SECTION 5

Description of Secondary and Cumulative Impacts Related to Projected Growth in the Planning Area

This section outlines the SCI associated with the infrastructure needed to accommodate growth in the Town of Cary. The area's transportation and utility infrastructure is being expanded and strengthened in response to its economic growth. In addition, the EMC included a condition in the Town's IBT certificate that required the return of wastewater effluent to the Cape Fear River basin by January 1, 2011. The newly constructed WWRWRF became operational in 2014 and discharges into the Cape Fear River, meeting this condition.

Analysis of impacts considers all proposed water, wastewater, and local transportation infrastructure planned for full build-out as described in the Town's Land Use Plan. These proposed infrastructure improvements are based on the Town's master plans for providing water and sewer services to its residents in a manner that will protect the environment. Overall, the Town is managing growth in a sustainable way.

Growth in the Town will be facilitated by transportation facilities, including the NCDOT development of NC 540, which improves access to RTP and other communities within Wake County (Figure 2-3). The section of this roadway that extends from I-40 to NC Highway 55 in Cary was completed in 2012. A portion of the future segment of NC 540 that will extend from NC Highway 55 to U.S. 64/U.S. 264 Bypass in Knightdale will extend through the Town. Direct impacts and SCI of this roadway project have been addressed by the NCDOT. In general, the environmental documents indicate that the roadway and associated interchanges will not induce growth but may change the location of growth. More intensive development is anticipated around the interchanges, but local governments already anticipate higher rates of growth in the project area of NC 540 (Arcadis, 2003; HNTB, 2003). Other roads are being widened, some with projects undertaken by the Town, to help accommodate future growth.

The RDU airport expects that changes in service would occur in the future if demands for air transportation increase significantly. There are currently no plans for expansion of facilities related to changes in airport capacity (pers. comm. Cayton, 2014)

The discussion provided in the following section reflects a general analysis of the potential for development to impact specific resources in the Planning Area, given current trends and literature records and input from State agencies. Agency correspondence is included in Appendix A. Mitigation efforts to limit these possible SCI are discussed in Section 6. As described in Section 1, direct impacts will be addressed in separate environmental documents that are prepared for individual infrastructure projects.

5.1 Topography and Floodplains

Clearing and grading of undeveloped lands change a site's topography. The Town reviews erosion and sediment control plans to minimize grading in areas of steep slopes.

If development within a floodplain occurs, the function of that floodplain is reduced. Water storage capacity is lessened by any structure constructed in a floodplain. Floodplains, if left undisturbed, provide other functions including wildlife habitat, surface water filtration, infiltration, and corridors for wildlife movement.

Impacts to floodplains vary with jurisdiction. Within the Town's urban growth area, impacts to floodplains are limited due to the Town's floodplain protection and riparian buffer ordinances described in Section 6. In areas outside the Town's current jurisdiction but within the Planning Area, impacts to floodplains also are limited by Wake County's floodplain protection ordinances described in Appendix B.

5.2 Soils

As land is developed, clearing and grading result in soil disturbance. When heavy equipment is used on development sites, soils become compacted. During grading, soil is moved; in some areas, it is removed, while in other areas it is replaced. Thus, the locations of soil types may change. During clearing and grading, some soils are eroded, but the resulting impacts can be minimized by following an approved site plan in accordance with the Town's ordinances described in Section 6.

5.3 Land Use

The Town's Land Use Plan was used to estimate future land use conditions. A land use plan is a guidance document that illustrates the land use the Town would like to see in a given area if development occurs. This does not mean that all land in a given area will be developed. The Land Use Plan represents full build-out conditions. Detailed land use plans developed for several small areas within the Planning Area and are shown in Figure 6-1 and discussed in Section 6.2. Figure 5-1 illustrates general land use categories within the Planning Area. Table 5-1 provides details on the area (square miles) within each general land use category. Table 5-1 also summarizes the conditions that will occur if all land is developed.

TABLE 5-1
Planning Area Future Land Use

General Land Use Type	Square Miles	Percent of Planning Area
Residential Developed	45.6	55%
Non-residential Developed[1]	25.3	31%
Open Space	10.8	13%
Open Water	0.7	1%
Total	**82.4**	**100%**

Source: Town of Cary, 2013b

[1] Transportation and mixed use are included within the Non-Residential category.

