and employment

of strict erosion and sediment control procedures are a few of the practices which will be employed.

Wetland – Only Practicable Alternative Finding. As described in "Avoidance and Minimization" above, extensive efforts were undertaken during the corridor development phase of the project to preserve and protect area wetlands in accordance with Executive Order 11990.

Wetland avoidance was evaluated during the early corridor location study by reviewing topographic maps from the US Geological Survey and aerial photography. National Wetland Inventory (NWI) mapping and soil survey maps for the study area were reviewed to map known locations of wetlands and hydric soils. The purpose of this review was to identify the number, extent and distribution of wetlands in the study area. Corridors were located to avoid wetlands whenever possible and to minimize impacts to wetlands when avoidance was not possible. The results of this evaluation indicated some wetlands systems in the study area could not be avoided.

Corridor selection was performed and corridors, which fulfilled the purpose of and need for the project and resulted in the least overall impacts to the human and natural environments (including wetlands), were selected for detailed study. During the detailed studies, wetlands in the proposed corridors were field investigated and wetland boundaries were determined. Acreages of impacts to wetlands for each alternative were estimated for each individual wetland within a functional 320-foot right-of-way (see Tables 4-23[a] and 4-23[b]). Alternatives were adjusted to avoid and minimize impacts to the extent possible based on the level of accuracy of information available.

Following the selection of Alternative 21 as the "least environmentally damaging practicable alternative," known as the LEDPA or the Preferred Alternative, wetlands within the corridor were delineated based on the 1987 COE Wetland Delineation Manual. Representatives of the US Army Corps of Engineers confirmed the delineation in the field. The locations of the delineated wetland areas were surveyed using Global Positioning Systems (GPS) and plotted on the project preliminary design mapping.

Using the actual wetland delineations, the preliminary design for the Preferred Alternative was adjusted to avoid wetland impacts to the maximum extent practicable and to minimize impacts to unavoidable wetland systems. Wetland minimization was incorporated into the preliminary design through the bridging of Brushy Creek. This minimization reduced the mitigable wetland impacts of the Preferred Alternative by 0.020 acre, from 2.393 to 2.373 acres (construction limit impact; see Table D-3 in Appendix D).

The implementation of NCDOT Best Management Practices for Protection of Surface Waters" will further minimize unavoidable indirect wetland impacts. Several of the practices that will be employed include:

- Mitigation of impacts caused by roadway crossings that impact greater than 150 linear feet or one-third of an acre of riparian buffer;
- Elimination of staging areas in lowland sites;
- Containment of oil, gasoline, and other hazardous materials near creeks, tributaries, and rivers;
- Reducing vegetation removal near creeks, tributaries, and rivers; and
- Implementation of high-quality water erosion and sedimentation control procedures.

Based on the above considerations, it is determined that there is no practicable alternative to the proposed construction in wetlands and the proposed action includes all practicable measures to minimize harm to wetlands that result from such use. The US Army Corps of Engineers, the US Environmental Protection Agency, the US Fish and Wildlife Service, and the North Carolina Department of Environment and Natural Resources have concurred with the selection of Alternative 21 as the "least environmentally damaging practicable alternative."

4.13.2 Stream Impacts

Impacts to streams are a jurisdictional issue for NCDENR. These impacts are discussed and quantified for the Preferred Alternative in Section 4.12.3 Water Resources ("Stream Delineation for Preferred Alternative") and in Tables 4-19(b) and 4-19(c). Based on the preliminary roadway design plans, 16,786 of the 18,389 linear feet of impacted streams will require mitigation (based on construction limits) for the Preferred Alternative.

A jurisdictional stream assessment was made in the field. On June 12, 2001, a COE representative field reviewed this assessment and revised perennial/intermittent stream designations as necessary and made preliminary mitigation recommendations. The assessment review also determined where on-site stream mitigation would be possible. The following is a preliminary COE evaluation of mitigation ratio requirements for this project:

- A 2:1 off-site compensatory stream mitigation ratio will be required unless the stream is being relocated on-site via natural stream design techniques (which is at a 1:1 stream mitigation).
- Stream mitigation (i.e., enhancement, preservation) adjacent to the project must be completed at a 2:1 mitigation ratio because the mitigation is not an on-site natural stream design relocation.

- High-level on-site enhancement mitigation, such as bank repairs, fencing out cattle, and grade repairs (restoring riffle-pool structure) may be completed at a 1:1 or 1.5 :1 stream mitigation ratio. This type of enhancement will best work along streams that parallel the project and are situated along animal grazing/pasture fields. The stream complex at Stream 2-15 may be a candidate for this type of enhancement mitigation.

- Riparian buffers installed along non-relocated stream banks may count toward stream preservation mitigation. The preservation mitigation ratio still needs to be determined. The non-relocated segment of Stream 7-1 may be a candidate for this type of preservation mitigation.

Bioengineering techniques will be applied to relocated streams. These techniques will result in meandering streams with riffles and pools. Native vegetation will be used to stabilize banks and root wads will be used instead of rip-rap as appropriate.

4.13.3 Protected Species

Federal Species. Species with the federal classification of Endangered (E) or Threatened (T), or officially proposed (P) for such listing, are protected under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). As of May 10, 2007, one federally protected species, the dwarf-flowered heartleaf (*Hexastylis naniflora*), is listed as Threatened for Cleveland County. A "Threatened" species is considered to be "a taxon likely to become endangered within the foreseeable future within all or a significant portion of its range."

Dwarf-Flowered Heartleaf – Information on the dwarf-flowered heartleaf and project impacts to this species is available in the following documents; the Biological Assessment is appended by reference, and the USFWS letter is in Appendix A.2:

- Revised Biological Assessment for Dwarf-Flowered Heartleaf (*Hexastylis naniflora*) for the Proposed US 74 Bypass Around Shelby, Cleveland County, NC, North Carolina Department of Transportation, Division of Highways, Project Development and Environmental Analysis Branch, Office of Natural Environment, January 13, 2004.

- United States Department of the Interior, Fish and Wildlife Service, Letter (Biological Opinion), May 11, 2004.

