Regional Water and Wastewater Infrastructure Concept Plan

US 421 Corridor

Pursuant to Session Law 2023-134

NORTH CAROLINA
Department of Environmental Quality

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North Carolina Department of Environmental Quality

Submitted May 1, 2024

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Executive Summary

Background and Study Purpose

The Regional Water and Wastewater Infrastructure Concept Plan for the US Hwy 421 Corridor in North Carolina (the Plan) was developed by the North Carolina Department of Environmental Quality (DEQ) to evaluate the current and future utility needs in the Study Area as directed in Session Law 2023-134. This Plan offers concepts where regionalization can address the concern that the current infrastructure needs along the US Hwy 421 Corridor will be unable to meet future economic and residential demand. This Plan is intended to be a high-level analysis of the region's water and wastewater needs and the potential methods to address future growth and environmental challenges in a responsible way. This study addresses the following items:

- Identifies the Study Area's public water and wastewater providers and develops an understanding of water supply and water quality needs and issues.
- Reviews the water and wastewater service areas and evaluates utility service to potentially underserved communities.
- Develops an estimate of the future demands due to regional population growth and economic development impacts.
- Evaluates the capacity and general treatment capabilities of existing treatment facilities in the Study Area
- Identifies opportunities to serve future demands under a cost-effective, environmentally responsible regionalized approach.
- Provides a financial evaluation of the study area to identify theoretical impacts to the affordability of water and sewer.
- Provides conceptual infrastructure plans for responsible solutions to meet future utility demands.

Study Area Definition and Stakeholders

The Study Area is a seven-county geographic area surrounding US Hwy 421 between I-85 in Greensboro and I-95 in Dunn, designated a high-priority corridor in the federal Infrastructure Investment and Jobs Act of 2021. These counties include: Guilford, Randolph, Chatham, Lee, Harnett, Johnston, and southern Wake. In total, there are 43 water and wastewater utility providers in the Study Area. This study area focuses primarily on the upper Cape Fear River basin but also includes portions of the Neuse and Yadkin-Pee Dee River basins.

Given the timeline limitations in this study (approximately three months), this study exclusively focused on publicly owned utility operations. Privately owned community and industrial systems were not included in this evaluation but would be included when evaluating Total Maximum Daily Load (TMDL) allocations in the future and considered for regional opportunities where they are applicable.

DEQ values public feedback and encourages stakeholder engagement throughout the planning processes. The expedited timeframe limited DEQ's ability to solicit feedback on proposals within this plan. DEQ

strongly encourages stakeholder engagement prior to implementing recommendations of this Plan. There were some direct and interactions by DEQ and its private consultant team to reach out to municipal water and wastewater providers and economic development leaders in the area.

Summary of Water Demands and Wastewater Flows Through 2050

The Plan defines the water and wastewater requirements within the Study Area through planning year 2050 and estimates the water and wastewater infrastructure improvements to meet the regional supply, treatment, and conveyance needs. Table 1-1 shows the difference between 2022 water and wastewater demands and the projected 2050 needs. These numbers represent county-wide needs based on a combination of demands for individual facilities within the county or region. These are detailed by facility in Section 3.

Table ES–1: Total County-Wide Water and Wastewater Projections

Water Demand Projections	2022 Avg Day Water Demand (MGD)	2050 Avg Day Water Demand (MGD)	Difference Average Day Demand (MGD)	2022 Max Day Water Demand (MGD)	2050 Max Day Water Demand (MGD)	Difference Maximum Day Water Demand (MGD)
Johnston County	21.09	40.4	+19.31	28.5	55.7	+27.2
Harnett County	24.9	54.2	+29.3	35.3	66.7	+31.4
Wake (Fuquay-Varina/Holly Springs)	6.4	17	+10.6	9.4	27.5	+18.1
Lee/Chatham	13.02	43.54	+30.52	16.58	58.41	+41.83
Triad (Guilford/Randolph)	68.91	101.7	+32.79	93.2	134.96	+41.76
Wastewater Flow Projections	**2022 Annual Avg WW Flow (MGD)**	**2050 Annual Avg WW Flow (MGD)**	**Difference Annual Average WW Flow (MGD)**	**2022 Max Month WW Flows (MGD)**	**2050 Max Month WW Flows (MGD)**	**Difference Max Month Wastewater Flow (MGD)**
Johnston County	9.57	35.18	+25.61	12.16	43.17	+31.01
Harnett County	10.6	22.0	+11.4	13.8	28.8	+15.0
Wake (Fuquay-Varina/Holly Springs)	5.7	20.4	+14.7	6.4	24.3	+17.9
Lee/Chatham	7.61	28.68	+21.07	9.54	37.0	+27.46
Triad (Guilford/Randolph)	54.25	85.07	+30.82	66.43	104.89	+38.46

Water demands and wastewater flows were projected using the 2022 Local Water Supply Plans (LWSP), recent and ongoing studies, and information provided by the NC Department of Commerce regarding anticipated growth due to incentivized economic development. Section 3 discusses these different demands in detail.

Table 1-1 shows that projected demands for water and wastewater increases across the Study Area. Harnett County, Chatham/Lee Counties, and the Triad are projected to see a substantial increase in water demands in 2050. As reflected in the recommendation sections, Harnett County is expected be well positioned to meet that projected demand while Chatham/Lee Counties and the Triad will require notable regionalization to meet their projected demand. For wastewater demands, the Triad is projected to see the most growth in projected flow demand, but Lee/Chatham County and Johnston County are projected to substantially increase their wastewater flow needs. **Strategic investment in wastewater across the Study Area will be required to meet this projected demand.**

The regional nature of the study allows for evaluation of opportunities for public water and wastewater providers to collaborate to improve efficiencies, reduce costs, improve overall water management, improve water quality, and meet the needs of underserved areas. This effort compliments the North Carolina Statewide Water and Wastewater Infrastructure Master Plan: The Road to Viability that was created by the State Water Infrastructure Authority according to NCGS §159G.

Water and Wastewater Treatment Requirements and Environmental Considerations

This study assumes that the Cape Fear River basin would be subject to nutrient removal criteria by 2050 due to nutrient impaired waters. Each facility in the Haw River sub-basin would remain at its current allocation, while all other facilities would operate with no net increase or a “hold the load” strategy, defined as the annual average discharged nutrient, Total Nitrogen (TN) and Total Phosphorus (TP) load over calendar years 2021-2023 as reported by the facility. This average load was then assigned to the facility as their Total Maximum Daily Load (TMDL) moving forward. In cases where the total discharged load was below the Limits of Conventional Treatment Technology, the TMDL was assumed to be a mass load allocation equivalent to the TN concentration of 3.0 mg/L and a TP concentration of 0.5 mg/L. This situation occurred when the average effluent flow was significantly less than the permitted capacity of the facility.

For new facilities and expansions, the nutrient allocation was assumed to be reduced to a TN of 3.0 mg/L and a TP of 0.18 mg/L in the Haw River sub-basin. While all other facilities in sub-basins other than the Haw River sub-basin were assumed to be assigned a mass nutrient allocation equivalent to a TN concentration of 3.0 mg/L and a TP concentration of 0.5 mg/L. The difference in basins is due to the nutrient related impairments in the Haw River reach of the Jordan Lake watershed.

Regional efforts offer solutions to the water and wastewater capacity needs for continued economic activity while also addressing environmental and health issues in the greater Cape Fear River basin. An overall improvement to the basin’s ecosystem could be achieved if significant upgrades can be limited to the proposed regionalized facilities utilizing the closure of aging and ineffective treatment systems. The alternatives recommended in this evaluation have accounted for an overall balance of the discharge of nutrients today with the capacity needs in the future.

The Cape Fear River basin is currently being modeled by the EPA. This model integrates data and knowledge of hydrological systems, nutrients, and other factors throughout the basin. This Plan is not informed by these results, as the modeling is not yet complete. Upon completion, DEQ recommends that

this Plan be reviewed to ensure that the modeling results do not negatively impact the recommendations in this Plan.

PFAS and 1,4-Dioxane are currently the primary contaminants of emerging concern in the Cape Fear River basin due to their impact on human health in drinking water. The presence of these contaminants has been documented through sampling by the NC Collaboratory, public water and wastewater utility providers, and other local and state entities. North Carolina ranked as the fourth highest state with the greatest number of drinking water systems identified with detectable levels of 1,4-Dioxane and third highest concentrations nationwide. Based on all available data, North Carolina has more than 300 water systems with PFAS levels that exceed the new EPA drinking water standards. That includes 42 municipal water systems serving nearly 3 million residents combined, as well as approximately 270 public water systems (20% of total) tested.

DEQ has prioritized actions statewide to reduce the impact of PFAS and 1,4-Dioxane contamination and address concerns of the downstream utilities and communities. Plans to upgrade existing facilities or add new facilities should consider the presence, impact and reduction of emerging contaminants as part of the regional strategies.

Financial Review of Stakeholders

Cost projections were made for each of the regional recommendations included in this Study. For the purpose of this study, the projections reflect expected costs as if all projects were built in 2024. However, these projects would likely be implemented in phases and true costs are likely to change based on a number of factors, including state or federal funding, fund balances, new regional water authorities or other governing structures, or costs of materials at the actual time of construction. While these cost estimates have the potential to significantly fluctuate overtime, they are useful in comparing strategies and offer an overview of the financial impacts on systems without state or federal investment.

The analysis also creates a framework that provides insights into the financial strength of the systems, particular areas of stress within the study area and what, if any, problems could arise from adding additional leverage to the systems in the study area. However, it should be noted that, due to a limited timeframe to complete the analysis, our evaluation was based only on publicly available data of public systems and did not include detailed discussions or in-depth examination of the overall financial condition of water and wastewater utility providers in the data set. The Financial Review report can be found in Appendix C.

This report does not attempt to quantify the financial impacts of not seeking regional solutions but does acknowledge the impacts this could have on municipal water and wastewater utilities and economic development opportunities beyond the initial capital investment. This study may also not capture all costs associated with environmental compliance. If the challenges cannot be addressed with regionalization, there is a risk that both the state and municipalities may not realize the full value of their investment, resulting in less general and enterprise fund revenue. Opportunities for a more cost-effective operational strategy to address treatment needs can be negatively impacted.

This study does not quantify the economic benefits generated as a result of proposed solutions including direct and indirect impacts to jobs, economic activity, and gross state domestic product.

Summary of Recommendations

General Recommendations and Discussion of Limitations

The Plan presents a range of alternatives for water and wastewater infrastructure improvements, including supply, treatment, and conveyance. The alternatives were evaluated using multiple considerations, such as technical feasibility, reliability, resiliency, sustainability, regulatory compliance, environmental impact, and financial viability. Given the limited time available for this study, additional steps may be necessary before pursuing particular actions. Certain limitations are highlighted, and general recommendations are offered to ensure a successful regionalization effort. These general recommendations include:

- Outreach and communication with a goal of building consensus with the affected stakeholders will be critical to the success of the regionalization approach.
- Further hydrologic study of the Cape Fear River basin is warranted to assess the likely yield available through the planning period.
- Where scenarios and improvements are recommended that appear feasible and favorable and garner the support of the stakeholders and regulatory community, site-specific studies are recommended to further assess the receiving stream and likely wastewater characteristics to better understand the suitability of the option and the level or treatment required to achieve the necessary water quality goals.
- Cooperation among stakeholders throughout the entire study area and beyond is necessary to achieve the desired outcome of this Plan. State support is likely necessary to facilitate those efforts.

The following limitations are highlighted:

- The financial review completed as part of this study was limited and based on publicly available data and does not capture changes in their financial outlook since the data was published. The study recommends an in-depth evaluation of the financial viability of these alternatives once they are selected.
- Projects may present implementation challenges when considering planning, financial impacts, and environmental permitting. Where this conceptual-level study identifies potential scenarios and solutions, it is recommended that further study of the needs and implementation schedule for specific project elements be completed. Additional study will better define the timing of expenditures and ensure the project elements are completed in a sequence that meets the needs of the area.
- Detailed engineering studies will need to be completed on each scenario by the interested public water and wastewater providers to confirm the solutions are addressing localized or facility-based needs.

The EPA has passed drinking water standards related to PFAS and this report provides cost estimates associated with meeting drinking water standards. The costs of meeting these treatment standards can be impacted by what happens upstream, including reducing contamination at the industrial source and treatment for emerging contaminants before it is discharged. Recommended actions will be required to meet all federal, state, and local regulatory requirements if they move forward. This report does not "pre-

approve" of any recommendation contained in this study. DEQ will rely on additional studies to complete environmental reviews.

Study Area Recommendations

The Plan is intended to serve as a guide and a resource for the public water and wastewater providers and stakeholders in the Study Area, as well as for decision-makers who provide oversight and funding for water and wastewater infrastructure projects. The study was completed with an objective regional perspective to define alternatives considered potentially feasible. The study does not reflect the preferences of individual local governments or water and wastewater providers and is not intended to imply that a consensus exists amongst stakeholders. The Plan is a starting point for further discussion, coordination, and collaboration among the interested parties to advance the regional water and wastewater planning and management in the US Hwy 421 Corridor.

The Plan recognizes that the conditions and circumstances in the Study Area are dynamic and may change over time, and that the alternatives and recommendations may need to be revisited and revised accordingly. Therefore, the Plan also suggests a process for periodic review and update of the Plan to ensure its relevance and usefulness.

Due to existing regional relationships, Cape Fear River sub-basins, and available water resources, the Study Area was divided into subregional areas identified as Johnston County, Harnett County, Lee and Chatham County, Southern Wake County and the Piedmont Triad. The recommendations included in this report are a set of potential strategies that meet the regional needs and goals for the Study Area.

Table ES–2: Summary of Costs Across Study Area

Water/Wastewater Provider	Sum of Recommended Improvements
Johnston County	$2,596,400,000
Harnett County	$443,300,000
Lee/Chatham County	$3,338,200,000
Southern Wake County	$720,400,000
Piedmont/Triad Region	$3,075,700,000
Total	**$10,174,000,000**

Johnston County

Johnston County Public Utilities is currently the regional water provider for the majority of the county, with Smithfield supplying its own water needs and the City of Dunn supplying the water needs of the Town of Benson. Based on the 2050 water supply needs, this regional arrangement is recommended to continue. It will require Johnston County Public Utilities to invest in a new intake, raw water pumping and water treatment facility to meet these needs.

The total cost for the recommended water improvements scenario estimated would require $884 million to fully implement. This number represents a rough order of magnitude costing scenario and is included in the report to compare potential needs between projects. This number does not account for any construction phasing, specify funding partners, or account for potential grants or directed allocations already provided or anticipated for these projects.

Wastewater treatment in the county is provided by the Town of Clayton, Johnston County Public Utilities, the Town of Kenly, the Town of Princeton, and the Town of Benson. Various expansions are required for these facilities; however, based on the separate Johnston County study recently completed by Hazen and others, no significant changes are suggested to the approach for meeting the County's wastewater needs through 2050.

The total cost for the recommended wastewater improvements scenario is estimated to require $1.71 billion to fully implement. Again, this number represents a rough order of magnitude costing scenario and is included in the report to compare potential needs between projects.

Table ES–3: Johnston County Summary of Recommendations

Water/Wastewater Provider	Type	Projected Cost	Short Description of Project
Johnston County Public Utilities	Water	$801,700,000	Proposed 21 MGD Lower Neuse Advanced WTP (J-W1, W2), Raw Water Intake, Pump Station and Piping (J-W3, W4) and Finished Water Piping (J-W7, W8)
Johnston County Public Utilities	Water	$23,600,000	Incorporation of 0.8 BG quarry reservoir with pump station (J-W5)
Johnston County Public Utilities	Water	$40,500,000	Advanced Treatment Upgrade to 18 MGD Timothy Broome WTP (J-W6)
Johnston County Public Utilities	Wastewater	$1,250,900,000	Expansion of the 210 WWTP from 4 MGD to 27 MGD (J-WW1), additional Nitrogen Allocation (J-WW2), Effluent Pump Station Expansion and Parallel Outfall (J-WW3,WW4)
Town of Smithfield	Water	$18,700,000	Advanced Treatment at Existing Smithfield WTP (J-W9)
Town of Clayton	Wastewater	$380,700,000	Clayton WWTP expansion from 6 MGD to 13 MGD (J-WW5), additional nitrogen allocation (J-WW6)
Town of Princeton	Wastewater	$17,300,000	Princeton WWTP expansion from 0.275 MGD to 0.6 MGD (J-WW7)
Town of Benson	Wastewater	$63,000,000	Benson WWTP expansion from 1.9 MGD to 3.1 MGD (J-WW8)
Total		**$2,596,400,000**	

Harnett County

Harnett Regional Water is the predominant supplier of water to Harnett County with the City of Dunn providing water to a portion of the county. Harnett Regional is also a significant provider of water for customers outside Harnett County. This approach is recommended to continue and no significant changes to the approach were identified to meet the needs of Harnett County through 2050. Based on the estimates of water demand for 2050, and the reported available supply, Harnett Regional's maximum daily demand is expected to exceed its reported capacity by 2.2 MGD in 2050. This deficiency can be addressed by not providing Johnston County 2.6 MGD during maximum day demand conditions. The need to further study the yields from the Cape Fear River at Erwin and Dunn was identified to ensure the planned supply capacities are likely to remain through 2050. Harnett County could benefit from additional proactive water planning and by encouraging the reuse of water in economic development projects.

The total cost for the recommended water improvements scenario is estimated to require $417 million to fully implement. This number represents a rough order of magnitude costing scenario and is included in the report as a way to compare potential needs between projects.

Harnett Regional owns and operates the North Harnett Regional Wastewater Treatment Plant (WWTP) and the South Harnett Regional WWTP. These facilities serve wastewater treatment needs inside and outside Harnett County. With the expansion of the North facility, Harnett County is projected to have sufficient wastewater treatment capacity through 2050.

The total cost for the recommended wastewater improvements scenario includes expansion to Dunn's Black River WWTP and is estimated to require $26 million to fully implement. This number represents a rough order of magnitude costing scenario and is included in the report as a way to compare potential needs between projects.

Table ES–4: Harnett County Summary of Recommendations

Water/Wastewater Provider	Type	Projected Cost	Short Description of Project
Harnett Regional	Water	$261,000,000	Proposed 12 MGD Harnett Regional Advanced WTP in Erwin (H-W1, W2)
Harnett Regional	Water	$94,500,000	Advanced Treatment Upgrade at Harnett Regional WTP (H-W3)
City of Dunn	Water	$61,500,000	A.B Uzzle Expansion from 8 MGD to 10 MGD with Advanced Treatment for CECs (H-W4, H-W5)
City of Dunn	Wastewater	$26,300,000	Black River WWTP expansion by 0.5 MGD (H-WW1)
Total		**$443,300,000**	

Lee and Chatham

The City of Sanford has established itself as a regional provider of water for Lee, Chatham and Southern Wake counties. Sanford's regionalization plans include an expansion of its water treatment plant, an expansion of the Siler City Water Treatment Plant (WTP) and accessing the Town of Pittsboro's and Chatham County's Jordan Lake Allocation via the Western Intake Partnership (WIP). If future studies confirm these needs and regulatory requirements are followed, the water supply needs through 2050 within the area can be met.

The total cost for the recommended water improvements scenario is estimated to require $1.37 billion to fully implement. Municipalities have received funding from multiple sources to initiate portions of this project. The costs associated with the southern Wake County supply from Sanford are reflected in the above cost estimate. This number represents a rough order of magnitude costing scenario does not account for any construction phasing or potential funding partners.

The City of Sanford's regionalization efforts also include wastewater service for the two counties. Sanford is proposing to upgrade its existing Big Buffalo WWTP and construct a new facility with a discharge to the Cape Fear River. The wastewater treatment facility in Siler City, which is currently addressing environmental compliance issues, has a planned expansion to 6 MGD (million gallons per day), can be expanded to 8 MGD, and is recommended to remain in service under a regional scenario. A new 3 MGD WWTP in Pittsboro that discharges to the Haw River is needed to help balance allowable nutrient loads between the Cape Fear and Haw River basins. Excess wastewater from Pittsboro will be conveyed to Sanford's WWTP for treatment. It is anticipated that the best available technology with conventional activated sludge will be required to meet total nitrogen and phosphorus targets in the Cape Fear River basin. These improvements, if successful, could address significant wastewater needs in the region.

The total cost for the recommended wastewater improvements scenario is estimated to require $1.79 billion to fully implement. This number represents a rough order of magnitude costing scenario and is included in the report as a way to compare potential needs between projects.