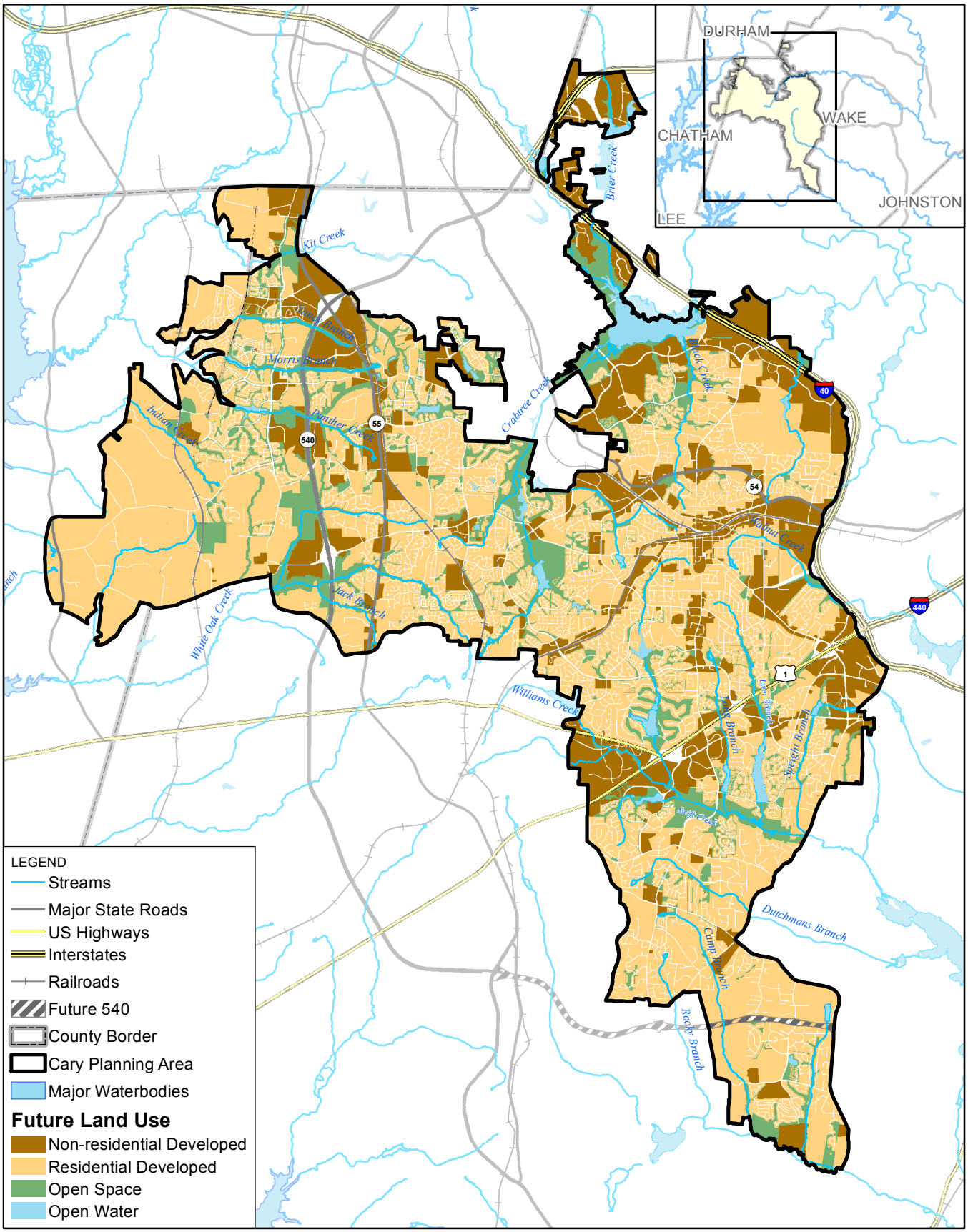

FIGURE 5-1
Future Land Use
2015 Secondary and Cumulative Impacts
Master Management Plan - Town of Cary

CH2MHILL

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Table 5-2 provides details on predicted future land use. As shown in Table 4-2, residential use (39 percent) is currently the predominant land use within the Planning Area with the majority of residential use classified as low-density (27 percent of total land use). Residential land uses continue to dominate the future land uses within the Planning Area. As shown in Tables 4-2 and 5-2, the largest changes between the current and future land use will be the reductions in agriculture and forested land. The largest increases in land use types will be in the medium-density residential and commercial categories. The institutional category shows a decrease in area in the future as compared to existing conditions. This is likely due to existing institutional areas being reclassified in the future as a part of larger mixed use zones.

TABLE 5-2
Planning Area Detailed Future Land Use

Land Use Type	Square Miles	Percent of Planning Area	Estimated Percent Imperviousness[3]	Estimated Impervious Area (Square Miles)
Commercial	2.5	3%	82%	2.1
Office Commercial/Industrial	3.5	4%	82%	2.9
Office Commercial/Institutional	6.1	7%	72%	4.4
Institutional	0.7	1%	72%	0.5
Mixed Use[1]	2.5	3%	72%	1.8
Transportation[2]	10.0	12%	87%	8.6
High-Density Residential	2.9	4%	72%	2.1
Medium-Density Residential	8.5	10%	44%	3.8
Low-Density Residential	27.8	34%	21%	5.8
Very Low-Density Residential	6.4	8%	6%	0.4
Parks/Open Space	10.8	13%	4%	0.4
Lakes	0.7	1%	N/A	-
Total	**82.4**	**100%**		**32.8**

Source: Town of Cary, 2013b

Note: The Town's land use categories are described in Appendix D.