Dwarf-flowered heartleaf is a perennial, evergreen, rhizomatous, and fleshy-rooted herb. The leaves are cordate to orbicular-cordate and essentially glabrous. Leaves have a leathery texture and are normally reticulately mottled with paler green and are 1.5 to 2.2 inches long and wide (Gaddy, 1987). Dwarf-flowered heartleaf differs from other members of the genus by having smaller flowers that narrow distally rather than broaden. This species produces solitary cream to maroon flowers during April and May (Kral 1983). These flowers are firm and fleshy and are usually found under the leaf litter. The flower consists of a calyx tube (0.2 to 0.4 inch long and 0.1 to 0.3 inch in diameter) and 3 spreading lobes (0.004 to 0.011 inch long and [0.004 to 0.011 inch wide at base). The calyx tube of the flower is flask-shaped and may or may not have a flare just above the middle (Gaddy 1987).

Hexastylis naniflora typically grows in acidic soils on north-facing bluffs and adjacent slopes, in boggy areas next to creeks or small drainages, and along the slopes of nearby hillsides and ravines. It is most often found where Pacolet, small-grain Madison gravelly sandy loam, or Musella soils are present. Sites range in size from small areas with a few plants to large sites of 25 or more acres. The density of plants ranges from less than 0.3 plant per square yard to greater than or equal to 0.6 plant per square yard. Occurrences are known from seven counties in North Carolina (Burke, Caldwell, Catawba, Cleveland, Lincoln, Polk, and Rutherford Counties) (Amoroso 1999) and three counties in South Carolina (Cherokee, Greenville, and Spartanburg Counties) (USFWS, 1997). Although its range is very restricted it is not as rare as once thought (Gaddy 1987).

DEIS Studies. A protected species survey was conducted during the peak blooming season of the dwarf-flowered heartleaf. Suitable habitat zones within the Tier 2 detailed study alternative corridors were visited on April 30, 1998. Colonies of the species were found throughout all corridors (see Exhibit 4-4(a)).

The following table indicates the number of dwarf-flowered heartleaf sites which were found within each of the Tier 2 detailed study alternative corridors during the 1998 survey:

Alternative	Number of DFHL Sites Found During 1998 Survey
1	11
3	9
7	11
9	9
13	11
15	9
16	11
18	9
19	12
21 (Preferred)	10

Preferred Alternative Corridor Survey. Sites within the Preferred Alternative corridor containing heartleaf species (Hexastylis sp.) were documented and compiled during a 1998 survey and a 1999/2000 survey. Based on these two surveys, a total of 36 sites within the Preferred Alternative corridor were confirmed as containing the dwarf-flowered heartleaf (shown on Exhibit 4-4(b)). A site is defined as a group of plants growing in close proximity to each other, generally associated with the same stream system.

Sites identified during the 1998 survey were utilized as reference sites for the 1999/2000 survey. Each site previously identified as containing a species of heartleaf was checked to determine which species of heartleaf was present. Thirty-six sites were confirmed to be dwarf-flowered heartleaf, and two sites were identified as little heartleaf (Hexastylis minor). Each of the 36 confirmed dwarf-flowered heartleaf sites were thoroughly searched to determine proximity to other sites and overall size.

Table 4-25 indicates the size of each of the 36 sites within the Preferred Alternative corridor, and the plant densities of each site.

In 2001, additional surveys were conducted just outside of the Preferred Alternative corridor in conjunction with the identification of potential indirect and cumulative effects for the project. An additional 12 sites (numbered 37 through 48) were identified during this survey.

IMPACTS - Table D-4 in Appendix D indicates the impacted area of each of the 36 sites within both the proposed right-of-way limits and the proposed construction limits. The total impacted dwarf-flowered heartleaf area within the proposed right-of-way limits of the Preferred Alternative is 5.275 acres; the total impact within the proposed construction limits is 3.714 acres. The January 2004 Revised Biological Assessment includes impacts for construction limits plus a ten-foot buffer, which is intended to more accurately approximate the impacts resulting from construction fill, excavation, mechanized clearing, and drainage; the total impact for the construction limits plus ten-foot buffer is 4.067 acres (see Table D-4).

Table 4-25

DWARF-FLOWERED HEARTLEAF SITES WITHIN THE PREFERRED ALTERNATIVE CORRIDOR

SITE #	# OF DFHL	AREA OF SITE (acres)	DFHL DENSITY (# / acre)	COMMENTS
1	264	0.54	489	
2	37	0.126	294	
3	26	0.097	268	Cow pasture, highly eroded stream banks and DFHL area, highly trampled, cow waste
4	3	0.0035	857	Low quality site, cutover area (including along stream bank), over-grown with blackberry and invasive Japanese honeysuckle
5	Guess of 4	0.012	333	Biologists could not locate any DFHL at site, guess of 4 represents one DFHL plant for each flagged corner of site, low quality site, cutover area, overgrown with invasive Japanese honeysuckle
6	5	0.0001	50,000	Low quality site, cutover area, overgrown with invasive Japanese honeysuckle
7	148	0.4	370	Cutover area, overgrown with invasive Japanese honeysuckle
8	311	0.4	778	No invasive species, high quality site
9	271	0.3	903	No invasive species, high quality site
10	365	0.6	608	
11	99	0.31	319	
12	1,501	2.1	715	No invasive species, high quality site
13	2,067	2.78	744	Very small amount of invasive English ivy, high quality site (especially near stream)
14	87	0.1	870	90 additional DFHL plants counted in area adjoining site but just outside of project corridor
15	336	0.2	1,680	Decent site despite running cedar and poison ivy as predominant ground cover
16	13	0.053	245	Small amount of invasive English ivy
17	4	0.001	4,000	No invasive species
18	54	0.049	1,102	No invasive species, high quality site for its size
19	1	0.000099	10,101	One additional DFHL plant counted several feet outside flagged site
20	16	0.12	133	Site partially covered by downed vegetation from clearing activities
21	19	0.022	864	Site mostly covered by downed vegetation from clearing activities, 20 additional DFHL plants counted in unflagged cleared area halfway between Sites 20 and 21
22	332	1.02	325	
23	97	0.48	202	Small amount of invasive English ivy
24	1,641	3.6	456	
25	743	2.77	268	Lots of invasive English ivy
26	64	0.23	278	
27	14	0.011	1,273	
28	206	1.11	186	
29	41	0.056	732	
30	184	0.28	657	
31	2,562	1.94	1,321	High quality area despite cutover area along site's

Table 4-25
DWARF-FLOWERED HEARTLEAF SITES WITHIN THE PREFERRED ALTERNATIVE CORRIDOR

SITE #	# OF DFHL	AREA OF SITE (acres)	DFHL DENSITY (# / acre)	COMMENTS
				western end
32	1,612	3.3	488	
33	48	0.044	1,091	
34	1,752	2	876	High quality site, no invasive species, lowest density along eastern 1/3 of site
35	90	0.057	1,579	High quality site despite size
36	20	0.0094	2,128	High quality site despite size, lots of invasive Kudzu located adjacent to (but not in or adjoining) site
36	**15,037**	**25.121099**	**599**	**TOTALS ***

* Total number of DFHL, site area, and site density of DFHL do not include additional 90 plants counted in area adjoining Site 14 but just outside of project corridor, one plant counted outside of Site 19, and 20 plants counted in an unflagged cleared area halfway between Sites 20 and 21.

