

SECTION V

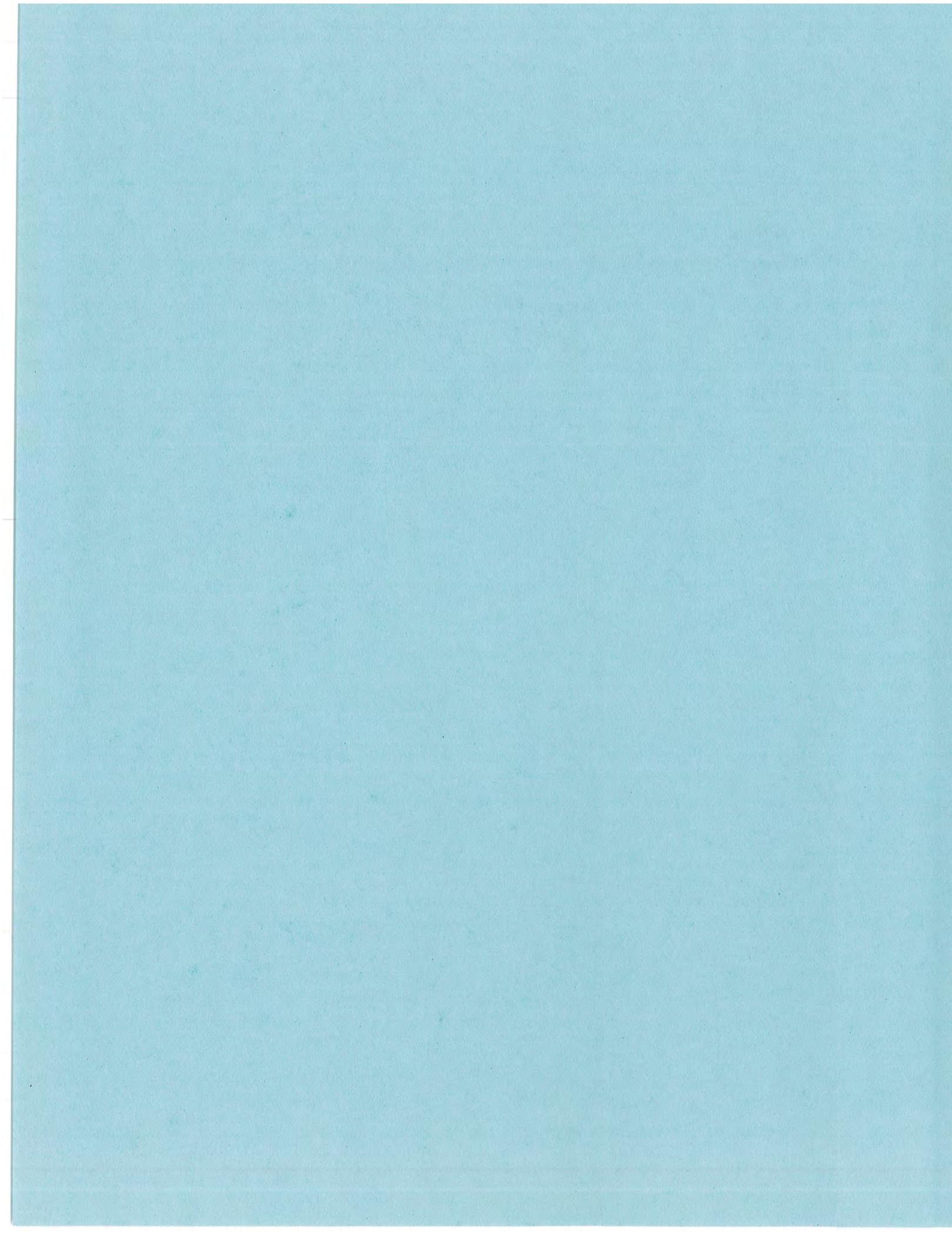
**ENVIRONMENTAL EFFECTS OF PROPOSED
ACTION**



BUILDING THE FUTURE

Winston-Salem

BUSINESS 40



V. ENVIRONMENTAL EFFECTS OF PROPOSED ACTION

The Project Study Area (PSA) was established approximately two (2) blocks north of US 421/I-40 Business along Second Street, just east of E. Salem Street, approximately two (2) blocks south of US 421/I-40 Business along Brookstown Avenue and Wachovia Street, and Crafton Street to the west, see Figure 25.

A. NATURAL RESOURCES

A Natural Resources Technical Report (NRTR) was completed for this project. The NRTR is based on field work in 2009 and 2013.

1. Physical Resources

The project study area lies in the western piedmont physiographic region of North Carolina. Topography in the project vicinity is comprised of gently rolling hills to sloping topography with fairly broad ridges. Elevations in the study area range from 800 to 900 feet above sea level. Land use within the project vicinity consists of urban development.

- a. **Soils.** The Forsyth Soil Survey identifies three soil types within project study area, as noted in Table 23.

Table 23. Soil Type in the Project Study Area

Soil Series	Mapping Unit	Drainage Class	Hydric Status
Chewacla loam	Ch	Somewhat poorly Drained	Hydric
Pancolet-Urban land complex 2-10%	PuE	Well Drained	Non-hydric
Pancolet-Urban land complex 10-25%	PuC	Well Drained	Non-hydric

- b. **Water Resources.** Water resources in the study areas are part of the Yadkin River Basin [U.S. Geological Survey (USGS) Hydrologic Unit 03040101]. There were five streams identified in project study area, as noted in Table 24. The location of the water resources are shown in Figure 26. The physical characteristics of the streams are provided in Table 25.

Table 24. Water Resources within the Project Study Area

Stream Name	Map ID	NCDWR Index Number	Best Usage Classification
Peters Creek	Peters Creek	12-94-12-8	C
UT to Peters Creek	SA	12-94-12-8	C
UT to Peters Creek	SB	12-94-12-8	C
Tar Branch	Tar Branch	12-94-12-7	C
UT to Tar Branch	SC	12-94-12-7	C

Table 25. Physical Characteristics of Water Resources within the Project Study Area

Map ID	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
Peters Creek	10	25	12-18	Boulder, cobble, silt, sand	Moderate	Clear
SA	1-5	2-4	1-8	Cobble, gravel, silt	Moderate	Clear
SB	5	12	6-12	Boulder, gravel, silt	Moderate	Turbid
Tar Branch	2-10	6-8	6-12	Boulder, cobble, gravel, sand, silt	Moderate	Clear
SC	0.6-1 ft	4	2-12	Cobble, gravel, silt, sand	Moderate	Clear

No High Quality Waters (HQW), Water Supply Watersheds (WS-I or WS-II), or Outstanding

Resource Waters (ORW) occur within 1.0 mile of the PSA. No waters within the project study area have been designated by the North Carolina Wildlife Resource Commission (NCWRC) as trout waters. Additionally, no waters have been identified by the National Marine Fisheries Service (NMFS) as habitat for anadromous fish and no Primary Nursing Areas are present within the project study area boundaries. Peters Creek and Tar Branch are not listed on the 2012 Final 303(d) List of Impaired Waters for North Carolina, nor do they drain to any 303(d) waters within 1.0 mile of project study area.

There have been no benthic samples or fish surveys conducted within 1.0 mile of the project study area.

2. Biotic Resources

- a. **Terrestrial Communities.** One terrestrial community was identified within project study area: maintained/disturbed. A brief description of the community type follows.

1) Maintained/Disturbed

Maintained/disturbed areas within the project study area included roadsides, power line right-of ways (ROW), businesses, and residences and their associated properties. This community is found throughout the PSAs and is either periodically mowed, or otherwise maintained. The PSAs are located in the downtown area of Winston-Salem and are considered to be in an urban environment. The vegetation in this community during the field visit included, but was not limited to the following: fescue, carolina geranium, catbrier, wild onion, white clover, kudzu, gill-on-the-ground, and English ivy. Dominant tree and shrub species include Chinese privet, red maple, southern red oak, and willow oak. Yards surrounding residences also had scattered landscaped ornamental plants.

2) Terrestrial Community Impacts

Terrestrial communities in the project study area may be impacted by project construction as a result of grading and paving of portions of the study area. At this time, decisions regarding the final design of the proposed road improvement project have not been made. Therefore, community data are presented in the context of total coverage of each type within the study area, as noted in Table 26. Once a final alignment and preliminary design have been determined, probable impacts to the community type will be determined.

Table 26. Coverage of Terrestrial Communities within the Project Study Area

Community	Coverage (acres)
Maintained/Disturbed	327.50
Total	327.50

- b. **Terrestrial Wildlife.** Many fauna species are highly adaptive and may populate or exploit the entire range of biotic communities located within the PSA (those species either observed or identified by tracks, scat, call, or other means during the field visit are indicated with an *). Mammal species that commonly exploit maintained/disturbed habitats found within the project study area include species such as eastern cottontail, raccoon, gray squirrel*, and Virginia opossum. Birds that commonly use maintained/disturbed habitats include the American crow*, blue jay, Carolina chickadee, northern cardinal, Carolina wren, and American robin.

Reptile species that may be found in the community described above include black rat snake, garter snake, fence lizard, eastern box turtle, snapping turtle, green anole, and southeastern five-lined skink. Amphibian species that may be observed include American toad and bullfrog.

- c. **Aquatic Communities.** Aquatic communities within project study area consist of Peters Creek and its two unnamed tributaries (UTs) (SA and SB) and Tar Branch and its UT (SC). All are perennial piedmont streams except for SA, which is an intermittent piedmont stream. The streams may provide breeding, shelter, and feeding opportunities for several amphibians. Common amphibians that inhabit or use these streams may include northern dusky salamander, green frog, and spring peeper. Fish species that may inhabit aquatic resources within the study area include redbreast sunfish and eastern mosquitofish. The streams within the project study area may likely also support a variety of benthic macroinvertebrates including caddisflies, dragonflies, damselflies, beetles, chironomid midges, craneflies, amphipods, isopods, and crayfish*.
- d. **Invasive Species.** Several invasive plant species were identified within PSA that are listed on the Invasive Exotic Plant List for North Carolina (NCDOT/NEU 2007). These species are listed below according to their Threat Level: Chinese Privet and kudzu

(Threat level 1) and gill-over-the-ground and English ivy (Threat level 2). NCDOT will follow the Department’s Best Management Practices (BMPs) for the management of invasive plant species.

3. Jurisdictional Issues

- a. **Clean Water Act Waters of the U.S.** Five jurisdictional streams were identified within PSA, as noted in Table 27. The locations of the streams are shown on Figure 26. The physical characteristics and water quality designations of each jurisdictional stream are detailed in Section V.A.1.b above. All streams have been designated as warm water streams for the purposes of stream mitigation.