1 Mixed use was categorized within the non-residential developed category in Table 5-1.

2 Transportation is not included in the land use coverages. The area used for transportation was estimated by subtracting the land use area from the transportation area.

3 Percent imperviousness values come from estimates from a modeling analysis (CH2M HILL, 2002a). Percent imperviousness values are capped in WSWs. Thus, actual percent imperviousness for a given high density development may not be as high as presented in the Table.

The Town is in the process of updating its Comprehensive Plan (known as the Cary Community Plan). The Cary Community Plan update is projected to be completed by late 2015. It is possible that land use patterns may change as a result of the Plan update, but patterns will be consistent. The most heavily urbanized areas in the Town will continue to be in the vicinity of RTP and other major planned employment centers, in designated mixed-use "activity centers" centered around major intersections throughout the Town, and adjacent to the major highway corridors.

The least dense portions of Town include residential areas in the west and southwest, in the vicinity of Jordan Lake, and in the most southeast portion of the Planning Area in the Middle Creek watershed. These watersheds are important to protect for drinking water

supply (Jordan Lake) and protection of downstream mussel species (Middle Creek). However, in these three areas, there will be an increase in low-density residential development from forest and agricultural land uses. As development occurs and land uses change, open space will be preserved by a number of measures. The Town has undertaken significant efforts to preserve recreational areas, areas of scenic value, and open spaces as described in Section 6. Tables 5-1 and 5-2 underestimate the amount of open space under future build-out conditions given land development requirements discussed in Section 6. While open spaces such as agricultural land and forests will still be lost to development, the impacts will be minimized by these efforts. Open spaces may become more fragmented, except along stream channels, where riparian buffers and floodplains will serve as habitat corridors.

To estimate the amount of open space that would be protected under the future land use plan, the Town's lakes, parks and greenways GIS data layers were compiled. The area included in each of these uses was 11.5 square miles or 14 percent of the Planning Area. This number is likely low as it considers full build-out conditions (e.g., it assumes that all forested and agricultural land is converted) and does not account for open space that may be preserved within a development. Floodplain width exceeds riparian buffer width in many areas; since the Town does not allow residential development within floodplains and commercial development is limited, these areas will also increase protected open space. As shown in Section 4.3, riparian buffers account for 15.0 square miles of the Planning Area (18 percent) and floodplains account for 5.6 square miles (7 percent of Planning Area). Most of the floodplain and buffer area is not identified as open space in Table 5.2. Other protected open space includes passive and active recreation areas, wetlands, and landscape buffers.

As the land use within the Planning Area changes, the amount of impervious surface will increase, which not only changes the viewshed, but also impacts surface and groundwater flow as described in Section 5.10. To estimate the impact of land use change on impervious surfaces, literature values were used to estimate the amount of impervious surface by land use type. Table 5-2 includes percentage imperviousness; the values listed were used in modeling analyses performed for the Town (CH2M HILL, 2002a). Based on these imperviousness values, an impervious area for each land use was estimated. These were then summed and divided by the total land area (with lakes subtracted from the total) to estimate the overall imperviousness value for future land use conditions. It is estimated that in the future over a third of the Planning Area could be developed into impervious surfaces. The marginal increase in impervious area between existing land use and future land use shows the Town's commitment to concentrate growth, thus reducing sprawl development. The Town's land use management strategies are further discussed in Section 6.

5.4 Wetlands

Wetlands within the Planning Area are primarily located within the riparian zones or floodplains of streams and lakes. Wetland losses may occur as land use changes occur and population density increases in the Planning Area. Wetland loss can result in habitat loss, habitat fragmentation, and reduction in species diversity. As discussed in Sections 4 and 6, the majority of wetlands will be protected by existing floodplain regulations. Other programs which protect wetlands are described in Section 6.

Wetland functions may also be decreased if pollutant impacts occur. For example, sediment loading from stormwater runoff may impact hydrology and vegetation within a wetland. Nutrient enrichment and other surface water pollutants may impact amphibians and aquatic organisms inhabiting a wetland. In the long term, overall quality and total acreage of wetlands may be decreased by SCI in upland portions of the Planning Area. However, these impacts will be minimized by stream buffers, floodplain protection, and other development controls.