Impacts likely to result from this project include loss of habitat, increased habitat fragmentation, and degradation of remaining habitat quality. The 36 sites likely represent at least two separate populations of dwarf-flowered heartleaf.

AVOIDANCE AND MINIMIZATION MEASURES - On January 17, 2001, the NEPA/404 Merger Team convened to discuss avoidance and minimization measures for the Preferred Alternative (then Concurrence Point #4 of the NEPA/404 Merger Process). The agencies included at this meeting were the US Fish and Wildlife Service (USFWS), the COE, the DWQ and the NCDENR Wildlife Resources Commission (WRC). Concurrence meeting discussions centered on avoidance and minimization of impacts to wetlands, streams, and dwarf-flowered heartleaf colonies. Several strategies were discussed at this meeting to minimize impacts to the dwarf-

flowered heartleaf plant; those which proved to be feasible from an engineering standpoint were implemented. Table D-1 summarizes all of the dwarf-flowered heartleaf (and other) avoidance/minimization measures examined in conjunction with Concurrence Point #4. Table D-4 indicates the quantitative changes in impacts that resulted from the changes that were feasible and consequently were actually effected as a part of the avoidance and minimization efforts.

MITIGATION - Mitigation for impacted sites has been determined in consultation with USFWS. There are two types of mitigation available for this project: onsite and off-site mitigation. The following are the measures proposed for this project:

- Purchase all or portions of Sites 7, 10, 11, 15, 16, 19, 20, 22, 24, 25, 28, 30, and 32 through right-of-way acquisition (these sites are within or directly adjacent to the proposed right-of-way limits for the project).
- Attempt to obtain conservation easements with access points for all of Sites 8, 9, 12, 13, 26, 33, 34, 35, and 43.
- Purchase the 1,079-acre tract of land known as the Broad River Tract (formerly known as International Paper Tract). This tract, which includes 47 acres of dwarf-flowered heartleaf habitat with 10,796 confirmed dwarf-flowered heartleaf plants, is located approximately one mile southwest of Boiling Springs. This tract has already been purchased by NCDOT.

Additional conservation recommendations provided by the USFWS in their May 11, 2004 biological opinion correspondence include the following:

- Measures to be implemented during construction:
  - Areas containing dwarf-flowered heartleaf plants, but not impacted by the project, will be clearly marked prior to any ground-disturbing activity on the site to assure that construction does not affect the plants.
  - A USFWS biologist will attend the preconstruction meeting to discuss the importance of avoiding the plants, and other environmental commitments that are a part of the project.

If it is determined necessary by the USFWS to relocate impacted plants, the work will be performed by qualified persons. The relocation work could include transplanting the vegetative portions of plants from existing sites to pre-selected, USFWS-approved alternate sites and/or dispersing seed from existing sites to the USFWS-approved sites.

Habitat for the dwarf-flowered heartleaf was found on 23 other NCDOT projects in Burke, Caldwell, Catawba and Cleveland counties since 1993. Protected species surveys and/or other project-related investigations located dwarf-flowered heartleaf populations on 13 of these projects (in addition to R-2707). The following table shows the Transportation Improvement Program project number, county, and date of the protected species survey/sighting for the 13 other projects on which the heartleaf was determined to exist:

TIP Number	County	Survey/ Sighting Date(s)
B-2119	Catawba	4/12/94
B-2816	Cleveland	3/25/97, 1998
B-3122	Burke	3/19/96, 2001
B-3141	Cleveland	4/16/96
E-2909	Catawba/Burke	4/12/94
R-2824	Burke	3/20/95
U-2307C	Catawba	5/4/95, 2001
U-2414	Catawba	5/4/95, 2001
U-2528AA	Catawba	3/20/95, 2001
R-85	Catawba	5/21/93
B-2937	Caldwell	5/15/98, 2001
B-3126	Caldwell	2001
R-2233A	Rutherford	2003

The NCDOT and FHWA have established a conservation area for the heartleaf in neighboring Catawba County to mitigate impacts to the species resulting from bridge replacement and highway construction projects. The Murray's Mill *Hexastylis Naniflora* Preserve, acquired by

NCDOT in May 1996, encompasses a 26-acre tract and includes a population of some 20,000 plants. A buffer surrounds the population to protect the plants in the event the adjacent land is developed. NCDOT currently is responsible for the long-term maintenance of the preserve.

BIOLOGICAL OPINION - The biological opinion issued by the US Fish and Wildlife Service is that "the project as proposed is not likely to jeopardize the continued existence of *Hexastylis naniflora*. No critical habitat has been designated for this species; therefore, none will be affected." (May 11, 2004 letter; see Appendix A.2).

State Species. A review of Natural Heritage Program (NHP) records indicated that no populations of state-listed plants or animals were identified from the study area, and no state-listed plants or animals were observed during field evaluations. Based on available information, no impacts to state-listed species are anticipated.

4.13.4 Unique Natural Areas

Since there are no designated rare or unique natural areas identified within the study area according to Natural Heritage Program records, there would be no impacts to such areas.

4.13.5 Rivers and Streams

Outstanding Resource Waters. No rivers in the study area are currently designated, or proposed for designation, as Outstanding Resource Waters; therefore, there would be no impacts to these waters.

Wild and Scenic Rivers (Federal). No rivers in the study area are currently designated, or proposed for designation, as Wild and Scenic; therefore, there would be no impacts to such rivers.

Natural and Scenic Rivers (State). No rivers in the study area are currently designated, or proposed for designation, as NC Natural and Scenic Rivers; therefore, there would be no impacts to such rivers.

Trout Streams. No streams in the immediate project area are classified as being Trout Streams; therefore, there would be no impacts to such streams.