Table 27. Characteristics of Water Resources within the Project Study Area

Map ID	Length (ft)	Classification	Compensatory Mitigation Required	River Basin Buffer
Peters Creek	789	Perennial	Yes	Not Subject
SA	185	Intermittent	Yes	Not Subject
	136	Perennial	Yes	Not Subject
SB	670	Perennial	Yes	Not Subject
Tar Branch	674	Perennial	Yes	Not Subject
SC	294	Perennial	Yes	Not Subject
Total	2,748			

No wetlands were found within the project study area.

- b. **Clean Water Act Permits.** The proposed project has been designated as an Environmental Assessment (EA) for the purposes of National Environmental Policy Act (NEPA) documentation. As a result, a Nationwide Permit (NWP) No. 14 will likely be applicable. The USACE holds the final discretion as to what permit will be required to authorize project construction.

In addition to the 404 permit, the corresponding Section 401 Water Quality Certifications (WQC) from the NCDWR will be required.

- c. **Construction Moratoria.** There are no trout waters or anadromous fish habitat located within the PSA. Therefore, no construction moratoria are anticipated at this time.
- d. **North Carolina River Basin Buffer Rules.** This project is located in the Yadkin River Basin and is, therefore, not subject to any NCDWQ regulated riparian buffer rules.
- f. **Rivers and Harbors Act Section 10 Navigable Waters.** No surface waters within the PSAs have been designated as Navigable Waters under Section 10 of the Rivers and Harbors Act.

- g. Summary of Anticipated Effects.** Based on preliminary hydraulic review of the existing facility and the proposed improvements the anticipated impacts to jurisdictional surface waters approximately total 90 linear feet and no wetland impacts. Anticipated impact to each stream and wetland are listed in Table 28.

Table 28. Anticipated Stream Impacts

Map ID	Impacts
Peters Creek	0 ft
SA	0 ft
SB	90 ft
Tar Branch	0 ft
SC	0 ft
Total Stream Impacts	90 ft

- g. Wetland and Stream Mitigation.**

1) Avoidance and Minimization of Impacts

The NCDOT will attempt to avoid and minimize impacts to streams and wetlands to the greatest extent practicable in choosing a preferred alternative and during project design. At this time, no final decisions have been made with regard to the design of the preferred alternative.

2) Compensatory Mitigation of Impacts

The NCDOT will investigate potential on-site stream and wetland mitigation opportunities once a final decision has been rendered with regard to the location of the preferred alternative. If on-site mitigation is not feasible, mitigation will be provided by the North Carolina Department of Environment and Natural Resources (NCDENR), Ecosystem Enhancement Program (EEP).

- h. Endangered Species Act Protected Species.** As of December 26, 2012, the United States Fish and Wildlife Service (USFWS) list three federally protected species for Forsyth County, as noted in Table 29. Suitable habitat for all three species is not present within the study area due to the urban nature of the location. A review of the North Carolina Natural Heritage Program (NCNHP) database, on July 24, 2013, indicated no occurrences of these three species within one mile of the study area. Therefore, the biological conclusion of ‘No Effect’ has been given for the red-cockaded woodpecker and small-anthered bittercress. The bog turtle is actually not protected under section 7 due to the T/SA (threatened due to similar appearance) status. A brief description of each species’ habitat requirements follows, along with the Biological Conclusion rendered based on survey results in the project study area.

Table 29. Federally Protected Species Listed for Forsyth County

Scientific Name	Common Name	Federal Status	Habitat Present	Biological Conclusion
<i>Clemmys muhlenbergii</i>	Bog Turtle	T(S/A)	No	No Survey Required
<i>Picoides borealis</i>	Red-cockaded woodpecker	E	No	No Effect
<i>Cardamine micranthera</i>	Small anthered bittercress	E	No	No Effect

E – Endangered

T (S/A) - Threatened due to similarity of appearance

Bog turtle

USFWS optimal survey window: April 1 – October 1 (visual surveys); April 1-June 15 (optimal for breeding/nesting); May 1-June 30 (trapping surveys)

Habitat Description: Bog turtle habitat consists of open, groundwater supplied (springfed), graminoid dominated wetlands along riparian corridors or on seepage slopes. These habitats are designated as mountain bogs by the NCNHP, but they are technically poor, moderate, or rich fens that may be associated with wet pastures and old drainage ditches that have saturated muddy substrates with open canopies. Plants found in bog turtle habitat include sedges, rushes, marsh ferns, herbs, shrubs (tag alder, hardhack, blueberry, etc.), and wetland tree species (red maple and silky willow). These habitats often support sphagnum moss and may contain carnivorous plants (sundews and pitcher plants) and rare orchids. Potential habitats may be found in western Piedmont and Mountain counties from 700 to 4500 feet elevation in North Carolina. Soil types (poorly drained silt loams) from which bog turtle habitats have been found include Arkaqua, Chewacla, Dellwood, Codorus complex, Hatboro, Nikwasi, Potomac – Iotla complex, Reddies, Rosman, Tate – Cullowhee complex, Toxaway, Tuckasegee – Cullasaja complex, Tusquitee, Watauga, and Wehadkee

Biological Conclusion: No Survey Required

Suitable habitat for bog turtle is not present in the project study area (PSA). A search of the North Carolina Natural Heritage Program (NCNHP) database (updated August 28, 2008) showed no recorded occurrences of bog turtle within 1.0 mile of the PSAs.

Red-cockaded woodpecker

USFWS optimal survey window: year round; November-early March (optimal)

Habitat Description: The red-cockaded woodpecker (RCW) typically occupies open, mature stands of southern pines, particularly longleaf pine (*Pinus palustris*), for foraging and nesting/roosting habitat. The RCW excavates cavities for nesting

and roosting in living pine trees, aged 60 years or older, and which are contiguous with pine stands at least 30 years of age to provide foraging habitat. The foraging range of the RCW is normally no more than 0.5 miles.

Biological Conclusion: No Effect

Suitable habitat for RCW is not present in the PSA due to the area being located in urban areas of Winston-Salem. Any pines that are in the study area are sporadic and few. A search of the NCNHP database (updated August 28, 2008) showed no recorded occurrences of RCW within 1.0 miles of the PSAs. It can be concluded that the construction of the proposed project will not affect RCWs.

Small-anthered bittercress

USFWS optimal survey window: April-May

Habitat Description: Small-anthered bittercress is endemic to the Dan River drainage of Roanoke River sub basin 03-02-01. This biennial or perennial herb occurs in moist, wet woods along small to intermittent sized streams, stream bank edges and seepages above the actual stream channel, wet rock crevices, and sand and gravel bars of small streams. This species prefers areas that are fully or partially shaded by shrubs and trees, but can occasionally be found in full sun. Soil series that it occurs on include Rion, Pacolet, and Wateree. Poorly viable occurrences may be found in disturbed areas subject to livestock trampling, silviculture, or encroachment by exotic, invasive species such as Japanese honeysuckle.

Biological Conclusion: No Effect

Suitable habitat for small-anthered bittercress is not present in the PSA. The project is located within the Yadkin River drainage basin and the streams within the project area have very little shading if any at all. A search of the NCNHP database (updated August 28, 2008) showed no recorded occurrences of small-anthered bittercress within 1.0 mile of the PSAs.

- i. **Bald and Golden Eagle Protection Act** Habitat for the bald eagle primarily consists of mature forest in proximity to large bodies of open water for foraging. Large dominant trees are utilized for nesting sites, typically within 1.0 mile of open water. There were no large trees suitable for bald eagle nesting found within the project study area. Also, there were no large open bodies of water for potential feeding habitat located within 1.0 mile of the PSA. A review of NCNHP records on August 21, 2013 indicates no known bald eagle occurrence within 1.0 mile of the PSA.
- j. **Endangered Species Act Candidate Species** As of December 26, 2012, the USFWS does not list any Candidate species for Forsyth County.

B. CULTURAL RESOURCES

This project is subject to compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. Section 106 requires Federal agencies to take into account the effect of their undertakings (federally funded, licensed, or permitted) on properties included in or eligible for inclusion in the National Register of Historic Places and afford the Advisory Council a reasonable opportunity to comment on such undertakings.

1. Historic Architectural Resources

The NCDOT conducted three (3) comprehensive architectural surveys of the project area and presented the findings in technical reports which were completed in 1999, 2006 and 2013. The surveys identified and recorded all properties over approximately fifty years of age within the Area of Potential Effects corresponding to the current project design. Both primary and secondary documentary research to establish historical and architectural contexts for the project area, as well as the development of individual buildings and structures were pursued. Recorded properties were evaluated for National Register eligibility as individual resources and contributing elements to historic districts. The 2013 investigation also assessed the continuing validity of the earlier studies and compiled a definitive list of the National Register – listed and – eligible properties in the project study area.

Unabridged versions of the historic architecture resources reports can be viewed at the Project Development & Environmental Analysis Unit, Century Center Building A, 1000 Birch Ridge Drive, Raleigh N.C.

Within the project study area there are seven (7) historic districts and seventeen (17) individual properties listed in or determined eligible for the National Register of Historic Places, see Figure 27. The resources and their eligibility statuses are detailed in Table 30 below.

Project effects on historic properties were discussed with North Carolina Historic Preservation Office (HPO) on December 3 and 17, 2013 and February 18, 2014 and the findings are also summarized in Table 30. The concurrence form for assessment of effects is included in Appendix B. NCDOT will continue to work with Forsyth County Historic Resources Commission to minimize any project effects on locally designated landmarks and districts.

Table 30. Historic Resources, Eligibility Statuses and Effects

Architectural Resource	Status	Effect
Ardmore Historic District	National Register (NR) - listed (Criteria A & C)	No Effect
Crafton Street Bridge (Bridge No. 381)	Determined NR-eligible (Criteria A & C)	No Effect

Table 30. Historic Resources, Eligibility Statuses and Effects (Cont.)