Table ES–5: Lee/Chatham County Summary of Recommendations

Water/Wastewater Provider	Type	Projected Cost	Short Description of Project
City of Sanford	Water	$418,500,000	Sanford WTP expansion from 12 MGD to 30 MGD (LC-W1.1), Advanced Treatment Upgrade (LC-W1.2)
City of Sanford	Water	$60,300,000	Transmission Line to TIP Site (LC-W1.8)
City of Sanford	Water	$140,500,000	Transmission Line to Fuquay-Varina/Holly Springs (LC-W1.9)
City of Sanford	Water	$26,800,000	Transmission from TIP to Sanford (LC-W1.14)
City of Sanford	Water	$391,500,000	Sanford WTP expansion from 30 MGD to 48 MGD (LC-W1.15), Advanced Treatment Upgrade (LC-W1.16)
City of Sanford	Wastewater	$778,300,000	New 14 MGD Hughes Creek WWTP, outfall to Cape Fear River, and Transfer Conveyance Lines (LC-WW2.6, WW2.7, WW2.8)
City of Sanford	Wastewater	$432,000,000	Big Buffalo WWTP Upgrades (LC-WW2.11)
Western Intake Partnership	Water	$326,300,000	WIP WTP expansion and advanced treatment by 13 MGD (LC-W1.3, W1.4)
Town of Pittsboro	Water	$23,900,000	Finished Water Piping from WIP to Pittsboro
Town of Pittsboro	Water	$37,000,000	Transmission Line, Booster Pump Station from TIP Site to Pittsboro (LC-W1.10, W1.11)
Town of Pittsboro	Wastewater	$166,300,000	18 MGD Pittsboro Lift Station, Conveyance to Big Buffalo WWTP (LC-WW2.2, WW2.3)
Town of Pittsboro	Wastewater	$151,200,000	New 3 MGD Pittsboro WWTP and Conveyance (LC-WW2.4, WW2.5)
Town of Pittsboro	Wastewater	$47,300,000	Chatham Park WWTP Expansion and Upgrade by 0.5 MGD (LC-WW2.9, WW2.10)
Town of Siler City	Water	$52,500,000	Siler City WTP expansion from 4 MGD to 6 MGD with Advanced Treatment (LC-W1.6, W1.7)
Town of Siler City	Water	$62,000,000	Transmission Line, Booster Pump Station from Pittsboro to Siler City (LC-W1.12, W1.13)
Town of Siler City	Wastewater	$210,000,000	Siler City WWTP Expansion from 4 MGD to 8 MGD (LC-WW2.1)
Carolina Trace	Wastewater	$8,100,000	Carolina Trace Transfer LS and Conveyance Lines (LC-WW2.12, WW2.13)
Town of Broadway	Wastewater	$5,700,000	Broadway Transfer LS and Conveyance Lines (LC-WW2.14, WW2.15)
Total		**$3,338,200,000**	

Southern Wake County

The Towns of Holly Springs and Fuquay-Varina in southern Wake County will be supplied water from a combination of Sanford and Harnett Regional. The infrastructure for Harnett Regional exists, and the infrastructure for Sanford's supply is being designed and constructed. The State of North Carolina has funded portions of this project. No additional conveyance facilities will be required, and expansion of Sanford's WTP to 42 MGD will be required prior to 2050. The cost for this expansion is reflected in the costs for Lee and Chatham Counties.

Fuquay-Varina's wastewater treatment needs can likely be met through 2050 via numerous options. These options are currently being studied and evaluated through development of an Environmental Impact Statement related to a requested Interbasin Transfer (IBT).

Holly Springs is currently evaluating options for expanding its Utley Creek Water Reclamation Facility. The options under consideration include collaboration with the Town of Cary at its Western Wake Regional Wastewater Facility and expansion of the Utley Creek facility, bypassing Utley Creek flow into Harris Lake and discharging some or all of the effluent to the Cape Fear River.

The total cost for the recommended wastewater improvements scenario is estimated to require between $564 and $879 million to fully implement. These costs represent a rough order of magnitude costing scenario and are included in the report as a way to compare potential needs between projects.

Table ES–6: Southern Wake County Summary of Recommendations

Water/Wastewater Provider	Type	Projected Cost	Short Description of Project
Town of Holly Springs	Wastewater	$405,400,000	Utley Creek WWTP Expansion to 12 MGD and pump effluent to Cape Fear River (SW-WW1.1, WW1.2, WW1.3)
Town of Fuquay-Varina	Wastewater	$315,000,000	Terrible Creek WWTP Expansion from 3 MGD to 12 MGD (SW-WW1)
Total		**$720,400,000**	

Piedmont Triad (Guilford and Randolph County)

Analysis of the Piedmont Triad Region indicates an increased need for the City of Greensboro and the smaller communities affected by the regional economic development initiatives. The regional solutions identified include an expansion of the Piedmont Triad Regional Water Authority (PTRWA) facility to 27 MGD, an upgrade of the Asheboro WTP at the existing capacity and a collaborative approach to meeting the needs of the area. The water demand needs for Franklinville, Ramseur and Liberty would be provided by these upgraded facilities such that treatment for emerging contaminants could be isolated to the larger facilities equipped to operate them.

It is noted that there are ongoing projects and studies in the region that can be impacted by the recommendations. These recommendations represent a concept that offers the most value in addressing regional economic development and environmental needs. Ultimately, local partners drive the decision-making process, and while we believe this option offers the most value, we offer alternatives that can

positively impact the region. We also recognize that there are several local factors that may lead to modifying these scenarios. In Section 10, this Study addresses the allocated resources to those projects if the stakeholders pursue the recommended option.

The total cost for the recommended water improvements scenario is estimated to require $465 million to fully implement. This number represents a rough order of magnitude costing scenario and is included in the report as a way to compare potential needs between projects.

A regionalized wastewater facility is necessary due to future capacity limitation in the City of Greensboro. Discussions with neighboring water and wastewater providers are underway and the City of Asheboro may have a viable solution. Should the future hydrologic and environmental evaluations support it, the Study identifies a regional solution to expand the Asheboro WWTP to a 30 MGD facility. Expanding this facility would allow Greensboro, High Point, Asheboro and Randleman to discharge to a regional state-of-the-art facility prepared to treat to the limits of technology for nutrients and contaminants of emerging concern. At present, there is no standard for contaminants of emerging concern for wastewater treatment and the cost of complying with potential future standards is not contemplated within this report. A regional facility in the Triad would likely need to anticipate treatment methods for contaminants of emerging concern. Due to the costs associated with wastewater treatment, DEQ strongly advises public water and wastewater providers to work with significant industrial users on reducing contamination at the source.

The Plan also identifies upgrades to the Ramseur WWTP facility to account for growth in the eastern Randolph County area.

The Liberty WWTP, Randleman WWTP, Seagrove/Ulah Metropolitan Water District WWTP, and the Town of Franklinville WWTP would be decommissioned under this scenario.

The total cost for the recommended wastewater improvements scenario is estimated to require $2.6 billion to fully implement. Municipal and county water and wastewater providers have been contemplating this need for some time and a combination of local, state, and/or federal funds would be necessary for this project. This estimate represents a rough order of magnitude costing scenario and does not account for any construction phasing or funding partners. This estimate may not include total costs associated with environmental compliance for wastewater treatment standards for emerging contaminants.

Table ES–7: Piedmont/Triad Summary of Recommendations

Water/Wastewater Provider	Type	Projected Cost	Short Description of Project
Piedmont Triad Regional Water Authority	Water	$352,900,000	PTRWA Expansion from 14.7 MGD to 29.4 MGD with Advanced Treatment (T-W1)
Randolph County	Water	$10,400,000	Water Service from PTRWA to Asheboro (T-W2)
City of Asheboro	Water	$21,100,000	Asheboro WTP Advanced Treatment Upgrades (T-W3)
City of Asheboro	Water	$53,300,000	Transmission Line for 7 MGD from Asheboro to Chatham County (CAM Site)
City of Asheboro	Wastewater	$1,269,000,000	Regional Facility Expansion costs to upgrade Existing Asheboro WWTP and Expand to 30 MGD (T-WW7)
City of Greensboro	Wastewater	$104,000,000	12 MGD Transfer Lift Station and Conveyance to the GSO/High Point Junction Box (T-WW2, WW3)
City of Greensboro/City of High Point	Wastewater	$136,600,000	18 MGD Conveyance from GSO/High Point JB to Regional Facility in Asheboro (T-WW5)
City of High Point	Wastewater	$52,500,000	6 MGD Transfer Lift Station and Conveyance to the GSO/High Point Junction Box (T-WW4)
City of High Point	Wastewater	$936,000,000	Eastside WWTP Upgrade to meet reduced limits and CEC Treatment (T-WW8)
City of Randleman	Wastewater	$23,900,000	Randleman Transfer Lift Station and Conveyance (T-WW6)
Town of Liberty	Water	$15,300,000	Transmission Line from Ramseur to Liberty (T-W4)
Town of Liberty	Water	$12,700,000	Redundancy Upgrade to Supply Liberty and Eastern Randolph County from Greensboro (T-W5)
Town of Liberty	Wastewater	$23,000,000	3 MGD Transfer Lift Station to Greensboro (T-WW14)
Town of Ramseur	Wastewater	$47,500,000	Expansion to 1 MGD and upgrade of existing WWTP (T-WW15)
Town of Franklinville	Wastewater	$7,400,000	0.75 MGD Transfer Lift Station and Conveyance (T-WW13)
Seagrove-Ulah Metro Water District	Wastewater	$10,100,000	0.8 MGD Lift Station and Conveyance (T-WW1)
Total		**$3,075,700,000**	

Financial Implications and Governance

The challenges and opportunities of regionalization governance approaches for public water and wastewater providers in North Carolina are a primary factor of the success of the alternatives presented. Regionalization refers to the process of collaborating and coordinating services among utilities to achieve their service objectives, such as enhanced efficiency, affordability and reliability. DEQ emphasizes the importance of defining the governance structure for regionalization, which entails identifying stakeholders, service delivery options, and funding capacity. This document also analyzes the regulatory framework that governs water and wastewater services, which seeks to protect public health, environmental resources, and consumer rights.

Whether created through interconnections and wholesale agreements, authorities or joint ownership, sharing in the responsibility of upgrades, compliance source reduction, and actions to address emerging contaminants will be more achievable financially if spread across multiple utilities.

Conclusions

The Study was completed with an objective regional perspective to define alternatives considered potentially feasible. The study does not necessarily reflect the preferences of any individual municipality or group of public water and wastewater providers and is not intended to imply that a consensus exists amongst stakeholders. Furthermore, any option being pursued must meet all state and federal regulatory requirements. Consequently, follow-up studies, coordination, and collaboration with state and regional water and wastewater providers and stakeholders will be warranted to advance the concepts presented.

In the Study Area, regionalization strategies are already underway in many instances and should be expanded in future infrastructure planning. This study identifies that without significant infrastructure investment and coordination among utilities, there is potential for negative impact on economic development activity. Given the known environmental and health impacts of increased nutrient discharges and emerging contaminants, there are opportunities for efficiencies to be gained by combining discharges and sharing in the cost of upgrades, source reduction measures and modern removal technologies. Upstream improvements will also benefit downstream public water and wastewater providers as nutrient and emerging compound levels improve. The challenge to regionalization will be ensuring governing bodies have sufficient control and can advocate for responsible growth at their desired pace in their municipalities. However, with future guidance on governance and funding support, regionalization of the Study Area will assure continued economic development success and protection of the river basin for downstream users.

1. Background and Study Purpose

As directed by S.L. 2023-134, the North Carolina Department of Environmental Quality (DEQ) was asked to develop a regional water and wastewater infrastructure plan for a seven-county geographic region in central North Carolina. This Concept Plan (Plan) covers the seven-county geographic area along the US Route 421 Economic Corridor (Study Area) and addresses both economic and environmental challenges and opportunities that come with rapid, transformative economic development. ***A healthy environment and a healthy economy go hand in hand. Therefore, as we plan for economic growth, we must also prioritize environmental stewardship.***

This Plan is a collaborative endeavor between public and private professionals. As authorized by S.L. 2023-134, DEQ was permitted to engage private sector partners to conduct research and assist in the completion of this concept Plan. DEQ contracted Hazen and Sawyer (Hazen) and its project partners, Freese and Nichols, Withers Ravenel and Raftelis (Hazen Team) to assist with developing the Plan. Each of these firms offer valuable knowledge due to their experience working directly with municipalities within the Study Area. This collaborative approach made it possible to offer innovative and practical solutions by the deadline determined by legislation.

The Plan defines the water and wastewater requirements within the study area through 2050 and the water and wastewater infrastructure improvements to meet the regional supply, treatment and conveyance needs. The regional nature of the study allows for evaluation of opportunities for public water and wastewater providers utilities to collaborate where warranted to improve efficiencies, reduce costs, improve overall water management, improve water quality and meet the needs of underserved areas. The scope of the study does not address the improvements within individual water and wastewater providers' distribution and collection systems. Significantly greater clarity and detail will be required to define those needs.

To our knowledge, this is the largest regional infrastructure plan in North Carolina's history. DEQ recognizes that this Plan is critical to identifying potential solutions or concepts to address the needs of the region. Both the public and private partners also realized that additional information and studies will be necessary to operationalize DEQ's recommendations. The analysis for this study relies on several prior and ongoing master planning initiatives by individual stakeholders, water and wastewater providers and regional organizations. Given the high-level nature and timeframe of this study and Plan development, the ongoing planning studies by public water and wastewater providers will continue to inform the facility actions within the Study Area.

The study was completed with an objective regional perspective to define alternatives considered potentially feasible. The study does not necessarily reflect the policy preferences of individuals or groups of utilities and stakeholders and is not intended to imply that a consensus exists amongst stakeholders. Also, recommendations and actions discussed within the plan will require all necessary permitting and some scenarios could present challenges that will require appropriate data and research to be submitted to DEQ prior to approval. ***Consequently, significant coordination, collaboration, research and regulatory permitting will be required to advance the concepts presented in this Plan.***

1.1 General Development Trends

General development trends in North Carolina reflect vibrant economic conditions and strong growth. The Study Area is experiencing additional growth in population and employment from several recent economic developments. These include incentivized projects at several key economic development sites, their associated indirect and induced growth implications and activity from other targeted sites dedicated for planned and future development to include those that may be part of the Economic Development Partnership of North Carolina's (EDPNC's) SelectSite Readiness Program. The study quantifies the growth assumed for these developments and other more typical growth within the Study Area.

1.2 Water Resource Management

The anticipated growth requires attention to the water resources within, and in some cases, adjacent to the Study Area. Water supply, water treatment and wastewater treatment are critical elements to meeting the needs of businesses, employees and population. The year 2050 was established as the planning horizon for this study. Therefore, the demands on water resources are estimated to include amounts required through the year 2050.

1.2.1 Water Availability Considerations

Expected growth through the planning horizon will increase the need for potable water in the Study Area. The study defines the water supply needs and compares them to the existing availability of source water. Most of the water supply needs in the Study Area are met through surface water withdrawals from reservoirs or rivers. It is important to note that current water supply availability is based on past conditions and USGS data. New projects will have to be re-evaluated before being approved. The use of the States's OASIS hydrologic modeling is recommended for use in planning as a predictive tool for what availability may be available under future scenarios.

The quantity and location of treated wastewater discharge to surface water influence the water available for withdrawal and other needs and are accounted for in the management of water resources. It is important to note that water and wastewater quantity is tied very closely to water quality. Water reuse is one strategy that can address both water supply demands and increased wastewater loadings. By reusing treated wastewater for industrial processes or irrigation, the water supply is augmented and pollutant loadings to the receiving waters are reduced.

1.2.2 Water Quality Considerations

Water quality is an important consideration in water resource management and impacts the requirements to treat water for use as well as the health of the surface waters and the ecosystems they support. Surface waters within the Study Area can be nutrient sensitive, impacted by contaminants of emerging concern, or have other impairments impacting their ability to receive treated wastewater with certain characteristics. Water quality has a significant impact on potential water quantity in the Study Area and is governed by state and federal regulation and laws.

1.2.3 River Basin and Interbasin Transfer (IBT) Considerations

The Study Area focuses primarily on the upper Cape Fear River basin but also includes portions of the Neuse and Yadkin-Pee Dee River basins. Interbasin transfer (IBT) statutory boundaries differ from watershed or river basin boundaries, but the boundaries are closely aligned in the Study Area. Considerations of existing IBT laws are acknowledged within the study; however, some of the potential scenarios were developed without stringently applying constraints that these IBT laws may create.

1.2.4 Financial Considerations

The cost of alternatives and the public water and wastewater providers' ability to finance and pay for the required infrastructure is an important consideration. It is unlikely that water and wastewater providers would accomplish these needs without financial support from the state or other sources. Capital costs are developed for alternatives, but these costs are based on several assumptions and do not account for already funded projects, planned investment, or local and federal investments. The general financial capacity of each stakeholder is assessed. Based on the cost estimates and financial review, a qualitative assessment is made regarding the need for funding assistance for the impacted public water and wastewater providers.

DEQ acknowledges that while regionalization comes with a financial obligation, regionalization can offer long-term value to the municipalities in the region and the state. The costs of not regionalizing are not fully known and will be difficult to quantify. As part of concept implementation and further refinements of individual public water and wastewater providers' participation in projects, further financial studies are required, including more detailed assessments of rate impacts to customers.

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2. Study Area Definition and Water and Wastewater Providers

2.1 Study Area Boundary

S.L 2023-134 defined the Study Area as "the geographic area surrounding United States Route 421 between Interstate Route 85 in Greensboro and Interstate Route 95 in Dunn, designated as a high-priority corridor in the Infrastructure Investment and Jobs Act of 2021." The Study Area is reflected in Figure 2-1 and includes a seven-county area consisting of the following:

- Johnston County
- Harnett County
- Lee County
- Chatham County
- Southern Wake County
- Randolph County
- Guilford County

While the Study Area is confined to this footprint, public water and wastewater providers within the Study Area are supported by systems adjacent to the Study Area and vice versa. As noted, this area is also home to some of North Carolina's most recent, transformative economic development projects. This study recognizes that the needs within the study area can be impacted by available capacity outside of the Study area.

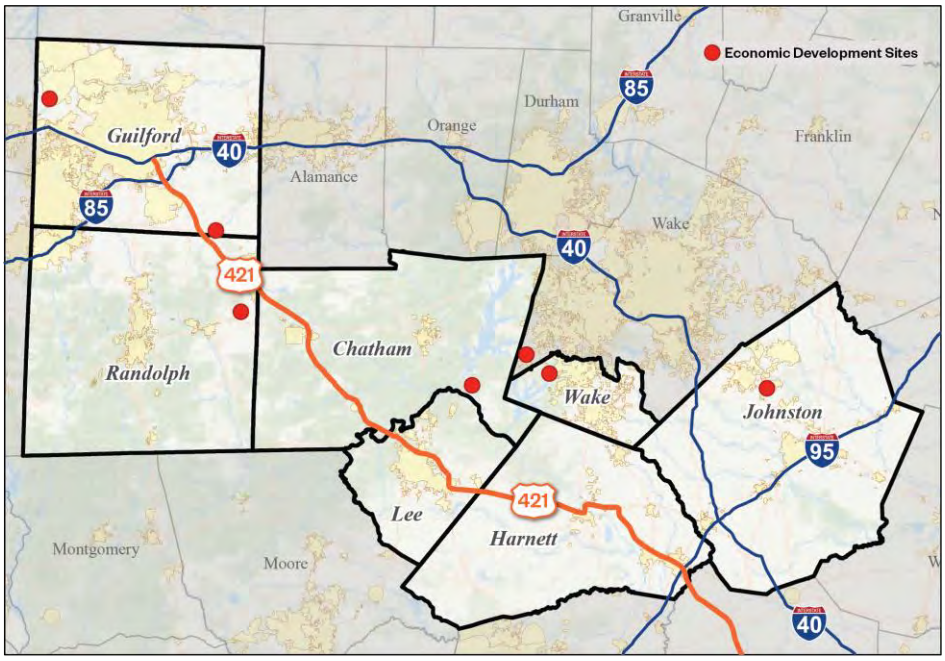

Figure 2-1: Study Area

The scope of this study was based on the above geographic footprint for the reasons stated, this study illustrates opportunities for similar efforts with public water and wastewater providers and areas beyond this Study Area. In some cases, large portions of other basins may warrant similar study. While this study is driven by the combination of unprecedented economic development, water quality and environmental challenges and limited solutions, as other areas of the state experience stress on water resources, a broad perspective will be beneficial.

2.2 Potentially Underserved Communities

Potentially Underserved Communities within the Study Area are identified using publicly available census data analyzed by DEQ. DEQ defines a Potentially Underserved Community by examining the race/ethnicity and poverty criteria for each census block group. The block group is then compared to both the county and the state and is classified by the Department as a Potentially Underserved Block Group if it meets the following criteria for race/ethnicity and poverty:

- **Race/Ethnicity:** Share of nonwhites and Hispanic or Latino (of any race) is over fifty percent OR Share of nonwhites and Hispanic or Latino (of any race) is at least ten percent higher than County or State share. AND
- **Poverty:** Share of population experiencing poverty is over twenty percent AND Share of households in poverty is at least five percent higher than the County or State share.

These selections occur on a block group level and this dataset is a selection of the 2019 ACS data from the data tables B03002—Hispanic or Latino Origin by Race—and S1701—Poverty Status in the Past 12 Months. Learn more about DEQ's Potentially Underserved Block Groups 2019 - Overview.

Figure 2-2 illustrates the potentially underserved communities within the Study Area.

The study includes analysis of potentially underserved areas to ensure the regional planning considers affordability and equips stakeholders to consider the water and wastewater capacity needs of these communities during discussion of future system expansions and regionalization recommendations.

2.3 Study Area Water and Wastewater Providers & Stakeholders

An initial task of the study was to develop a comprehensive list of public water and wastewater providers to be included. In most cases, the providers are existing utilities providing water, wastewater or both services within the Study Area. Forty-three (43) water and wastewater providers were identified for consideration in the study. In some cases, providers are mostly or entirely served by existing regional systems. Where those situations exist, for the purpose of this study, the needs of those public water and wastewater providers are accounted for within the regional system from which they are served. Table 2-1 identifies the water and wastewater providers reflected by this study.