4.14 VISUAL AND AESTHETIC IMPACTS

Because the Tier 2 detailed study alternatives (including the Preferred Alternative) are located in a predominantly rural area, the visual impacts of each alternative could be greater than in a more densely populated area where highways and development are common sights. Conversely, most of the areas traversed by the Tier 2 detailed study alternatives (including the Preferred Alternative) are sparsely populated, and the visual impacts would be limited to fewer people. In places where the terrain is cleared and fairly level, the visibility of a new location bypass would be increased, as would the likelihood of visual effects. Landscaping along the highway corridors could potentially minimize some of these effects.

Due to the topography of the study area and construction and cost considerations, it is anticipated that most of the grade separations required for the bypass portion of the Preferred Alternative would be constructed with the local crossing road passing over the proposed US 74 facility; this

arrangement would tend to somewhat lessen the visual impacts of the new highway along the local crossing roads.

Interchange locations would potentially have the greatest visual impact, both from a standpoint of actual appearance and from subsequent anticipated induced commercial and industrial development at these locations. A proposed interchange location closer to a town boundary might cause less perceived visual impact due to concurrent town expansion, whether coincidental or intentional to the new highway construction; however, greater actual concentration of pre-existing residential development and/or community facilities at the town fringe could be adversely impacted visually by the more proximate interchange location. Pre-existing commercial and industrial facilities would not generally be perceived as sustaining adverse visual or aesthetic impacts, since many of these types of operations place a higher value on proximity and access to transportation facilities than on aesthetic considerations. The exact visual impacts of the proposed interchange locations cannot be assessed with certainty, as right-of-way boundaries and many interchange design details are not yet finalized, and future land uses are not known. For the purposes of general comparison, Table 4-26 provides a summary of interchange locations, tentative configurations, and site land uses and land use intensities.

The bypass termini at US 74 will require flyover interchanges, the distinguishing characteristic of which would be a one-lane ramp that would cross over the diverging freeway to rejoin US 74 on the other side. The purpose of the flyover is to create a smooth transition between the existing facility and the new location freeway; it is not intended to provide access to surrounding surface streets. The visual effects of a flyover tend to be minimal because there is typically no adjacent induced development, and because the ramp itself is a fairly simple, compact structure.

Table 4-26
TIER 2 DETAILED STUDY ALTERNATIVE PROPOSED INTERCHANGES

Interchange Location [1]	Alternative	Proposed Configuration [2]	Site Characteristics
US 74 West	1, 3, 7, 9	Flyover	Rural agricultural; small subdivision
SR 1162	13, 15, 16, 18, 19, 21*	Partial Cloverleaf	Rural agricultural; scattered residences
US 74 West	13, 15, 16, 18, 19, 21*	Flyover	Rural agricultural/residential; scattered residences and small subdivisions
SR 1322	1, 3, 7, 9	Diamond	Rural, with nearby industrial uses
SR 1313	13, 15, 16, 18, 19, 21*	Partial Cloverleaf	Industrial uses, primarily; church
NC 226	1, 3, 7, 9	Diamond	Rural agricultural; nearby church
NC 226	13, 15, 16, 18	Diamond	Rural agricultural; nearby church
NC 226	19	Diamond	Rural agricultural
NC 226	21*	Partial Cloverleaf[3]	Rural agricultural
NC 18	1, 3, 13, 15	Diamond	Low density residential; subdivisions and scattered residences
NC 18	7, 9, 16, 18, 19, 21*	Diamond (Possible Future Partial Cloverleaf)	Low density residential; scattered residential and commercial uses
NC 150	1, 3, 7, 9, 13, 15, 16, 18, 19	Partial Cloverleaf	Scattered commercial uses; nearby agriculture
NC 150	21*	Partial Cloverleaf or Single Point Urban Interchange[3]	Scattered commercial uses; nearby agriculture
US 74 East	3, 9, 15, 18, 21*	Flyover	Low density commercial; sand pit; adjacent forested land
SR 2245	3, 9, 15, 18, 21*	Diamond	Rural residential; some agricultural uses
US 74 East	1, 7, 13, 16, 19	Flyover	Rural agricultural; adjacent school

[1] In order from west to east
[2] Interchange determinations are preliminary and subject to change.
[3] Interchange type has been modified for the Preferred Alternative based on preliminary roadway design.

* Preferred Alternative

The remaining interchanges (diamond and partial cloverleaf configurations) will permit vehicles to enter and exit the freeway facility. The interchange at Washburn Switch Road (SR 1313) for Alternatives 13, 15, 16, 18, 19, and 21 (Preferred Alternative) and the interchange at NC 150 (all alternatives, including the Preferred Alternative) would also have minimal visual impacts, due to the pre-existing industrial and commercial developments at those locations. Interchange locations with the greatest potential visual impacts would be those at outlying residential areas, as is the case for the interchange at NC 18 for Alternatives 1, 3, 13, and 15; and those that are primarily agricultural and removed from areas of development, such as the interchanges on NC 226 (including the Preferred Alternative).

NC 226 Scenic Byway - Because the southern terminus of the NC 226 Scenic Byway is located several kilometers (miles) north of the proposed interchange location on NC 226, it is very unlikely that the presence of the interchange or immediate induced development would have a visual effect. However, the interchange on NC 226 would greatly improve access to the general area, making it more attractive for residential development. In the long term, accelerated development could negatively affect the visual character of the byway. (See Section 4.16 for a detailed discussion of secondary land use impacts.)

4.15 IMPACTS DURING CONSTRUCTION

Impacts during construction of this project are expected to be similar to those associated with any major roadway construction. The increase in noise and air pollution, erosion, utility disruptions, traffic maintenance, visual and safety considerations must be examined during

design and construction. The plans and specifications for the project will be developed to minimize these and other impacts.

Prior to right-of-way acquisition, there will be a design public hearing for the Preferred Alternative to address details of the project and potential impacts from construction. A preconstruction conference also will be held involving the contractor, local officials, public utility officials and the Division of Highways. This preconstruction conference will address construction procedures and precautionary measures to minimize construction impacts. Notification of the North Carolina Geodetic Survey must also take place prior to construction, to allow ample time for relocation of any affected geodetic markers.

Potential construction impacts are summarized below.

4.15.1 Air Quality

Adverse construction impacts to air quality may include air pollutant emissions from construction equipment exhaust; fugitive dust emissions from clearing, demolition, grading, and other construction activities; open burning for the disposal of construction debris; and particulate matter emitted from hot asphalt plants providing materials for construction.