Architectural Resource	Status	Effect
West End Historic District	NR-listed, Locally Designated Historic District (Criteria A, B, & C)	No Adverse Effect, Additional review if a retaining wall is needed
West Fourth Street Historic District	Determined NR-eligible (Criteria A & C)	No Adverse Effect
West Salem Historic District	NR-listed (Criteria A & C)	No Adverse Effect
Holly Avenue Historic District	NR-listed (Criteria A & C)	No Adverse Effect, Address non-economic remnants
James Mitchell Rogers House	NR-listed, Locally Designated Landmark (Criteria A, B, & C)	No Effect, Alternative 3
James Mitchell Rogers House	NR-listed, Locally Designated Landmark (Criteria A, B, & C)	No Adverse Effect, Flatten curve of ramp, Alternative 4
Conrad Starbuck House	NR-listed, Locally Designated Landmark (Criterion C)	No Adverse Effect
Shamrock Mills	NR-listed (Criteria A & C)	No Effect
Henry F. Shaffner House	Determined NR-eligible, Study-listed (Criteria B & C)	No Adverse Effect Alternative 3
Henry F. Shaffner House	Determined NR-eligible, Study-listed (Criteria B & C)	Adverse Effect, diminished access to the facility's parking off High Street, Alternative 4
Colonel William Allen Blair House	NR-listed, Locally Designated Landmark (Criteria A, B, & C)	No Effect
Hylehurst	NR-listed, Locally Designated Landmark (Criteria B & C)	No Effect
Indera-Mills	NR-listed (Criterion A)	No Effect
Arista Cotton Mill	NR-listed, Locally Designated Landmark (Criterion A)	No Effect
Brickenstein-Leinbach House	NR-listed, Locally Designated Landmark (Criterion C, Criteria Consideration B)	No Effect
Commercial Retail Building	Determined NR-eligible, Demolished (Criterion C)	No Effect
Winston-Salem Southbound Freight Warehouse and Office	NR-listed, Locally Designated Landmark (Criterion A)	No Effect
Salem Town Hall and Fire Station	NR-listed, Locally Designated Landmark (Criteria A & B)	No Effect
Winston-Salem City Hall	NR-listed, Locally Designated Landmark (Criteria A & C)	No Effect
Church-Cemetery Residential Historic District	Determined NR-eligible, (Criteria A & C)	No Effect
Salem Cemetery	Determined NR-eligible, Study-listed	No Effect
Old Salem Historic District	National Historic Landmark, NR-listed, Locally Designated Historic District (Criteria A, B, & C)	No Effect
Commercial Building (300 South Marshall Street)	Determined NR-eligible (Criteria A & C)	No Effect
Commercial Building (330-332 South Main Street)	Determined NR-eligible (Criteria A & C)	No Effect

- a. **Temporary (During Construction) Off-Site Intersections Improvements.** The project was analyzed for areas where temporary improvements may be necessary during construction in the year 2021, worst case construction scenario, with the closure of US 421/I-40 Business and the removal of Broad, Marshall and Cherry Street bridges or the removal of Broad, Liberty and Main Street bridges. Of the eighty-eight (88) major intersections analyzed, thirteen (13) intersections were recommended for temporary improvements.

The thirteen (13) intersections recommended for temporary improvements were determined to be constructible with only minor impacts/changes but would yield significant improvement in the intersection operations. Six (6) of the thirteen (13) intersections are either located in/or adjacent to historic properties or districts. The effects of these temporary intersection improvements on historic properties were discussed with HPO on December 3, 2013 and the findings are also summarized in Table 31.

Table 31. Historic Resources - Temporary Off-Site Intersections Improvements

No.	Location	Proposed Improvement	In or Adjacent to Historic Properties	Effect
1	Peters Creek Parkway at I-40 Business Eastbound Ramp (New)	Use the on-ramp pavement to provide two left turn lanes and two right turn lanes on the off-ramp (loop)	No	N/A
2	Peters Creek Parkway at I-40 Business Westbound Ramp (New)	Convert the left most southbound through lane to a separate left turn lane (providing a second left turn lane)	No	N/A
3	Peters Creek Parkway/Second Street at First Street	Provide a second left turn lane eastbound and a third left turn lane westbound	No	N/A
4	Broad Street at Second Street	Convert the left most eastbound through lane to a shared left/through lane	No	N/A
5	Broad Street at Fifth Street	Provide a separate left turn lane westbound	Yes West End Historic District (NR)	No Effect
6	Broad Street at Sixth Street	Provide a separate left turn lane westbound	Yes West End Historic District (NR)	No Effect
7	Marshall Street at Academy Street	Provide a separate left turn lane southbound	Yes West Salem Historic District (NR)	No Effect
8	Third Street at Liberty Street	Provide a separate left turn lane westbound	Yes Downtown Winston-Salem Historic District (DE) & Forsyth County Courthouse (NR)	No Effect

Table 31. Historic Resources - Temporary Off-Site Intersections Improvements (Cont.)

No.	Location	Proposed Improvement	In or Adjacent to Historic Properties	Effect
9	Martin Luther King Jr. Drive at Marshall Street & Cherry Street	Provide a second left turn lane southbound	No	N/A
10	First Street at Northwest Boulevard	Provide a separate right turn lane westbound	Yes West Highlands Historic District (SL)	No Effect
11	First Street at Hawthorne Road	Provide a separate right turn lane northbound	Yes West Highlands Historic District (SL)	No Effect
12	Northwest Boulevard at Broad Street/Thurmond Road	Provide a separate left turn lane eastbound	No	N/A
13	Peters Creek Parkway at Silas Creek Parkway	Provide a second left turn lane southbound, convert the right most eastbound left turn lane to a through lane and convert the right most eastbound through lane to a second right turn lane	No	N/A

 Denotes a temporary intersection improvement in or adjacent to historic properties

b. Temporary (During Construction) Off-Site Roadway Improvements. The project was analyzed for areas where temporary improvements may be necessary during construction in the year 2021, worst case construction scenario, with the closure of US 421/I-40 Business and the removal of Broad, Marshall and Cherry Street bridges or the removal of Broad, Liberty and Main Street bridges. The analysis included the roadway network and major intersections to determine the impacts on traffic. Additional coordination with the public, the City of Winston-Salem and NCDOT staff is needed to determine offsite roadway improvements and proposed detour routes during construction. Any/all effects of other road network improvements and possible detour routes during construction on historic properties will be coordinated with HPO prior to the completion of the final environmental document.

c. Long Term (2040 Design Year) Off-Site Intersections Improvements. The project was analyzed for areas where permanent off-site improvements may be necessary in the design year, 2040, for both alternatives. The analyses included the roadway network and major intersections to determine the impacts on traffic.

Forty-six (46) major intersections were analyzed in Alternative 3 regarding potential improvements as discussed in Section IV.R.3 [Long Term Off-Site Intersection Improvements] above. One (1) of the five (5) intersections locations recommend for improvement in Alternative 3, Main Street at I-40 Business Eastbound On-Ramp, may affect historic properties. The effects of this long term off-site intersection

improvement on historic properties were discussed with HPO on February 04, 2014 with a finding of “No Effect”.

Forty-two (42) major intersections analyzed in Alternative 4 regarding potential improvements as discussed in Section IV.R.3 [Long Term Off-Site Intersection Improvements] above. None of the three (3) intersections locations with recommended improvements for Alternative 4 will affect historic properties.

In the design year, 2040, the Marshall Street and Cherry Street at Martin Luther King, Jr. Drive Extension intersections indicate the need for improvements for both alternatives. Intersection improvements for these intersections are currently under development. NCDOT will coordinate with HPO should the proposed improvements potentially affect historic properties.

NCDOT, HPO, Forsyth County Historic Resources Commission, and the Arts Council of Winston-Salem and Forsyth County, and City of Winston-Salem will work together on the plans for the retaining walls, bridges, and lighting to develop a unified design that incorporates public art in keeping with NCDOT’s and the City of Winston-Salem’s public art policies and the historic integrity of the project study area.

2. Archaeological Resources

The project was first reviewed by the State Historic Preservation Office - Office of State Archaeology (OSA) in 1997 as a Programmatic Categorical Exclusion (PCE), it was recommended that no archaeological investigations would be required since “the affected areas, both within the existing right-of-way and where new right-of-way may be required, have little potential to disturb undiscovered significant archaeological sites, given the limited scope of the project.” Over time, revisions to the project were made and subsequently reviewed by OSA, which maintained the previous recommendation for no archaeological investigations most recently in a memo dated October 13, 2004. Since then, additional revisions have been made to the proposed project. Therefore, current and past design plans were overlaid to determine areas that may be affected and were not part of any previous cultural resource review. A reconnaissance of such areas was then conducted in March 2013, with a representative of the NCDOT’s Historic Architecture Section. Afterwards in late March 2013, a meeting was held with OSA to consult regarding the findings of the reconnaissance survey and determine whether the original recommendation of “no archaeological investigations required” would still be valid. As a result of this discussion, the NCDOT’s Archaeology Section did not recommend any further archaeological investigations for this project and maintains the 2004 State Historic Preservation Office (SHPO) correspondence as still valid, in regards to archaeological resources. However, if design plans change prior to construction, then additional consultation regarding archaeology will be required.

A memorandum dated April 22, 2013 from SHPO concurred with recommendation of the NCDOT Archaeology Section, see Appendix C.

C. SECTION 4(F)/6(F) RESOURCES

A provision in the Department of Transportation Act of 1966 (49 USC 303), Section 4(f) states that “Subject to subsection (d), the Secretary may approve a transportation program or project (other than any project for a park road or parkway under section 204 of title 23) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if 1) there is no prudent and feasible alternative to using that land; and 2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use. “

The Land and Water Conservation Fund Act (LWCF) of 1965(16 USC 460), as amended, allows states and local governments to obtain grants for acquiring or improving parks and recreation areas. Section 6(f) of this Act prohibits the conversion of property acquired or developed with these grants to a non-recreational purpose without the approval of the Department of Interior – National Park Service.

1. Section 4(f) Resources

Within the Direct Community Impact Area (DCIA) there are seven (7) historic districts and seventeen (17) individual properties listed in or determined eligible for the National Register of Historic Places. The DCIA is defined to inventory notable community concerns and resources and to assess potential direct impacts to the community as part of the Community Impact Assessment. The DCIA boundary is synonymous with the project study area (PSA). The resources, their eligibility statuses and the effects are detailed in Table 30 above. Federal Highway Administration (FHWA) intends to use SHPO’s concurrence with “No Effect” or “No Adverse Effect” as the basis for a “de minimis” finding for all referenced properties, pursuant to Section 4(f). Table 32 below lists the historic resources with “No Adverse Effect” or “Adverse Effect” under Section 106 and impact/use regarding Section 4(f) within the PSA.

Table 32. Section 4(f) Resources, Relation to Resource and Use

Section 4(f) Resource	Relation to Resource	Use
West End Historic District (NR)	Project within existing Right-of-Way – Alternative 3 & 4	No
West Fourth Street Historic District (NR)	Temporary Construction Easement – Alternative 3 & 4	No
West Salem Historic District (NR)	Temporary Construction Easement – Alternative 3 & 4	No
Holly Avenue Historic District (NR)	Additional Right-of-Way for T-turnaround – Alternative 4	de minimis
James Mitchell Rogers House (NR)	Temporary Construction Easement – Alternative 3 & 4	No
Conrad Starbuck House (NR)	Temporary Construction Easement – Alternative 3 & 4	No

Table 32. Section 4(f) Resources, Relation to Resource and Use (Cont.)

Section 4(f) Resource	Relation to Resource	Use
Henry F. Shaffner House (NR) (SL)	Temporary Construction Easement – Alternative 3	No
Henry F. Shaffner House (NR) (SL)	Temporary Construction Easement – Alternative 4	No

2. Section 6(f) Resources

Land and Water Conservation Funds were used in the development of Winston Square Park which is located at the intersection of Holly Avenue and Spruce Street. Though Winston Square Park is located in the Demographic Study Area (DSA) it is outside the PSA. The proposed improvements will not impact Winston Square Park.