5.5 Prime or Unique Agricultural Land

The amount of agricultural lands will be reduced in the Planning Area as lands are converted, mainly to residential uses. This includes the conversion of many acres of prime farmland soils. However, recent growth has already converted many acres of agriculture and prime farmland soils within the Planning Area to other land uses. This conversion and disturbance of soils would likely continue to occur even without the proposed infrastructure as residential lots serviced by wells and septic systems increase in the area given the proximity of the Planning Area to RTP and a strong local economy. While the pattern of growth may be different than predicted, and density may be lower, prime farmland soils will still likely be converted and/or disturbed.

These impacts of land use changes could also include the degradation of a land use type through the introduction of adjacent, incompatible urban land uses. For example, the loss of viable farm income can occur when subdivisions are built adjacent to farmland. Because the value of the farmland rises as urbanization of the area occurs, farmers can be forced out of business due to increased property taxes. In addition, the new residential growth may cause associated farming businesses to move away. This change leads to increasingly hazardous traffic conditions for operators of farm equipment and can lead to vandalism of crops.

5.6 Public Lands and Scenic, Recreational, and State Natural Areas

Growth in the Planning Area should have limited impact on scenic and recreational areas that are currently part of the park system. These areas may become more valued by the community as forested areas are converted to other land uses. The Town recognizes the value of these spaces and has a plan of action to protect natural resources and open space, which is outlined in Section 6.

With continued implementation of the Town's plans, scenic areas, open space, and parks will be a high priority for the Town and will provide mitigation for losses of open space as the Town grows.

A large percentage of the open space in the Planning Area is the NCWRC gamelands, as illustrated on Figure 4-1. The Town has met with NCWRC to address the impact of the Amberly, Forest Oaks, and other planned developments that had the potential to impact Jordan gamelands, as no hunting is allowed within 150 yards of a residence. When the northwest area is built out, the safety zone will extend into Chatham County. NCWRC indicates that the 150-yard rule does not apply to the use of archery equipment on the Jordan gamelands.

5.7 Areas of Archaeological or Historical Value

Historical areas may be impacted directly by future projects, but indirect impacts are unlikely. Direct impacts to historic resources will be assessed individually during project planning processes. Assessing historical properties is beyond the scope of this document due to its focus on SCI.

Some loss of historic resources could inadvertently occur with development. For example, an unknown cemetery could be destroyed. Where historic resources are known, they should be protected over time due to implementation of the Town's Historic Preservation Master Plan, discussed in Section 6. A goal of the plan is to preserve historical landscapes that reflect the Town's rural heritage. The Town will negotiate protection of historic resources during the development process. Finally, some structural damage could occur due to vibrations from increased traffic or from acid rain that may occur from increased emissions to the atmosphere. It is likely that few SCI will occur to cultural and historical resources.

5.8 Air Quality

The cumulative impacts of a growing population may impact air quality in the Planning Area. As more vehicles travel within the Planning Area, levels of emitted air pollution may increase. Even without the proposed infrastructure, the population within the area is likely to increase and contribute to higher levels of air pollution. While industrial emissions may also increase in the Planning Area, the primary source of air pollution is likely to continue to be vehicles. Without improved roadways, it is likely that traffic problems would increase, which would exacerbate existing air quality problems. Smog, ozone, and carbon monoxide are the pollutants of concern within the Planning Area. These pollutants are monitored.

As a result of air pollution, the area may see an increase in the number of Ozone Action Days, which are tracked as a measure of air quality by the USEPA. Increased ozone levels can impact human health; on Ozone Action Days, outdoor activity should be limited for health reasons and at-risk populations should remain inside. Smog can decrease visibility, and increased nitrogen and sulfur emissions can lead to acid rain.

To address the impacts of growth on air quality, the Town is actively pursuing alternative modes of transportation, as described in Section 6. A regional light rail system is planned for the Triangle area (Wake County, 2012). Several regional planning efforts aim to reduce vehicle miles traveled and appropriately size roads according to air quality modeling analyses (TJCOG, 2013 and 2014).These programs are further described in Section 6 and Appendix B. Despite regional efforts, SCI to air quality have the potential to occur due to increased amount of traffic.

5.9 Noise Levels

The predicted growth in the Planning Area will produce greater amounts of noise from a greater density of land uses, more people living in the study area, more businesses and industries operating in the area, and an increase in number of vehicles using local roadways. The continued growth and development of the Planning Area will impact community noise levels through the introduction of additional domestic and commercial traffic and

intensification of industry. High noise levels can also impact human health. Urbanization will increase the base level of noise, potentially impacting wildlife behavior.

Efforts taken to improve air quality by promoting alternative forms of transportation will also limit SCI to noise levels in the Planning Area, as described in Sections 6 and 7.