Vehicular activity associated with construction operations is not expected to represent an air quality problem, except for temporary fugitive dust emissions.

Fugitive dust emissions can be mitigated by minimizing the area of exposed earth material; providing temporary and permanent seeding and landscaping as early as possible; providing

coverage for hauled and stockpiled materials; and, applying water to stabilize exposed earth and haul areas. The NCDOT Standard Specifications for Roads and Structures, Section 107, Legal Relations and Responsibility to Public, requires that the contractor control dust within the project area and all other areas affected by the construction of the project (i.e., unpaved roads, haul roads, disposal and borrow sites, etc.).

In accordance with Section 200, Clearing and Grubbing, of the NCDOT Standard Specifications for Roads and Structures, when debris is disposed of by burning, all burning shall be done in such a manner as to prevent injury to all property within and outside of the right-of-way. Burning shall be done in compliance with all local, state, and federal laws, ordinances and regulations. All burning shall be under the constant care of competent watchmen. Burning shall be thorough and shall not be permitted to smolder and result in dense smoke.

Particulate matter emitted from hot mix asphalt plants providing materials for construction will be controlled within the limits established by the State Air Pollution Control Board.

4.15.2 Water Quality

Soil erosion resulting from roadway grading operations constitutes the major potential impact to water quality. The amount of erosion during construction varies dependent on the size of the disturbed area, roadway vertical grades, roadway cut and fill slopes, and the effectiveness of installed erosion control devices. The effectiveness of the erosion control devices will depend upon the quality of maintaining the devices.

Based upon the presence of water supply reservoirs, flood control structures, and wetlands, lakes and other natural habitats within the study area, the entire study area is deemed sensitive to sedimentation impacts. Temporary construction impacts due to erosion and sedimentation will be minimized through implementation of a stringent erosion control schedule and the NCDOT Best Management Practices for Protection of Surface Waters, as applicable. The contractor will follow contract specifications pertaining to erosion control measures as outlined in 23 CFR 650 Subpart B and Article 107-13 entitled "Control of Erosion, Siltation, and Pollution" (NCDOT, Standard Specifications for Roads and Structures).

Mitigation measures to control erosion and sedimentation are described in the Federal-Aid Policy Guide and the North Carolina Administrative Codes, Chapter 4, Sedimentation Control. Measures commonly recommended for the construction phase of highway projects include: mulching, sodding, diversion berms, sediment catch basins, and clean-up practices. Construction activities shall be organized in stages to minimize the exposures of cleared areas and erodible earth to the extent possible. Wherever feasible, erosion control measures shall be retained as permanent features in the roadway design.

4.15.3 Noise

Construction noise, especially during the grading and structure building phase, is of particular concern. The operation of equipment, such as front-end loaders, bulldozers, graders, scrapers, compressors, and pile drivers, will cause temporary noise impacts during construction.

Although FHWA has not established specific methods for predicting construction noise impacts, it has specified that the following general steps be performed for this type of project:

- Identify land use or activities which may be affected by noise from construction of the project;
- Determine measures which are needed to minimize or eliminate adverse construction noise impacts to the community; and,
- Incorporate the needed noise abatement measures in the construction contract plans and specifications.

Noise sensitive areas near project construction sites may experience increases in noise levels. These increases, however, would be temporary and would not require special mitigation. Table 4-27 indicates the noise levels which can be anticipated during construction for various types of equipment, based on the General Services Administration Standards adopted in 1972. No areas within the study area where extreme quiet is necessary will be impacted by construction noise.

Adverse effects from construction noise can be minimized by limiting the permitted times and/or days for operating certain equipment, and by locating temporary construction work areas and material storage areas away from noise sensitive receptors.

4.15.4 Biotic Communities

Construction practices such as staging and stockpiling operations could result in the displacement of the resident wildlife population. Both the clearing of habitats and the noise and vibration from construction operations could result in disruption to mobile wildlife species. Sedentary species may be lost. The period of construction activities would be a period of maximum disruption since this would initiate competition between relocatees and the resident wildlife populations adjacent to the construction site. Biotic impacts are anticipated to be temporary, however, because staging and stockpiling areas will be abandoned after construction. Ultimately, these areas may provide replacement habitat for some wildlife species.

Table 4-27

CONSTRUCTION EQUIPMENT NOISE LEVELS

TYPE OF EQUIPMENT	GSA MAXIMUM ALLOWABLE NOISE LEVEL AT 50 FEET (dBA)	EXTENT OF NOISE IMPACT IN EXCESS OF 70 DBA (Feet)
Front loader	79	150
Backhoe	85	300
Dozer graders, tractor	80	160
Concrete mixer, concrete pump, crane, derrick	82-88	200-400
Pumps	76	100
Generators	78	140
Compressors	81	180
Pile drivers	101	1,865
Jack hammers	88	400
Rock drill	98	1,335
Pneumatic tools	86	335
Saws, vibrations	76-78	100-140
Truck	91	600
Scrapers, pavers	88-89	400-465

SOURCE: General Services Administration Standards, 1972.

4.15.5 Construction Waste

Waste and construction debris shall be disposed of in areas that are outside of the right-of-way and provided by the contractor, unless otherwise required by the plans or special provisions. Disposal of waste or debris in active public waste or disposal areas will not be permitted.

Standards included in the NCDOT's Standard Specifications require the contractor to exercise every reasonable precaution throughout construction of the project to prevent pollution of rivers, streams, and water impoundments. Pollutants such as chemicals, fuels, lubricants, bitumes, raw sewage, and other harmful wastes will not be discharged into or alongside rivers, streams or impoundments or into natural or man-made channels emptying into such receiving waters.

Renovations of structures containing asbestos material and demolitions of both non-asbestos containing structures and asbestos containing structures must be in accordance with NCAC 2D.0525, which requires notifications and removal prior to demolition.

The contractor is required by NCDOT Standard Specifications to provide sanitary facilities for use by his employees during construction of the project. The contractor will be required to observe and comply with all laws, ordinances, regulations, orders and decrees regarding the disposal of solid waste.

4.15.6 Maintenance of Traffic

The contractor will be required to maintain through and local traffic including all existing roads which cross, intersect or are located within the project limits.

Construction work will be carried out in a manner which would create a minimum amount of inconvenience to traffic, especially emergency service vehicles. Detours will be adequately signed and maintained.