D. FARMLAND

The Farmland Protection Policy Act (FPPA) requires all federal agencies or their representatives to consider the potential impact to prime farmland of all land acquisition and construction projects. There are no soils classified as prime, unique, or having state or local importance in the vicinity of the project. This project is not subject to FPPA requirements due to its location, within an urbanized area per the US Census. Therefore, the project will not involve the direct conversion of farmland acreage within these classifications.

E. SOCIAL EFFECTS

1. Neighborhoods/Communities

Neighborhoods within the PSA are shown on Figure 28. Each neighborhood is defined by common type of land use, period of development, or a prominent community feature. Neighborhood boundaries were developed in coordination with the City of Winston-Salem staff during the early phases of the public involvement program for this project. All or a portion of nine (9) named neighborhoods are located within the PSA and help define the community. These nine neighborhoods are described below, from west to east:

- **Ardmore** – Located in the southwestern PSA, this neighborhood is large and includes the Wake Forest University Baptist Medical Center. The neighborhood is known for its post-World War II automobile-centric pattern of development. Only a small portion of this neighborhood is within the PSA. This area is the southwest quadrant of the Peters Creek Parkway interchange with US 421/I-40 Business. The portion of this neighborhood within the PSA consists of commercial property along Peters Creek Parkway with residential uses (mostly single family homes) comprising the rest of the area.
- **West End** – This entire neighborhood was originally conceived as a resort and residential community, and was laid out in 1890. A portion of the West End neighborhood is a historic district and is considered one of North Carolina's finest

examples of a turn-of-the-century streetcar suburb. Only a small portion of the West End is within the PSA, and this portion is not historic. The portion of the neighborhood within the PSA is comprised entirely of retail stores, parking lots and vacant lots near the BB&T Ballpark.

- **West End South** – Located immediately to the south of the West End neighborhood, this neighborhood continues the pattern of development initiated by the West End community and is also a historic district. The portion of the neighborhood within the PSA is primarily older single-family homes.
- **Westdale** – Located immediately to the east of the West End South neighborhood, this neighborhood is entirely within the PSA and consists of smaller single-family homes, along with some duplexes and multi-unit buildings.
- **Wachovia Highlands** – This neighborhood is located south of US 421/I-40 Business on the east side of Peters Creek Parkway and includes a portion of the West Salem historic district. The northern half of the neighborhood is located in the PSA. Land use in the PSA generally consists of smaller, older homes, with some newer townhomes located adjacent to US 421/I-40 Business along Salem Pointe Lane. Auto-oriented retail uses are located along Peters Creek Parkway. This is the most densely populated neighborhood in the PSA and has notable populations of African American, Hispanic, and low-income residents.
- **South Marshall** – Located in the central portion of the PSA south of US 421/I-40 Business between Broad Street and Main Street, approximately one third of the neighborhood is located in the PSA. Within the PSA, the neighborhood primarily consists of retail, office, and mixed-use spaces. Several hotels and residential lots are also scattered throughout the neighborhood. This neighborhood also includes portions of the West Salem and Old Salem historic districts.
- **Holly Avenue** – Located east of Broad Street on the north side of US 421/I-40 Business, this neighborhood includes single and multi-family residential uses, including some new townhomes, along with neighborhood churches and community services. Approximately half of the neighborhood is located within the PSA. The Holly Avenue historic district is located in this neighborhood. It was noted during a site visit that several homes in the neighborhood have been converted to commercial uses, such as law offices, particularly along Spruce Street at the eastern edge of the neighborhood.
- **Downtown** – This neighborhood is located north of US 421/I-40 Business in the northeastern portion of the PSA and includes the Central Business District, the Clark Campbell Multimodal Transportation Center, multiple new housing developments and portions of the developing Wake Forest Innovation Quarter. Within the PSA,

the neighborhood primarily consists of high-rise office buildings, surface parking, parking structures and government and community services.

- **Old Salem** – This neighborhood is located south of US 421/I-40 Business in the southeastern portion of the PSA. This neighborhood is the site of the original town of Salem and today includes the Old Salem Historic District, the Salem Academy and College, and multiple historic properties. The district is a tourist attraction drawing visitors to the community from around the nation. It has a high median home value compared to Forsyth County as a whole. Only a small portion of the neighborhood is located within the PSA. The portion of the neighborhood within the PSA includes the Salem Cemetery, several single-family homes, office and retail space, and parking lots.

2. Relocation of Residences and Businesses

Due to the limited width of the existing right-of-way, some additional right-of-way will be required for the project, particularly at interchanges.

Under both alternatives, in the southeast quadrant of the Peters Creek Parkway interchange, it is estimated that between 10 to 15 residential lots (some vacant) would be acquired from the Wachovia Highlands neighborhood to allow for a new loop ramp as part of the Peters Creek Parkway interchange improvements. Preliminary concepts showed the existing connection between Apple Street and Gregory Street being eliminated as a result of the new loop ramp, resulting in the streets becoming cul-de-sacs. Based on neighborhood concerns, the design has been modified to maintain connectivity between Gregory Street and Apple Street. However, this requires additional right-of-way and property acquisition. Some properties in this area may experience noise and visual impacts from the new interchange ramp adjacent to their neighborhood.

Additional right-of-way will also be required from residential lots north of US 421/I-40 Business along the west side of Peters Creek Parkway (these properties are accessed from Westdale Avenue) to allow for proposed improvements to Peters Creek Parkway, but few if any relocations are anticipated based on the current design.

Under the Liberty/Main Alternative, some right-of-way would be required from the Piedmont Dialysis Center property on the south side of US 421/I-40 Business east of Brookstown Avenue and two commercial properties (with buildings that appear to be vacant) on the north side of US 421/I-40 Business east of Brookstown Avenue to allow for reconfigured ramps to Broad Street. Also under the Liberty/Main Alternative, additional right-of-way would be required between Cherry Street and Liberty Street on both sides of US 421/I-40 Business. On the south side of US 421/I-40 Business, a new eastbound ramp to Liberty Street may impact two commercial properties with office buildings (Carolina Business Interiors and the US Bankruptcy Court), as well as parking areas adjacent to the

Strollway and the former Downtown Middle School. On the north side of US 421/I-40 Business, a parking area would be impacted.

Under the Cherry/Marshall Alternative, additional right-of-way would be required between Cherry Street and Liberty Street, but to a lesser extent than under the Liberty/Main Alternative. Right-of-way would be required from parking areas on both the north and south sides of US 421/I-40 Business in this area.

A copy of the unabridged version of the full technical report entitled Community Impact Assessment Report STIP Project U-2827B, WBS #34872.1.1 can be viewed in the Project Development & Environmental Analysis Unit, Century Center Building A, 1000 Birch Ridge Drive, Raleigh.

3. Environmental Justice

Title VI of the Civil Rights Act of 1964, as amended, provides that no person on the ground of race, color, national origin, sex, age, and handicap/disability, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low Income Populations," issued in 1994, directs all federal agencies to determine whether a proposed action will have an adverse or disproportionate impact on minority and/or low income populations. In compliance with Executive Order 12898, a review was completed to determine whether these social groups will experience disproportionately adverse health and/or environmental impacts from the proposed project.

Based on 2010 U.S. Census data, there were two block groups within the DSA where the percentage of a specific minority population group was greater than the percentage of Forsyth County by at least ten percentage points. These block groups are indicated by colored shapes shown on Figure 29. Both of these block groups have notable African American populations and one also has a notable population identifying their race as "Other". Census Tract 1 Block Group 1, located north of Business 40 and east of Brookstown Avenue, has a population that is 37.8 percent African American, compared to 26 percent for Forsyth County. Census Tract 9 Block Group 2, located south of Business 40 and east of Peters Creek Parkway (including the Wachovia Highlands neighborhood) has a population that is 43.2 percent African American. This block group also has a notable population of 18 percent identifying their race as "Other" in the 2010 Census, which is more than double the Forsyth County percentage of 7.2 percent. This "Other" race category most likely corresponds to the notable Hispanic population in this block group, as described below.

The Hispanic population of Forsyth County more than doubled between 2000 and 2010. In 2010, Hispanics made up nearly 12 percent of the county's population. Within the DSA, there was a slight increase in the Hispanic population between 2000 and 2010, from 10.7

percent to 11 percent. Within the DSA, Census Tract 9, Block Group 2, which includes the Wachovia Highlands neighborhood, has a Hispanic population of 23.1 percent, which is notably higher than the Forsyth County percentage of 11.9 percent.

4. Limited English Proficiency

On August 11, 2000, the President signed Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency." The Executive Order requires Federal agencies to examine the services they provide, identify any need for services to those with limited English proficiency (LEP), and develop and implement a system to provide those services so LEP persons can have meaningful access to them.^{R6}

Census data indicate that the DSA includes 163 Spanish-speaking adults (4.4 percent of the DSA's adult population) that speak English less than "Very Well". The DSA does not meet the US Department of Justice's Safe Harbor threshold of either five percent of the total DSA adult population or 1,000 adult persons within a particular language group who speak English less than "Very Well." Spanish language population of more than 50 persons are found in Census Tract 1, Block Group 1 north of US 421/I-40 Business in the central business district and in Census Tract 9, Block Group 2 south of US 421/I-40 Business and east of Peters Creek Parkway in the Wachovia Highlands Neighborhood. These block groups are indicated with green squares on Figure 29.

F. BICYCLE & PEDESTRIAN FACILITIES

1. Bicycle Facilities

In addition to the Strollway, portions of two locally-designated bike routes are located in the PSA, as shown on Figure 30. The following provides a description of each route:

- a. **Route 8.** Downtown Loop –This route enters the PSA from the north on Cherry Street and makes a loop around First and Second Streets. It crosses US 421/I-40 Business on Broad Street and heads south out of the PSA. It loops around and crosses US 421/I-40 Business again along the western boundary of the PSA on Crafton Street and proceeds north out of the PSA.
- b. **Route 11.** Old Salem Connector – This route crosses through the PSA and across US 421/I-40 Business on Main and Liberty Streets.

There are currently no dedicated bike lanes on any streets within the PSA; however, several bicyclists were observed in the PSA (both north and south of US 421/I-40 Business) during a site visit on December 4th, 2013. Most of the popular commuter bike routes noted by the City's Pedestrian and Bicycle Coordinator are located outside the PSA.

2. Pedestrian Facilities

The sidewalk system is extensive throughout the PSA, and sidewalks were observed on nearly all streets. Pedestrian activity centers are shown on Figure 30.

The highest concentrations of pedestrian activity within the PSA were observed along First Street near its intersection with the Strollway and Corpening Plaza Park, and along First and Second Streets near City Hall, the municipal building, and Wachovia Tower. Located north of the PSA, the Fourth Street corridor, especially between Cherry Street and Poplar Street, includes numerous restaurants and bars that attract high pedestrian activity during the lunch and evening hours. The area surrounding BB&T Ballpark also experiences high pedestrian activity levels during baseball games. Worn pedestrian paths were noted near the ballpark where no sidewalks are provided along the east side of Second Street, north of First Street.