5.10 Water Resources

5.10.1 Surface Water

SCI to surface water resources have the potential to occur in both the Neuse and Cape Fear River basins. With the addition of infrastructure, population density will rise in the Planning Area. Even without the planned infrastructure, population will increase in the Planning Area due to its proximity to RTP and the strong local economy. However, this growth would likely be less dense, would be serviced by wells and septic or community systems, and travel times would increase without road improvements. It should also be noted that there are no requirements for maintenance of septic systems, and small community systems are not required to have an operator onsite 24 hours a day. In addition, growth without infrastructure may fall below thresholds established for stormwater controls or for erosion and sediment control plans.

As a result of the increase in population and associated development, the impervious area within the Planning Area will increase, resulting in an increase in stormwater runoff during a rain event due to a decrease in pervious areas. Pollutant loads and scouring will increase without practices to control runoff rates. Without adequate controls, typical urban stormwater pollutants include sediment, nutrients (nitrogen, phosphorus), bacteria (fecal coliform as indicators), and potential toxicants (metals, oil and grease, hydrocarbons, and pesticides). The increase in runoff may increase pollutant loads, which will cause a decline in water quality and create subsequent impacts on aquatic habitat, wetlands, and sensitive aquatic and amphibian species in the area.

Increases in impervious surface will increase the rate of runoff, which also may impact fluvial system stability, stream channel sinuosity, streambank slopes, floodplain dynamics, and hydrologic flow rates, and thus aquatic and riverine habitats. For example, during storms, a higher amount of rainfall will flow directly to streams, causing higher storm event flows, which may cause streambank erosion and a degraded aquatic habitat. Less rainfall will percolate to groundwater, which can reduce base flow during dry weather. However, it should also be noted that the impacts of storm events on base flow conditions are smaller in western Wake County than in other areas of the County due to soil types found within the Planning Area. A groundwater study completed by Wake County in 2003 identifies the presence of a high percentage of hydrologic soils groups C and D (low infiltration capacity) in the Jordan Lake and Harris Lake watersheds. In addition, low flow recharge rates in streams were the lowest in western Wake County watersheds, 0 gal/acre/day in Jordan Lake watershed; 2 gal/acre/day in Swift Creek; and 3 gal/acre/day in Middle Creek (CDM, 2003). An update to this comprehensive groundwater study has not occurred since 2003.

All waters within the Planning Area are classified as NSW in response to excessive growths of macroscopic and/or microscopic vegetation in both the Jordan Lake watershed and the Neuse River basin. Current strategies to limit nutrient loading will help protect water quality; however, as runoff volumes increase, nutrient loading could continue to impact

water quality. As agricultural land uses decrease in the Planning Area, impacts from this land use type may decrease.

The construction of sewer lines, water lines, and roads may impact water quality, particularly where they cross streams. There are sediment impacts from construction, although the use of proper erosion and sediment controls help minimize this impact. In general, these are direct impacts, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town will review the cumulative direct impact in future EAs and EISs.

NCDENR monitoring of both benthic macroinvertebrate and fish communities within the Planning Area will indicate if any water quality declines are impacting aquatic communities. The composition of these aquatic communities provides insight into the effects of sediment loading, nutrient enrichment, and stream temperature changes, to name a few parameters.

5.10.1.1 303(d)-Listed Streams

Land use changes may impact both water quality and quantity in the Planning Area. These impacts may limit or impede the ability of the State to prepare and effectively implement management strategies to improve water quality in Section 303(d)-listed waterbodies, which include Black Creek, Brier Creek, Crabtree Creek, Lake Crabtree, Little Brier Creek, Middle Creek, Richlands Creek, Swift Creek, Walnut Creek, and Williams Creek (NCDENR, 2012a). Swift Creek and Williams Creek were not included in the draft 2014 list and have a TMDL discussed in Section 6 (NCDENR, 2014). These waterbodies are currently subject to water quality or aquatic habitat stresses, primarily from stormwater and urban runoff. Since these waterbodies are located in areas that are already urbanized, it will likely be difficult to attain a healthy aquatic community there, even with no future development. Increases in runoff may further degrade these waterbodies within the Town's Planning Area.

5.10.2 Groundwater

As water and sewer services are expanded, fewer residents will rely on groundwater as a public water supply source. Also, a number of septic tank/ground absorption systems serving residences may be eliminated. These are positive secondary impacts to the groundwater resources of the Planning Area by reducing the demand for groundwater as a source for drinking water and the public health risk of groundwater contamination in the Planning Area from leaking or failing septic tanks.

Future development may degrade groundwater quality if contaminants common to urban activities reach the groundwater. These include fertilizers, petroleum products, semi-volatile and volatile organic compounds, and metals and nutrients from stormwater runoff.

A general increase in impervious surfaces may also impede groundwater recharge and the groundwater's ability to maintain base flow during drought conditions. However, Wake County's groundwater study illustrates the lowest recharge rates in the western part of the County. In the Jordan Lake watershed, groundwater recharge ranges from approximately 2 to 4 inches per year as compared to central and eastern portions of the County, which have rates of 7 to 9 inches per year (CDM, 2003).