The contractor will be required to provide, erect and maintain barricades, warning lights, danger signals, signs and sufficient flagmen to direct traffic during construction. All necessary precautions will be used to protect the construction workers and the safety of the public.

Two-way traffic should be maintained, if possible, at all times. However, if one-way traffic is required, traffic will be periodically altered by flagmen and/or traffic control devices in order to minimize excessive delays.

Signing, barricades, lighting, traffic control devices, and traffic control operations used in maintaining traffic will be in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways.

4.16 INDIRECT AND CUMULATIVE EFFECTS

4.16.1 Definition

This Indirect and Cumulative Effects (ICE) section covers the *reasonably foreseeable* (i.e., the effect is sufficiently likely and can logically be accounted for in the forecasting of probable effects) effects to the human and physical environment that may become apparent as a result of the construction of the proposed Bypass, and deals with two distinct types of effects: *Indirect* and

Cumulative. Indirect effects are defined by the Council on Environmental Quality (CEQ) regulations as those that are:

"...caused by the action [and which] are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density of growth rate, and related effects in air and water and other natural systems, including ecosystems."

Cumulative effects are defined by the CEQ regulations as:

"[An] impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

The full ICE document (appended by reference) also served as a screening tool to determine if the indirect and cumulative effects analysis included therein provided a suitable level of scrutiny, or if a second tier, more detailed analysis was necessary. It was determined that there was no need for additional studies upon the completion of the ICE report.

4.16.2 ICE Study Area

Only the Preferred Alternative and the No Build alternative were studied in this analysis. Also, Cleveland County was designated as the overall ICE study area for this project, since use of

county-level data substantially improved the likelihood that meaningful data projections would be available for issues such as population, housing, and employment. Information from the Cleveland County Comprehensive Land Use Plan as well as individual municipal land use plans and capital improvement plans (as available) were used to generate a thorough assessment of the 'baseline conditions' in the study area.

Population growth trends within the ICE study area were also examined. Table 4-28 summarizes these data.

4.16.3 ICE Notable Features

Notable features are features within the study area that are likely to be changed as a result of the project. These include:

- Protected Species: Rare plant and animal species as listed by the North Carolina National Heritage Program (NHP); also the locations of exemplary natural communities and special animal habitats found in the state.
- Architectural Features and Historic Sites: Historic resources in the study area. The listing comprises properties that are currently listed or are eligible for listing on the national Register of historic Places.
- Potential Hazardous Materials Sites: Places with the potential, should they be disturbed, to release hazardous materials into the environment. This includes Underground Storage Tanks (USTs), junkyards and landfills.
- Streams and Water Quality Areas: natural resources that contribute to water quality. This includes lakes and rivers, but pays special attention to wetlands, streams, impaired water bodies, water supply watersheds and floodplains.
- Soils: Types of soil that support specific plant communities as well as soils that would be conducive to development.

Table 4-28
Summary of Population Trends from 1970 - 2000

Town	INCREASE (+) / DECREASE (-)			
	1970-1980	1980-1990	1990-2000	Overall (1970 - 2000)
Belwood	-	+	+	+
Boiling Springs	+	+	+	+
Casar	+	-	-	-
Cleveland County	+	+	+	+
Earl	+	+	+	+
Fallston	+	-	+	+
Grover	+	-	+	+
Kings Mountain	+	-	+	+
Kingstown*	N/A	N/A	-	N/A
Lattimore	-	-	+	+
Lawndale	-	+	+	+
Mooresboro	-	-	+	-
Patterson Springs	+	-	-	+
Polkville	+	+	-	+
Shelby **	-	-	+	+
Waco	+	-	+	+

* Kingstown was incorporated in 1989. Prior data is not available.

** Shelby's population increase from 1990 to 2000 was largely due to annexation. However, the NC State Office of Planning has estimated that modest increases would have occurred due to births and in-migrations anyway. The 1970-2000 change would most likely have been a decrease without the annexation increases.

- Minority and Low-Income Communities: Areas where the populations of minorities (all persons not listed as "white alone") and / or low-income (at a considerable level below the poverty line) persons are concentrated. These areas are considered "Environmental Justice Areas."

Table 4-29 provides an overview of the notable features identified.

Table 4-29
PROJECT-SPECIFIC NOTABLE FEATURES

Issue/Notable Feature	Known/Specific Concerns	
Protected Species (USFWS)	Dwarf-flowered heartleaf sites - threatened	
	Carolina saxifrage – FSC	
	Sweet pinesap – FSC	
	Torrey's mountain-mint - FSC	
Architectural Historic Sites	Hamilton-McBrayer Farm (near Shelby) [1]	
	Charles C. Hamrick House (Shelby) [1]	
	Burwell Blanton House (Shelby) [1]	
	Coleman Blanton Farm (near Shelby) [1]	
	Cleveland County Bridge No. 79 (Shelby) [1]	
	Banker's House (Shelby)	
	Central School Historic District (Shelby)	
	Central Shelby Historic District (Shelby)	
	Cleveland County Courthouse (Shelby)	
	Dr. Victor McBrayer House (Shelby)	
	Joseph Suttle House (near Shelby)	
	Joshua Beam House (Shelby)	
	Masonic Temple Building (Shelby)	
	Webbley (aka O. Max Gardener House) (Shelby)	
	E.B. Hamrick Hall (Boiling Springs)	
	Irvin-Hamrick Log House (Boiling Springs)	
	John Lattimore House (Polkville)	
Hazardous Materials Sites[2]	Wortman family landfill on SR 1315 (near Shelby)	
	Lowman Road junkyard (Shelby)	
	SR 2047 junkyard (Shelby)	
	Other sites, as noted on Exhibit 2, ICE report	
Streams/Water Quality	Perennial streams	
	Downstream water quality	
	NCDENR DWQ Section 303(d) List streams	Brushy Creek (portion) Beaverdam Creek (portion) Buffalo Creek (portion) Lick Creek (portion)
	Water Quality Critical Area at Moss Lake	
Aesthetics	Visual	
	Rural lifestyle / ambiance	
Land Uses	Agricultural land	
	Woodlands	
	Planned subdivisions	
	Planned industrial development near SR 1313	
	Walmart distribution center near NC 226	
Soils	Approximately three-quarters of ICE study area soils are at least moderately suitable for development	

Table 4-29
PROJECT-SPECIFIC NOTABLE FEATURES
(continued)

Issue/Notable Feature	Known/Specific Concerns
Minority and Low–Income Communities	Light Oak neighborhood
	Eskridge Grove Baptist Church
	Other areas, as noted on Exhibit 2

[1] These were identified within the Area of Potential Effect for the US 74 Shelby Bypass.
[2] "Known/Specific Concerns" list includes landfill and junkyards that were identified for the Preferred Alternative; UST sites exist for the Preferred Alternative. Various types of sites were found on other project alternatives that would likely fall within any ICE study area identified (since those were within the EIS study area, which is typically smaller).