DEQ values public feedback and encourages stakeholder engagement throughout the planning processes. Given the expedited timeframe mandated by this study DEQ did not have the option to solicit feedback on proposals within this Plan. DEQ strongly encourages stakeholder engagement prior to implementing recommendations of this Plan. DEQ did directly, and indirectly through their private consultant team, reach out to municipalities within these areas. DEQ did engage in administrative level dialogue with a

number of municipal administrative leaders, economic developers, environmental groups, trade associations and local and state elected leaders.

Table 2–1: Water and Wastewater Providers

County	Public Water and Wastewater Providers
Johnston County	Johnston County, Clayton, Wilsons Mills, Smithfield, Selma, Four Oaks, Pine Level, Princeton, Micro, Kenly, Benson, Smithfield South
Harnett County	Harnett Regional Water, Lillington, Angier, Coats, Dunn
Lee County	Sanford, Broadway, Carolina Trace
Southern Wake County	Fuquay-Varina, Holly Springs
Chatham County	Chatham County, Pittsboro (including Chatham Park), Siler City, Goldston Gulf
Randolph County	Randolph County, Trinity, Archdale, Liberty, Randleman, Asheboro, Franklinville, Ramseur, Seagrove
Guilford County	High Point, Jamestown, Greensboro, Oak Ridge, Stokesdale, Summerfield, Piedmont Triad Regional Water Authority, Gibsonville

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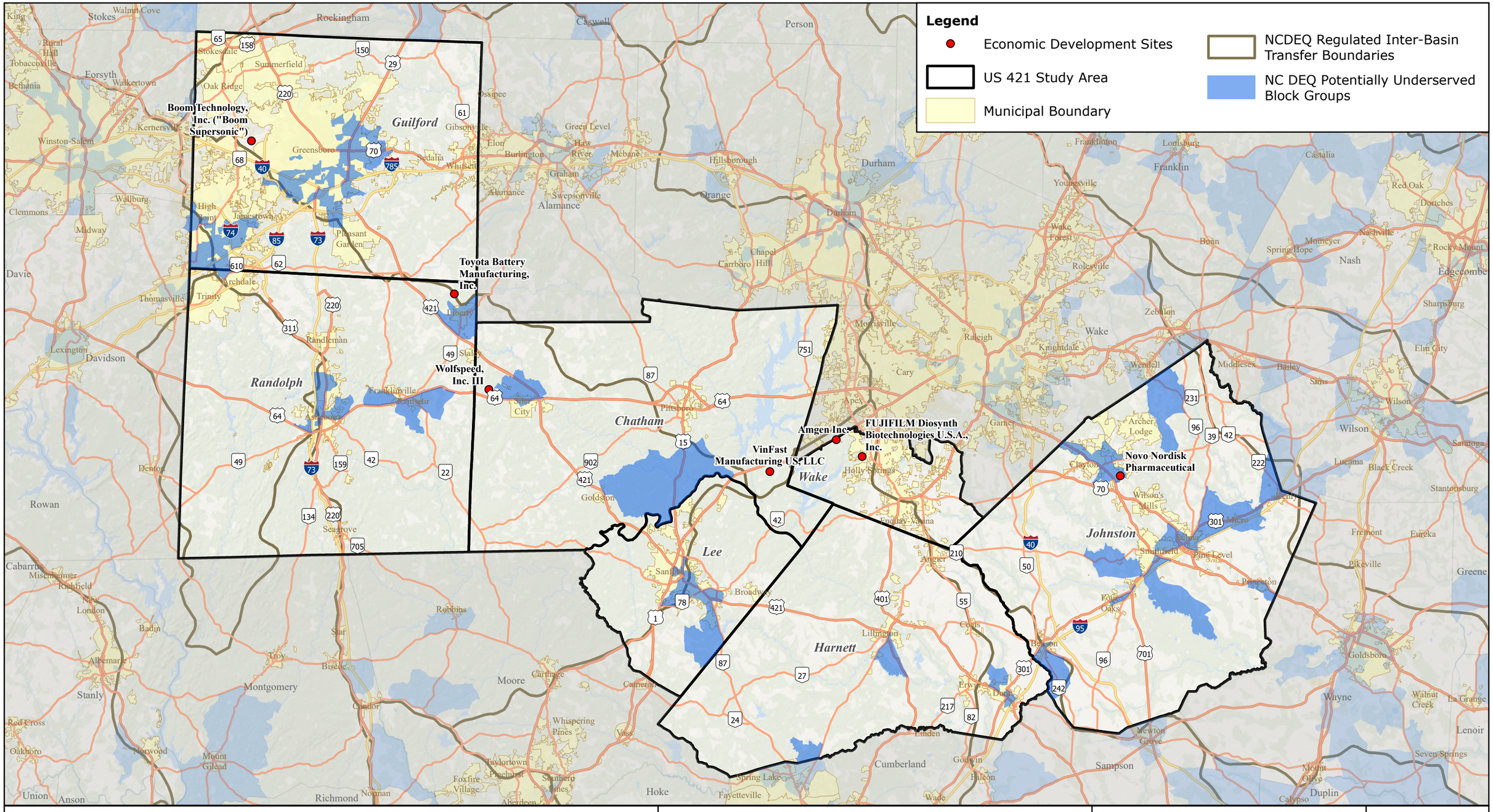

N

0 5 10 15 20 Miles

Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**STUDY AREA** **POTENTIALLY UNDERSERVED COMMUNITIES**	Figure 2-2 April 2024
North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel	

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3. Water Demand and Wastewater Flow Projections

3.1 Methodology for Water Demand and Wastewater Flow Projections

This study relies heavily on the best available data regarding water and wastewater demands. The development of new water and wastewater projections for each utility provider was not possible within the study timeframe. Hazen relied on existing datasets and other sources, including: Local Water Supply Plans (LWSP) developed by individual systems and submitted to DEQ's Division of Water Resources (DWR), previously completed or ongoing planning studies completed for or by public water and wastewater providers, input from local representatives familiar with growth not captured in existing available data and projections from the North Carolina Department of Commerce (NC Commerce) for major incentivized economic developments. In many cases, the growth and future water and wastewater needs are dynamic due to the rapidly changing development conditions and the imperfect understanding of how this development will impact the Study Area.

3.1.1 Local Water Supply Plans (LWSP)

The LWSPs submitted by each of the public water and wastewater providers were used as the baseline projections for this study. In general, the 2022 LWSPs were relied upon as an initial basis for planning since they had been reviewed by DWR staff, and in most cases, were complete (i.e., no longer considered provisional). LWSPs include current water usage, current wastewater flows and water planning projections through 2050.

3.1.2 Recent and Ongoing Studies

In many cases, the utility provider had previously completed or has ongoing planning studies that were referenced and relied upon for adjustments to, or replacement of, the projections included in the LWSP. Where they existed, they were used as a source of best-available information to define the water and wastewater needs. DEQ expects that LWSPs will be updated to account for the growth discussed in this study.

3.1.3 NC Incentivized Economic Development Sites

The activity at North Carolina's economic development sites is an important driver for growth and demand considerations in this study. The study highlights seven recently incentivized economic development projects within the Study Area with two projects occupying all or a portion of two of North Carolina's six current Megasites. Table 3-1 identifies six industry partners associated with these projects within the Study Area. The seventh, Novo Nordisk in Johnston County, received incentives less recently, but continues to be an important factor in Johnston County's economic and infrastructure needs.

Table 3–1: Recently Incentivized Economic Development Projects, Locations and Partners

Site Name	Location	Industry Partner
CaMP Helix	Holly Springs (Wake County)	Amgen
Chatham-Siler City	Siler City (Chatham County)	Wolfspeed
Greensboro-Randolph	Liberty (Randolph County)	Toyota (Phases I and II)
Holly Springs Business Park	Holly Springs (Wake County)	FUJIFILM Diosynth Biotechnologies
Piedmont Triad International Airport	Greensboro (Guilford County)	Boom Supersonic
Triangle Innovation Point	Moncure (Chatham County)	VinFast (Automotive and Battery Facilities)

The projects identified in Table 3-1 at these sites requires water and wastewater services for the specified project as well as the associated businesses (indirect) that may choose to co-locate adjacent to these industries and for complementary businesses (induced) and service industries that may be attracted by the concentration of the customer base associated with the overall development.

NC Commerce provided DEQ and Hazen with projections of the economic impact expected for six recently incentivized projects within the Study Area through three types of effects – direct, indirect and induced – that were, for the purposes of this study, represented as new employee job growth. The data from NC Commerce includes the six projects identified in Table 3-1 but breaks down the Toyota project into Phases 1 and 2 and the VinFast project into two distinct categories: auto assembly and battery manufacturing. This is illustrated in Table 3-2.

Water and wastewater demand associated with this development activity was estimated for the industries themselves, the associated and complementary industries and businesses, and the new employee job growth using the methodology discussed below.

3.1.3.1 Industry Partner Demands

It is difficult to predict the actual demands of the identified direct, indirect and induced businesses that could be created within the 2050 planning year with total accuracy. Several factors can impact infrastructure and human capital demands including the expansion of existing businesses or additional large economic development projects locating within the Study Area. One large, transformative project can significantly impact available capacities within the Study Area. When considering economic impacts and infrastructure needs, partners will benefit from a thorough evaluation of this report and the availability of water and wastewater during the business recruitment and expansion process.

In general, the contract amounts listed in existing Economic Development Agreements (EDAs) for the planned incentivized industrial development were used to project the water and wastewater needs for the projects unless later, more reliable information was available, warranting a different projection. The contract amounts in the EDAs may represent minimum commitments over a relatively short time period as compared to the 2050 planning year.

Water and wastewater capacity to accommodate possible future expansions of these recently incentivized projects are not directly considered by this Plan; however, planning projections generally do anticipate continued economic growth in the vicinity of these sites and may be adequate for expansions. Specifically, after gathering data for this Plan, FUJIFILM Diosynth announced an expansion of their Holly Springs facility on April 11, 2024. The water/wastewater and human capital demands related to the second phase *are* captured within our calculations, but the impact of the second phase on indirect and induced jobs are not reflected in Section 3.1.3.2.

It should also be noted that many of the industries North Carolina is recently attracting have the potential to require significant water and wastewater quantities with considerable waste treatment needs. The assumed demands for the recently incentivized projects in the Study Area are provided in Table 3-2 and are included in the demand projections by county presented in Section 3.2.

Table 3–2: Industry Partner Daily Demand Projections

New Industrial Demands	Industry Partner and Location								
	Wolfspeed Chatham	Toyota Phase I Randolph	Toyota Phase II Randolph	VinFast Auto Chatham	VinFast Battery Chatham	Amgen Wake	FUJIFILM Diosynth Wake	Boom Supersonic Guilford	Totals
Water (MGD)	2.00	4.54		2.85		0.40	0.76	0.03	**10.58**
Wastewater (MGD)	1.17	0.66		1.90		0.40	0.76	0.027	**4.92**

3.1.3.2 Associated and Complementary Industry and Business Demands

Each incentivized industry is anticipated to spur the development and growth of indirect associated and complementary businesses located in close proximity to the listed economic development sites that will have their own associated water and wastewater demands. The demands of these indirect or induced businesses are ultimately unknown. It might be assumed that most induced businesses will have much smaller demands than those associated with identified developments in the study. However, some indirect businesses are likely to have significant water and wastewater demands of their own. In some areas within the Study Area, these indirect and induced businesses have been updated and incorporated into the LWSP, while others were adjusted based on best available data as indicated in Section 3.2. On April 11, 2024, FUJIFILM Diosynth announced an additional 680 direct jobs for its phase two expansion in Holly Springs. DEQ was able to confirm and include water and wastewater capacities for both phases, but indirect and induced jobs in Table 3-4 reflect phase one employments as the data was gathered prior to announcement. Similarly, Toyota has announced additional jobs (totaling approximately 5,000), but NC Commerce did not create an additional economic impact detailing indirect and induced jobs after Toyota's Phase 2 announcements. Table 3-4 represents the number of jobs that are expected to be filled in the Study Area not the total number of jobs announced for the project.

3.1.3.3 New Job Growth Demands

NC Commerce developed new job growth projections for each direct, indirect and induced economic activity associated with the incentivized industrial developments. These industries are expected to bring a total of 45,883 jobs to North Carolina. Table 3-3 shows the total number of jobs expected to be created by

each industry. Since these economic impact analyses were completed, Toyota has announced a total of 5,000 direct jobs for its Liberty, NC facility and FUJIFILM Diosynth has announced an additional 680 jobs for a total of 1,405 direct jobs for its Holly Springs location. Tables 3-3 and 3-4 do not reflect the direct, induced, or indirect jobs created by these recent announcements.

Table 3–3: Total New Direct, Indirect, Induced Jobs per project across North Carolina

Total New Jobs	Industry Partner and Location								
	Wolfspeed	Toyota Phase I	Toyota Phase II	VinFast Auto	VinFast Battery	Amgen	FUJIFILM Diosynth	Boom Supersonic	
	Chatham	Randolph	Randolph	Chatham	Chatham	Wake	Wake	Guilford	Totals
Direct	1,802	1,750	2,125	4,056	3,444	355	725	1,761	**16,018**
Indirect	2,476	848	1,030	6,915	1,669	205	512	1,327	**15,982**
Induced	2,196	1,223	1,485	4,882	2,406	353	754	1,586	**14,885**
Total	6,475	3,821	4,639	15,852	7,519	913	1.990	4,674	**45,883**

A total of 21,594 new employees are predicted to move into the Study Area to meet these industrial needs. The economic model used by NC Commerce assigns this new job growth to the geographic area surrounding each incentivized project to represent the proportion of the new employees within one of four commuting distances of the developments: less than 10 miles, between 10 and 24 miles, between 25 and 50 miles, and beyond 50 miles.

To plot the residential impact these direct, indirect, and induced jobs would have on the region, Hazen converted the new job growth projections to a new residential population based on the assumption that each employee would represent a household of 2.5 people. The additional population estimates totaled 53,986 for the study area and were distributed by county based on proximity to the respective sites within 24 miles as shown on Figure 3-1. Distribution of population within each county was further refined based on a weighting developed according to the 2050 population for each utility stakeholder prior to the addition of new job growth. Demands for new residents beyond 24 miles from the sites are assumed to be included in existing LWSPs or other local projections. A per capita water and wastewater demand of 60 gallons per person per day (60 gpcd) was applied to estimate the additional demands attributable to the economic development sites. Table 3-3 summarizes these population and demand projections by site. This table does not represent the total jobs created by each of these industries.

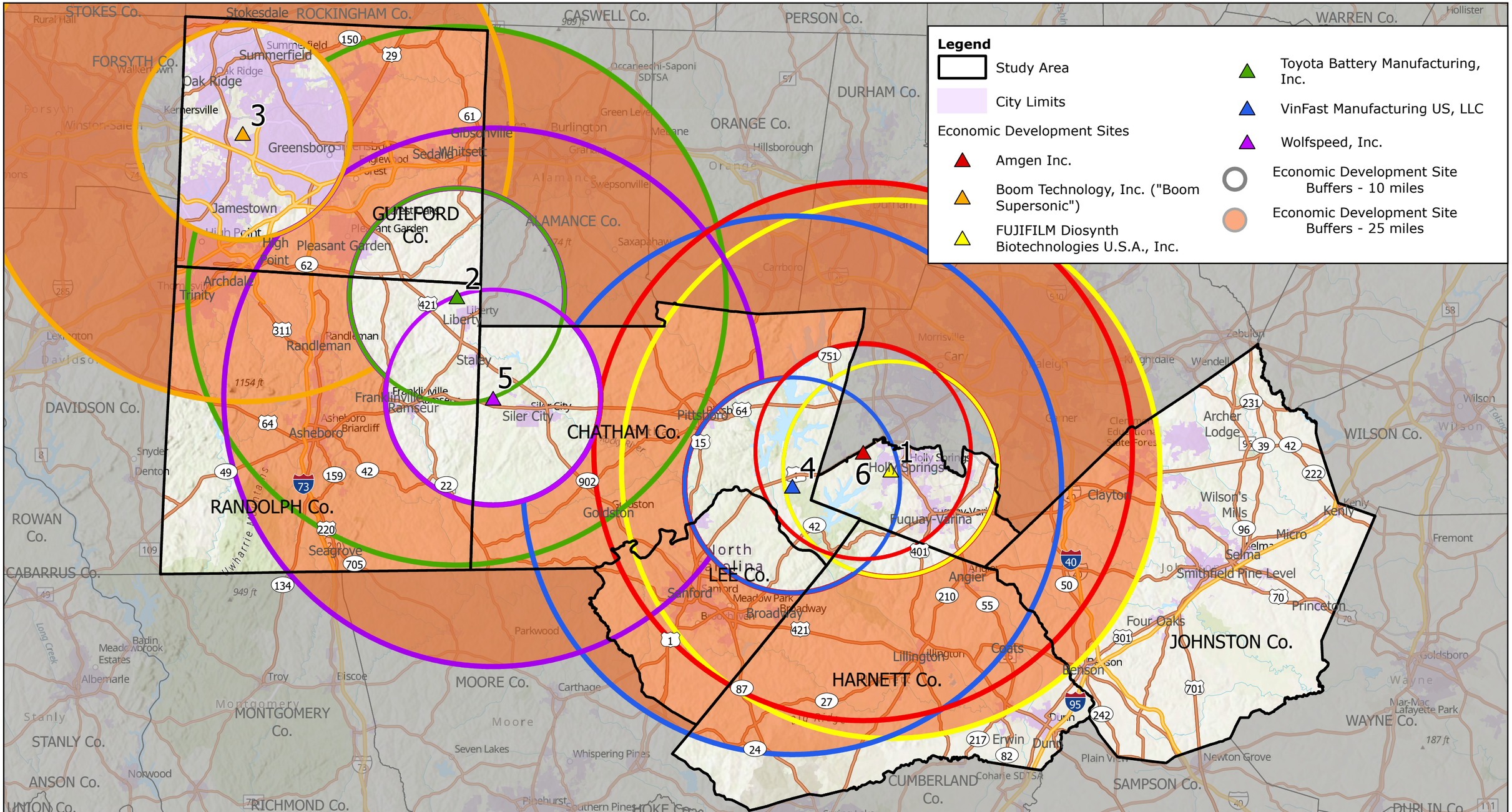

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Table 3–4: Residential Demand Projections from Incentive-Based Development within the Study Area

		Industry Partner and Location								
		Wolfspeed	**Toyota Phase I**	**Toyota Phase II**	**VinFast Auto**	**VinFast Battery**	**Amgen**	**FUJIFILM Diosynth**	**Boom Supersonic**	
		Chatham	**Randolph**	**Randolph**	**Chatham**	**Chatham**	**Wake**	**Wake**	**Guilford**	**Totals**
New Resident Employees within Study Area by Type	Direct	829	877	1,065	2,105	1,786	178	399	811	8,052
	Indirect	1,079	390	474	3,057	794	99	267	597	6,759
	Induced	957	563	683	2,158	1,145	170	393	714	6,784
	Total New Jobs	**2,866**	**1,830**	**2,223**	**7,321**	**3,726**	**447**	**1,059**	**2,122**	**21,594**
Resulting Population Growth within Study Area	Job-Derived Population	7,165	4,576	5,556	18,303	9,315	1,118	2,647	5,306	53,986
	County Population (2022)	79,083	144,836		79,083		1,171,331		548,632	2,022,965
	Population Growth (percent)	9%	3%	4%	23%	12%	0.1%	0.2%	1%	3%
New Job-Derived Residential Water Demand	million gallons per day (MGD)	0.43	0.27	0.33	1.10	0.56	0.07	0.16	0.32	3.24
Population and Residential Demand by Proximity to Project Site (by Percent)	Less than 10 Miles	34%	32%	32%	33%	31%	35%	36%	36%	
	10 to 24 Miles	26%	34%	34%	29%	29%	30%	30%	27%	
	25 to 50 Miles	18%	16%	16%	17%	18%	15%	15%	14%	
	Greater than 50 Miles	22%	18%	18%	21%	21%	20%	19%	22%	
New Residential Water Demand by Proximity to Project Site	Less than 10 Miles (MGD)	0.15	0.09	0.11	0.36	0.18	0.02	0.06	0.11	1.07
	10 to 24 Miles (MGD)	0.11	0.09	0.11	0.32	0.16	0.02	0.05	0.09	0.96
	Assign to Region (MGD)	0.17	0.09	0.11	0.42	0.22	0.02	0.05	0.12	1.21

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3.1.4 Existing Economic Development Sites and the NC Selectsites Development

3.1.4.1 Selectsite Demands

EDPNC is currently conducting a state-wide study to identify locations for the Selectsites Program, as directed by S.L. 2023-134 section 11.12. The Selectsites program will identify fifteen candidate sites across the state by June 2024. Once identified, Selectsites are likely to have investments that will make each site attractive to prospective economic projects. The Study Area already has numerous potential economic sites being marketed for development. The Selectsite report is not complete at the time of this study. Therefore, a series of assumptions were made to account for the direct water and wastewater needs for the potential that Selectsites may be identified within the study area.