5.11 Forest Resources

According to Town land use planning data, much of the forested land within the Planning Area will be converted to other uses. Even without the proposed infrastructure, forested lands would likely be converted to low-density residential land that would be serviced by wells and septic systems. The majority of the forested lands within the Planning Area are currently a mixture of pine and oak forests.

Forested communities are likely to remain along stream channels. Overall, forested wildlife habitat will be reduced within the Planning Area and may become more fragmented.

Impacts to forested lands will be lower in the Jordan Lake watershed, because of water supply watershed regulations limiting the amount of built-upon area. The Land Use Plan only includes low-density residential development in this watershed, protecting some forest resources, wildlife habitat, and the Town's drinking water supply.

Trees filter air and their shade can cool air temperatures. Loss of forest resources may also impact air quality and temperature.

5.12 Shellfish or Fish and their Habitats

Degradation of water quality and aquatic habitats can impact aquatic resources, including fish and shellfish communities. Sources of degradation include increasing erosion of stream channels, sedimentation from construction activities, changed hydrology from increased impervious surfaces, and increased stormwater runoff containing high levels of nonpoint source pollutants. These changes may affect a fish community by altering species diversity and/or the number of individuals within a community, thus decreasing the potential for a sustainable healthy fish community. Those species of fish that are less tolerant of habitat stress and pollutants may disappear from a community, causing a decrease in species diversity. This may occur without a change in the overall quantity of fish present, or both may occur: a community may lose diversity and population.

One of the changes that may impact the community is sedimentation of channel substrate. Insectivorous fish species dependent on healthy benthic macroinvertebrate communities may be impacted by a loss or change in their food source. Darters and other fish species dependent on riffle habitats may disappear with habitat impacts. Another factor that can change a fish community is the replacement of sensitive fish species by pollutant-tolerant exotic species.

The construction of sewer lines, water lines, and roads may also impact water quality and aquatic habitat, particularly where they cross streams. There are sediment impacts from construction, although the use of proper erosion and sediment controls helps minimize such impacts. In addition, where culverts are used for road crossings and not buried to a sufficient depth, a natural substrate will no longer exist to provide aquatic habitat. In general, these impacts are direct impacts, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town will review the cumulative direct impact in future EAs and EISs.

5.13 Wildlife and Natural Vegetation

Wildlife resources are primarily impacted by habitat impacts. Further urbanization of the region may impact wildlife resources through the continued:

- Loss, fragmentation, or degradation of sensitive and non-sensitive aquatic and terrestrial species and their habitats through conversion of land and wetland areas and filling or piping of streams for residential, business, or public facility uses. (The loss of habitat may also increase distances between suitable habitats for a given species.)
- Degradation of air resources through increased automobile usage and traffic congestion.
- Loss of species diversity through the combined impacts listed above.

Terrestrial species are impacted by loss of habitat as land use changes occur. Cumulatively, land use changes fragment the landscape. Habitat fragmentation makes wildlife movement more difficult. Over time, a loss in the number of wildlife individuals may occur as fewer and fewer acres of suitable habitat remain. This impacts the sustainability of a given species and may decrease species and genetic diversity.

Without proper protective measures in place, changes in land use will impact aquatic species and their habitats. The changes in land use may lead to increased sedimentation and can deliver more stormwater pollutants to the system, reduce the stability of streambanks, and cause other channel modifications.

Impacts to fish communities, as well as forested areas and habitats, were discussed above.

5.13.1 Rare, Threatened, or Endangered Species

While the ESA protects threatened and endangered species from takings, SCI to a species' habitat may, over the long term, reduce the number of individuals of a species. Table 5-3 presents a list of potentially present federally listed species within the Planning Area and possible SCI to these species. This list is based on the presence of habitat and observations of the species within Wake County (USFWS, 2014a). The federally protected bald eagle and federal species of concern, the Atlantic pigtoe, have been observed within the Planning Area. No Federally-listed threatened or endangered species have been observed within the Planning Area (NCNHP, 2014).