4.16.4 Effect–Causing Activities

Effect-causing activities are those effects that conflict with trends, goals, and notable features of the study area. An inventory of development projects, proposed access/entry points for the proposed US 74 Shelby Bypass, and research regarding development trends was used to create a matrix of reasonably foreseeable future activities and their impacts. Effects anticipated from induced development at the proposed Bypass and from other projects anticipated to cumulatively affect notable features are generally similar, and largely consist of modification of regime (wetlands, floodplains, and watersheds) and waste emplacement and treatment (underground storage tanks / hazardous materials sites).

4.16.5 Local Official Input

Issues raised by local officials concerning the future impacts of the construction of the Bypass, as well as other commentary on future development, included:

- Commercial / industrial development is expected to occur near the proposed Bypass.
- The proposed Bypass might hurt businesses in downtown Shelby.
- Economic development and growth are generally important to jurisdictions.

4.16.6 Induced Development Potential

Effect-causing activities are compared with baseline conditions to investigate cause-and-effect relationships indicating the propensity for induced development. By combining factors influencing induced development with other issues of concern (i.e., environmental justice issues and conflict with the notable features identified), the development potential of each interchange along US 74 (both existing [in Kings Mountain] and proposed [in Shelby]) was assessed. The NC 18 and US 74 East (Shelby Bypass) interchanges were assessed as having high development potential, and NC 150 and SR 2245 were assessed as having medium potential. All other interchanges were considered to be of low potential for development. The potential conflicts of the interchanges with notable features can be ameliorated somewhat through use of minimization strategies.

An evaluation performed to determine how well the No Build and Build alternatives each achieve the land planning goals of the various jurisdictions in the ICE study area established that overall, a Build alternative would better help to achieve the community goals identified than the No Build alternative.

4.16.7 Effects Minimization

A range of strategies are available to minimize effects, including policy strategies at the municipal level and the county level and through the NCDOT and other agencies. These are summarized as follows:

Wetlands, Floodplains and Wildlife: Impacts Minimization

- *Set an acceptable threshold for wetland and floodplain loss or degradation.*
- *Avoid/minimize natural resource impacts through established protocols and techniques.*
- *Require the implementation of least-invasive practices for sand and gravel mining.*

Minority and Low Income Communities

- *Utilize economic development tools for Minority and Low-Income communities.*
- *Utilize Impact fees for development.*

General Effects

- *Create Overlay Zoning Districts.*
- *Create Transfer /Purchase of Development Rights Programs.*
- *Use GIS mapping to determine the most desirable areas to preserve.*
- *Extend Control of Access at designated interchanges.*

Based on the information presented in this document, no further analysis is deemed necessary for indirect and cumulative effects; the anticipated effects of this project are relatively moderate.

4.17 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction of the Preferred Alternative of the US 74 Shelby Bypass in the proposed corridor will require certain irreversible and irretrievable commitments of resources.

Woodlands, farmland, floodplains and other land taken in right-of-way will be irreversibly committed to transportation use. Loss of businesses, wildlife, farm and forest products

associated with these lands will be irretrievable. Construction of the freeway will have an irreversible effect on noise, water, and air quality along the corridor.

In addition to natural resources, there are human resources which will be consumed. The labor, energy, and materials committed for construction of the freeway will be irretrievable. A commitment of funds will be necessary for construction and maintenance of the new facility.

The project's irreversible commitment of resources is outweighed by the beneficial commitment of a safer, improved transportation facility. Benefits will consist of improved local accessibility, savings in vehicle operating costs and time, and maintaining and improving the communities' economic growth. A good surface transportation facility is one of the essential factors for the economic growth and well-being of the community.

4.18 RELATIONSHIP BETWEEN SHORT-TERM IMPACTS AND LONG-TERM PRODUCTIVITY

This section discusses the relationship between those aspects of the human environment that must be used in construction of the project as they may relate to the long-term productivity of the area.

The construction phase of the proposed action will cause short-term impacts on the environment. These impacts will include increased noise and air pollution, increased erosion and siltation of streams and ponds, and occasional disruption of utilities and traffic. No long-term impacts are expected from the construction activity.

The proposed action will require displacement of homes and businesses within the proposed right-of-way. However, replacement housing available will be found for the displaced homeowners and tenants within the study area. Many of the businesses will relocate and employment opportunities will be redistributed to new locations. Improved access within the study area will increase land value and stimulate long-term residential and business growth.

Construction of the freeway will cause short-term changes and losses to natural resources. Aquatic and terrestrial habitats within the limits of construction will be replaced by the freeway. However, some habitat value within the right-of-way could be eventually restored as a result of aquatic and terrestrial productivity and migration.

Land use planning and/or zoning control by local municipal and county officials should ensure development along the proposed freeway that is compatible with the highway environment and existing land use. Long-term land use goals will control growth and development along the roadway and provide a safe and cost-effective transportation facility.

4.19 SUMMARY OF ENVIRONMENTAL CONSEQUENCES FOR TIER 2 DETAILED STUDY ALTERNATIVES

A summary of impacts for the Tier 2 detailed study alternatives is shown in Table 4-30. Impacts shown in this table for the Preferred Alternative are those which correspond to the other Tier 2 detailed study alternatives at the DEIS level of detail used for analysis and analysis methodology. These are the data that were used to select the Least Environmentally Damaging Practicable Alternative or Preferred Alternative.