While DEQ believes it is unlikely that 8 of the 15 Selectsites will be located within the Study Area, data suggests that sites located in the Study Area are likely to be attractive for development for a number of reasons (proximity to related businesses, workforce, etc.) regardless of whether they are identified as part of the Selectsite program. For the purposes of this study, it was assumed that the Selectsite program may identify candidate economic development sites that may be developed in the approximate vicinity of each recently incentivized project, along with an additional economic development site in Harnett County. Hazen relied on their recently completed study for Johnston County to account for additional economic development growth and was not included in this part of the analysis. Additionally, it was assumed that a Selectsite was likely to be identified from the pool of existing available economic development sites.

EDPNC has developed a range of typical water and wastewater needs for the categories of industrial developed contemplated for North Carolina's Selectsites. These projections were based on an analysis of project announcements and expansions, previous and current Requests for Information and Proposals, and input from industry partners for projects since 2016 that included a minimum of 500 jobs and $500 million in investments. Table 3-4 provides a summary of these projections, including average water and wastewater demands for each individual industry category, as well as across all categories. The average demands across all categories were calculated both with and without the semiconductor category. The potential flows associated with semiconductor industry are exceptionally high and were expected to skew the needs assessment.

Table 3–5: Water and Wastewater Demand Assumptions for Selectsites

Industry Category	Facility Size (SF) Range	Acreage Range	Water Demand Range (MGD)	Water Demand Average (MGD)	Sewer Demand Range (MGD)	Sewer Demand Average (MGD)
Aerospace	115,000 - 1,200,000	65 - 4,000	0.1 - 1.0	0.55	0.1 - 1.0	0.55
Automotive (OEM, Man. & Incl. E.V.)	150,000 - 20,000,000	180 - 3,600	0.1 - 20	10.05	0.1 - 3.5	1.80
Clean Energy	160,000 - 2,400,000	100 - 2,000	0.05 - 2.8	1.43	0.01 - 2.5	1.26
EV Battery	120,000 - 4,500,000	120 - 1,825	1.0 - 5.5	3.25	0.15 - 2.2	1.18
Food Processing	300,000 - 1,300,000	200 - 600	0.25 - 1.0	0.63	0.25 - 1.0	0.63
Life Sciences	62,000 - 1,000,000	150 - 600	0.4 - 1.5	0.95	0.25 - 1.0	0.63
Semiconductor	350,000 - 6,000,000	25 - 1,800	0.2 - 45	22.60	0.5 - 41	20.75
Average Demands (All Categories)			**5.64**		**3.83**	
Average Demands (Excluding Semiconductor)			**2.81**		**1.01**	

Using this methodology, Hazen assumed average demands of 2.81 MGD for water and 1.01 MGD for wastewater at each location in Guilford, Randolph, Chatham, Lee, Harnett and Southern Wake Counties. Hazen was able to determine that the potential capacity needs were already accounted for in the some LWSP or recent capacity projections. To avoid overestimating capacities in these counties these projected demands were not included again. These averaged demands of likely industries were added to the remaining sites.

3.1.4.2 Demands for Other Business Sectors

Additionally, NC Commerce indicated that the following business sectors (as characterized by the National American Industry Classification System descriptions) have potential to locate within the Study Area as an indirect or induced business of recently incentivized projects identified in Table 3-1:

- Automobile manufacturing
- Storage manufacturing
- Aircraft manufacturing
- Semiconductor and related device manufacturing
- Biological product (except diagnostic) manufacturing
- Wholesale- Motor vehicle and motor vehicle parts and supplies
- Carpet and rug mills
- Motor vehicle seating and interior trim manufacturing
- Wholesale- Other durable goods merchant wholesalers
- Industrial gas manufacturing

DEQ notes that capacities for business sectors listed above that are not included in Table 3-4 were not specifically calculated in this Plan, except where they might be included as general growth normally reflected in Local Water Supply Plans. Some industries in the list above might require special attention regarding wastewater constituents and contaminants of emerging concern.

3.2 Water Demand and Wastewater Flow Projections

The water and wastewater flow projections generated based on the above review and analysis were applied to specific portions of the Study Area as defined below. Water treatment facilities are sized to accommodate the maximum day demands and wastewater treatment facilities are sized to accommodate the maximum monthly flows for which NPDES permits are issued. For the purpose of identifying facility needs, the study generally presents maximum daily water demands and maximum monthly wastewater flows. It is important to note, however, that the average daily demands and flows are relied upon for regulatory thresholds for the timing of expansion planning and implementations. Given the focus of this study is conceptually defining the facilities and their costs required to meet a 2050 condition, as opposed to the actual timing of improvements, the maximum daily demands and maximum monthly flows are the primary focus for these evaluations.

The study assessed current demands and flows and projections for the same in 2050 and did not capture interim planning years. However, a steady growth rate cannot be assumed through the planning horizon, and given recent development, a significant percentage of the demand and flow increases projected in this report are likely to occur within the next decade. **Also, permitting to meet these projections is required and without proper review DEQ cannot guarantee that changes made to meet these projections are approvable. These projections are best characterized as a concept plan to meet projected water and wastewater needs that will require additional study and permitting.**

3.2.1 Water and Wastewater Projections - Johnston County

The following summarizes the basis for water and wastewater projections within Johnston County:

- Hazen is currently completing the Long-Term Water Supply Planning study for Johnston County. This study reflects recent analysis of projected water demands for the Johnston County customers, as well as systems supplied by Johnston County, to include the Town of Clayton. The projections include significant increases in industrial demand and associated population growth in the service area. Consequently, the projections reflected in that recent study are relied upon for this study.
- The water demand for Johnston County includes sales of 1.5 MGD to Fuquay-Varina. This is technically scheduled to end in 2049 but is assumed in the 2050 projection.
- A revised Engineering Alternatives Analysis completed for Johnston County in March 2024 by Dewberry Engineers was used to define the wastewater capacity requirements for Johnston County through 2045 and the projections were extrapolated to 2050 for use in this study.
- Studies completed for the Town of Clayton by HDR informed both the water demand projections noted above for Johnston County, as well as the anticipated wastewater flows for Clayton. The projections completed by HDR went through 2045 and were extrapolated to 2050 for use in this study.
- The LWSP for the Town of Smithfield is relied upon for the water demand projections.

- The projections for the Town of Benson were based on a combination of LWSP data and updates warranted based on the Engineering Alternatives Analysis completed for Benson by The Wooten Company dated December 2021.
- Water demands for Kenly and Princeton are based on the 2022 LWSP data. The Wastewater flow projections for 2050 for each are based on the current ratio of water to wastewater, applied to the projected water usage in 2050.

Table 3–6: Water and Wastewater Projections - Johnston County

Water and Wastewater Provider				
Water Demand Projections	**2022 Average Day Water Demand (MGD)**	**2050 Average Day Water Demand (MGD)**	**2022 Maximum Day Water Demand (MGD)**	**2050 Maximum Day Water Demand (MGD)**
Johnston County (Includes Clayton, Four Oaks, Selma, Pine Level, Princeton, Kenly, Micro, Wilson Mills, Smithfield South)	15.8	32.4	21.6	45.2
Smithfield	4.5	5.7	5.9	7.4
Benson	0.79	2.3	1.0	3.1
Wastewater Flow Projections	**2022 Average Day Wastewater Flow (MGD)**	**2050 Average Day Wastewater Flow (MGD)**	**2022 Maximum Month Wastewater Flows (MGD)**	**2050 Maximum Month Wastewater Flows (MGD)**
Johnston County (Includes Smithfield, Four Oaks, Selma, Pine Level)	6.5	21.3	6.9	26.6
Clayton	1.6	10.6	3.5	12.6
Kenly	0.35	0.43	0.5	0.6
Princeton	0.16	0.25	0.16	0.27
Benson	0.96	2.6	1.1	3.1

3.2.2 Water and Wastewater projections - Harnett County

The following summarizes the basis for water and wastewater projections within Harnett County:

- The water demand projections for areas supplied by Harnett Regional Water (HRW) within Harnett County are based on the 2022 LWSPs for each of the entities. A peaking factor of 1.41 was observed for annual average to maximum day relationship in 2022 and is applied to the 2050 projections.
- A water demand of 2.81 MGD was added to the HRW LWSP projections for a Selectsite, and 0.163 MGD was added to the HRW LWSP projections for the population increases defined by NC Commerce guidance for the economic development sites.

- The areas outside of Harnett County and supplied by HRW are based on LWSP data and generally reflect the contract amounts in 2050. It is assumed the contract amounts are consistent with maximum daily usage in 2050.
- The projections for the City of Dunn are a combination of LWSP data with adjustments by Withers Ravenel based on prior studies related to increased development along the I-95 corridor.

Table 3–7: Water and Wastewater Projections - Harnett County

Water and Wastewater Provider				
Water Demand Projections	**2022 Average Day Water Demand (MGD)**	**2050 Average Day Water Demand (MGD)**	**2022 Maximum Day Water Demand (MGD)**	**2050 Maximum Day Water Demand (MGD)**
Harnett County (Includes Lillington, Angier, Coats)	11.4	18.6	16.1	28.0
Harnett Regional Water Sales Outside of Harnett County	10.1	29.2	14.2	29.2
Total Water Demands on Harnett Regional WTP	**21.5**	**47.8**	**30.3**	**57.2**
Dunn	1.9	2.4	2.8	3.6
Dunn Water Sales Outside Harnett County	1.5	4.0	2.2	5.9
Total Water Demand on Dunn WTP	**3.4**	**6.4**	**5.0**	**9.5**
Wastewater Flow Projections	**2022 Average Day Wastewater Flow (MGD)**	**2050 Average Day Wastewater Flow (MGD)**	**2022 Maximum Month Wastewater Flows (MGD)**	**2050 Maximum Month Wastewater Flows (MGD)**
Harnett County (Includes Lillington, Angier, Coats)	3.2	8.1	4.0	10.4
Harnett Regional Water Sales Outside of Harnett County	5.4	11.4	6.8	14.5
Dunn	2.0	2.5	3.0	3.9

3.2.3 Water and Wastewater projections – Southern Wake County (Fuquay-Varina, Holly Springs)

The following summarizes the basis for water and wastewater projections for Fuquay-Varina and Holly Springs:

- The draft Regional Water Supply Requirements Forecast Technical Memorandum submitted in February 2024 and currently under review as part of the Triangle Regional Water Supply Plan by HDR and Hazen were relied upon to define the water capacity requirements for Holly Springs and Fuquay-Varina through 2050.
- The draft Alternatives Analysis for Utley Creek Water Reclamation Facility Expansion submitted in March 2024 by Hazen was relied upon to define the wastewater capacity

requirements for Holly Springs through 2040. The study included build out projections with an assumed year of 2070. 2050 projections were linearly interpolated utilizing the 2040 and 2070 projections.

- To account for a future economic development site in the Holly Springs area, the above referenced water demand projection by Hazen was adjusted upward to ensure 2.81 MGD, the average water demand for the Selectsites as noted above, was included in the 2050 planning horizon. The average wastewater flows of 1.01 MGD for Selectsites was included in the planning efforts for Utley Creek WRF.
- The draft Fuquay-Varina Environmental Impact Statement for Interbasin Transfer for Water Supply from Cape Fear River to Neuse River submitted in March 2024 by Hazen is currently under review. Wastewater projections from this study were relied upon to define wastewater capacity requirements for Fuquay-Varina through 2050. The inclusion of data currently under review should not be interpreted as pre-approval or acceptance of any specific proposal.
- The Town of Fuquay-Varina projections take into account a portion of the Town's service area that is on community or individual wells that discharge to the Town's sewer system. The service area for Fuquay-Varina is not a 1:1 ratio as is often the case with other municipalities. The wastewater flow projections also account for a percentage of existing septic systems being converted to public water and wastewater providers in the future.

Table 3–8: Water and Wastewater Projections – Southern Wake County

Water and Wastewater Provider				
Water Demand Projections	**2022 Average Day Water Demand (MGD)**	**2050 Average Day Water Demand (MGD)**	**2022 Maximum Day Water Demand (MGD)**	**2050 Maximum Day Water Demand (MGD)**
Fuquay-Varina	3.0	7.6	4.5	11.4
Holly Springs	3.4	9.4	4.9	16.1
Wastewater Flow Projections	**2022 Average Day Wastewater Flow (MGD)**	**2050 Average Day Wastewater Flow (MGD)**	**2022 Maximum Month Wastewater Flows (MGD)**	**2050 Maximum Month Wastewater Flows (MGD)**
Fuquay-Varina	2.8	11.0	3.3	13.0
Holly Springs	2.9	9.4	3.1	11.3

3.2.4 Water and Wastewater Projections – Lee and Chatham County

The following summarizes the basis for water and wastewater projections for Lee and Chatham County:

- The City of Sanford, Town of Broadway, Carolina Trace and Goldston Gulf water demands are based on LWSP data. Wastewater projections are based on ratios of water to wastewater applied to future water demands. The LWSP data relied upon for these providers was reviewed against the population increases projected by NC Commerce and confirmed the LWSP were adequate to account for this population growth.
- Water demands for Chatham County are based on a combination of LWSP data with updates for site-specific small area plans developed by Freese and Nichols (FNI) in 2023 and demand data compiled by Hazen in 2022 for the Western Intake Partnership (WIP).
- Water demands and wastewater flows for Siler City are based on recent projections completed by FNI during the development of the 2024 capital improvements plan (CIP) for Siler City. Hazen reviewed the data from the ongoing study by Freese and Nichols and determined that population increases projected by NC Commerce was captured in the CIP. These demand projections also account for the 2.81 MGD of water and 1.01 MGD of wastewater demands required for future Selectsite developments in both the Siler City and Moncure areas.
- Water demand and wastewater flows for Pittsboro are based on recent projections developed by FNI in 2022. The Pittsboro projections also include the Chatham Park development.

Table 3–9: Water and Wastewater Projections – Lee and Chatham County

Water and Wastewater Provider				
Water Demand Projections	**2022 Average Day Water Demand (MGD)**	**2050 Average Day Water Demand (MGD)**	**2022 Maximum Day Water Demand (MGD)**	**2050 Maximum Day Water Demand (MGD)**
Sanford	6.0	12.0	7.3	14.4
Broadway	0.10	0.13	0.15	0.20
Carolina Trace	0.20	0.23	0.35	0.40
Chatham County	3.0	10.6	4.0	15.1
Goldston Gulf	0.12	0.08	0.18	0.11
Pittsboro	0.9	10.7	1.3	16.1
Siler City	2.7	9.8	3.3	12.1
Wastewater Flow Projections	**2022 Average Day Wastewater Flow (MGD)**	**2050 Average Day Wastewater Flow (MGD)**	**2022 Maximum Month Wastewater Flows (MGD)**	**2050 Maximum Month Wastewater Flows (MGD)**
Sanford	3.5	9.3	4.2	12.1
Broadway	0.09	0.12	0.13	0.17
Carolina Trace	0.26	0.26	0.33	0.33
Chatham County	0.0	4.6	0.0	5.7
Goldston Gulf	0.0	0.1	0.0	0.1
Pittsboro	0.56	8.6	0.68	11.2
Siler City	3.2	5.7	4.2	7.4

3.2.5 Water and Wastewater Projections – Triad (Randolph and Guilford County)

The following summarizes the basis for water and wastewater projections for Randolph and Guilford County:

- The Piedmont Triad Regional Water Authority (PTRWA) is a wholesale drinking water supplier to water utility providers in Randolph and Guilford County. Member governments include the Cities of Archdale, Greensboro, High Point and Randleman, the Town of Jamestown and Randolph County. As a wholesale supplier, the utility does not have an individual customer base, and therefore, is not included in the demand requirements for the region.
- The LWSP for the City of Greensboro is relied upon for the water demand projections. Hazen is currently in the beginning phases of both the water distribution and sewer collection master plans for the City of Greensboro and will be taking a deeper dive into the future demand projections. However, an additional water demand of 2.81 MGD was added to account for a future Selectsite in Guilford County. It was also confirmed that local planning would support an additional Selectsite wastewater demand of 1.01 MGD.

- The 2022 LWSP showed that very little growth was planned for the City of Archdale in future years. Through conversations with Archdale staff, we have learned of the approval of approximately 2,000 housing units and a few low-water-demand commercial interests that would increase their demands from originally reported values. Thus, the demands included in this study have been adjusted to reflect growth.
- The LWSP for the Town of Jamestown is relied upon for the water demand projections.
- The LWSP for the Town of Gibsonville was relied upon for the water demand projections.
- The LWSP for the Town of Stokesdale was relied upon for the water demand projections.
- The Town of Oak Ridge is currently designing a system to be connected to the Winston-Salem/Forsyth County Utilities Commission to provide water for fire flow protection and possibly potable water supply in the future.
- The Town of Summerfield is currently in design to provide fire protection services only, utilizing groundwater supply wells and is therefore not associated with a demand.
- Summerfield Holdings is a private development in the region and is anticipated to need approximately 1.0 MGD Maximum Day Demand (MDD) in the future from a regional partner.
- Hazen relied on the 2022 Water and Sewer Master Plan Phase 2 Report by Wooten Company to adjust the demands for the water and wastewater providers in Randolph County that do not appear to include the anticipated growth from Toyota or other economic site development.
- The 2022 LWSP for the City of Asheboro was determined to include sufficient future demand projections to provide 2.81 MGD of water and 1.01 MGD of wastewater capacity for a future Selectsite.
- The LWSP for the Town of Liberty didn't appear to reflect the anticipated growth in the area due to the Toyota and Wolfspeed Megasites. They have been adjusted with consideration to the Wooten report and the NC Commerce modeling indicators.
- The Town of Ramseur's LWSP did not appear to reflect the anticipated growth due to the anticipated development. The projections have been adjusted to reflect recent reports and this analysis.
- The Franklinville LWSP did not reflect the anticipated growth in the area due to anticipated development. Projections have been adjusted to reflect recent reports.
- The Randleman LWSP did not reflect the anticipated growth in the area due to recent developments. Projections have been adjusted to reflect recent reports.
- Trinity's water supply is provided by Davidson Water, Inc. and therefore Trinity does not have an LWSP to rely upon. The demands below were developed based on feedback from water providers in the study.

- Randolph County is currently developing their water system. Initially it will operate as a wholesale utility with no individual customer base and therefore does not have an assigned demand.

Table 3–10: Water and Wastewater Projections – Triad

Water and Wastewater Provider Water Demand Projections	2022 Average Day Water Demand (MGD)	2050 Average Day Water Demand (MGD)	2022 Maximum Day Water Demand (MGD)	2050 Maximum Day Water Demand (MGD)
Greensboro	34.8	47.8	48.2	65.2
High Point	13.3	14.9	17.3	19.4
Jamestown	0.50	0.86	0.65	1.12
Gibsonville	0.60	1.20	0.78	1.56
Stokesdale	0.15	0.27	0.20	0.35
Oak Ridge	System in Development			
Summerfield Holdings	0	0	0.8	1.0
Summerfield	System in Development, Fire Flow Only			
Archdale	0.85	1.2	1.71	1.88
Liberty	0.26	0.55	0.33	0.71
Ramseur	0.50	0.78	1.26	1.96
Franklinville	0.10	0.35	0.13	0.45
Asheboro	5.0	11.7	6.3	14.7
Randleman	0.80	1.38	1.98	3.40
Trinity	0.05	0.1	0.1	0.15
Seagrove-Ulah Metro Water District	0.20	0.21	0.26	0.28
Piedmont Triad Regional Water Authority	11.8	20.4	13.2	22.8
Randolph County	-	-	-	-

Wastewater Flow Projections	2022 Average Day Wastewater Flow (MGD)	2050 Average Day Wastewater Flow (MGD)	2022 Maximum Month Wastewater Flows (MGD)	2050 Maximum Month Wastewater Flows (MGD)
Greensboro	33.0	53.1	36.6	60.8
High Point	14.0	17.3	20.0	24.7
Jamestown	0.6	1.4	1.2	2.1
Gibsonville	0.7	1.4	0.9	1.8
Stokesdale	Does not have a collection system			
Oak Ridge	Does not have a collection system			
Summerfield Holdings	Does not have a collection system			
Summerfield	Does not have a collection system			
Archdale	1.0	1.2	1.2	1.4
Liberty	0.3	0.6	0.5	1.1
Ramseur	0.2	0.3	0.3	0.4
Franklinville	0.04	0.14	0.05	0.18
Asheboro	3.6	8.3	4.6	10.7
Randleman	0.6	1.1	0.8	1.4
Trinity	0.01	0.02	0.02	0.03
Seagrove-Ulah Metro Water District	0.2	0.21	0.26	0.28
Piedmont Triad Regional Water Authority	Does not have a collection system			
Randolph County	Does not have a collection system			

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4. Water and Wastewater Treatment Requirements

4.1 Water Treatment Considerations

4.1.1 Conventional Treatment

Conventional water treatment includes processes to ensure the removal of contaminants and the delivery of safe drinking water to customers that complies with state and federal regulations. These processes generally consist of coagulation and flocculation, sedimentation, filtration, disinfection, pH adjustment and disinfection. A variety of chemicals are added during conventional treatment to facilitate each of the processes. Conventional treatment achieves the removal of suspended solids, pathogens, organic matter, chemical contaminants, turbidity and color.

Conventional water treatment plants in North Carolina adhere to regulations set by the Environmental Protection Agency (EPA) and to ensure the quality and safety of drinking water. Regular testing and monitoring ensure that the water meets all regulatory standards before it reaches consumers.