Potential issues for pedestrian safety were noted along First Street and Second Street during a site visit. Crosswalks are faded and there are no pedestrian signals at several intersections along these one-way streets.

The City of Winston-Salem/Forsyth County's *Greenway Plan Update* (December 2012) is a companion document to the 2002 *Greenway Plan* and provides a prioritized system of proposed greenways for construction over the next ten to fifteen years. No priority projects are located in the PSA. However, there is a proposed sidepath/on-street facility adjacent to the north side of US 421/I-40 Business shown on the Forsyth County Greenway Plan that would connect the existing Strollway to the BB&T Ballpark. The City of Winston-Salem has expressed interest in incorporating this path into the US 421/I-40 Business project. NCDOT is investigating the feasibility of this request. NCDOT will coordinate its findings with the City of Winston-Salem and resolve this item prior to the final environmental document.

G. TRANSIT

The Winston-Salem Transit Authority (WSTA) operates eleven (11) bus routes, see Section II.C.6.a [Transit], through the project area. None of the routes operate directly on Business 40, but most of the routes operating in the PSA use bridges that cross US 421/I-40 Business. All of these routes begin and end at the Clark Campbell Multimodal Transportation Center, which offers a place for passengers to connect to other WSTA routes. The Transportation Center is located on Fifth Street north of the PSA. Greyhound Bus Lines offers service from the Transportation Center for regional or interstate travel. The Piedmont Authority for Regional Transportation (PART) also provides service from the Transportation Center to nearby Kernersville and the PART regional hub near the Piedmont Triad International Airport, where riders can then take express routes to High Point or Greensboro. PART service, see Section II.C.6.a [Transit], departs from the Transportation Center every half-hour during the morning and afternoon peak hours, and every hour during mid-day hours. All of the referenced transit

routes in the PSA are equally likely to be impacted as bridges and US 421/I-40 Business are closed during construction.

H. RECREATIONAL FACILITIES

Multiple community facilities such as parks, greenways, and sporting arenas are located throughout the PSA and are shown on Figure 30. Brief descriptions are provided for these resources, which are listed in order of potential to be affected by the proposed Business 40 project from high to low.

These resources within the PSA include one (1) greenway, one (1) park and one (1) baseball stadium.

- **Strollway**. This 1.2-mile paved/gravel trail runs north-south in the eastern PSA from 4th Street in Downtown to the Salem Creek Greenway at Salem Avenue and Main Street on the south side of Old Salem. The Strollway is the first conversion of an abandoned railroad right-of-way to a walking path in the state of North Carolina. The Strollway crosses under US 421/I-40 Business between Cherry Street and Liberty Street. An extension of the Strollway north along Trade Street to Martin Luther King Jr. Drive and Northwest Boulevard is planned by the City and is included in the *Comprehensive Transportation Plan* (May 2012) and the *Downtown Plan* (August 2013). However, the extension is not included in any current fiscally-constrained plans.
- **Corpening Plaza Park**. Located north of US 421/I-40 Business in the eastern PSA at 100 West Second Street, this 2.4-acre urban garden/open space is operated by the City of Winston-Salem.
- **BB&T Ballpark**. Was opened in 2010 and is the home stadium for the Winston-Salem Dash, a minor league baseball team affiliated with the Chicago White Sox. The baseball season generally runs from April through September, with several home games each week. Most games are at 7:00 p.m., but there are some afternoon games, usually on Sundays. The facility has seating for approximately 6,500 spectators. The BB&T Ballpark is a privately owned and managed for profit facility and is not a Section 4(f) resource.

US 421/I-40 Business forms the southern boundary of the ballpark property. Primary access to the park property is from Peters Creek Parkway, with additional access provided from Broad Street. A free shuttle service funded by the Downtown Winston-Salem Partnership is provided between the ballpark and the transportation center and includes a stop at the Center City West Parking Deck (650 West Fourth Street) for Friday and Saturday evening games. Wayfinding signage and markings on the sidewalks also guide pedestrians from the parking garage to the ballpark.

I. OTHER PUBLIC FACILITIES AND SERVICES

The following institutional and cultural resources are located in the PSA and shown on Figure 30:

- Mt Carmel Church (C4 on Figure 30) – Located at 1017 Apple Street, this is a small community church in the Wachovia Highlands neighborhood.
- Children’s Museum of Winston-Salem (F13 on Figure 30) – Located south of US 421/I-40 Business at 390 South Liberty Street, the museum is open seven days a week and provides multiple fun and educational exhibits for children.
- Salem Cemetery – This cemetery is located in the southeastern PSA. The cemetery was founded in the 1700s with the original town of Salem and is part of the Old Salem Historic District.

The following paragraphs describe emergency services provided to the PSA, as well as any related facilities located within the PSA. These services include fire, police and medical services.

- Fire Service
The City of Winston-Salem is divided into four fire districts with 19 fire stations located throughout the city. No stations are located within the PSA; however, three of the City’s 19 stations provide service to the PSA. Fire Station One’s response area includes all of the downtown high-rise development and surrounding residential areas, including the northern portion of the PSA. Fire Station Four responds to the southeastern portion of the PSA, and Fire Station Six’s response area includes the southwestern portion of the PSA.
- Police Service
West of US 52, US 421/I-40 Business forms the boundary between Winston-Salem Police Department Districts 1 and 3, with District 1 covering the area north of US 421/I-40 Business and District 3 covering the area south of US 421/I-40 Business. Areas east of US 52 are covered by District 2. The police department headquarters are located at 725 North Cherry Street, several blocks north of the PSA.
- Medical Services
Emergency medical services are provided by Forsyth County Emergency Medical Services (EMS), which provides 24 hour-a-day advanced life support and pre-hospital emergency medical care for all of Forsyth County.
Piedmont Dialysis Center is located in the PSA at 655 Cotton Street on the south side of US 421/I-40 Business between Broad Street and Brookstown Avenue (Notable Feature F7 on Figure 30). The privately-owned dialysis center is open Monday through Saturday and has 85 dialysis stations.

J. ECONOMIC EFFECTS

Removal of the Broad Street ramps proposed with the Alternative 4 may impact gas stations in the northwest, northeast, and southeast quadrants of the existing Broad Street interchange due to the nature of their business and dependence on drive-by customers. Customer volumes and sales at these convenience stations would likely be impacted adversely by the loss of easy access to and from US 421/I-40 Business. Similarly, patronage at the Royal Inn motel located in the southwest quadrant of the interchange may also be adversely impacted by the loss of easy access to US 421/I-40 Business. Under the Alternative 3, the Broad Street interchange would be modified to a westbound off-ramp and an eastbound on-ramp. This alternative may also impact the businesses discussed above since they would not have bi-directional access to and from US 421/I-40 Business, but the impacts are anticipated to be less severe than with the Cherry/Marshall Alternative.

The Hawthorne Inn and Conference Center is located south of US 421/I-40 Business on the south side of High Street at its intersection with Spruce Street. The facility is owned by Wake Forest Baptist Medical Center and is used by visiting doctors and patients' families and is also open to the general public. Removal of the High Street ramp from US 421/I-40 Business eastbound under the Alternative 3 would affect how this property is accessed from US 421/I-40 Business. Under the Alternative 3, travelers to and from the inn would have to use interchanges at Main Street/Liberty Street or Peters Creek Parkway. Under the Alternative 4, removal of the Spruce Street bridge would impact how patrons of the facility access US 421/I-40 Business and downtown. However, under the Cherry/Marshall Alternative, the High Street ramp from US 421/I-40 Business eastbound would remain and full access to US 421/I-40 Business would be provided at Cherry Street/ Marshall Street.

An office building on the south side of US 421/I-40 Business west of Liberty Street that currently houses a business interiors company would likely be relocated under both project alternatives. Under the Alternative 3, a new ramp is proposed just south of the building. Under both alternatives, Liberty Street is proposed to be elevated over US 421/I-40 Business, which would likely remove access to this property.

Selection of either the Alternative 3 or the Alternative 4 would change the way some businesses in the downtown area are accessed from US 421/I-40 Business. However, impacts to these businesses are expected to be minimal due to the availability of alternate routes. Potential impacts to businesses could be further minimized through effective wayfinding signage. To assist in minimizing business impacts as a result of the project, especially during the two-year closure of US 421/I-40 Business, NCDOT is working with the City of Winston-Salem and other entities to develop a Strategic Marketing and Communications Plan for the project. This plan also includes strategies for maintaining public support for the project and keeping the public informed during construction

K. LAND USE

1. EXISTING LAND USE AND ZONING

There are differences in the nature and density of land uses north and south of US 421/I-40 Business, primarily as a result of two separate communities (Winston and Salem) growing together. The Town of Salem was originally established on the south side of US 421/I-40 Business. Today, this area is comprised of many historic districts and consists primarily of residential and institutional development (Figure 31). The Town of Winston developed to the north of historic Salem as an industrial center, and today it contains the majority of the downtown Central Business District. Together, these areas complement each other by providing a healthy mix of commercial and residential land uses with recreational opportunities and cultural attractions.

The PSA includes all or portions of nine (9) named neighborhoods (outlined in orange on Figure 31), which are all well-established and generally consist of older homes and office/commercial structures, though redevelopment is occurring in several areas. Neighborhoods closest to downtown are experiencing redevelopment, with higher-density residential and office/commercial uses as well as the conversion of existing residential structures to business uses. The conversion of industrial and office/commercial spaces to residential is also occurring. Neighborhoods south of US 421/I-40 Business consist of mostly single-family homes. Overall, the neighborhoods in the PSA blend together to compliment the historic character of the community and support the community's businesses, education centers, and medical facilities.

There are recreational opportunities including public parks, greenways, and designated bicycle routes located in and around the project, area as shown on the Community Context Map (Figure 30). Recreational facilities in the PSA include the Strollway, Corpening Plaza Park, and BB&T Ballpark. The Strollway provides a pedestrian/bicycle link across US 421/I-40 Business and Corpening Plaza provides open space for downtown workers and residents, and serves as a gathering place for community events. Events at BB&T Ballpark attract people from within and outside the PSA.

Due to the limited amount of vacant land available within the PSA, opportunities for development are generally limited to adaptive reuse of existing structures or redevelopment of existing lots. An example of a recent redevelopment project in the PSA is the BB&T Ballpark, which is privately owned and managed utilized public-private financing for the construction, opened in 2010. Current development projects in the PSA are shown on Figure 30, and include the development of an apartment building adjacent to BB&T Ballpark and redevelopment of a former Best Western hotel (south of US 421/I-40 Business on Cherry Street) into a residential complex known as Hilltop House.

