SECTION 5

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

This section outlines the SCI associated with the infrastructure needed to accommodate the needs of the Town of Holly Springs' residents, including planned growth. The area's transportation and utility infrastructure is being expanded and strengthened in response to its economic growth. 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. The Town's primary goal is to develop cost-effective methods to provide necessary services and infrastructure, through expansions, to its residents in a manner that will protect the environment.

The discussion in this Section provides 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 possible SCI are discussed in Section 6. Overall SCI to environmental features discussed in this section will be minimized by regulations in the Town's Unified Development Ordinance (UDO) and Town Code. 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 development sites will change a site's topography. The Town reviews erosion and sediment control plans to minimize grading in areas with steep slopes, where possible.

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

Impacts to floodplains will vary based on jurisdiction. Within the Town's limits and ETJ, impacts to floodplains will be limited due to the Town's floodplain protection and riparian buffer ordinance in Section 6. In areas outside the Town's limits and ETJ but within the Planning Area, impacts to floodplains are also limited by Wake County's protection ordinance described in Appendix B.

5.2 Soils

As land is developed, clearing and grading will result in soil disturbance. By using heavy equipment on development sites, soils will be compacted. During grading, soil will be moved; in some areas it will be removed, while in other areas it will be replaced. Thus, the location of soil types may change. During clearing and grading some soils will be eroded, but the impacts

from this will be minimized by following an approved site plan in accordance with the Town's ordinances described in Section 6.

5.3 Land Use

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. The Town has also developed small area plans, discussed in Section 6. This does not mean that all land in a given area will be developed.

TABLE 5-1
Town of Holly Springs Future Land Use

General Land Use Type	Square Miles	Percent of Planning Area
Residential Developed	21.6	36%
Non-residential Developed[1]	9.6	16%
Open Space	5.2	9%
Harris Lake	4.5	7%
Duke Energy		
Undeveloped	8.8	14%
Developed	3.0	5%
Gamelands	8.1	13%
Total	60.8	100%

Source: Town of Holly Springs, 2013; Wake County, 2013, NCWRC 2013a

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

The Town's Land Use Plan was used to estimate future land use conditions (Design Based Planning, 2009). Figure 5-1 illustrates the general land use categories within the Planning Area. Table 5-1 provides detail on the area (square miles) within each general land use category. It should be noted that land use will change even without the Town's planned infrastructure given its proximity to Research Triangle Park (RTP) and the strong local economy. The pattern and rate of growth without infrastructure will be different; growth without infrastructure may be less dense than growth supported by infrastructure and the Land Use Plan, but it may be spread over a larger area. According to future land use planning, approximately 52 percent of the land will be developed and 9 percent will be open space with another approximately 39 percent including Harris Lake and land currently owned by Duke Energy. The Town anticipates some business park development in this area if Duke Energy chooses to develop its lands. The Duke Energy lands are not included as mitigation measures within this Plan.

Open spaces may become more fragmented near the Town Village Center and other areas designated for higher density development. Impacts will be less in the vicinity of Harris Lake since lower density development is planned in this area.