Table 4-30
SUMMARY OF IMPACTS FOR 10 TIER 2 DETAILED STUDY ALTERNATIVES

IMPACT	Build Alternative									
	1	3	7	9	13	15	16	18	19	21
Community Facilities Potentially Affected (1)	7	9	8	10	8	10	9	11	8	10
Residences Relocated	202	219	166	183	255	272	219	236	218	235
Businesses Relocated	9	25	17	33	16	32	24	40	26	42
Churches Relocated	3	4	4	5	3	4	4	5	3	4
Total Relocations	214	248	187	221	274	308	247	281	247	281
Parks and Recreational Sites Affected (2)	1	1	0	0	1	1	0	0	0	0
Historic Sites Adversely Affected	0	0	0	0	0	0	0	0	0	0
Noise Receptors with 10 or 15 dBA Minimum Increase	150	100	149	99	141	91	140	90	131	81
Noise Receptors Equal to or Exceeding 66/71 dBA Criterion	74	63	68	57	99	88	93	82	95	84
Total Impacted Noise Receptors Without Barriers	188	141	184	137	205	158	201	154	194	147
Total Impacted Noise Receptors With Barriers	112	105	109	102	116	109	113	106	117	110
Hazardous Materials Sites Potentially Affected	7	8	6	7	8	9	7	8	7	8
Prime Farmland (3): Acres	414	395	401	382	356	337	343	324	317	298
State and Locally Important Farmland (3): Acres	326	322	305	301	273	269	252	248	272	268
Stream Crossings	38	36	36	34	38	36	36	34	37	35
Floodplain Encroachments	8	4	8	4	11	7	11	7	10	6
Forest Land (3): Acres	351	303	343	295	318	270	310	261	326	277
Agricultural/Cleared Land (3): Acres	313.0	315.5	302.4	304.9	277.4	279.9	266.8	269.3	255.2	257.7
Wetlands (3), (4): Acres	0.526	0.000	0.526	0.000	0.526	0.000	0.526	0.000	0.526	0.000
Palustrine Open Water (3): Acres	2.437	2.108	2.363	2.034	2.091	1.762	2.017	1.688	2.042	1.713
Surface Waters (3): Acres	5.158	3.944	4.499	3.285	5.132	3.918	4.473	3.259	4.498	3.284
Right-of-Way Cost: Millions	$33.613	$39.598	$28.768	$34.753	$38.644	$44.629	$33.799	$39.784	$37.579	$43.564
Construction Cost: Millions	$167.000	$163.100	$164.800	$160.900	$164.900	$161.000	$162.700	$158.800	$159.800	$155.900
Total Cost: Millions	$200.613	$202.698	$193.568	$195.653	$203.544	$205.629	$196.499	$198.584	$197.379	$199.464

ALTERNATIVE IDENTIFICATION LEGEND
1: A-J-M-N-S (a) (b)
3: A-J-M-N-P-S (b) (c)
7: A-J-K-M-N-S (a) (b)
9: A-J-K-M-N-P-S (b) (c)
13: A-C'-J-M-N-S (a) (d)
15: A-C'-J-M-N-P-S (c) (d)
16: A-C'-J-K-M-N-S (a) (d)
18: A-C'-J-K-M-N-P-S (c) (d)
19: A-C'-K-M-N-S (a) (d) (e)
21: A-C'-K-M-N-P-S (c) (d) (e)

Notes:
(1) "Community Facilities Potentially Affected" include all facilities which fall within the corridors; these are not necessarily all relocatees. There were no schools within the corridors, so there are no schools included in these totals, although schools may sustain other impacts from highway proximity. A total of 11 churches and 3 cemeteries were identified within the various Tier 2 detailed alternative corridors. Shelby Seventh Day Adventist Church was not included in the totals because it was not in existence at the time of the Tier 2 analyses.
(2) The one recreational facilitiy identified is a privately owned golf facility and is not a Section 4(f) parkland property.
(3) This quantity is prorated from corridor-wide data to represent a typical average right-of-way width impact.
(4) Reflects bridging of either of the two wetland sites on Beaverdam Creek.

Notes:
(a) Segment M-N was shifted and is somewhat different from the Segment M-N shown on Exhibit 2-9 (in Alternatives 1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, and 23 of the Tier 1 detailed study alternatives).
(b) Segments A-B and B-J from the original alternatives were consolidated into a single Segment A-J for those alternatives remaining as Tier 2 detailed study alternatives.
(c) Due to shifts in the detailed study alternative segments, former Segment M-P became a combination of revised Segment M-N (as described in footnote (a) and revised Segment N-P (which is not the same as the Tier 1 detailed study alternative Crossover N-P).
(d) Segments A-C and C-C' from the original alternatives were consolidated into a single Segment A-C' for those alternatives remaining as Tier 2 detailed study alternatives.
(e) Segments C'-K' and K'-K from the original alternatives were consolidated into a single Segment C'-K for those alternatives remaining as Tier 2 detailed study alternatives.

Table 4-31 indicates the impacts of the Preferred Alternative based on the preliminary roadway design plans for this alternative and the more detailed studies performed. The impacts shown in this table are the impacts within the proposed right-of-way limits established by the design.

Table 4-31
SUMMARY OF IMPACTS FOR PREFERRED ALTERNATIVE

CATEGORY OF IMPACT			IMPACT
Streams (Length Taken)	Right-of-Way Limits	Perennial	12,347 lf
		Intermittent	11,707 lf
		TOTAL	24,054 lf
		Mitigable	21,940 lf
	Construction Limits	Perennial	9,148 lf
		Intermittent	9,241 lf
		TOTAL	18,389 lf
		Mitigable	16,786 lf
Wetlands (Area Taken) [1]	Right-of-Way Limits	PSS1	1.340 acres
		PFO1	1.514 acres
		PEM1	0.216 acres
		PEM2	0.050 acres
		TOTAL	3.120 acres
		Mitigable	3.070 acres
	Construction Limits	PSS1	1.160 acres
		PFO1	0.999 acres
		PEM1	0.214 acres
		PEM2	0.020 acres
		TOTAL	2.393 acres
		Mitigable	2.373 acres
Dwarf-Flowered Heartleaf Sites (Area Taken)	Right-of-Way Limits		5.275 acres
	Construction Limits		3.714 acres
	Construction Limits + 10-Foot Buffer		4.067 acres
Relocations	Residences		165
	Businesses		25
	Churches [2]		2
	Total		192
Noise	Receptors with Substantial Increase		49
	Receptors Approaching or Exceeding 67/72 dBA		34
	Total Impacted Receptors without Barriers		68
	Total Impacted Receptors with Barriers		40
Costs [3]	Right-of-Way		$ 51,600,000
	Construction		$196,300,000
	Total		$247,900,000

[1] See Section 4.13.1 for wetland definitions.
[2] Total churches does not include Eskridge Grove Church
[3] See Section 2.4.7 for derivation of cost data.