Small-scale redevelopment observed in the PSA generally consisted of conversion of homes to office/commercial uses and replacement of older single-family and small multi-family

structures with new single-family and townhome units. Constraints to development within the PSA include steep topography in some areas and a limited amount of vacant land.

The Winston-Salem/Forsyth County Unified Development Ordinances (UDO) are the compilation of regulations that govern land use, including the Zoning Ordinance, Environmental Ordinance, and Subdivision Regulations. The most recent update to the zoning ordinance was in 2007, with various amendments through December 2012. A review of the current zoning classifications did not identify any areas of the PSA that are inconsistent with site visit observations. Current land use, as observed during site visits, is shown on Figure 31. Plans for development within the PSA are consistent with existing zoning.

2. FUTURE LAND USE

The direction of the community is guided by planning and development goals outlined in multiple local area plans produced by the Winston-Salem and Forsyth County, City-County Planning Board. The following local area plans and goals are summarized in Community Direction and Goals, of the Community Characteristics Report (CCR). A copy of the unabridged version of the full technical report entitled Community Characteristics Report STIP #U-2827B, WBS #34872.1.1 can be viewed in the Project Development & Environmental Analysis Unit, Century Center Building A, 1000 Birch Ridge Drive, Raleigh.

- Local Land Use Plans and Ordinances
 - *Unified Development Ordinances*
 - *Legacy Development Guide/Legacy 2030*
 - *South Central Winston-Salem Area Plan (2004).*
 - *The Downtown Plan (2007).*
 - *Southwest Winston-Salem Area Plan (2009).*
 - *Southeast Winston-Salem Area Plan (2002).*
 - *East-Northeast Winston-Salem Area Plan (2008).*

- Private Development Plans
 - *Winston-Salem State University Master Plan (2007)*
 - *Martin Luther King Jr. Drive Corridor Plan (2009)*
 - *Piedmont Triad Research Park Master Plan*

None of the small area, master, or comprehensive plans discussed in the Community Characteristics Report (CCR) that apply to the PSA for this CIA have been updated since the publication of the CCR. These include the *South Central Winston-Salem Area Plan (2004)* and the *Southwest Winston-Salem Area Plan (2009)*.

- The *South Central Winston-Salem Area Plan* includes most of the PSA east of Peters Creek Parkway. Transportation recommendations applicable to the PSA include

proposed traffic calming measure to reduce the volume and speed of traffic on First and Second Streets through the Holly Avenue Neighborhood by providing alternative routes and modifications, including: construction of a service road parallel to US 421/I-40 Business from the North Main Street off-ramp to Cherry Street; extension of 8th Street/Martin Luther King Jr. Drive to Northwest Boulevard; and, opening of First and Second Streets to two-way traffic. The plan also recommends minimizing the use of dead ends and cul-de-sacs, and requiring connection of local streets unless extreme topographic situations exist.

- The *Southwest Winston-Salem Area Plan* covers the portion of the PSA west of Peters Creek Parkway and identifies the area along Peters Creek Parkway south of US 421/I-40 Business as having potential for redevelopment/revitalization opportunities. Specifically, the properties on the east side of Peters Creek Parkway between US 421/I-40 Business and Academy Street are within a half-mile of BB&T Ballpark stadium and have the potential for redevelopment into businesses associated with the ballpark, such as restaurants and specialty retail stores. General recommendations for these properties include redevelopment and rezoning of property along Peters Creek Parkway, limiting access to Gregory Street from redeveloped sites, and the use of pedestrian-friendly design for redeveloped sites.

Two new or updated land use and vision plans have been prepared since the CCR in March 2012. These plans include the Legacy 2030 Update (August 2013) and The Downtown Plan (2013).

- *The Legacy 2030 Update (August 2013)*
Legacy, adopted 2001, is the City of Winston-Salem comprehensive plan. The Legacy Comprehensive Plan was summarized in the CCR. The Legacy 2030 Update only made changes to small portions of the Legacy 2030 Plan. The adopted Legacy 2030 Update chapters were reviewed and did not contain any revisions to the information presented in the CCR. Therefore, there are no updates to the information presented the CCR regarding Legacy 2030.
- *The Downtown Plan (2013)*
The area on the north side of US 421/I-40 Business in the PSA is included in *The Downtown Plan* (2013). The plan differs from other area plans in that its focus is to identify opportunities and make recommendations for improvements that will specifically boost economic activity in the Central Business District.

The proposed land use map included in the *Legacy 2030 Update* does not propose any changes to the existing zoning on any property in the study area.

3. PROJECT COMPATIBILITY WITH LOCAL PLANS

The proposed project is consistent with the Winston-Salem Urban Area 2035 Transportation Plan Update and the Air Quality Conformity Analysis Report was adopted by the Winston-Salem Urban Area Transportation Advisory Committee (TAC) on January 17, 2013 and approved by FHWA on March 6, 2013. The 2035 Transportation Plan Update includes a fiscally constrained plan that identifies projects and priorities for the Winston-Salem Metropolitan Planning Organization (MPO). This project is the first listed project on the 2016-2021 Street and Highway Project List of the 2035 Winston-Salem Urban Area 2035 Transportation Plan Update.

L. OTHER ITEMS OF CONCERN

During construction, temporary impacts in the form of noise and vibration may be experienced by properties adjacent to the roadway. With the exception of the southeast quadrant of the Peters Creek Parkway interchange (discussed above), permanent noise and vibration impacts are not anticipated since the project involves improvements to an existing roadway and will not provide additional travel lanes.

During construction, there is the potential for neighborhoods adjacent to US 421/I-40 Business to experience increased exposure to traffic due to people using detour routes while US 421/I-40 Business is closed. This may result in temporary noise and air quality impacts as well as increased travel times. Local travelers may use neighborhood streets to avoid traffic on signed detour routes, but regional travelers are likely to stay on signed detour routes because they are unfamiliar with the local street network. NCDOT is using traffic modeling to estimate where the detoured traffic will go and to plan intersection improvements to improve traffic flow. Specific detour routes have not yet been determined. When potential detour routes have been identified, potential community impacts as a result of detour route used during the two-year closure of US 421/I-40 Business will be studied in an addendum to the Community Impact Assessment (CIA) report prior to the final environmental document.

M. INDIRECT AND CUMULATIVE EFFECTS

Although access to major roadways and water/sewer service availability are not limiting factors for development, there is very limited available land in the Future Land Use Study Area (FLUSA), see Figure 32. The project will be confined almost entirely to the existing US 421/I-40 Business right-of-way, the project will not reduce travel times or provide new or improved access to any properties, but will delete and reconfigure interchanges thus changing access. The deletion and reconfiguration of interchanges will create shifts in travel patterns in the FLUSA, but are unlikely to create changes in land use as a result of the project. Development and redevelopment projects in the FLUSA are not dependent upon construction of the project, but rather upon market conditions.

Based on the information analyzed, the indirect land use effects screening tool reflects minimal concern for indirect and cumulative effects potential and concludes that a Land Use Scenario Assessment is not warranted. Implementation of the US 421/I-40 Business project would not contribute, in conjunction with past, present, or future projects, to significant adverse indirect and cumulative effects on resources in the FLUSA.

N. FLOOD HAZARD EVALUATION

The Federal Emergency Management Administration (FEMA), in cooperation with federal, state, and local governments, developed floodway boundaries and Flood Insurance Rate Maps (FIRM). Forsyth County and the City of Winston-Salem are participants in the National Flood Insurance Program, administrated by FEMA. Based on the most current information available from the NC Floodplain Mapping Program (FMP) Peters Creek is in a designated flood hazard zone. No construction activities will occur within the designated flood hazard zone therefore no further action is required.

O. PROJECT ENHANCEMENTS

Enhancements for the project have been developed by the project Bridge and Design Working Group (B&D WG), see Section VI.A.2.e [Working Group Meetings]. The B&D WG has held seven (7) meetings and have worked on developing bridge design elements (rails, lighting, retaining walls, sidewalks, other treatments), public art for the bridges (on the exterior of the bridges and along the cross street section of the bridge) and the Green Street Pedestrian bridge. The renderings of their work are depicted in Figures 33, 34, 35 and 36.

- One style of enhancement of the proposed replacement bridges, as viewed traveling on US 421/I-40 Business, shows a traditional rail with stamped brick texture that is consistent with the brick found in many Winston-Salem establishments, see Figure 33.
- Another style of enhancement of the proposed replacement bridges, as viewed traveling on US 421/I-40 Business, shows a traditional rail with a limestone texture to replicate some of the buildings in Old Salem, see Figure 34.
- One style of enhancement for the cross street level of the proposed replacement bridges, as viewed traveling on the cross street, shows a traditional green rail, stamped herringbone-pattern sidewalk, and traditional light posts, see Figure 35.
- Another style of enhancement for the cross street level of the proposed replacement bridges, as viewed traveling on the cross street, shows a decorative green rail, stamped herringbone-pattern sidewalk, and traditional light posts, see Figure 36.

The B&D WG will be continuing their work beyond the Environmental Assessment (EA) stage of the project. Additional items to be completed by the B&D WG include completing their work on Public art (on the exterior of the bridges and along the cross street section of the bridge),

the refining the enhancements for Green Street Pedestrian bridge and developing a hierarchy for the eleven (11) bridges within the project limits and finalizing enhancements for each bridge.

Upon completion of the B&D WG sessions NCDOT and the City of Winston-Salem will review the proposed enhancements for the project and determine the feasibility of implementing the enhancements and the cost share for the proposed enhancements. The City of Winston-Salem participation in the cost of the enhancements will be per a municipal agreement prior to construction.

P. TRAFFIC NOISE ANALYSIS

In accordance with Title 23 Code of Federal Regulations Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise (Title 23 CFR 772) and the North Carolina Department of Transportation Traffic Noise Abatement Policy, each Type I highway project must be analyzed for predicted traffic noise impacts. In general, Type I projects are proposed Federal or Federal-aid highway projects for construction of a highway or interchange on new location, improvements of an existing highway which substantially changes the horizontal or vertical alignment or increases the vehicle capacity, or projects that involve new construction or substantial alteration of transportation facilities such as weigh stations, rest stops, ride-share lots or toll plazas.

Traffic noise impacts are determined through implementing the current Traffic Noise Model (TNM) approved by the Federal Highway Administration and following procedures detailed in Title 23 CFR 772 and the NCDOT Traffic Noise Analysis and Abatement Manual. When traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures must be considered for reducing or eliminating these impacts. Temporary and localized noise impacts will likely occur as a result of project construction activities. Construction noise control measures will be incorporated into the project plans and specifications.

A copy of the unabridged version of the full technical report entitled Design Noise Report / I-40 Business/US 421/US 158 Pavement Rehabilitation and Replacement of Bridges STIP Project U-2827B can be viewed in the Project Development & Environmental Analysis Unit, Century Center Building A, 1000 Birch Ridge Drive, Raleigh.