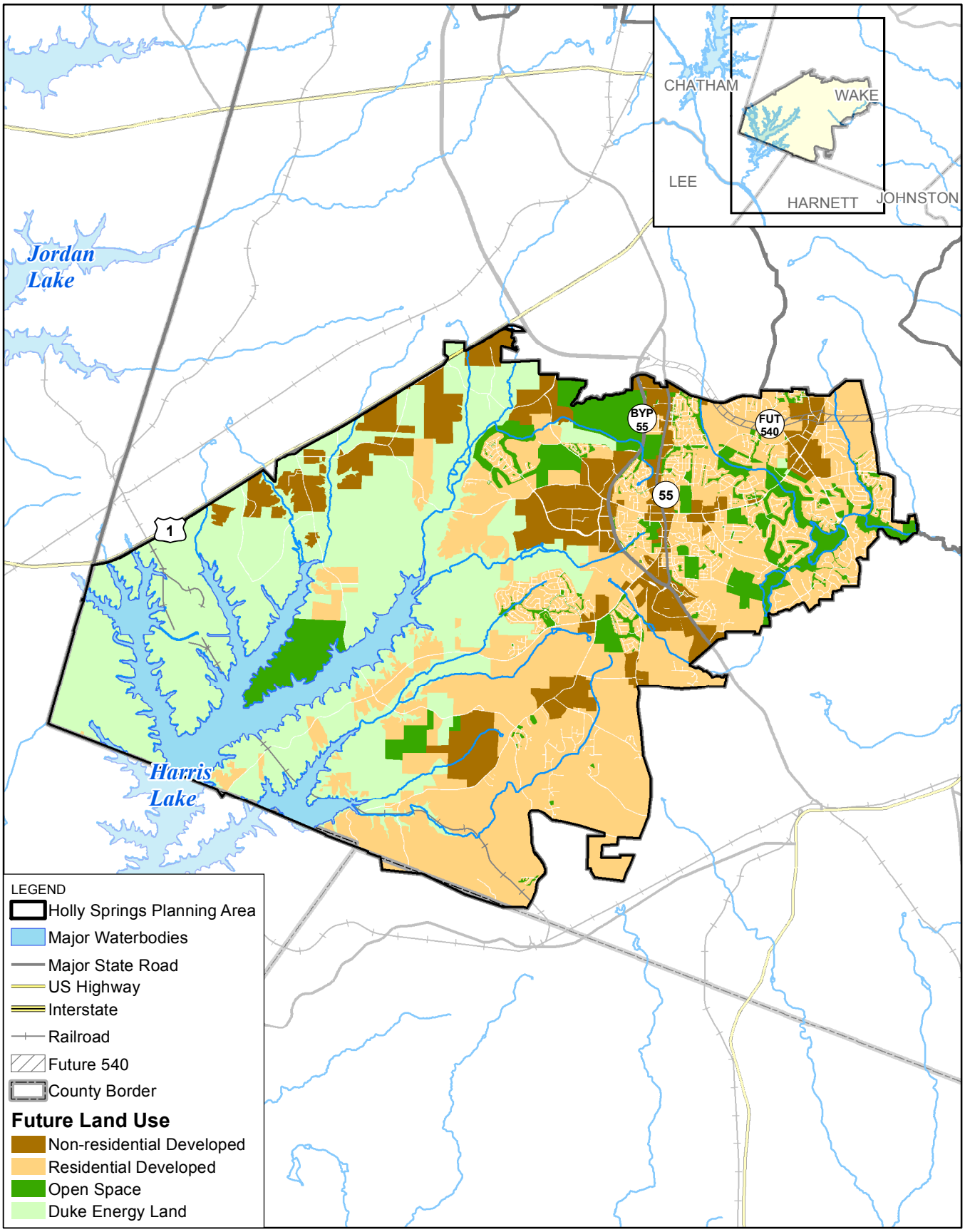

FIGURE 5-1
Future Land Use
2015 Secondary and Cumulative Impacts
Master Management Plan - Town of Holly Springs

CH2MHILL

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Table 5-2 provides information on the detailed future land use classifications, based on build-out conditions. Table 5-2 also includes an estimated percent imperviousness; the values listed were based on modeling analyses performed for the Town of Cary (CH2M HILL, 2002a). These values are based on literature values. The Town of Holly Springs defines its residential land use categories in a different manner than the Town of Cary. These densities included under the two Town's residential categories were compared and impervious values, based on densities rather than residential land use category, were assigned. Based on the impervious percentages, an impervious land area for each land use category was estimated. These areas were then summed and divided by the total land area (with lakes subtracted from the total) to estimate overall imperviousness for existing land use conditions. It is estimated that over a quarter of the Planning Area will be impervious.

TABLE 5-2
Town of Holly Springs Detailed Future Land Use

Land Use Type	Square Miles	Percent of Planning Area	Estimated Percent Impervious[3]	Estimated Impervious Square Miles
Commercial	1.2	2%	82	1.0
Industrial	0.9	1%	82	0.7
Business Park	2.9	5%	72	2.1
Mixed Use	2.1	4%	72	1.5
Medium/High-Density Residential[1]	14.3	24%	33	4.6
Low-Density Residential	7.3	12%	21	1.5
Open Space	5.2	9%	4	0.2
Duke Energy Lands				
Undeveloped	8.8	14%	3	0.3
Business Park	3.0	5%	72	2.2
Gameland	8.1	13%	2	0.2
Harris Lake	4.5	7%	N/A	N/A
Transportation[2]	2.5	4%	87	2.2
Total	**60.8**	**100.0**		**16.5**

Source: Town of Holly Springs, 2012, 2013; Wake County, 2013
Note: The Town's land use categories are described in Appendix D.