4.1.2 Advanced Treatment for Removal of Contaminants of Emerging Concern

Advanced water treatment methods are being utilized in addition to conventional treatment to address the presence of per- and polyfluoroalkyl substances (PFAS), 1,4-Dioxane and other emerging contaminants in water sources. PFAS are often referred to as “forever chemicals” because they are persistent in the environment, do not degrade naturally and have been shown to bioaccumulate. These contaminants are known to be harmful to human health and the environment. North Carolina ranked as the fourth highest state with the greatest number of drinking water systems identified with detectable levels of 1,4-Dioxane and third highest concentrations nationwide. The most recent data suggests that North Carolina’s exposure to 1,4-Dioxane remains above the national average. Based on a nationwide sampling of drinking water systems for 1,4-Dioxane under EPA’s Third Unregulated Contaminant Monitoring Rule, 4% of measurements data collected across NC showed detectable levels of the contaminant at 24 public water systems. Most of these systems are in the Cape Fear River basin.

DEQ is committed to addressing treatment of emerging contaminants across the state. While working with drinking water systems to assess PFAS levels throughout North Carolina, all available data shows more than 300 water systems in our state have PFAS levels that will exceed the new EPA drinking water standards. That includes 42 municipal water systems serving nearly 3 million residents combined, as well as approximately 270 public water systems (20% of total) tested.

Source reduction measures at industrial discharge points are the most cost-effective way to reduce emerging compounds in drinking water sources and minimize the burden of treatment at drinking water plants. Techniques such as granular activated carbon (GAC) filtration, reverse osmosis (RO), ion exchange and advanced oxidation processes (AOPs) are being employed to effectively remove PFAS and 1,4-Dioxane from water sources. These processes are also effective at removing other emerging contaminants.

GAC filtration involves passing water through a bed of activated carbon where PFAS or other compounds can adsorb to the surface of the media and be removed. Ion exchange is another method where ions in the water are exchanged with ions in a resin to remove contaminants. AOPs use powerful oxidants called hydroxyl radicals to break down contaminants into harmless byproducts. Membrane treatment is also an option for the removal of contaminants from water through filtration that are not effectively removed by conventional treatment. Each advanced treatment approach has advantages and disadvantages and requires site-specific evaluations to define the most appropriate application based on the contaminants present.

These advanced treatment methods are being implemented in water treatment plants across North Carolina to ensure customers have clean drinking water that meets EPA standards. For example, Cape Fear Public Utility Authority's Sweeney Water Treatment Plant, Lower Cape Fear Water and Sewer Authority's Bladen Bluffs Water Treatment Plant and Pender County Utilities' Surface Water Treatment Plant are utilizing GAC filtration to remove PFAS. Brunswick County Water System is undergoing an upgrade that includes RO membranes for the removal of PFAS and 1,4-Dioxane. Monitoring and testing are also conducted to ensure the effectiveness of these treatment processes in removing PFAS and 1,4-Dioxane from water sources.

DEQ has been working with public water systems to assess PFAS levels across the state and prepare water providers for compliance with the National Primary Drinking Water Regulation announced on April 10, 2024. EPA has set the legally enforceable levels for six PFAS and Public water systems have five years to meet the standards. The maximum contaminant levels (MCLs) are:

- PFOA 4.0 parts per trillion (ppt)
- PFOS 4.0ppt
- GenX chemicals 10ppt
- PFNA 10ppt
- PFHxS 10ppt
- Hazard index calculation for mixtures of GenX, PFBS, PFNA and PFHxS

DEQ is also providing technical assistance and funding opportunities to reduce PFAS, change source water and/or install treatment.

Under DEQ's Action Strategy for PFAS, DEQ is taking a whole-of-department approach to protect communities by identifying, reducing and remediating PFAS pollution. DEQ's regulatory divisions are requiring PFAS information from new facilities and industries and adding permit conditions as appropriate to address PFAS wastewater discharges to require disclosure of data and additional monitoring. DEQ and our economic development partners work together to proactively address emerging contaminants early in the business recruitment and expansion efforts.

Data indicates that the cost of addressing PFAS contamination in the publicly owned treatment facilities is much more expensive relative to addressing contamination at the industrial source. Reductions at the source reduce the burden of treatment costs to utility rate payers. DEQ strongly encourages proactive and vigilant action by public water and wastewater providers and pretreatment system operators to know the level of emerging contaminants in industrial waste constituents in order to protect the environment, downstream users of water resources and rate payers across the state.

Below is a summary of actions completed or underway for addressing contaminants of emerging concern at water treatment facilities in the Study Area:

- The City of Greensboro is under contract with a consultant to design a PFAS treatment system at the Mitchell WTP. Presently, the city has indicated this project will likely use Granular Activated Carbon (GAC) for removal/reduction of PFAS.
- PTRWA is under contract with a Design/Build team to reduce the effluent concentrations of 1,4-Dioxane in the potable water by Reverse Osmosis technology.
- The Town of Pittsboro installed GAC contactors at their facility to reduce the PFAS concentration in their drinking water.
- The City of Sanford will install GAC in their upcoming update at the water treatment facility for the reduction of PFAS.
- Western Intake Partnership will install GAC and/or Ion Exchange for removal/reduction of PFAS in their future facility.
- Johnston County is under contract to complete a study to understand the impact of PFAS in their drinking water and will develop treatment techniques if necessary.
- The City of Burlington is outside of our Study Area but is a discharger into the Haw River. They are undertaking a study for PFAS and 1,4-Dioxane removal at their two water treatment plants.

4.2 Wastewater Treatment Considerations

4.2.1 Conventional Treatment

Conventional wastewater treatment removes solids, organic matter, nutrients, and pollutants from wastewater using a combination of physical, chemical, and biological processes and operations. These processes are broken down into pre-treatment, primary treatment, secondary treatment and tertiary treatment. Conventional wastewater treatment plants in North Carolina adhere to regulations set by the EPA and DEQ. All wastewater discharges to surface waters must receive a permit to control water pollution through the National Pollutant Discharge Elimination System (NPDES) program. Compliance with the NPDES permit is tracked through the submittal of discharge monitoring reports (DMRs).

4.2.2 Environmental Assessment of Receiving Streams

While the majority of the Study Area is located in the Cape Fear River basin, small portions of the Study Area either receive or discharge water to the Neuse or Yadkin-Pee Dee River basins. Knowing the designated uses, existing water quality conditions and nutrient restrictions in these neighboring basins is critical when public water and wastewater providers begin to evaluate where to expand or grow their water intakes or discharges.

Cape Fear River Basin: Deep and Upper Cape Fear Sub-basins

Water quality data collected in the Deep and Upper Cape Fear sub-basins indicate that the waterbodies located in these sub-basins are impacted by excess nutrients. To protect water quality and designated uses in the basin, DEQ adopted a "hold the load" strategy for the central portion of the Cape Fear River basin. The strategy is intended to limit additional loading of nitrogen and phosphorus, with the understanding that a reduction in nutrient loading will likely be needed throughout this section of the basin until water quality modeling can show otherwise. Tools to assist with NPDES management decisions are underway and include a watershed nutrient response model and a Nutrient Criteria Development Plan (NCDP) process which will be followed by a Total Maximum Daily Load (TMDL) and/or nutrient management strategy to control nitrogen and phosphorus loading in this portion of the basin. The model currently being developed by EPA will play a critical role in supporting future permitting and management strategies to protect not only this portion of the basin but downstream as well.

Cape Fear River Basin: Haw River Sub-basin

The EPA approved a TMDL for the Jordan Lake watershed in September 2007. The approved TMDL estimated the allowable pollutant load for total nitrogen (TN) and total phosphorus (TP) in the lake, and it allocated the loads to known sources. Portions of the Jordan Lake Nutrient Rules (15A NCAC 02B .0263-.0273) went into effect in August 2009. The purpose of the rule is to "establish minimum nutrient control requirements for point source wastewater discharges in the Jordan Lake watershed in order to restore and maintain water quality in the reservoir and its tributaries and protect their designated uses, including water supply" [15A NCAC 02B .0270 (1)]. The point source dischargers in the Haw River arm of Jordan lake currently have an allocation of nitrogen and phosphorus based on these management programs. Each discharger has a certain amount of nitrogen and phosphorus that they are permitted to use. They can sell their nitrogen or phosphorus to another facility within the Haw River arm, but there is no additional load that can be added to this watershed.

Neuse River Basin

Excess amounts of nutrients such as nitrogen and phosphorus have caused problems including low oxygen levels, extensive fish kills and harmful algal blooms in the Neuse River estuary. In response to these issues, North Carolina developed the Neuse Nutrient Strategy, a set of rules designed to equitably regulate sources of nutrient pollution in the basin including wastewater, stormwater and agricultural nutrient sources. The rules also protect riparian buffers and mandate training for professionals that apply fertilizer. The rules went into effect in 1997 and seek to reduce nitrogen levels in the estuary by 30% from a 1991-1995 baseline. Phosphorus levels are to remain the same as the baseline. Point source dischargers have an allocation of nitrogen, and each discharger has a certain amount of nitrogen (annual load) that they are permitted to use. No additional nitrogen is allowed beyond the current allocations.

Yadkin-Pee Dee River Basin: Lower Yadkin Sub-basin (Includes High Rock Lake)

High Rock Lake is experiencing water quality issues due to excess nutrients. DEQ is actively working with a stakeholder committee to draft new state requirements (rules) to address the excess nutrients in the sub-basin and technical advisory groups are being convened to investigate different control strategies for nutrient sources. The rules are expected to impact a wide range of nutrient sources, including, but not

limited to, impervious surfaces, stormwater runoff, agriculture, wastewater dischargers and riparian buffers. Existing discharge limits will likely remain the same until the rules are in place.

4.2.2.1 Nutrient Management

The Hazen Team conducted a high-level assessment of nutrient impacts on receiving streams within the Study Area. The assessment was based on existing nutrient limits in NPDES permits and information reported by wastewater utility providers in their discharge monitoring reports.

In this study, the assumed limits of technology for conventional wastewater treatment for Total Nitrogen (TN) removal is 3 mg/L, and the assumed limits of technology for Total Phosphorus (TP) removal is generally 0.5 mg/L. For this study, the Hazen Team compared the current Total Nitrogen and Total Phosphorus effluent discharge loadings reported by the wastewater utility providers to the achievable nutrient loading assuming conventional treatment limits of technology are being used. The Hazen Team used the current "hold the load" strategy being implemented by DEQ for dischargers in the central portion of the Cape Fear River basin. Because there are nutrient strategies in place for Jordan Lake, the study evaluated a TP concentration of 0.18 mg/L for all new or reduced loading scenarios for dischargers in the Haw River arm of the lake.

The following summarizes the basis for determining existing total nitrogen and total phosphorus effluent discharge loading by the wastewater treatment facilities within the Study Area:

- For treatment facilities that have TN and/or TP discharge limits, either concentration or load based, in their current NPDES permit, the annual load (lbs/yr) used in this Study's nutrient assessment was based on the facility's permitted maximum month capacity.
- For treatment facilities that do not have TN or TP discharge limits in their current NPDES permit, historical effluent data was used to estimate the facility's average effluent annual TN and TP load (lbs/yr) over the years 2021-2023. This estimated historical load was used as the facility's theoretical nutrient load for this Study's nutrient assessment. In the scenario where a facility's estimated historical annual load resulted in a TN or TP concentration less than the assumed limits of technology at the facility's permitted maximum month capacity, then a theoretical TN concentration of 3 mg/L and a TP concentration of 0.5 mg/L were used to assign an annual nutrient load (lbs/yr) based on the facility's permitted maximum month capacity.
    - The sources for the historical effluent data include:
        - Discharge Monitoring Reports (DMRs) provided to DEQ for January 2022 through October 2023
        - EPA – Enforcement and Compliance History Online (ECHO) website for 2021 data and November/December 2023 data
    - An average summer and an average winter TN and TP load were calculated based on three years of data, 2021-2023. For facilities that report load (lbs) values in their DMRs, an average annual load from 2021-2023 was the discharge loading assigned

for that facility as part of this Study. For facilities that only report TN and TP concentrations (mg/L), the average concentration from the summer sample dates (the summer season defined as April 1 – October 31 to match the NPDES permit definition) was multiplied by the total summer flow to estimate the summer nutrient load (lbs/summer). The summer nutrient load for the three years 2021-2023 was then averaged to generate the estimated summer load for that facility. The same procedure was used to calculate the estimated winter load (the winter season defined as January 1-March 31 and November 1-December 31 to match the NPDES permit definition). The average summer nutrient load and the average winter nutrient load were added together for an average annual nutrient load.

- There is a range in the frequency of TN and TP concentration samples by the various facilities within the Study Area. The frequency ranged from weekly samples, monthly samples and quarterly samples. For the facilities that only take quarterly TN and TP concentration samples, the estimated annual nutrient load values calculated for those facilities are only based on one winter sample and three summer samples. In order to refine the estimated annual nutrient loads presented in this Study, it is recommended that facilities increase the frequency in which they take TN and TP samples.

- For treatment facilities that only have seasonal TN and/or TP discharge load limits in their current NPDES permit, the annual load (lbs/yr) used in this Study's nutrient assessment was calculated as the sum of the facility's permitted summer load at maximum month capacity and the historical average winter nutrient load estimated using 2021-2023 DMR data as described above.

- For non-discharge, spray irrigation treatment facilities that do not have TN or TP load allocations, a theoretical TN concentration of 3 mg/L and a TP concentration of 0.5 mg/L were used to assign an annual nutrient load (lbs/yr) based on the facility's permitted maximum month capacity for use in this Study's nutrient assessment.

The existing TN and TP effluent discharge loads for the wastewater treatment facilities within the Study Area based on the above methodology are summarized in Table 4-1.

TN and TP effluent discharge loads were calculated for the wastewater treatment facilities within the Study Area assuming treatment upgrades allowed the facilities to meet conventional treatment limits of technology TN and TP concentrations. The loads presented in Table 4-2 are based on the facility's permitted maximum month capacity, a TN concentration of 3.0 mg/L and a TP concentration of 0.5 mg/L. The total phosphorus load for facilities in the Haw River sub-basin is based on a TP concentration of 0.18 mg/L because of existing nutrient management strategies in place for Jordan Lake.

Based on the need to "hold the load" in the Cape Fear River basin, this nutrient assessment estimated the nutrient load that would become available with treatment upgrades to the facilities within the Study Area. This available load was calculated by subtracting the facility's existing nutrient load from the calculated load based on treatment upgrades to meet limits of technology. A summary of the available nutrient load from each treatment facility within the Study Area is presented in Table 4-2. Some facilities within the Study Area already have nutrient permit limits that are equal to the limits of technology concentrations or historical data demonstrates the facility is already treating to the limits of technology concentrations. For

these facilities, no nutrient load is assumed to become available. Appendix B combines Tables 4-1 and 4-2 into a single table.

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Table 4–1: Existing Total Nitrogen and Total Phosphorus Effluent Loads Within the Study Area

Utility / Facility Name	Basin / Sub-basin	Capacity (MGD)[1,2]	Current Permit Limits				Theoretical / Permitted Loads	
			TN		TP		TN	TP
			mg/L	lbs/yr	mg/L	lbs/yr	lbs/yr	lbs/yr
Johnston Co. - Central Johnston Co. WWTP	Neuse / Upper Neuse	13.5	-	73,477 [4]	2	-	73,477 [4]	82,191
Clayton - Sams Branch WWTP [2]	Neuse / Upper Neuse	10	-	89,842	2	-	89,842	60,882
Kenly - Kenly Regional WWTP	Neuse /Upper Neuse	0.63	-	7,096	2	-	7,096	3,836
Princeton - Princeton WWTP	Neuse /Upper Neuse	0.275	M&R	-	M&R	-	7,451	2,037
Benson - Benson WWTP	Neuse /Upper Neuse	1.9	-	33,070	2	-	33,070	11,568
Harnett Co. - North Harnett Regional WWTP [2]	Cape Fear / Upper Cape Fear	16.5	-	115,550 lbs/Summer	-	38,517 lbs/Summer	167,729	48,948
Harnett Co. - South Harnett Regional WWTP	Cape Fear /Upper Cape Fear	15	-	105,046 lbs/Summer	-	35,015 lbs/Summer	171,648	54,943
Dunn - Black River WWTP	Cape Fear /Upper Cape Fear	3.75	M&R	-	M&R	-	52,944	8,114
Fuquay-Varina - Terrible Creek WWTP [2]	Neuse /Lower Neuse	6	-	68,489	2	-	68,489	36,529
Holly Springs - Holly Springs WWTP [2]	Cape Fear /Upper Cape Fear	8	5	-	0.5	-	121,764	12,176
Sanford - Big Buffalo WWTP	Cape Fear /Deep	12	-	64,628 lbs/Summer	-	20,138 lbs/Summer	109,588 [3]	33,149
Broadway - Broadway WWTP [2]	Cape Fear /Upper Cape Fear	0.16	M&R	-	M&R	-	1,461 [3]	244 [3]
Carolina Trace - Carolina Trace WWTP	Cape Fear /Upper Cape Fear	0.675	M&R	-	M&R	-	6,164 [3]	3,336
Pittsboro - Pittsboro WWTP	Cape Fear /Haw	1.249 [5]	-	36,202	-	322 lbs/Sum	36,202	552
Siler City - Siler City WWTP [2]	Cape Fear /Deep	6	-	54,800	0.5 /2	-	54,800	20,466
Greensboro - T.Z. Osborne WRF	Cape Fear /Haw	56	-	891,272	-	112,044	891,272	112,044
High Point - Eastside WWTP	Cape Fear /Deep	26	6	474,865	0.5	39,420	474,865	39,420
High Point - Westside WWTP	Yadkin Pee Dee /Lower Yadkin	10	-	159,870	-	13,341	159,870	15,221 [3]
Liberty - Town of Liberty WWTP	Cape Fear /Deep	0.55	Non-discharge / irrigation facility				5,023 [3]	837 [3]
Ramseur - Ramseur WWTP	Cape Fear /Deep	0.48	M&R	-	M&R	-	6,255	2,148
Franklinville - Franklinville WWTP	Cape Fear /Deep	0.1	M&R	-	M&R	-	2,795	1,311
Asheboro - Asheboro WWTP	Cape Fear /Deep	9	M&R	-	M&R	-	205,645	13,698 [3]
Randleman - Randleman WWTP	Cape Fear /Deep	1.745	M&R	-	M&R	-	15,936 [3]	4,974
Trinity - Trinity American Corp.	Wastewater is sent to High Point Westside WWTP so nutrient loads from this Utility are excluded from this assessment.							
Seagrove/Ulah Metro Water District WWTP	Cape Fear /Deep	0.036	Non-discharge / irrigation facility				329 [3]	55 [3]

[1]Maximum Month Facility Capacity from NPDES Permit.

[2]For facilities with tiered flows and nutrient load limits in their current NPDES permit, the future tiered flow and nutrient load limits are listed and used in this Study's nutrient assessment.

[3]The theoretical TN or TP load is based on assumed limits of technology concentrations (TN = 3 mg/L, TP = 0.5 mg/L) at maximum month facility capacity.

[4]Johnston County is in the process of trying to purchase additional nitrogen allocation.

[5]Capacity includes Outfall 001A (Pittsboro) and Outfall 001B (Chatham Park). Additional 1.971 MGD effluent capacity available in permit if effluent pipe to Haw River (002) is constructed.