1. Traffic Noise Impacts and Noise Contours

The maximum number of receptors in each project alternative predicted to become impacted by future (2040) traffic noise is shown in the Table 33 below. The table includes those receptors expected to experience traffic noise impacts by either approaching or exceeding the FHWA Noise Abatement Criteria or by a substantial increase in exterior noise levels.

The maximum extent of the 71- and 66- dB(A) noise level contours measured from the edge of the nearest travel lane is 111 feet and 201 feet, respectively.

Table 33. Predicted Traffic Noise Impacts by Alternative*

Traffic Noise Impacts				
Alternative	Residential (NAC B)**	Places of Worship/Schools, etc. (NAC C & D)**	Businesses (NAC E)**	Totals
Existing	90	0	N/A	90
No-Build	90	0	N/A	90
3	82	0	N/A	82
4	82	0	N/A	82

*Per TNM[®]2.5 and in accordance with 23 CFR Part 772

** Noise Abatement Criterion (NAC)

2. No-Build Alternative

The Traffic Noise Analysis also considered traffic noise impacts for the “No-Build” alternative. If the proposed project does not occur, 90 receptors are predicted to experience traffic noise impacts and the future (2040) traffic noise levels will increase by approximately 1-dBA over existing (2013) noise levels. Based upon research, humans barely detect noise level changes of 2-3 dBA. A 5-dBA change is more readily noticeable. Therefore, most people working and living near the roadway will not notice this predicted increase.

3. Traffic Noise Abatement Measures

Measures for reducing or eliminating the traffic noise impacts were considered for all impacted receptors in each alternative. The primary noise abatement measures evaluated for highway projects include highway alignment changes, traffic system management measures, establishment of buffer zones, noise barriers and noise insulation (NAC D only). For each of these measures, benefits versus costs (reasonableness), engineering feasibility, effectiveness and practicability and other factors were included in the noise abatement considerations.

Substantially changing the highway alignment to minimize noise impacts is not considered to be a viable option for this project due to engineering and/or environmental factors. Traffic system management measures are not considered viable for noise abatement due to the negative impact they would have on the capacity and level of service of the proposed roadway. Costs to acquire buffer zones for impacted receptors will exceed the NCDOT base

dollar value of \$37,500 plus an incremental increase of \$525 (as defined in the NCDOT Policy) per benefited receptor, causing this abatement measure to be unreasonable.

4. Noise Barriers

Noise barriers include two basic types: earthen berms and noise walls. These structures act to diffract, absorb and reflect highway traffic noise. For this project, earthen berms are not found to be a viable abatement measure because the additional right-of-way, materials and construction costs are estimated to exceed the NCDOT maximum allowable base quantity of 7,000 cubic yards, plus an incremental increase of 100 cubic yards per benefited receptor, as defined in the NCDOT Policy.

A noise barrier evaluation was conducted for this project utilizing the Traffic Noise Model 2.5 (TNM) software developed by the FHWA. The first potential barrier location evaluated with TNM is adjacent to US 421/I-40 Business eastbound, from west of Crafton Street to east of Taylor Street SW in Noise Study Area (NSA) 1, see Figure 37. Based upon criteria defined in the NCDOT Traffic Noise Abatement Policy, this barrier is preliminarily justified and recommended for construction, contingent upon completion of the project design and the public involvement process.

The second potential barrier location evaluated with TNM is adjacent to US 421/I-40 Business westbound, from west of Crafton Street to east of Taylor Street SW in NSA 2. Based upon criteria defined in the NCDOT Traffic Noise Abatement Policy, this barrier is preliminarily justified and recommended for construction, contingent upon completion of the project design and the public involvement process.

The third potential barrier location evaluated with TNM is adjacent to US 421/I-40 Business eastbound from West 4th Street to NC150/Peters Creek Parkway, and adjacent to NC150/Peters Creek Parkway southbound from US 421/I-40 Business to West 4th Street in NSA 3. Based upon criteria defined in the NCDOT Traffic Noise Abatement Policy, this barrier is preliminarily justified and recommended for construction, contingent upon completion of the project design and the public involvement process.

The fourth potential barrier location evaluated with TNM consists of two walls that function as a combination wall system. The barriers are adjacent to US 421/I-40 Business westbound from east of West 4th Street to west of Peters Creek Parkway, and adjacent to Peters Creek Parkway southbound from south of Park Circle to south of the US 421/I-40 Business overpass bridge in NSA 4. Based upon criteria defined in the NCDOT Traffic Noise Abatement Policy, this barrier is preliminarily justified and recommended for construction, contingent upon completion of the project design and the public involvement process.

The fifth potential barrier location evaluated with TNM is adjacent to NC150/Peters Creek Parkway northbound from approximately 600 feet south of the entrance ramp to US 421/I-40 Business eastbound, adjacent to the entrance ramp to US 421/I-40 Business eastbound,

and adjacent to US 421/I-40 Business eastbound to west of South Green Street in NSA 5. Based upon criteria defined in the NCDOT Traffic Noise Abatement Policy, this barrier is preliminarily justified and recommended for construction, contingent upon completion of the project design and the public involvement process.

NSA 6 includes several structures, but only two noise-sensitive land use receptors, for which no noise impacts were predicted. In accordance with the NCDOT Traffic Noise Abatement Policy, consideration for abatement within NSA 6 was not warranted and no barrier locations were evaluated.

The sixth potential barrier location evaluated with TNM included four barrier designs associated with the two (2) study alternatives: 3 and 4. The proposed barrier designs are adjacent to I-40 Business westbound from east of Brookstown Avenue, to west of South Marshall Street in NSA 7. Based upon criteria defined in the NCDOT Traffic Noise Abatement Policy, this barrier is preliminarily justified and recommended for construction, contingent upon completion of the project design and the public involvement process.

The seventh potential barrier location evaluated with TNM included two barrier designs in NSA 8 associated with two study alternates: 3 and 4.

The barrier design for Alternative 3 is adjacent to US 421/I-40 Business eastbound between Main Street and South Church Street. Based upon criteria defined in the NCDOT Traffic Noise Abatement Policy, this barrier is preliminarily justified and recommended for construction, contingent upon selection of Alternative 3 and completion of the project design and the public involvement process.

An additional barrier design for Alternative 3 was prepared in a different location. The barrier is adjacent to US 421/I-40 Business eastbound, east of South Church Street to west of East Salem Avenue. Based upon feasibility and reasonableness criteria defined in the NCDOT Traffic Noise Abatement Policy, this additional barrier is not feasible and is not cost-effective and, therefore, is not recommended for construction.

The barrier design for Alternative 4 is adjacent to US 421/I-40 Business eastbound between Main Street and South Church Street. Based upon criteria defined in the NCDOT Traffic Noise Abatement Policy, this barrier is preliminarily justified and recommended for construction, contingent upon selection of Alternative 4 and completion of the project design and the public involvement process.

An additional barrier design for Alternative 4 was prepared in a different location. The barrier is adjacent to US 421/I-40 Business eastbound, east of South Church Street to west of East Salem Avenue. Based upon feasibility and reasonableness criteria defined in the NCDOT Traffic Noise Abatement Policy, this additional barrier

is not feasible and is not cost-effective and, therefore, is not recommended for construction.

5. Summary

Based on this initial study, traffic noise abatement is preliminarily recommended pending completion of the final design and the public involvement process. This evaluation completes the highway traffic noise requirements of Title 23 CFR Part 772. An additional noise analysis will be performed during final design of this project to develop more detailed locations and dimensions of the recommended noise barriers.

In accordance with NCDOT Traffic Noise Abatement Policy, the Federal/State governments are not responsible for providing noise abatement measures for new development for which building permits are issued after the Date of Public Knowledge. The Date of Public Knowledge of the proposed highway project will be the approval date of the Finding of No Significant Impact (FONSI). For development occurring after this date, local governing bodies are responsible to insure that noise compatible designs are utilized along the proposed facility.

Q. AIR QUALITY ANALYSIS

Air pollution originates from various sources. Emissions from industry and internal combustion engines are the most prevalent sources. The impact resulting from highway construction ranges from intensifying existing air pollution problems to improving the ambient air quality. Changing traffic patterns are a primary concern when determining the impact of a new highway facility or the improvement of an existing highway facility.

The Federal Clean Air Act of 1970 established the National Ambient Air Quality Standards (NAAQS). These standards were established to protect the public from known or anticipated effects of air pollutants. The most recent amendments to the NAAQS contain criteria for sulfur dioxide (SO₂), particulate matter (PM), carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), and lead (Pb).

The primary pollutants from motor vehicles are unburned hydrocarbons, nitrous oxides, carbon monoxide, and particulates. Hydrocarbons and nitrogen oxides can combine in a complex series of reactions catalyzed by sunlight to produce photochemical oxidants such as ozone and NO₂. Because these reactions take place over a period of several hours, maximum concentrations of photochemical oxidants are often found far downwind of the precursor sources.

1. Attainment Status

The project is located in Forsyth County, which is within the Winston Salem maintenance area for carbon monoxide (CO) as defined by the U.S. Environmental Protection Agency

(EPA). The Winston Salem area was redesignated by EPA for CO on September 18, 1995 and due to improved monitoring data was placed under a limited maintenance plan (conformity is required without a regional emissions analysis) on July 22, 2013. Section 176(c) of the Clean Air Act (CAA) requires that transportation plans, programs, and projects conform to the intent of the state air quality implementation plan (SIP). The current SIP does not contain any transportation control measures for Forsyth County. The Winston-Salem Metropolitan Planning Organization (MPO) 2035 Long Range Transportation Plan (LRTP), the High Point MPO 2035 LRTP and the 2012-2018 Transportation Improvement Programs (TIPs) conform to the intent of the SIP. The USDOT made a conformity determination on the Winston-Salem MPO LRTP on March 6, 2013, the High Point MPO LRTP on March 6, 2013 the Winston Salem MPO TIP on October 1, 2013 and the High Point MPO TIP on October 1, 2013. The current conformity determination is consistent with the final conformity rule found in 40 CFR Parts 51 and 93. A conformity determination process is underway for the two alternatives described in this document. It is anticipated that a conformity determination will be completed for the preferred alternative in the Finding of No Significant Impact (FONSI) by mid October 2014. Once the conformity determination is complete the FONSI document can be approved by FHWA.

2. Carbon Monoxide Microscale Analysis

Because the project is located within the Winston Salem maintenance area for carbon monoxide (CO), a microscale air quality analysis was performed to determine future CO concentrations resulting, from the proposed highway improvements. "CAL3QHC - A Modeling Methodology for Predicting Pollutant Concentrations near Roadway Intersections" was used to predict the CO concentration near sensitive receptors. The two-year grace period before MOVES2010b was required for quantitative CO analyses ended on December 20, 2012. Thus, MOVES2010b was used to predict the emission factors in the analysis years. Consultation with the North Carolina Department of Environment & Natural Resources' Air Quality Section indicated that an ambient CO concentration of 2.7 ppm is suitable for calculations in Forsyth County.