[1]The percent impervious for the Medium/High Density Residential category was assumed to be the average of the values for medium and high density residential outlined in Table 4-1.

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

[3] Percent impervious estimates are based on a modeling analysis done for the Town of Cary (CH2M HILL, 2002a)

The majority of the area within the Town's Planning Area is designated for residential uses. The low density residential land use type also includes agricultural uses. The most heavily urbanized area is and will be the main core of the Town, in the northeast portion of the

Planning Area. High-density residential areas are designated to be located within close proximity to major commercial land uses and major transportation corridors and connections. The largest increases in land use types will be in the medium/high density residential category. Mixed-use development is also encouraged with the Land Use Plan. The most rural portions of the Town will be in the southwest, toward Harnett County, Chatham County, and Harris Lake.

5.3.1 Forested and Agricultural Land

The Land Use Plan does not include categories for forested and agricultural land. As described above, the Land Use Plan is a guidance document that indicates the land use the Town prefers if land is developed. Agricultural land is allowed as a land use within the low-density residential development category. Similarly, currently forested land may remain as forest. The Town encourages the incorporation of existing natural features, such as wooded areas and slopes, into the design of all new developments to preserve natural character (Design Based Planning, 2009).

Currently the majority of the Planning Area is forested land. The largest changes between the current and future land use will be the reductions in forested land and the increases in residential development. Even without the proposed municipal infrastructure, growth is likely to occur in the Planning Area. A large portion of the Town's Planning Area includes forested open space around the Shearon Harris Nuclear Power Plant; this area is mostly owned by Duke Power and future land uses may include a business park; however, it is likely a large portion of this area remains undeveloped.

5.3.2 Protection of Open Space

The Town has mechanisms in place to protect open space through the development process, as presented in Section 6. Table 5-1 underestimates the amount of open space under future build-out conditions, as a significant amount of the open space would be required within residential developments. The Town's Vision Holly Springs Comprehensive Plan has several policies encouraging the protection of open space and environmentally sensitive areas within the Land Use Element; the Parks, Recreation and Open Space Element; and the Environmental Element (Design Based Planning, 2009). While open spaces such as agricultural land and forests will still be lost to development, the impacts will be minimized by these efforts.

An example of required open space is the Town's ordinance to protect riparian buffers and floodplains. Figure 4-1 illustrates the riparian buffers within the Town's ETJ and these buffers account for 0.9 square miles of protected open space (1.5 percent of the Planning Area). Streams outside the Town's ETJ fall within the County's jurisdiction and have protection strategies in place as well. However, the County does not have a riparian buffer GIS layer to include a buffer open space calculation. These streams will fall under the Town's jurisdiction once the ETJ is expanded. When this occurs, the Town will need to verify whether the streams are perennial, intermittent, or ephemeral, which will determine the size of the buffer as described in Section 6.

The FEMA regulated floodplain area inside the Planning Area is 10.5 square miles (17.3 percent of the Planning Area) and is likely to increase with the new FIRMs currently under development. This does not include Town-regulated floodplains which provide additional flood protection, and, similar to the riparian buffer and floodplain data layers, are not distinguished from other land use categories. In addition, other areas within development areas, such as perimeter buffers and other required recreation areas, are actually open space.

Therefore, open space areas in Tables 5-1 and 5-2 are underestimated as there are many areas that are undeveloped open space within the developed land use designations.

5.4 Wetlands

Wetlands within the Planning Area are located primarily within the riparian zones or floodplains of streams and lakes. Wetlands identified by the NWI are shown on Figure 4-3 and summarized in Table 4-3. It is important to note the NWI does not map all jurisdictional wetlands and therefore underestimates the total acres of wetlands. 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 Section 4, the majority of wetlands will be protected by existing stream buffer and floodplain regulations. Other programs which protect wetlands are described in Section 6. Wetland functions also may be decreased if pollutant impacts occur. For example, sediment loading and stormwater runoff may impact hydrology and vegetation within a wetland. Nutrient enrichment and other surface water pollutants may impact aquatic and amphibious organisms inhabiting a wetland. In the long term, overall quality of wetlands may be decreased by SCI in upland portions of the Planning Area. However, these impacts will be minimized by stream buffers and other development controls.