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Table 4–2: Estimated Available Nutrient Load Within the Study Area with Conventional Treatment Upgrades to Facilities

Utility / Facility Name	Basin / Sub-basin	Capacity (MGD)[1,2]	Nutrient Loads Based on Limits of Technology		Available Load with Limits of Technology Upgrade	
			TN	TP	TN	TP
			lbs/yr	lbs/yr	lbs/yr	lbs/yr
Johnston Co. - Central Johnston Co. WWTP	Neuse / Upper Neuse	13.5	123,286	20,548	-	61,643
Clayton - Sams Branch WWTP [2]	Neuse / Upper Neuse	10	89,842	15,221	-	45,662
Kenly - Kenly Regional WWTP	Neuse /Upper Neuse	0.63	5,753	959	1,343	2,877
Princeton - Princeton WWTP	Neuse /Upper Neuse	0.275	2,511	419	4,939	1,619
Benson - Benson WWTP	Neuse /Upper Neuse	1.9	17,351	2,892	15,719	8,676
Harnett Co. - North Harnett Regional WWTP [2]	Cape Fear / Upper Cape Fear	16.5	150,683	25,114	17,046	23,834
Harnett Co. - South Harnett Regional WWTP	Cape Fear /Upper Cape Fear	15	136,985	22,831	34,664	32,113
Dunn - Black River WWTP	Cape Fear /Upper Cape Fear	3.75	34,246	5,708	18,698	2,406
Fuquay-Varina - Terrible Creek WWTP [2]	Neuse /Lower Neuse	6	54,794	9,132	13,695	27,397
Holly Springs - Holly Springs WWTP [2]	Cape Fear /Upper Cape Fear	8	73,058	12,176	48,706	-
Sanford - Big Buffalo WWTP	Cape Fear /Deep	12	109,588	18,265	-	14,884
Broadway - Broadway WWTP [2]	Cape Fear /Upper Cape Fear	0.16	1,461	244	-	-
Carolina Trace - Carolina Trace WWTP	Cape Fear /Upper Cape Fear	0.675	6,164	1,027	-	2,309
Pittsboro - Pittsboro WWTP	Cape Fear /Haw	1.249 [4]	11,406	684 [3]	24,796	-
Siler City - Siler City WWTP [2]	Cape Fear /Deep	6	54,794	9,132	6	11,334
Greensboro - T.Z. Osborne WRF	Cape Fear /Haw	56	511,409	30,685 [3]	379,863	81,359
High Point - Eastside WWTP	Cape Fear /Deep	26	237,440	39,420	237,425	-
High Point - Westside WWTP	Yadkin Pee Dee /Lower Yadkin	10	91,323	15,221	68,547	-
Liberty - Town of Liberty WWTP	Cape Fear /Deep	0.55	5,023	837	5,023	837
Ramseur - Ramseur WWTP	Cape Fear /Deep	0.48	4,384	731	1,872	1,417
Franklinville - Franklinville WWTP	Cape Fear /Deep	0.1	913	152	1,882	1,159
Asheboro - Asheboro WWTP	Cape Fear /Deep	9	82,191	13,698	123,454	-
Randleman - Randleman WWTP	Cape Fear /Deep	1.745	15,936	2,656	-	2,318
Trinity - Trinity American Corp.	*Wastewater is sent to High Point Westside WWTP so nutrient loads from this Utility are excluded from this assessment.*					
Seagrove/Ulah Metro Water District WWTP	Cape Fear /Deep	0.036	329	55	329	55

[1]Maximum Month Facility Capacity from NPDES Permit.
[2]For facilities with tiered flows and nutrient load limits in their current NPDES permit, the future tiered flow and nutrient load limits are listed and used in this Study's nutrient assessment.
[3]For facilities located in the Haw sub-basin, a TP concentration of 0.18 mg/L was used to calculate the total phosphorus load instead of 0.5 mg/L.
[4]Capacity includes Outfall 001A (Pittsboro) and Outfall 001B (Chatham Park). Additional 1.971 MGD effluent capacity available in permit if effluent pipe to Haw River (002) is constructed.

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A summary of available nutrient load that would become available within each sub-basin of the Study Area based on treatment upgrades to the facilities that discharge to the sub-basin is presented in Table 4-3. An equivalent flow for each sub-basin was calculated based on the available TN and TP loads with a TN concentration of 3.0 mg/L, and a TP concentration of 0.5 mg/L. For the Haw River sub-basin, the available flow was calculated based on a TP concentration of 0.18 mg/L. The available loads presented are not representative of all opportunities within the sub-basins except for the Deep sub-basin. There are treatment facilities outside of the Study Area that discharge into the other sub-basins which are not accounted for as part of this nutrient assessment. Impacts of non-point discharges were also not accounted for in this study.

Table 4–3: Available Nutrient Load in Each Sub-basin with Conventional Treatment Upgrades

	Total Load Available		Equivalent Flow	
	TN	TP	TN = 3.0 mg/L	TP = 0.5 / 0.18 mg/L
Basin/Sub-basin	lbs/yr	lbs/yr	MGD	MGD
Cape Fear/Deep	369,991	32,005	40.5	21.0
Cape Fear/Haw	404,659	81,359	44.3	148.5
Cape Fear/Upper Cape Fear	119,114	60,661	13.0	39.9
Neuse/Lower Neuse	13,695	27,397	1.5	18.0
Yadkin Pee Dee/Lower Yadkin	68,547	-	7.5	0.0

4.2.2.2 Summary of Impairments

The federal Clean Water Act (CWA) requires states to report biennially to the EPA on the quality of the waters in their state. To determine how well waterbodies are meeting their best-intended use, chemical, physical and biological parameters are regularly assessed by DWR. Where enough samples exist, waterbodies are determined to be meeting or exceeding criteria based on a five-year dataset, assigned waterbody classification and existing water quality standards. Impaired waters are waterbodies where water quality samples are exceeding water quality standards for a particular parameter. Procedures used to evaluate water quality and assign categories are explained in detail in the Integrated Report (IR) methodology.

Figure 4-1 illustrates the listed impairments within the Study Area. The impairment criteria are as stated in the *2022 303(d) Listing and Delisting Methodology* (DEQ, 2021), which was approved by the Environmental Management Commission (EMC) on May 13, 2021. While all impairments reflect concerns, impairments due to chlorophyll *a*, dissolved oxygen (DO) and benthos are common concerns when considering a waterbody's ability to assimilate a new or increased discharge of treated wastewater. The water quality conditions also influence the constituent limits imposed in NPDES permits for discharges. Further evaluations of the individual streams are necessary to assess the viability of the planning concepts presented in this study.

DWR is currently developing the fourth basinwide water resources management plan (basin plan) for the Cape Fear River basin. Basin plans provide information on water quality and water quantity related issues and identify areas that need additional protection, restoration, or preservation to ensure the waters of the

state are meeting their designated uses. The basin plan includes an in-depth overview of water quality data collected between 2000 and 2022 and identifies waters that are on the 2022 303(d) list of impaired waters. DWR anticipates completion of the basin plan towards the end of 2024. Once approved by the EMC, the basin plan can be used in conjunction with this Plan to help guide local decisions for protecting water resources.

4.2.2.3 Contaminants of Emerging Concern

PFAS and 1,4-Dioxane are currently the primary contaminants of emerging concern in the Cape Fear River basin. The presence of these contaminants has been documented through sampling and widely publicized in the basin. DEQ has prioritized actions statewide to reduce the presence of PFAS and 1,4-Dioxane and address concerns of the downstream public water and wastewater providers and communities.

In June 2022, DEQ published the Action Strategy for PFAS, a whole-of-department approach to address PFAS contamination and reduces sources and exposure throughout North Carolina. In April 2024, the EPA finalized national drinking water standards for six PFAS compounds. The standards apply to drinking water systems, which will have 5 years to meet the new Maximum Contaminant Levels (MCLs).

Wastewater treatment has an impact on drinking water supplies and aquatic life as they discharge into surface waters. Public water supply systems provide drinking water to over 9 million North Carolinians. Approximately 459 of the 2,200 systems obtain their source water from surface water supplies. When these source waters are contaminated with pollutant concentrations above state or federal drinking water standards, the systems are required to install and operate treatment systems. The water quality of surface water discharges from industrial and other direct sources plays an important role in the level of treatment required at drinking water systems. DEQ maintains the delegated authority to ensure pollutant discharges from direct dischargers and pretreatment operations comply with the federal Clean Water Act.

Multiple projects are currently underway to address PFAS, with additional efforts expected as water systems take actions to meet the MCLs. DEQ is providing technical assistance and utilizing federal funding to assist utilities. Several of the projects listed below have received grants or low-interest loans though the State Water Infrastructure Authority process.

DEQ also strongly encourages proactive, open dialogue with industries when evaluating waste constituents entering municipal collections systems and wastewater facilities. The best, most cost-effective way to address PFAS and 1,4-Dioxane is prevention at the source.

Below is a summary of actions completed or underway for addressing contaminants of emerging concern at wastewater treatment facilities in the Study Area:

- The City of Greensboro is currently under a Special Order by Consent (SOC) to reduce the concentrations of 1,4-Dioxane in their discharge at the T.Z. Osborne WRF, through source identification and removal in the sewershed and has shown reductions in their effluent concentrations since signing the SOC.
- The City of High Point is working to identify industries and sources to reduce the discharge concentrations to the Eastside WWTP facility.

- The City of Burlington is outside of our Study Area but is a discharger into the Haw River. Burlington is under a settlement agreement requiring them to take measures to control the sources of PFAS and 1,4-Dioxane. They have ongoing studies to define sources of PFAS in their collection system to allow collaboration with local industry to reduce these discharges.

4.2.3 Advanced Treatment

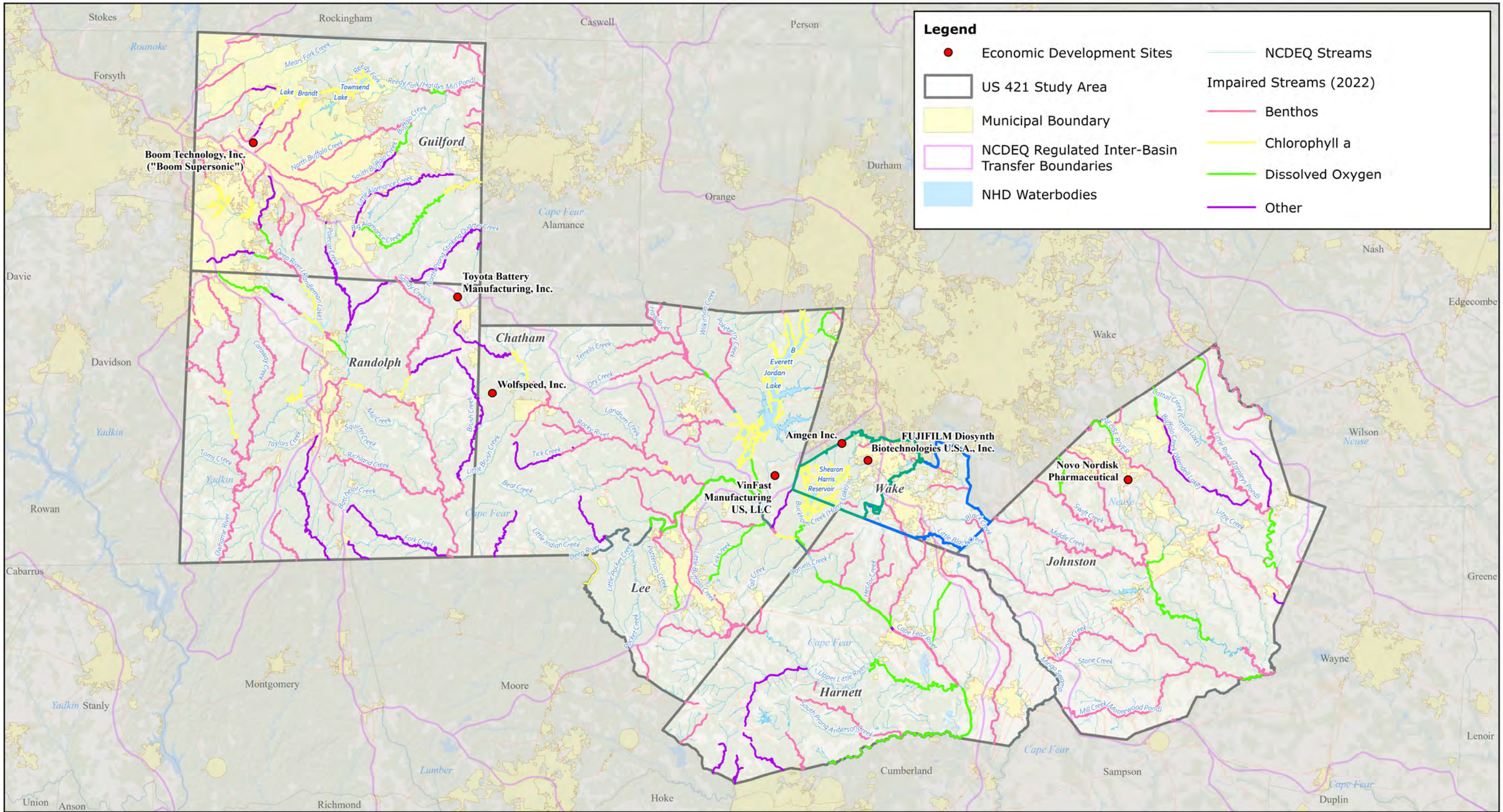
The regulatory drivers in the Cape Fear River basin include removing nitrogen to less than concentrations reliably achieved with conventional treatment (e.g., ≤ 3 mg/L TN), PFAS removal and 1,4 Dioxane removal. Table 4-4 provides a description of these regulatory drivers and the recommended treatment technology.

Table 4–4: Summary of Regulatory Drivers in the Cape Fear River Basin

Regulatory Driver	Description	Possible Treatment Technologies
Total Nitrogen	• Future NPDES permits may require treatment facilities to meet effluent total nitrogen targets less than the current limits of technology as flows increase. • nbDON concentrations in the effluent may limit the ability for some facilities to meet lower total nitrogen concentration targets with only conventional activated sludge technology. • Advanced nbDON removal technology may be needed or wasteload allocation can be redistributed amongst the basin. The latter will be the most cost efficient for facilities participating in regional solutions.	• Optimized Biological Nutrient Removal Systems. • Ozone or Ozone + H2O2 • Nitrifying filters • Denitrifying filters • Granular activated carbon • Nanofiltration (NF)/Reverse Osmosis (RO)
Total Phosphorus	• Future NPDES Permits and additional flow needed to meet the demands for future development may require lower TP limits than the current limits of technology	• Optimization of biological phosphorus removal may be required. • Additional chemical facilities on Secondary clarification.
1,4-Dioxane	• Used primarily as a stabilizer for chlorinated solvents. • Included in new NPDES permits as monthly monitoring and reporting. • Regulatory drivers in the Cape Fear River basin are moving towards requiring treatment at upstream SIUs and possibly at WWTPs to address uncontrollable constituents.	• Source Reduction • Ozone + H_2O_2 • Reverse Osmosis • Advanced Oxidation • Ion exchange resin
PFAS	• Common uses include non-stick cookware, water-repellent and stain- resistant fabrics, cosmetics and firefighting foams. • Included in current NPDES permit as quarterly monitoring and reporting. • Will require removal at wastewater treatment facilities that are affecting uses of water intended for drinking water supplies.	• Granular activated carbon • Reverse Osmosis • Ion Exchange • Source reductions

There is commonality in the advanced treatment technologies needed for each pollutant of concern to include advanced oxidation and granular activated carbon. Additionally, biologically active filters will be needed for nitrification and denitrification to achieve additional TN removal. Future studies will be required for facilities requiring limits below conventional technology.

Industry knowledge of the available advanced treatment technologies for emerging contaminants continues to evolve. Prior to design of any facility, the Hazen Team recommends piloting advanced treatment processes to confirm treatment efficiency and selection of site-specific design criteria for facility sizing.



N

0 5 10 15 20 Miles

Regional Water and Wastewater Infrastructure Master Plan
US 421 Corridor

Impaired Streams Within Study Area

Figure 4-1

April 2024

North Carolina Department of Environmental Quality

Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

PATH: J:\23\1189-NCDEQ Comprehensive Water WW Planning\GIS\Exhibits\ImpactedStreams\US421_ImpairedStreams_Figure_V2.aprx; Layout: 421_CMP_Basemap_landscape_tabloid; User: tchristian

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5. Water Supply, Water Treatment and Wastewater Treatment Capacity, Condition and Needs Summary

5.1 Johnston County

Johnston County includes 11 separate public water and wastewater providers. The Johnston County water system is currently a regional water provider to nearly all the water systems in the county, Fuquay-Varina in Wake County and water systems in Wayne County. The Town of Clayton is the largest wholesale customer of the Johnston County water system and will be a large percentage of the County's system demand into the future.

The Town of Smithfield provides its own water. The Town of Benson in southern Johnston County is supplied largely by the City of Dunn.

The rural nature of Johnston County results in a significant number of its water customers having on-site septic systems; thus, only a portion of the county's water customers have wastewater collection and centralized wastewater treatment. The wastewater treatment facilities in the county are currently owned and operated by the Towns of Clayton, Kenly, Princeton, Benson and Johnston County.

The Johnston County Board of Commissioners has authorized a Regionalization Study and Infrastructure Analysis to determine the potential for a regionalization scenario of the public water and wastewater providers within Johnston County. That regionalization study is ongoing at the time of this study of broader regionalization alternatives with the seven-county Study Area. Since the county-level regionalization study does not alter the needs within the county or the likely way they are addressed, it is not considered a factor in this current study.

A significant factor influencing the water resource planning for Johnston County is the county boundary, which generally coincides with the Neuse River basin boundary. Its northern county line is the river basin boundary between the Little River sub-basin and the Contentnea Creek sub-basin, and its southern county line, which is the river basin boundary between the Neuse River basin and the Cape Fear basin. The western county line generally establishes the service area boundary between Raleigh Water and systems within Johnston County. In general, Raleigh Water provides utility services within Wake County up to the county line. The Neuse River and Little River both cross Johnston County.

5.1.1 Water Supply

Johnston County and the Town of Smithfield are the predominant suppliers of water within the county. They both withdraw water from the Neuse River and the proximity of these withdrawals is such that the state considers them a single withdrawal from the river. Johnston County has seven additional interconnections with bordering systems that provide the county with water. However, the Neuse River is the dominant supply for the Johnston County water system. The Johnston County's Timothy G. Broome Water Plant is undergoing improvements now and will be able to treat and deliver up to 18 MGD upon its completion. The Smithfield Water Plant has a capacity of 8.3 MGD.

In August 2019, Hazen was engaged to complete a Long-Term Water Supply Study (LTWSP) for Johnston County Public Utilities. This included assessing the future water demands of its service area and the demands of its wholesale customers. The report is being finalized now and total maximum daily demand for Johnston County is projected to be 45.2 MGD in 2050. This results in a deficit of 20.7 MGD. Table 5-1 below summarizes the demands and supply capacities in 2050 for the water providers in Johnston County.

Table 5–1: Water Demand and Supply Summary - Johnston County

Water and Wastewater Provider	Description	2050 Demand/ Capacity (MGD)
Johnston County (Includes Clayton, Four Oaks, Selma, Pine Level, Princeton, Kenly, Micro, Wilson Mills, Smithfield South)	Max Day Demand	45.2
	Existing Timothy G. Broome WTP Capacity	18
	Available Water Contract Capacity (Wilson, Harnett Regional, Smithfield)	6.5
	Max Day 2050 Water Deficit	20.7
Town of Smithfield	Max Day Demand (with 3 MGD to Johnston County)	7.4
	Smithfield WTP Capacity	8.3
	Max Day 2050 Water Deficit	n/a
Town of Benson	Max Day Demand	3.1
	Existing Water Purchase Capacity (Dunn and Johnston County)	1.325
	Max Day 2050 Water Deficit	1.8

As part of the evaluations for the LTWSP for Johnston County, alternatives were evaluated. This included scenarios within the county and potential opportunities for water supply from neighboring systems, including Harnett County, Dunn, Raleigh Water and the City of Wilson. After an extensive review of all options, including expanded regional approaches, the new Lower Neuse WTP with a withdrawal from the Neuse River near the Johnston/Wayne County line was determined to be preferred. This recommendation is largely influenced by the combination of the magnitude of the water supply deficit and the challenges of meeting this demand from a source outside the Neuse River basin. The proposed water supply option includes the use of the 0.8 billion gallon (BG) quarry, owned by Johnston County, near Princeton for raw water supply storage and to increase its yield beyond what is available from the river alone. The potential for securing an additional quarry with a volume of approximately 8 BG in the future could allow an increase in yield of approximately 17 MGD. Therefore, the Lower Neuse Intake and WTP offer significant additional demand beyond the 2050 planning horizon.

Due to the exhaustive and recent review of the water supply requirements and options for Johnston County as part of the LTWSP, this work was not revisited during this study. The findings and recommendations of the LTWSP were incorporated into the Plan for the Study Area. For the purpose of this study, it is assumed a WTP capacity of 21 MGD is developed at the Lower Neuse WTP to meet the

2050 needs and purchases from other systems through 2050 remain. Section 6 includes a discussion of situations within Johnston County that could lend themselves to further regionalization.

The Town of Smithfield's projections for water demands, including its supply to Johnston County, do not exceed its capacity from the Neuse River. Thus, no water supply changes are contemplated in this study for Smithfield.

Table 5-1 reveals the Town of Benson does not have adequate water supply to meet its needs through 2050. Benson is currently supplied by both the City of Dunn and Johnston County, with the predominant supply from Dunn. The LTWSP for Johnston County assumes Dunn continues to supply water to Benson. It appears Dunn has the capacity to meet these needs and the existing infrastructure is in place to support this option. The geographic proximity of Dunn and Benson are favorable for their continued collaboration. The discharge of wastewater and IBT considerations will influence the implementation of both water and wastewater options for Benson.

5.1.2 Water Treatment

The county is supplied by two major treatment sources, the 8.3 MGD Smithfield WTP and the County's Timothy G. Broome WTP, currently being upgraded and expanded to 18 MGD. The Smithfield WTP is adequate for its projected demands in 2050. However, an additional 21 MGD is required to meet Johnston County Public Utility's maximum day demand in 2050. The Town of Benson does not have its own water treatment facilities.

EPA rules setting limits for six specific PFAS compounds were released on April 10, 2024. Advanced treatment is highly recommended for both the existing and proposed Johnston County WTPs, and the Smithfield WTP based on currently available data.

5.1.3 Wastewater Treatment

Wastewater treatment in the County is provided by the Town of Clayton, Johnston County Public Utilities, the Town of Kenly, the Town of Princeton and the Town of Benson.

The Town of Clayton is currently constructing a new WWTP facility with an initial capacity of 6 MGD and they have an NPDES permit for expansion to 10 MGD. The Town of Clayton's recent flow projections predict a required wastewater capacity of 12.6 MGD in 2050. Approximately 25,225 lbs of additional nitrogen allocation will be required for Clayton's wastewater facility expansion from 10 MGD to 12.6 MGD if a total nitrogen concentration of 3.0 mg/L is assumed.