Table 34. Air Quality No-Build

Comparison of Model Results to Ambient Air Quality Standards for CO for the Intersection of I-40 Business Eastbound Ramp and Peters Creek Parkway				
Measurement Period	NAAQS (ppm)	2020 No-Build Conditions (PM Peak)	2025 No-Build Conditions (PM Peak)	2040 No-Build Conditions (PM Peak)
1-hour (peak)	35	3.5	3.5	3.6
8-hour	9	2.8	2.8	2.9

Table 35. Air Quality Build

Comparison of Model Results to Ambient Air Quality Standards for CO for the Intersection of I-40 Business Eastbound Ramp and Peters Creek Parkway				
Measurement Period	NAAQS (ppm)	2020 Build Conditions (PM Peak)	2025 Build Conditions (PM Peak)	2040 Build Conditions (PM Peak)
1-hour (peak)	35	3.6	3.6	3.7
8-hour	9	2.9	2.9	3.0

3. Mobile Source Air Toxics

a. **Background** Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (<http://www.epa.gov/iris/>). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (<http://www.epa.gov/ttn/atw/nata1999/>). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules. The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOBILE6.2 model, even if vehicle activity (vehicle-miles travelled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050, as shown in Figure 38.

b. **Motor Vehicle Emissions Simulator (MOVES)** According to EPA, MOVES improves upon the previous MOBILE model in several key aspects: MOVES is based on a vast amount of in-use vehicle data collected and analyzed since the latest release of MOBILE, including millions of emissions measurements from light-duty vehicles. Analysis of this data enhanced EPA's understanding of how mobile sources

contribute to emissions inventories and the relative effectiveness of various control strategies. In addition, MOVES accounts for the significant effects that vehicle speed and temperature have on PM emissions estimates, whereas MOBILE did not. MOVES2010b includes all air toxic pollutants in NATA that are emitted by mobile sources. EPA has incorporated more recent data into MOVES2010b to update and enhance the quality of MSAT emission estimates. These data reflect advanced emission control technology and modern fuels, plus additional data for older technology vehicles.

Based on an FHWA analysis using EPA's MOVES2010b model, as shown in Figure 1, even if vehicle-miles travelled (VMT) increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period.

The implications of MOVES on MSAT emissions estimates compared to MOBILE are: lower estimates of total MSAT emissions; significantly lower benzene emissions; significantly higher diesel PM emissions, especially for lower speeds. Consequently, diesel PM is projected to be the dominant component of the emissions total.

- c. **MSAT Research** Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, we are duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

- d. **NEPA Context** The NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the Federal Government be interpreted and administered in accordance with its environmental protection goals. The NEPA also requires Federal agencies to use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment. The NEPA requires and FHWA is committed to the examination and avoidance of potential impacts to the natural and human environment when considering approval of proposed transportation projects. In addition to evaluating the potential environmental effects, we must also take into account the need for safe and efficient transportation in reaching a

decision that is in the best overall public interest. The FHWA policies and procedures for implementing NEPA are contained in regulation at 23 CFR Part 771.

- e. **Consideration of MSAT in NEPA Documents** The FHWA developed a tiered approach for analyzing MSAT in NEPA documents, depending on specific project circumstances. The FHWA has identified three levels of analysis:

- No analysis for projects with no potential for meaningful MSAT effects;
- Qualitative analysis for projects with low potential MSAT effects; or
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

1) Exempt Projects or Projects with No Meaningful Potential MSAT Effects

This category includes projects that are qualified as categorical exclusion under 23 CFR 771.117(c), projects that are exempt under the Clean Air Act conformity rule under 40 CFR 93.126 and projects with no meaningful impacts on traffic volumes or vehicle mix. No analysis or discussion of MSATs is necessary for these projects and documentation sufficient to demonstrate that the project qualifies as a categorical exclusion and/or exempt project will suffice. The project record should document the basis for the determination of “no meaningful potential impacts” with a brief description of the factors considered.

2) Projects with Low Potential MSAT Effects

These projects include those that improve operations of highway, transit or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase emissions. This category covers a broad range of projects, including minor widening projects and new interchanges, such as those that replace a signalized intersection or where design year traffic is not projected to meet the 140,000 to 150,000 AADT criterion. For these projects, a qualitative assessment of emissions projections should be conducted. Most highway projects are included in this category.

3) Projects with Higher Potential MSAT Effects

This category includes highway projects that have the potential for meaningful differences among project alternatives through 1) the addition of significant capacity where the AADT is projected to be in the range of 140,000 to 150,000 or greater by the design year or 2) the significant alteration to a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location, and 3) their being located close to populated areas or concentrations of vulnerable populations (i.e., schools, nursing homes, hospitals)..These projects require a quantitative analysis, and only a limited number of projects will fall into this category. Mitigation options should be identified and considered in the analysis when meaningful differences

in levels of MSAT emissions are identified. All projects warranting a Quantitative MSAT Analysis should include the seven priority MSAT pollutants.

This project falls under Category (2) because it is intended to improve the operations of a highway, transit or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase emissions, and the Design Year traffic is not projected to meet or exceed the 140,000 to 150,000 AADT criterion.

- f. **Qualitative MSAT Analysis.** A qualitative MSAT analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives found at;

www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

For each alternative in this EA, the amount of MSAT emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for the alternative. The VMTs estimated for the Build alternatives are slightly higher than those for the No-Build alternative, because the additional capacity increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. Refer to Table 36. This increase in VMT would lead to higher MSAT emissions for the preferred action alternative along the highway corridor, along with a corresponding decrease in MSAT emissions along the parallel routes. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to EPA's MOVES2010b model, emissions of all of the priority MSAT decrease as speed increases.

The estimated daily VMT for the proposed Build Alternatives is 1 percent higher than the No-Build Alternative. This increase is primarily due to the alternatives higher traffic volumes. Thus, while MSAT emissions would be expected to increase because of the changing local traffic patterns, the potential local impact of MSAT would be reduced due to the proposed roadway shifting away from highly concentrated areas of sensitive receptors to less concentrated, more rural receptor concentrations.

Table 36. Vehicle Miles Traveled (VMT)

US 421/I-40 Business, West of Fourth Street to Church Street Winston Salem, NC	
Design Year 2040	Daily VMT
No-Build	127,080
Build	128,760

The Preferred Alternative is not known at the time this report was completed; consequently, it is not known where any specific localized increases in MSAT concentrations would likely be most pronounced. However, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. In sum, when a highway is widened, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No-Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

Regardless of the alternative chosen, emissions will likely be lower than present levels in the design year 2040 as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent from 2010 to 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future for all Build Alternatives.

In sum, under the Build Alternatives in the design year it is expected there would be higher MSAT emissions in the study area relative to the No-Build Alternative due to increased VMT. There also could be increases in MSAT levels in a few localized areas where VMT increases. However, EPA's vehicle and fuel regulations will bring about lower MSAT levels for the area in the future than today.

g. Incomplete or Unavailable Information for Project Specific MSAT Health Impact

Analysis. In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The U.S. Environmental Protection Agency (EPA) is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, <http://www.epa.gov/iris/>). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are; cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, <http://pubs.healtheffects.org/view.php?id=282>) or in the future as vehicle emissions substantially decrease (HEI, <http://pubs.healtheffects.org/view.php?id=306>).

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts - each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI

(<http://pubs.healtheffects.org/view.php?id=282>). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA (<http://www.epa.gov/risk/basicinformation.htm#g>) and the HEI (<http://pubs.healtheffects.org/getfile.php?u=395>) have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

4. Conclusion

What we know about mobile source air toxics is still evolving. As the science progresses FHWA will continue to revise and update this guidance. FHWA is working with Stakeholders, EPA and others to better understand the strengths and weaknesses of developing analysis tools and the applicability on the project level decision documentation process.

5. Summary

Vehicles are a major contributor to decreased air quality because they emit a variety of pollutants into the air. Changing traffic patterns are a primary concern when determining the impact of a new roadway or the improvement of an existing roadway. New roadways or the widening of existing roadways increase localized levels of vehicle emissions, but these increases could be offset due to increases in speeds from reductions in congestion and because vehicle emissions will decrease in areas where traffic shifts to the new roadway. Significant progress has been made in reducing criteria pollutant emissions from motor vehicles and improving air quality, even as vehicle travel has increased rapidly.

After performing a microscale CO analysis, the proposed project has been found not to exceed the 1-hour or 8-hour standards for this pollutant. The project is located in Forsyth County, which complies with the National Ambient Air Quality Standards. This project will not add substantial new capacity or create a facility that is likely to meaningfully increase emissions. Therefore, it is not anticipated to create any adverse effects on the air quality of this maintenance area. This evaluation completes the assessment requirements for air quality of the 1990 Clean Air Act Amendments and the NEPA process, and no additional reports are necessary.

R. HAZARDOUS MATERIAL

This section presents the results of a hazardous material evaluation conducted along the above referenced project. The main purpose of this investigation is to identify properties within the project study area that are or may be contaminated and therefore result in increased project costs and future liability if acquired by the Department. Hazardous material impacts may include, but are not limited to, active and abandoned underground storage tank (UST) sites, hazardous waste sites, regulated landfills and unregulated dumpsites.

The Geographical Information System (GIS) was consulted to identify known sites of concern in relation to the project corridor. NCDOT GeoEnvironmental Section personnel originally conducted field reconnaissance along the above mentioned project on April 5, 2004 and January 15, 2005. A search of appropriate environmental agencies' databases and Sanborn Maps was performed to update and assist in evaluating sites identified during this study.

Based the referenced search within the project study area, seven (7) sites may contain petroleum USTs, no Hazardous Waste Sites, no apparent landfills and no geo environmental concerns were identified within the project area. Preliminary site assessments will be

conducted for all potentially contaminated sites within the proposed right-of-way prior to right-of-way acquisition. Potentially contaminated properties within the project area are presented on Figure 39 and Table 37 below.

Table 37. Known or Potentially Hazardous Materials Sites within Project Study Area

Site No.	Site Name	Facility ID#	Location
1	Filly's Gentlemen's Club	None Identified	400 Peters Creek Parkway
2	Priceless Rent-A-Car	N/A	375 Peters Creek Parkway
3	In' n Out Convenience Store	0-036448	110 South Broad Street
4	Parking Lot ¹	0-016066 30999	Ballpark Way
5	Huff's Broad Street	0-015211 14235	101 South Broad Street
6	Fairway One Stop 7	0-015813	225 South Broad Street
7	Carolina Business Interiors	None Identified	210 S. Liberty Street

¹ Former Exxon gas station was located on the west side of South Broad Street

THIS PORTION OF THE PAGE IS INTENTIONALLY LEFT BLANK