TABLE 5-3
Likelihood of SCI to Federally Listed Species within Wake County

Scientific Name	Common Name	Federal Status	County Status	Likelihood of SCI within Planning Area*
Animals				
Aimophila aestivalis	Bachman's Sparrow	FSC	Historic	Not likely to be impacted
Ambloplites cavifrons	Roanoke bass	FSC	Current	Not likely to be impacted
Anguilla rostrata	American eel	FSC	Current	Not likely to be impacted
Etheostoma collis lepidinion	Carolina darter	FSC	Probable/ potential	Not likely to be impacted
Haliaeetus leucocephalus	Bald eagle	BGPA	Current	Not likely to be impacted
Heterodon simus	Southern hognose snake	FSC	Obscure	Not likely to be impacted
Lythrurus matutinus	Pinewoods shiner	FSC	Current	Not likely to be impacted
Myotis austroriparius	Southeastern myotis	FSC	Historic	Not likely to be impacted
Myotis septentrionalis	Northern long-eared bat	P	Current	Not likely to be impacted
Noturus furiosus	Carolina madtom	FSC	Current	Not likely to be impacted
Picoides borealis	Red-cockaded woodpecker	E	Historic	Not likely to be impacted
Invertebrates				
Alasmidonta heterodon	Dwarf wedgemussel	E	Current	Possible impact
Elliptio lanceolata	Yellow lance	FSC	Current	Possible impact
Fusconaia masoni	Atlantic pigtoe	FSC	Current	Possible impact
Lasmigona subviridis	Green floater	FSC	Current	Possible impact
Insects				
Speyeria Diana	Diana fritillary	FSC	Obscure	Not likely to be impacted
Plants				
Lindera subcoriacea	Bog spicebush	FSC	Current	Possible impact
Monotropsis odorata	Sweet Pinesap	FSC	Historic	Not likely to be impacted
Rhus michauxii	Michaux's sumac	E	Current	Not likely to be impacted
Sagittaria weatherbiana	Grassleaf arrowhead	FSC	Historic	Not likely to be impacted
Trillium pusillum var. *pusillum*	Carolina least trillium	FSC	Current	Possible impact

* A probable impact indicates that without proper mitigation policies and ordinances, an impact to the species is likely. With the mitigation programs summarized in Section 6, the likelihood of impacts will be reduced. A possible impact has a lower probability of impact than a probable impact without proper mitigation policies and ordinances in place.

A bald eagle nesting site is present just north of Lake Crabtree and others are near Jordan Lake. It is unlikely that the bald eagle will be impacted by SCI associated with growth in the Planning Area. The food source for this bird is primarily the fish from the plentiful amount of open water in and near the Planning Area. The Town's stormwater, erosion and sediment control, and riparian buffer ordinances, as well as WSW programs, should limit impacts to open waters and this species' food sources.

Another species listed within Wake County is the Northern long-eared bat. This species has not been observed within the Planning Area or Wake County according to the NHEO database

(NCNHP, 2014). The Northern long-eared bat is not likely to be impacted by SCI within the Planning Area, and the primary threat to the species is white-nose syndrome.

The FSC Atlantic pigtoe was located in Middle Creek during the 2004 CZR mussel survey (CZR, 2004). The Atlantic pigtoe was observed on Middle Creek and Swift Creek downstream of the Planning Area in 2001 and 2012, respectively, according to NHEO database (NCNHP, 2014). No dwarf wedgemussel individuals were located within the Planning Area during the CZR survey (CZR, 2004). In addition, no dwarf wedgemussels were found during a survey conducted in 2001 in downstream areas of Middle Creek from roughly 1,500 feet upstream of SR 1006 to SR 1330 in Johnston County (CZR, 2001). The NHEO database indicates no dwarf wedgemussels have been observed within the Planning Area, but were observed in 2012 on Swift Creek, downstream of the Planning Area (NCNHP, 2014). Impact from proposed infrastructure to mussel species is possible, but would be limited by mitigation strategies described in Section 6, as well as by the impoundments on Swift Creek, all of which would protect downstream species.

Communication with wildlife agencies indicates that there could be impacts to downstream populations through development along Middle Creek and its tributaries downstream of Sunset Lake. Much of this area is protected as floodplain, which will result in wide riparian corridors since the Town's ordinances prohibit residential development in the floodplain and commercial development rarely occurs in the floodplain. A GIS analysis of the Middle Creek floodplain below Sunset Lake indicates that there is approximately 0.32 square mile in floodplain along a mainstem length of approximately 9,500 feet. This results in an average floodplain width of 940 feet, or approximately 470 feet on each side of the creek. A similar analysis on the tributaries that drain the Town's Planning Area below Sunset Lake indicates an average floodplain width of approximately 370 feet, or 185 feet on each side of the stream. No other federally listed mussel species were found within the Planning Area.

Other state-listed mussel species are present within the Planning Area. For these aquatic species to survive, their aquatic habitats and associated host fish communities must be preserved. Methods to address and mitigate SCI that may affect water quality and aquatic habitats of these species are presented in Section 6.

Michaux's sumac is listed as federally endangered and has been located elsewhere in Wake County; no known occurrences of the plant have been recorded within the Planning Area (NCNHP, 2014). Therefore, it is unlikely that this species will be impacted by SCI within the Planning Area. However, since it is located in the County, the potential for direct impacts from all future infrastructure projects will be evaluated. The plant prefers habitat that is disturbed periodically, such as that found along utility lines. Thus, the Town will evaluate the potential for impacts to this species in future environmental documents.