Johnston County operates the existing Central WWTP with a capacity of 9.5 MGD and is constructing the new 210 WWTP with an initial capacity of 4 MGD, for a combined capacity of 13.5 MGD. Plans to expand the 210 WWTP to 8 MGD are ongoing. The Central WWTP is an older facility and is subject to flooding. Johnston County's plans are to progressively reduce the capacity at the Central WWTP and increase the capacity at the new 210 WWTP. The 2050 projection for wastewater capacity in Johnston County is 26.6 MGD. Therefore, an expansion of the 210 WWTP to an ultimate capacity of 27 MGD is assumed for 2050. Additional nitrogen allocation will be required for the expansion of the 210 WWTP facility for the 2050 conditions. With a doubling of the permitted flow from the current 13.5 MGD to 27

MGD, 123,300 lbs of additional nitrogen are required if the facility achieves a total nitrogen concentration of 3.0 mg/L.

The Town of Kenly wastewater projections indicate a required wastewater facility capacity of 0.6 MGD by 2050 and its current permitted WWTP capacity of 0.630 MGD.

The Town of Princeton wastewater projections indicate a required wastewater facility capacity of 0.42 MGD by 2050. This projection is based on LWSP data and current ratios of water to wastewater. The Princeton WWTP is permitted for 0.275 MGD. During 2020 their annual flows exceeded 90% of the permitted capacity. In October 2022 the Town requested speculative limits for 0.6 MGD and 0.95 MGD. In January 2023, speculative limits were issued. For the purpose of this study, it is assumed their WWTP is expanded to 0.6 MGD. There have been discussions between Johnston County Public Utilities and the Towns of Princeton and Kenly regarding Johnston County Public Utilities accepting their wastewater. However, the proximity of the facilities to Johnston County facilities is not favorable for conveyance of wastewater, therefore, expansion is assumed for this study.

The Town of Benson wastewater flow" are expected to exceed the plant's existing permitted limit of 1.9 MGD by 2050. The projected wastewater flows are 3.1 MGD. Benson is reportedly evaluating options for additional wastewater capacity and effluent discharge locations. The suitability of effluent discharge options may influence the water supply source for Benson to address IBT concerns. It is assumed Benson will expand its wastewater facility to meet the projected needs; however, Section 6 below includes regionalization considerations.

5.1.4 Underserved Communities

A review of the Potentially Underserved Communities on Figure 2-2 against existing water distribution maps reveals there is broad coverage of publicly available drinking water throughout Johnston County, including those areas defined as Potentially Underserved. Therefore, the continued supply of drinking water to these areas is dependent on sustaining sufficient water capacity to meet the projected needs within the county, and regionalization infrastructure, if warranted, would not improve access to drinking water in these communities in Johnston County.

Centralized wastewater service is most common in the county's municipal areas. More rural areas rely on decentralized wastewater services, such as septic tanks. Increasing access to centralized wastewater service, if desired, is primarily a function of expanding the service areas of the existing systems and not dependent upon regional infrastructure to reach these communities. It should be noted that the wastewater flow projections reflect a continued reliance on decentralized wastewater services outside the municipal areas and changes to that philosophy would impact the required wastewater treatment and discharge capacity requirements.

5.2 Harnett County

Harnett Regional Water (HRW) and the City of Dunn are the only two municipal water and wastewater service providers in Harnett County. Both HRW and the City of Dunn provide water to customers inside and outside Harnett County. Harnett County population is expected to increase through 2050 with particularly strong population growth in northern portions of Harnett County as growth in southern Wake

County moves south. Economic development sites for FUJIFILM Diosynth Biotechnologies, VinFast Manufacturing and Amgen Inc. are projected to impact the residential population and increase water demand in Harnett County. Current residential construction in northern Harnett County is reflective of this growth.

5.2.1 Water Supply

The Cape Fear River flows through Harnett County and Lillington. It is the only surface water source of drinking water for the county, including the City of Dunn. HRW is planning an additional future surface water withdrawal of 12 MGD from the Cape Fear River in Erwin. Table 5-2 below summarizes the existing water treatment capacities in Harnett County, as well as the reported available supply. The available raw water supply is reported by HRW and Dunn in each of their LWSPs.

The available water supply for HRW in Lillington is reported to be 42 MGD, well below the previously determined raw water supply in excess of 58 MGD. The reduction to 42 MGD is driven by recent analyses completed by USGS for the Cape Fear River as part of the Sanford WTP permitting. The USGS analysis suggests that no further expansion of the HRW WTP beyond 42 MGD would be permitted. While available yields at future intakes at Erwin and Dunn are reported to be 12 MGD for each facility, caution should be used with each of these assumptions given the reductions in yield observed at Lillington.

The total maximum day demand for HRW in 2050 is projected to be 57.2 MGD, a bit greater than the projected available raw water supply. There are a number of ways this deficit could be addressed if it occurs, with a likely option being to avoid a transfer to Johnston County during the maximum day demand conditions. Other options include utilizing water reuse strategies or purchasing additional water from Dunn. This deficit is driven in large part due to the hypothetical addition of 2.81 MGD to Harnett Regional's demand for a possible economic development site under the Selectsite program or another program. Given the deficit occurs in 2050 and as a result of a hypothetical scenario, infrastructure improvements or major shifts in regionalization approaches are not anticipated in this study. Section 10 of this report identifies a comprehensive hydrologic modeling effort as a recommended follow-up effort to better define what future water supply will be in this portion of the river when the recommended withdrawals and returns in the study are accounted for.

The City of Dunn's WTP will be adequate with an expansion from 8 MGD to 10 MGD to meet the projected 2050 maximum day demand for Dunn of 9.5 MGD, so long as the projected future supply capacity of 12 MGD at the Dunn intake can be maintained. Prior water supply studies completed for Dunn are based on them being a key provider of water along the I-95 corridor north and south of Dunn.

Table 5–2: Water Supply and Treatment Summary – Harnett County

	Location of Intake on Cape Fear River	Permitted WTP Capacity (MGD)	Available Raw Water Supply (MGD)
Harnett Regional Water WTP	Lillington	42	42
Harnett Regional Water (Contract Supply – Dunn)	n/a	n/a	1
Harnett Regional Water (future source)	Erwin	n/a	12
		Subtotal – Harnett Regional Water	**55**
City of Dunn WTP	Erwin	8.0	12.0

5.2.2 Water Treatment

The Harnett Regional WTP has a rated capacity of 42 MGD and is a conventional WTP with a withdrawal on the Cape Fear River in Lillington. Publicly available data published by DEQ following PFAS sampling in 2022 did not include PFAS data for HRW; however, based on observed concentrations at other facilities upstream and downstream of the HRW, it is assumed the proposed EPA regulation for PFAS will require advanced treatment for removal of PFAS compounds at HRW Dunn facilities. Therefore, it is assumed all existing and new water treatment capacity in Harnett County will be upgraded for PFAS removal.

The City of Dunn owns and operates the 8 MGD A.B. Uzzle WTP conventional filtration plant and that facility can be expanded to 10 MGD to accommodate the projected demand. The raw water intake structure is on the Cape Fear River. Similar to HRW, it is assumed that pending EPA regulations for PFAS concentrations will necessitate the installation of advanced treatment to remove these contaminants of emerging concern.

5.2.3 Wastewater Treatment

Harnett Regional Water owns and operates two wastewater treatment plants: the North Regional WWTP located in Lillington, which discharges directly into the Cape Fear River, and the South Regional WWTP located on Shady Grove Road in Spring Lake in southern Harnett County, which discharges into the Lower Little River, which flows east into the Cape Fear River.

The North Harnett Regional WWTP, currently rated for 7.5 MGD, is presently slated for a major expansion to 16.5 MGD, with construction commencing in 2024. The South Harnett Regional WWTP was expanded to 15 MGD in 2013. In 2023, HRW requested that the total nitrogen (TN) mass (annual poundage limit) allocation for the two plants become proportionally flow equalized, and DEQ granted this request, which effectively shifted a portion of the TN mass from the south plant to the north plant. This transference of TN mass will enable both plants to have similar effective TN mass/concentration requirements.

The population served by the North and South WWTPs is comprised of HRW customers and bulk customers inside and outside Harnett County. Currently, slightly less than 20% of the county's population is served by the HRW wastewater system, excluding the bulk customers within the county. HRW's plan

for 2050 is to increase the portion of the county's population outside the municipal areas served by their wastewater system to approximately 35%.

HRW's 2050 projected wastewater flow is based on increased water usage from projected population growth inside and outside the county, including HRW customers and bulk customers. The additional sewer flow from the impact of the economic development sites has been accounted for in the 2050 flow. This includes the assumption of a Selectsite facility with an assumed flow rate of 1.01 MGD being located in Harnett County. The projected 2050 max month flow for the North WWTP is 14.5 MGD, below the 16.5 MGD permitted expansion at the North facility. The 2050 projected maximum month flow for the South WWTP is 10.9 MGD, below the 15 MGD permitted flow for that facility.

The City of Dunn owns and operates the 3.75 MGD Black River WWTP, which discharges into the Cape Fear River. The facility includes a 3 MG equalization tank. Historical issues with wet weather inflow and infiltration (I/I), sanitary sewer overflows (SSO) and flow violations at the Black River WWTP, the City was placed on sewer moratorium and subsequently in 2022 the City of Dunn negotiated a Special Order by Consent (SOC) with DEQ. The City of Dunn is completing numerous sewer rehabilitation projects to reduce the I/I flow. According to the SOC, the sewer moratorium will gradually be lifted in phased increments as each sewer project is completed. Dunn has evaluated several strategies to address these problems and the SOC has been amended to accommodate the most recently proposed strategies. Economic development opportunity is expected to increase once Dunn completes necessary wastewater treatment improvements.

The City of Dunn's projected 2050 flow is based on increased water usage from projected population growth. The projected 2050 wastewater max month flow is projected to be 3.9 MGD, which exceeds the current Dunn WWTP capacity of 3.75 MGD. The SOC issued includes the addition of 1.522 MGD of wastewater allocation as projects are completed. Based on this agreement, it is assumed justification has been made that the existing system can handle increased capacity once the rehabilitation projects are complete, thus marginal additional wastewater treatment capacity is required for future growth to 2050. However, it is not reasonable to assume an expansion of 0.15 MGD, thus for the purpose of this study, we have assumed an additional 0.5 MGD would be incorporated into the facility before 2050.

5.2.4 Potentially Underserved Communities

The Potentially Underserved Communities within Harnett County shown on Figure 2-2 were reviewed against a map of the public water systems within Harnett County. The public water distribution systems within Harnett County have extensive geographic coverage throughout the county, including the areas where the Potentially Underserved Communities exist. Consequently, regionalization infrastructure is not necessary for water service to these communities.

Like most counties, centralized wastewater services are limited to municipal areas and other isolated pockets of the county. Geographically, the majority of the county does not have centralized wastewater service and decentralized wastewater services like septic systems are relied upon heavily. Increasing access to centralized wastewater service if desired, is primarily a function of expanding the service areas of the existing systems and not dependent upon regional infrastructure to reach these communities. It should be noted that the wastewater flow projections reflect a continued reliance on decentralized

wastewater services outside the municipal areas, and changes to that philosophy would impact the required wastewater treatment and discharge capacity requirements.

5.3 Lee and Chatham County

Water and wastewater services in Lee County are provided for the City of Sanford, Broadway and Carolina Trace, as well as the Town of Goldston (located in Chatham County). Water service in Chatham County is provided by Siler City, Pittsboro and three water service areas in Chatham County known as the North, Asbury and Southwest systems. Chatham County does not provide wastewater service, with the exception of a small package plant in Bynum. Siler City and Pittsboro both provide wastewater service, and the Chatham Park development is currently serviced by the privately-owned Chatham Park Water Reclamation Facility. The Moncure area of Chatham County which includes the Triangle Innovation Point (TIP) Megasite and includes the VinFast EV facility will receive water and wastewater service from the City of Sanford.

The City of Sanford and Town of Pittsboro are in the final stages of merging their facilities. Ownership of all of Pittsboro's water and wastewater infrastructure will be transferred to Sanford by June 30, 2024. The City of Sanford is currently operating the Siler City Wastewater Treatment plant, as a condition for Siler City accessing a direct allocation authorized under S.L. 2023-134. Siler City and Sanford are discussing the potential of merger for a portion of their utility system, but no final decisions have been made at the time of this report. Note that Sanford is in the process of rebranding as Tri River Water as it transitions to becoming a regional water and wastewater service provider. Sanford is currently collaborating with Chatham County and Siler City to meet the needs of the region.

5.3.1 Water Supply

There are three existing water supplies for Chatham County and one in Lee County. They include the Siler City WTP on the Rocky River, the Pittsboro WTP on the Haw River, the Chatham County WTP on Jordan Lake and the Sanford WTP on the Cape Fear River. The Western Intake Partners (WIP) (Durham, OWASA, Chatham County and Pittsboro) are in the process of designing a new water treatment facility on the western side of Jordan Lake, just south of US 64. Table 5-3 summarizes the available supply for Lee and Chatham Counties, and Table 5-4 summarizes the maximum day demand conditions for 2050. Some combination of the supplies summarized in Table 5-5 are projected to be required to meet the 2050 maximum day demand conditions.

Table 5–3: Available Water Supply Summary – Lee and Chatham County

Facility	Location of Supply	Available Raw Water Supply (MGD)	Corresponding Maximum Day Capacity[1] (MGD)	Comments
Sanford WTP	Cape Fear River	37	37	37 MGD is based on 20% of 7Q10
Chatham County WTP	Jordan Lake	13	19.5	Chatham County' allocation from Jordan Lake is 13 MGD on an annual average
Siler City WTP	Rocky River	4	6	Supply of 4 MGD is annual average
Pittsboro WTP	Haw River	2	2	Sanford does not plan to keep Pittsboro's WTP
Pittsboro	Jordan Lake	6	9	Pittsboro's allocation from Jordan Lake is 6 MGD on an annual average
Holly Springs	Jordan Lake	2	3	Holly Springs' allocation from Jordan Lake is 2 MGD on an annual average
		Total	**75.5**	**Assumes all existing supplies are relied upon.**

(1) Assumes an annual average to maximum day peaking factor of 1.5.

Table 5–4: Required Water Supply Summary – Lee and Chatham County

Areas	**2050** Projected Maximum Day Demand (MGD)	Comments
Sanford, Lee County, Broadway, Carolina Trace	15	
Chatham County, Pittsboro, Goldston Gulf, Siler City	43.4	
Fuquay-Varina	9.4	2 MGD of the 11.4 MGD 2050 Fuquay-Varina Max Day Demand is met by Harnett County
Holly Springs	6.1	10 MGD of the 16.1 MGD 2050 Holly Springs max Day Demand is supplied by Harnett County
Total Demand	**73.9**	

Table 5–5: Existing Water Supply and Treatment Summary – Lee and Chatham County

Facility	Location of Supply	Existing Permitted WTP Capacity (MGD)	Available Raw Water Supply (MGD)	Comments
Sanford WTP	Cape Fear River	30	37	Expansion from 12 MGD to 30 MGD is underway. 37 MGD is based on 20% of 7Q10
Chatham County WTP	Jordan Lake	2.8	13	Chatham County' allocation from Jordan Lake is 13 MGD
Siler City WTP	Rocky River	4	4	Supply is annual average – WTP is expandable to 6 MGD
Pittsboro WTP	Haw River	2	n/a	Sanford does not plan to keep Pittsboro's WTP

5.3.2 Water Treatment

The City of Sanford Water Filtration Facility (WFF) is currently the water service provider for the city, the Town of Broadway and Carolina Trace in Lee County, as well as the Town of Goldston and Chatham County's Asbury and Southwest systems. The 12 MGD facility is currently being expanded to 30 MGD and will provide water to Pittsboro, Fuquay-Varina, Holly Springs and the southern portion of Chatham's "North" service area which includes the Triangle Innovation Point (TIP) Megasite/VinFast Electric Vehicle Manufacturing facility and future vendor park. While the yield at the Sanford intake site has been limited to 37 MGD based on the recent determination by USGS, expansion beyond the proposed 30 MGD facility, and even beyond 37 MGD, is being contemplated by Sanford given that some or all of the Chatham County, Pittsboro and/or Holly Springs allocations from Jordan Lake could potentially be withdrawn from below the dam at the Sanford intake. The scenarios for the 2050 planning horizon consider water treatment capacities at the Sanford WTP of 48 MGD to 62 MGD depending upon the degree to which WIP is relied upon. The balance between these options will need to be considered further in the context of access to the Jordan Lake allocations.

The Town of Siler City WTP is an existing 4.0 MGD facility. Expansion of the facility to 6 MGD is contemplated to take advantage of the yield available in the Town's existing reservoirs on the Rocky River.

The Town of Pittsboro's WTP withdraws water from the Haw River. The Haw River presents treatment challenges due to the presence of PFAS and 1,4-Dioxane in the river from upstream sources. Sanford does not anticipate continuing to maintain and operate this WTP following development of replacement supply capacity.

Chatham County's WTP is on the east side of Jordan Lake and has an existing permitted capacity of 2.8 MGD. Limitations within the facility prevent it from sustaining a finished water supply greater than about 2 MGD. Consequently, the county is contemplating upgrades to that facility to allow the full 2.8 MGD to be delivered.

The expansion underway at the Sanford WTP includes GAC facilities for removal of contaminants of emerging concern. It is assumed that all of the water treatment capacity needs for Lee and Chatham counties would be equipped with advanced treatment for this purpose.

5.3.3 Wastewater Treatment

Wastewater treatment is provided by three facilities in Chatham County and three facilities in Lee County, with the exception of several small package plants in Chatham County which are assumed to continue to provide services to their respective customers. Pittsboro is in the process of designing a new lift station at its existing WWTP to convey wastewater to Sanford's Big Buffalo WWTP and remove their existing 0.75 MGD WWTP from service. Siler City is in the process of expanding its existing 4 MGD facility to a capacity of 6 MGD. Chatham Park has the other existing WWTP in Chatham County currently rated for 0.5 MGD, but it is expandable to 1 MGD or greater. In Lee County, Sanford is exploring options for an upgrade of the existing 12 MGD Big Buffalo WWTP and construction of a new WWTP in the northern part of Lee County with a new discharge downstream of Buckhorn Dam. Broadway and Carolina Trace both operate small WWTPs, permitted for 0.16 MGD and 0.675 MGD, respectively, in Lee County.

The total permitted treatment capacity of the facilities In Lee and Chatham Counties Is 18.09 MGD, and the elimination of the Pittsboro, Broadway and Carolina Trace WWTPs will reduce that to 16.5 MGD. The 2050 projections for maximum monthly flows within the Lee and Chatham County service areas is 37.1 MGD, requiring an additional wastewater treatment capacity of 20.6 MGD. Siler City WWTP is currently being expanded by 2 MGD (for a total of 6 MGD) and has submitted a request for speculative limits to expand by an additional 2 MGD for a potential total of 8 MGD. The combination of expansion of the Big Buffalo WWTP and a new Hughes Creek WWTP in the northern portion of Sanford's service area are contemplated by Sanford to meet the wastewater treatment need in Lee and Chatham Counties in 2050. An alternate option is to construct new WWTP capacity in the vicinity of Pittsboro with a discharge to the Haw River.

Sanford will need to consider the opportunities to manage the total nitrogen discharge amongst the facilities within Lee and Chatham Counties to meet the total nitrogen limits imposed due to nitrogen impairments at Sanford's discharge locations.

5.3.4 Potentially Underserved Communities

The Potentially Underserved Communities within Lee and Chatham Counties are shown on Figure 2-2 and were reviewed against a map of the public water systems within the Counties. The public water distribution systems within Lee County have broad geographic coverage throughout the county, including the areas where the Potentially Underserved Communities exist southwest of Sanford. Consequently, regionalization infrastructure is not necessary for water service to these communities in Lee County.

Figure 2-2 shows Chatham County has a large block of Potentially Underserved Communities in the southern area of Chatham County generally between Moncure, Goldston and Pittsboro. Chatham County has water service in a portion of this area and planned infrastructure between Sanford and areas in Chatham County will result in additional regional water and wastewater conveyance systems to improve access to these services in this area.

There is a Potentially Underserved Community in the northern portions of Siler City. Between the existing water and wastewater systems in this area and the planned improvements to accommodate growth anticipated from Wolfspeed, this community will have access to water and wastewater upon completion of the required improvements.

5.4 Southern Wake County

Southern Wake County in this Study Area includes the towns of Holly Springs and Fuquay-Varina. Both towns are experiencing rapid growth and have been actively evaluating their options for expanding their water and wastewater capacities. The discussion below summarizes their existing capabilities and the options available for meeting their future needs.

5.4.1 Water Supply

Holly Springs
Holly Springs owns 10 MGD of capacity in the Harnett Regional WTP and the existing 36-inch transmission main supplying their systems. Holly Springs is in partnership with the City of Sanford for an additional 4 MGD of supply, with capacity in the transmission main for this to increase to 6 MGD in the future. Holly Springs' 2050 demand is projected to be 16.1 MGD, therefore, their water supply needs are potentially met as a result of the regionalization with the City of Sanford and Harnett Regional.

Fuquay-Varina
Fuquay-Varina currently meets its water supply requirements through water purchase agreements with Raleigh Water, Harnett Regional Water and Johnston County. The Raleigh Water and Johnston County supply agreements will sunset in advance of the 2050 planning horizon. The Harnett County contract to supply 2.0 MGD is recurring.