While some wetland loss still occurs with permitting programs, overall SCI to wetlands in the Planning Area will be minimized by the stream buffer regulations in the UDO and floodplain regulations in the Town Code.

5.5 Prime or Unique Agriculture

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. However, recent growth has already converted many acres of agriculture and prime farmland within the Planning Area. This conversion would likely continue, even without the proposed infrastructure, in the absence of this infrastructure. Residential lots serviced by wells and septic systems would likely increase given the strong local economy. While the pattern of growth may be different and density may be lower, farmland will likely be converted.

These impacts of land use changes could also include 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.

While the Land Use Plan does not have an agriculture category (Table 5-2), agriculture is a permitted land use in the low-density residential land use category. It is likely that in the more rural areas of the Planning Area, southwest toward Harnett County, Chatham County, and Harris Lake, agriculture will remain.

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. With continued implementation of the Town's Plans; described in Section 6, greenways, 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.

5.7 Areas of Archaeological or Historical Value

Historical areas may be impacted directly by future projects. 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, but this should be infrequent. For example, an unknown cemetery could be destroyed. Where historic resources are known, they should be protected over time due to the implementation of the Town's Parks, Recreation, and Open Space Master Plan (Design Based Planning, 2007) as well as the Village District Area Plan (Town of Holly Springs, 2009a), discussed in Section 6. There are three properties within the Town listed on the NRHP. These properties include the Mims House, the Holly Springs Masonic Lodge, and the Holleman House in New Hill.

A goal of the Town is to preserve historical landscapes that reflect the Town's rural heritage, including protecting working farms. This commitment is shown through the Town's purchase of Suggs Farm as well as the Mims property, both of which are now preserved as part of the Town's park system, discussed in Section 6. It is likely that limited 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, population within the region as a whole is likely to increase and contribute to higher levels of air pollution. While industrial emissions also could increase in the Planning Area, the primary source of air pollution is likely to remain as 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 and are monitored. As a result of 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); in addition, several regional planning efforts aim to reduce vehicle miles traveled and appropriately size roads according to air quality modeling analyses

(TJCOG, 2013). 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, as well as the increase in number of vehicles using local roadways. The continued growth and development of the Planning Area will significantly impact the community noise levels through the introduction of additional domestic and commercial traffic and industry. High noise levels can also impact human health. Urbanization will also 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. Even without the addition of planned infrastructure improvements, population density will rise in the Planning Area due the strong local economy. However, this growth would likely be less dense, would be serviced by individual or community wells and septic systems, and travel time would increase without planned road improvements. In addition, growth without infrastructure may fall below thresholds established for stormwater controls or for erosion and sediment control plans.

As a result of population increases, the impervious area will increase which will increase the stormwater runoff because there will be less pervious area for the rainfall to percolate into the soils. Pollutant loads and scouring will increase without practices to control runoff rates. Without adequate controls, typical urban stormwater pollutants including sediment, nutrients (nitrogen, phosphorus), bacteria (fecal coliform as indicators), and potential toxicants (metals, oil and grease, hydrocarbons, and pesticides) may increase. The increase in pollutant load which will cause a decline in water quality and stream channel stability, and may 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 larger volume of rainfall will run 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. It should also be noted that the hydrologic impacts during storms and base flow conditions are smaller in western Wake County than in other areas of the County. 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. 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).

Those waters within the Neuse River basin portion of the Planning Area are classified as NSW in response to excessive growth of macroscopic and/or microscopic vegetation in the Neuse River estuary. 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 will decrease in the watershed.

The construction of sewer lines, water lines, and roads may also 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 impacts are direct impacts, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town knows the general location of its water and sewer lines, but the data are not specific enough to examine the number of utility crossings for its entire Planning Area, but will review it as a cumulative direct impact in future EAs and EISs.

Middle Creek is the only 303(d) listed waterbody in the Planning Area. The impairment is based on the ecological and biological integrity as well as turbidity (NCDENR, 2012a). The Town will participate in any TMDL process if developed for this watershed.

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 SCI to the groundwater resources of the Planning Area by reducing the public health risk of groundwater contamination in the Planning Area from leaking or failing septic tanks. The soils in western Wake County do not percolate well; without public infrastructure, new septic systems may come online that may fail and negatively impact groundwater quality and public health. A project undertaken by the Town within the past few years eliminated a 200-home, low-income community's failing well and septic system; many of the individual wells were contaminated. Other opportunities for public water extensions to eliminate contaminated wells still exist in the growth area surrounding the Town.