5.13.2 Natural Vegetation

Within the Planning Area, natural vegetation is typical of Piedmont upland and bottomland communities. However, smaller unique ecosystems are also present. These communities have the potential to be impacted by SCI resulting from growth in the Planning Area. As forested lands are converted to other uses, natural communities will decrease in size. Rare communities may be lost if adequate protection is not available.

Loss of natural vegetation also occurs in disturbed areas, as non-native exotic species may begin to out-compete native vegetation and alter community structure. As naturally vegetated areas are converted to other uses, wildlife habitat is lost and/or fragmented. SCI may limit the occurrence of major tracts of natural vegetation to locations along stream channels currently protected by undisturbed buffer zones. Even without the proposed infrastructure, forested land may be converted to residential land served by wells and septic systems. This conversion would likely result in many of the same impacts to natural vegetation and habitat described above.

5.14 Introduction of Toxic Substances

As urbanization continues in the Planning Area, the potential for release of toxic substances from residential and commercial sources increases. The improper disposal of these substances could have adverse impacts on the environment by entering the groundwater system through landfill leachate or entering the sewer system and reaching the WWTPs. Improper disposal could impact groundwater and surface water quality and potentially impact human health through drinking water supplies, fish consumption, and other means.

As the amounts of traffic and urban uses in the receiving basin increase, stormwater runoff will contain increasing levels of water pollutants, some of them toxic. Typical urban stormwater pollutants include sediment and silt, nitrogen and phosphorus from lawn fertilizers, oils and greases, rubber deposits, toxic chemicals, pesticides and herbicides, and road salts. Unless contained and treated before entering surface waters, this urban stormwater could impact the water quality and sensitive species living within the receiving basin.

The long-term impact of new toxic discharges to surface- and groundwater from urban stormwater, and accidental and/or intentional spill of household and industrial chemicals in the receiving basin, could lead to declines in water quality without proper protective measures in place. This could contribute to the loss of wildlife and their habitats.

5.15 Summary of Secondary and Cumulative Impacts

Table 5-4 presents a summary of possible and anticipated SCI to natural resources as a result of current and future growth in the Planning Area. This summary does not determine the level of significance of impacts to each of the natural resource categories. Mitigation measures to limit environmental resource impacts are detailed in Section 6.

TABLE 5-4
Potential SCI, within the Planning Area, to be Addressed by Permitting and Mitigation

Environmental Resource	Potential for SCI	Types of SCIs
Topography and Floodplains	LI	Limited commercial development could occur in floodplain with special use permit; this could result in reduction in water storage capacity, habitat, surface water filtration, and infiltration.
		Isolation of floodplain from stream by channel entrenchment
Soils	PI	Soil erosion and compaction from new development
Land Use	PI	Conversion of agricultural and forested land uses to mainly residential land uses
Wetlands	LI	Wetland loss, resulting in loss of habitat, habitat fragmentation, reduction in genetic diversity, and loss of flow attenuation
		Loss of wetland function through pollutant loading
Prime or Unique Agricultural Land	PI	Possibility of conversion to other uses
Public Lands and Scenic, Recreational Areas, and State Natural Areas	LI	Possibility of conversion of adjacent land uses
Areas of Archaeological or Historical Value	LI	Possibility of conversion of adjacent land uses
		Structural damage due to acid rain and vibrations
Air Quality	PI	Reduction in air quality due to increased vehicular traffic
		Reduction in air quality benefits of trees
		Negative impacts to human health (such as asthma)
		Acid rain
		Reduced visibility
Noise Levels	PI	Increase in overall noise level in Planning Area
		Negative impacts to human health
Surface Water Resources	PI	Water quality degradation; increase in stormwater runoff
		Alteration of natural hydrograph (e.g., magnitude, timing, frequency, duration, rate of change); lower and more frequent low-flow conditions; alteration of channel morphology
Groundwater Resources	LI	Reduction in use for drinking water; potential to become contaminated
		Groundwater inflow which provides baseflow in streams and supports aquatic life during droughts may be reduced
Forest Resources	PI	Conversion to other uses
		Reduction in air quality; increase in near-surface air temperature; habitat fragmentation
Shellfish or Fish and their Habitats	PI	Possible aquatic habitat degradation
		Disruption of food chain; reduction in aquatic insect number and diversity through loss of riffle habitat; reduction in potential for long-term population sustainability
Wildlife and Natural Vegetation	PI	Reduction in available habitat
		Habitat fragmentation; reduction in genetic diversity; reduction in species tolerance; increased dispersal distance to suitable habitat; reduction in potential for long-term population sustainability
Introduction of Toxic Substances	LI	Increase in likelihood of contamination
		Negative impacts to human health

Notes:

PI = Potential Impact (major relevance in SEPA documents and permitting applications)
LI = Limited Impact (minor relevance in SEPA documents and permitting applications)