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

A general increase in impervious surfaces may also impede groundwater recharge and the groundwater's ability to maintain base flow to streams during drought conditions. However, Wake County's groundwater study illustrates the lowest recharge rates in the western part of the County. In the Harris Lake watershed, groundwater recharge ranges from 2 to 4 inches per year. The central and eastern portions of the County have recharge rates which range from 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 planned infrastructure, forested land will likely be converted to low-density residential land that will 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. Timbering activities can also impact hydrology and wildlife; however, the Town has a timbering ordinance in place that helps to strengthen current forestry requirements. Town review of timbering plans and the preservation of perimeter and riparian buffers reduces SCI to forests and other resources associated with forests.

Impacts to forested land will be lower in the vicinity of Harris Lake as much of this area is within lands owned by Duke Power and is unlikely to be developed. Silviculture activities may continue to occur in this area.

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

5.12 Shellfish or Fish and their Habitats

Degradation of water quality and aquatic habitats may, in turn, impact aquatic resources and fish 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, which decreases the potential for a long-term 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 the overall quantity of fish present changing. Or both may occur—a community may lose diversity and population.

Changes that may impact the community include 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. Other factors that may change a fish community include 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 help minimize this impact. In addition, where culverts are used for road crossings and not sufficiently buried, 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 does not have the data to review this impact for its entire Planning Area, but will review it as a cumulative direct impact in future EAs and EISs.

These impacts are, and will be, limited in the Planning Area by the Town's current mitigation measures and regulations. As discussed in Section 5.1, water quality and quantity impacts will

be limited by stream buffers, floodplain protection and best management practices (BMPs). Where practical, bottomless culverts, bridges, and other applicable devices will be used. Protecting the habitats of fish communities will, in turn, protect the fishes themselves.

The Bass Lake Restoration project was designed to provide habitat. The Town is working in cooperation with the NCWRC to stock the lake.

5.13 Wildlife and Natural Vegetation

Wildlife resources are primarily impacted by habitat changes. Further urbanization of the region may impact SCI to 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 habitat 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 general 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 decreases species and genetic diversity.

Impacts to aquatic species and their habitats may also occur without proper protective measures in place. These changes in land use lead to increased sedimentation and can deliver more stormwater pollutants to the system, reduce the stability of stream banks, and cause other significant channel modifications.

Impacts to fish communities were discussed in Section 5.12. Forested areas and habitats were discussed in Section 5.11.

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 at some time within Wake County (USFWS, 2014a). The federally protected bald eagle and federally endangered Michaux's Sumac have been observed within the Planning Area (NCNHP, 2014).

There is a potential for impact to populations of Michaux's sumac due to fire suppression and habitat loss. It is likely that present populations will remain small. The area where this species is present is planned for low-density residential development only, which will help limit impacts.

A bald eagle nesting site, which is protected by the Bald Eagle Protection Act, is present near Harris 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 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 species is not likely to be impacted by SCI within the Planning Area as the primary threat to the species is white-nose syndrome.

It is of note that no dwarf wedgemussels were located within the Planning Area during a freshwater mussel field survey conducted by CZR in summer 2004. In addition, no dwarf wedgemussels were found during a survey conducted in 2001 in downstream areas of Middle Creek from approximately 1,500 feet upstream of SR 1006 to SR 1330 in Johnston County (CZR, 2001). Since no dwarf wedgemussels were located in Middle Creek during either survey, and the Sunset Lake impoundment will protect downstream areas, the potential for proposed infrastructure to impact this species is low. The federal species of concern Atlantic pigtoe (*Fusconaia masoni*), was found downstream of the Planning Area on Middle Creek (NCNHP, 2014).

Communication with wildlife agencies indicates that there could be impacts to downstream populations through development on Middle Creek and its tributaries downstream of Sunset Lake. As shown on Figure 4-1, much of this area is protected as floodplain, and will result in wide riparian corridors since the Town's ordinance prohibits residential development in the floodplain, and non-residential development in the floodplain rarely occurs. A GIS analysis of the Middle Creek floodplain below Sunset Lake indicates that there are approximately 0.27 square miles of floodplain along a mainstem length of approximately 7,850 feet, within the Town's Planning Area. This results in an average floodplain width of 960 feet, or approximately 480 feet on each side of the creek. A similar analysis conducted on the two tributaries that drain the Town's Planning Area below Sunset Lake indicate an average floodplain width of 300 feet or 150 feet on each side of the stream.

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

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*
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	Not likely to be impacted
Monotropsis odorata	Sweet Pinesap	FSC	Historic	Not likely to be impacted
Rhus michauxii	Michaux's sumac	E	Current	Possible impact
Sagittaria weatherbiana	Grassleaf arrowhead	FSC	Historic	Not likely to be impacted
Trillium pusillum var. *pusillum*	Carolina least trillium	FSC	Current	Not likely to be impacted

*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.

There are State-listed mussel species present within the Planning Area, as outlined in Section 4. 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 impact water quality and aquatic habitats of these species are presented in Section 6. They include riparian buffer protection, erosion and sediment control, and stormwater runoff control.

The construction of sewer lines, water lines, and roads may also impact water quality and the aquatic habitat of these rare mussels, particularly where the infrastructure crosses streams. There are sediment impacts from construction although the use of proper erosion and sediment controls help minimize this impact. In addition, where culverts are used for road crossings and not sufficiently buried, a natural substrate will no longer exist to provide aquatic habitat. The Town requires buried culverts and bridges to the maximum extent practical. Therefore, culverts are always recessed at least one foot. In general, these impacts are direct impacts, but there is also a cumulative direct impact from previous crossings and other future crossings. The Town does not have the data to review this impact for its entire Planning Area, but will review it as a cumulative direct impact in future EAs and EISs. For future infrastructure projects that may impact rare species, the Town will work with agencies to determine whether surveys are needed to evaluate potential impacts.

There are several areas of undeveloped park land and preserved open space within the Town, particularly along Middle Creek. The Town continues to monitor an approximate 40-acre area of habitat for the state-listed Easter tiger salamander (*Ambystoma tigrinum*) along Middle Creek, which includes floodplain protection area. The Town intends on protecting this area in a

voluntary dedicated tiger salamander preserve through coordination directly with the property owners. The Town owns a 74-acre and 50-acre undeveloped park property known as Sunset Oaks and Woodcreek Park site, respectively. In 2011 the town was granted a 46-acre tract of land, known as the Jordan property, which is adjacent to a 48-acre tract owned by the Town of Cary.

The Town has policies in place to further protect this species as described in Section 6. Impacts to this species should be limited.

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 run the risk of being lost if adequate protection is not afforded to them.

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 locations 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.

Trees and vegetation are integral to habitat protection, air quality improvement, control of surface water runoff, and temperature moderation. The Town has a tree protection section found in Section 7 of the UDO, as described in Section 6. Stream buffers also provide protection of natural vegetation along stream channels, protecting both natural vegetation and aquatic resources.

5.14Introduction 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 WRF. 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 amount 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 the surface water and groundwater from urban stormwater, landfill leachate, 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 potential loss of wildlife and their habitats.

The Town has programs to prevent toxic releases and treat them when they do occur. The Town has a stormwater education program that provides the public with valuable knowledge to make them aware of the impacts of toxins reaching the stormwater system. This education program encourages the public to limit the use of common toxins such as lawn pesticides and herbicides to help prevent the problem.

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 table is meant as a summary and does not determine the level of significance of impacts to each of the natural resource categories. Mitigation efforts to limit environmental resource impacts are detailed in Section 6.

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

Environmental Resource	Potential for SCI	Types of SCIs
Topography and Floodplains	LI	Minimal impacts could occur from commercial development in the floodplain; this could result in reduction of 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	Loss results in loss of habitat and habitat fragmentation, reduction in genetic diversity, and loss of attenuation of flow capabilities Loss of wetland function through pollutant loading
Prime or Unique Agriculture	PI	Conversion to other uses
Public Lands and Scenic, Recreational, 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 Negative impacts to human health (such as asthma) Acid rain Reduced visibility
Noise Level	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 (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 reduction, which provides base flow 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; reduction
Shellfish or Fish and their Habitat	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 = Areas of Potential Impact (major relevance in SEPA documents and permitting applications)
LI = Areas of Limited Impact (minor relevance in SEPA documents and permitting applications)

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