Fuquay-Varina is in partnership with the City of Sanford for 6 MGD of additional supply, with desire to increase their participation in the Sanford facilities. The transmission main under design is sized to accommodate a transfer of 10 MGD from Sanford to Fuquay-Varina. The long-term supply of 2 MGD from Harnett Regional and 10 MGD from Sanford are adequate to meet the 2050 planning need of 11.4 MGD.

The interbasin transfer (IBT) Certificate required to discharge water that originated from the Cape Fear River basin, beyond 2 MGD, has not been approved by the EMC, nor has DEQ issued a Record of Decision (ROD) on the environmental document under development. The Terrible Creek WWTP has a current design capacity of 3.0 MGD with a permitted limit of 6.0 MGD; however, issuance of this permit did not fully consider that the majority of the water is planned to originate from the Cape Fear River basin. The EMC will need to grant the Town an IBT Certificate before being allowed to discharge water sourced from the Cape Fear River basin from either Harnett County or the City of Sanford at a rate exceeding the allowed statutory threshold (2.0 MGD) with consumptive use in the receiving basin considered in that total basin transfer.

5.4.2 Water Treatment

Holly Springs and Fuquay-Varina do not have their own water treatment facilities. Their water needs are met though regional partnerships with Harnett Regional Water and the City of Sanford.

5.4.3 Wastewater Treatment

Holly Springs
Holly Springs is currently evaluating options to meet its wastewater needs. The Utley Creek WWTP is permitted for expansion to 8 MGD and design for that expansion is proceeding at this time. Utley Creek has a history of eutrophication issues, dating back to at least 1996 and DEQ has routinely raised concerns about the discharge location. Hazen has offered several concepts to address these concerns and increase the wastewater capacity beyond 8 MGD. These concepts include the following and their capacities have been adjusted to align with the 2050 flows projected:

- Expand the Utley Creek WWTP to 11.5 MGD and discharge the capacity to the Cape Fear River.
- Allow the Utley Creek WWTP to remain at 8 MGD and divert 3.5 MGD (or more) of wastewater to the Town of Cary's Western Wake Regional Water Reclamation Facility (WWRWRF).
- Expand the Utley Creek WWTP to 11.5 MGD, with discharge of flows above 8 MGD to the Cape Fear River. DEQ has concerns relating to the long-term viability of the current discharge location.

Section 6 includes figures illustrating these options. Costs for these options are considered as described in Section 8. The cost associated with diverting wastewater to the WWRWRF is competitive with that for diverting only a portion of the Utley Creek WWTP flow to the Cape Fear River. In 2007, Holly Springs and the Western Wake Regional Partnership began negotiations to send effluent discharged from Utley Creek to the Cape Fear via the Western Wake Regional Partnership, but the parties were not ultimately able to come to an agreement. DEQ sees this as a viable option, especially given the rapid growth the area is experiencing, particularly from BioLife industries. If Holly Springs and the Town of Cary were able to create a workable solution, it could provide another option to address needs in the area. Holly Springs will be required to manage their nutrient discharge through treatment technologies.

Fuquay-Varina
The Town of Fuquay-Varina owns and operates the 3 MGD Terrible Creek WWTP that discharges the Neuse River basin. The facility is currently being expanded to 6 MGD and there is an opportunity to expand that facility to 9 MGD in the future.

The Town also discharges wastewater to Harnett Regional's North WWTP. An ongoing expansion of that facility permits Fuquay-Varina to discharge a maximum monthly capacity of 6 MGD to Harnett Regional. There is existing wastewater conveyance infrastructure to convey this flow.

Consequently, Fuquay-Varina has adequate wastewater capacity options to meet its needs through 2050; however, these planned improvements are dependent upon necessary approvals from DEQ and the EMC.

5.4.4 Potentially Underserved Communities

There are no Potentially Underserved Communities within the portion of Wake County included in this Study Area.

5.5 Piedmont Triad (Guilford and Randolph Counties)

The Piedmont Triad region of the Study Area is defined by Guilford and Randolph Counties. Water and wastewater services in the two counties are provided by 14 public water and wastewater providers with four additional facilities actively planning or with water systems in construction. As with other areas along the 421 Corridor, the Triad region has experienced, and is anticipating, significant development in response to Boom Supersonic, Toyota and Wolfspeed at the developing Megasites surrounding the Triad. Water services in Guilford County are provided by the Cities of Greensboro and High Point, the Towns of Jamestown, Gibsonville and Stokesdale, as well as the Piedmont Triad Regional Water Authority.

Water services in Randolph County are provided by the Cities of Asheboro, Randleman, Archdale and Trinity (via Davidson Water, Inc.), the Towns of Ramseur, Liberty, and Franklinville, the Seagrove-Ulah Metro Water District and the Piedmont Triad Regional Water Authority. Additionally, the Towns of Oak Ridge and Summerfield and Randolph County are all currently in the process of developing water systems to serve portions of Guilford and Randolph Counties not currently being served.

Wastewater services are provided generally by each utility with the exception of a few noted in the section below that have contracted capacity in High Point's Eastside WWTP. The region's largest facilities will experience capacity constraints in upcoming years and a regionalized solution will be the most advantageous solution to promote continued growth.

5.5.1 Water Supply and Treatment

Piedmont Triad Regional Water Authority (Guilford/Randolph)
The Piedmont Triad region has had a regional solution since the late 2000s, when the Piedmont Triad Regional Water Authority began producing potable water in response to drought. The facility was a regional response for the Cities of Archdale, Greensboro, High Point and Randleman, the Town of Jamestown and Randolph County. In addition, the region is prepared for PTRWA to take on a larger role in both water and wastewater services.

PTRWA currently operates a 14.7 MGD conventional treatment facility located on Randleman Lake. The Randleman Lake reservoir has a safe yield of 48 MGD. Due to the arrangements of PTRWA's contracts with the member utilities, the facility is relatively consistent with production throughout the year, allowing the water utility providers with treatment facilities to respond directly to fluctuations in demand.

PTRWA is currently under contract to expand the facility to a 24 MGD permitted facility with advanced treatment technologies to address 1,4-Dioxane removal.

City of Greensboro (Guilford)
The City of Greensboro owns and operates two water treatment facilities, Townsend WTP and Mitchell WTP, with a series of three reservoirs, Lake Higgins, Brandt and Townsend. The Townsend WTP is a 30 MGD facility located on the Lake Townsend reservoir, however, staff have indicated Townsend is limited

to 26 MGD. Mitchell WTP is a 24 MGD facility with an intake on Lake Brandt but is limited to 18 MGD. This report anticipates the Mitchell WTP can provide 20 MGD when needed thus the combined current capacity is limited to 44 MGD and future capacity is limited to 46 MGD. The City also purchases 10.35 MGD from the City of Burlington, Reidsville and PTRWA.

The Mitchell WTP Is currently undertaking a design to reduce PFAS concentrations with the Installation of a Granular Activated Carbon facility and should be online in the next few years.

City of High Point (Guilford)
The City of High Point owns and operates the Ward WTP with a treatment capacity of 24 MGD. The City also purchases water from PTRWA at an annual average of 2.73 MGD and sells water to Jamestown at an annual average of 0.4 MGD. The raw water comes from City Lake and Oak Hollow Lake and totals a safe yield of approximately 34 MGD.

Town of Jamestown (Guilford)
The Town of Jamestown purchases their water supply from the City of High Point as a delivery point from PTRWA. The City of High Point and PTRWA appear to be capable of providing their water supply for the foreseeable future.

City of Archdale (Guilford/Randolph)
The City of Archdale purchases their water from PTRWA and will be a part of the expansion. PTRWA will be able to meet their water needs for the foreseeable future.

Town of Gibsonville (Guilford)
The Town of Gibsonville currently contracts with the City of Burlington for their water service, no change is anticipated in this study. The water needs for the Town of Gibsonville will not be included in the regional solutions.

Town of Stokesdale (Guilford)
The Town of Stokesdale contracts with the Winston-Salem/Forsyth County Utilities Commission for its water service and has recently extended its contract for a maximum capacity of 500,000 gallons per day. This capacity will meet their needs for the duration of this study. The water needs for the Town of Stokesdale will not be included in the regional solutions.

Town of Oak Ridge (Guilford)
The Town of Oak Ridge is planning for a new water system. They are contracted with the Winston-Salem/Forsyth County Utilities Commission to provide the water needed. The quantity is unknown as of the time of this study. The water needs for the Town of Oak Ridge will not be included in the regional solutions.

Summerfield and Summerfield Holdings (Guilford)
The Town of Summerfield and Summerfield Holdings do not currently have water systems. The Town of Summerfield is actively looking at a water system to provide fire protection services only supplied by local groundwater wells and therefore will not be included in the regional solutions.

Summerfield Holdings is discussing opportunities to be served by an adjacent utility if the opportunity is available. A demand of 0.8 MGD was assumed for this area in previous studies completed by Hazen and Sawyer.

City of Asheboro (Randolph)
The City of Asheboro operates a 12 MGD facility with a raw water intake in the Uwharrie River sub-basin in the Yadkin River basin with a safe yield of 26.5 MGD. However, the City has a grandfathered interbasin transfer up to 9.36 MGD and would not be able to expand without applying for an IBT Certification. The City of Asheboro's WTP facility is in need of repair and is expected to be a regional solution to meet the 2050 demands in the Triad.

City of Randleman (Randolph)
The City of Randleman purchases water from the PTRWA exclusively and does not have a water treatment facility.

Town of Ramseur (Randolph)
The Town of Ramseur operates a water treatment facility rated for 1 MGD. The facility is currently on free chlorine and has approached Randolph County for funding to convert to chloramines similar to others in the area. The facility is in need of upgrades and has access to a raw water supply of 6.6 MGD.

Franklinville (Randolph)
The Town of Franklinville currently purchases water from the Town of Ramseur and has approached the City of Asheboro to investigate the possibility of a secondary source.

Town of Liberty (Randolph)
The Town of Liberty currently operates a groundwater supplied system with a series of 8 wells across the town. The system is limited to 0.56 MGD which is not anticipated to meet the 2050 demands and may be difficult to expand. A connection to Ramseur is being investigated to serve the area and a secondary connection to Greensboro should be considered for resiliency.

Randolph County (Randolph)
Randolph County has an allocated supply from PTRWA but has not had a water system until recently. The Eastern Randolph Water and Sewer District, recently renewed, is currently planning to expand water service across the eastern portion of the County.

City of Trinity (Randolph)
The City of Trinity is within the Davidson Water, Inc. service area. The Town does not operate a public water system.

Seagrove/Ulah Metro Water District (Randolph)
The Seagrove/Ulah Metro Water District currently purchases water from the City of Asheboro for their system.

5.5.2 Wastewater Treatment

City of Greensboro (Guilford)
The City of Greensboro owns and operates the T.Z. Osborne WRF, a 56 MGD facility discharging to South Buffalo Creek in the Haw River sub-basin. The facility was recently upgraded to a five-stage facility capable of removing nitrogen and phosphorus to meet their permit levels. T.Z. Osborne WRF is potentially capable of expanding to 60 MGD with very little upgrade and is currently under a Special Order for Consent for the reduction of 1,4-Dioxane discharge. The facility is reducing their 1,4-Dioxane discharge concentrations through source reduction measures and other pre-treatment.

City of High Point (Guilford)
The City of High Point owns and operates the Eastside WWTP in the Deep River sub-basin and the Westside WWTP in the Yadkin River basin. The Eastside WWTP is a 26 MGD facility discharging to Randleman Lake, downstream of the intake for PTRWA. Westside WWTP is a 10 MGD facility. Both facilities have the ability to reduce TN and TP to their permit levels and are operating successfully.

The Eastside WWTP facility has recently received speculative limits for expansion to 32 MGD. However, Randleman Lake, Eastside's discharge water body, is a water supply lake and if possible, strategies should be explored to minimize the opportunity of emerging contaminant discharges where possible. Opportunities to divert this 6 MGD expansion to a regional facility should be explored.

Town of Jamestown (Guilford)
The Town of Jamestown owns 2 MGD capacity in the Eastside WWTP, which will nearly meet their needs in 2050.

City of Archdale (Guilford/Randolph)
The City of Archdale owns 2.5 MGD capacity in the Eastside WWTP at High Point, which will meet their needs for the foreseeable future. In addition, the Cities of Archdale and Trinity have studied the alternative to build a WWTP discharging to the Yadkin River basin to meet their future needs. It is unclear at the time of this study when, if ever, this alternative will be pursued. Therefore, we have not included it in the alternative scenarios.

Town of Gibsonville (Guilford)
The Town of Gibsonville contracts with the City of Burlington to treat their wastewater and no change is anticipated in this study. The wastewater needs for the Town of Gibsonville will not be included in the regional solutions.

Town of Stokesdale (Guilford)
The Town of Stokesdale does not operate a public wastewater system.

Town of Oak Ridge (Guilford)
The Town of Oak Ridge does not operate a public wastewater system.

Summerfield and Summerfield Holdings (Guilford)
The Town of Summerfield and Summerfield Holdings does not currently operate a public wastewater system. Wastewater may be conveyed to an adjacent utility for Summerfield Holdings, but regional opportunities were not considered for the study.

City of Asheboro (Randolph)
The City of Asheboro operates a 9 MGD facility discharging to the Deep River sub-basin. The facility is experiencing some intermittent discharge of 1,4-Dioxane. The City reports working with their industries to handle its concerns with source reduction and pretreatment.

City of Randleman (Randolph)
The City of Randleman operates a WWTP with a maximum month capacity of 1.745 MGD. The facility needs to be upgraded to take on additional flow.

Town of Ramseur (Randolph)
The Town of Ramseur operates a wastewater treatment plant on the Deep River with a maximum month treatment capacity of 0.48 MGD. The facility is not capable of taking on much additional flow without upgrades and expansion.

Town of Franklinville (Randolph)
The Town of Franklinville operates a treatment facility capable of treating 100,000 gallons per day. The facility will not be able to treat the anticipated demands in 2050 and should be considered for removal from service and combined with the Town of Ramseur or other regional opportunity in the future.

Town of Liberty (Randolph)
The Town of Liberty operates a sprayfield irrigation wastewater facility with a capacity of 0.55 MGD. The facility has reported in other ongoing studies they do not have enough available land to effectively expand the facility and will need to regionalize with a different facility to meet future demands.

Randolph County (Randolph)
Randolph County does not operate a public wastewater system.

City of Trinity (Randolph)
The City of Trinity will send their wastewater to the City of High Point's Westside WWTP.

Seagrove/Ulah Metro Water District (Randolph)
The Seagrove/Ulah Metro Water District currently treats its wastewater at a sprayfield irrigation facility rated for 400,000 gallons per day. They also partner with the City of Asheboro to pump some of their flow for the northern portion of their system. The facility is in need of upgrade and the permanent solution should be to regionalize the remainder of their flow with the City of Asheboro.

5.5.3 Potentially Underserved Communities

The Potentially Underserved Communities within Randolph and Guilford Counties are generally within the municipal areas of High Point, Greensboro and Asheboro and surrounding Liberty, Franklinville and Ramseur. Therefore, water and wastewater service coverage to these communities in Randolph and Guilford Counties either exists or is dependent upon available capacity to allow the municipal boundaries to be extended to these communities adjacent to the municipalities. Consequently, the physical presence of regionalization infrastructure is not likely to improve access to water and wastewater services for these communities; however, the increased capacities of available water and wastewater treatment with regionalization will present opportunities to benefit these Potentially Underserved areas.

In addition, the policies preventing the City of Greensboro from partnering with surrounding communities is anticipated to change in upcoming months allowing them to serve some portions of unincorporated Guilford County.

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6. Regionalization Opportunities

6.1 Johnston County

6.1.1 Water Supply and Treatment

Johnston County Public Utilities is a regional water provider and Section 5.1.1 of this study describes the water demands and facility capacities required to meet the needs within the County. Johnston County's proximity to river basins could positively impact projected water supply needs of 45.2 MGD from within the Neuse River basin. A separate, recent study by Hazen suggests Johnston County's needs can be adequately met via the proposed lower Neuse River intake and associated WTP. Hazen's separate study suggests that additional supply capacity could also be available from the proposed Lower Neuse facilities with the future addition of 8 BG of additional quarry storage. Refer to Figure 6-1 for an illustration of this planned approach. It should be noted that Johnston County is in a different river basin than the rest of the Study Area.

Other regional considerations are as follows:

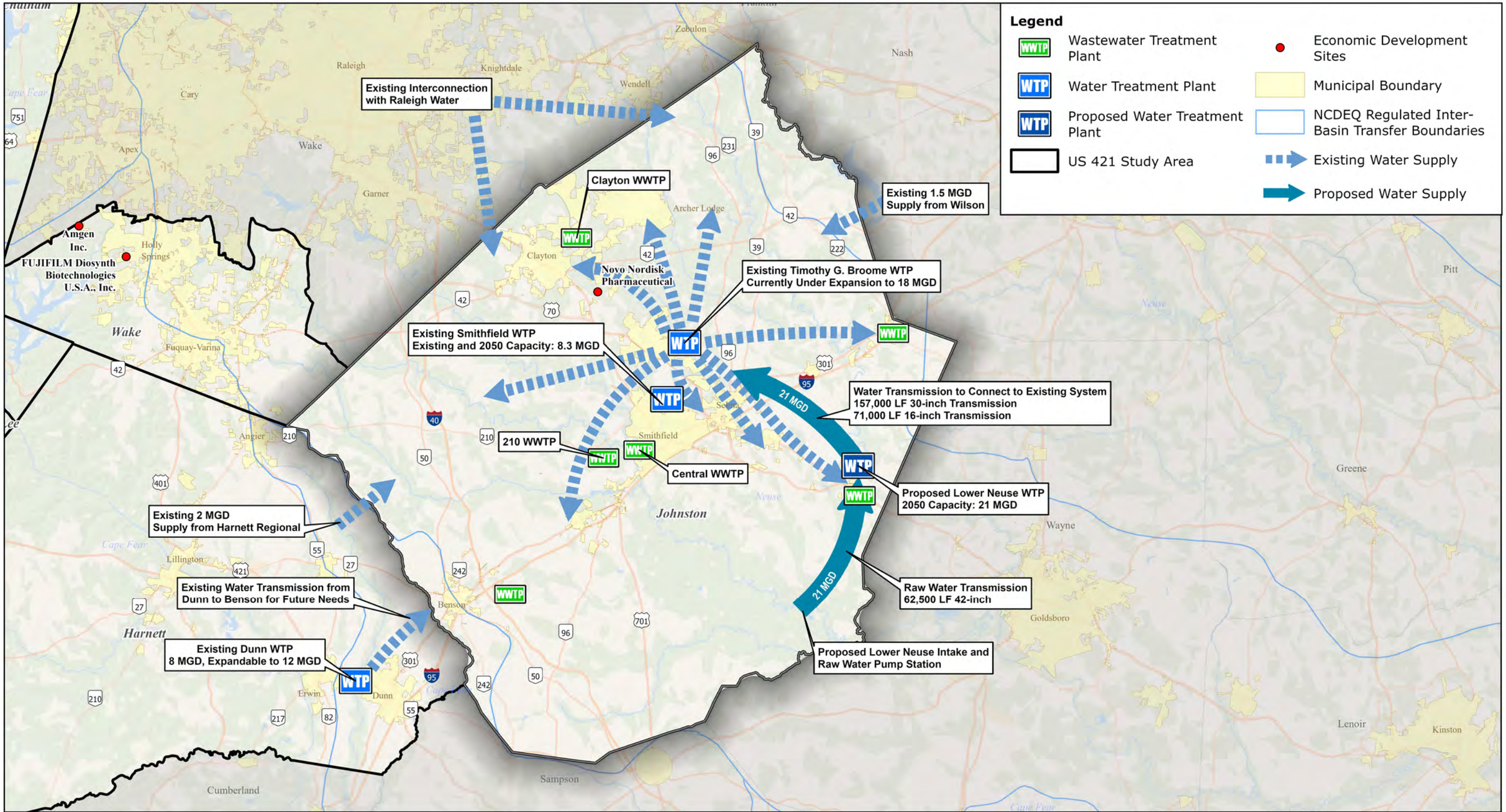
- The City of Dunn is the primary provider for the Town of Benson. A discussion of water supply available at the City of Dunn WTP is discussed in Section 5.2.1. If it is determined that supply capacity is more limited in the Cape Fear River than reported for Dunn, increasing Johnston County's supply to Benson, or even Dunn, could be considered. Interbasin transfer (IBT) implications would need to be considered.
- Harnett Regional is under contract to provide 2.0 MGD to Johnston County long-term. Given the recently observed reductions in water supply yield in the Cape Fear River near Sanford and Lillington, it should be anticipated that Harnett Regional may not continue to supply Johnston County Public Utilities and they would offset the Harnett Regional supply at the proposed Lower Neuse facilities.
- As noted previously, the location of Johnston County relative to the Neuse River basin boundary complicates how it transfers water to and from neighboring systems to the north and south. While Raleigh Water is not part of this study, it should be noted that regionalization between Raleigh Water and Johnston County could be beneficial. Hazen's separate, recent study of the basin as part of the LTWSP suggests that Raleigh Water cannot offset Johnston County's need for the proposed Lower Neuse facilities; however, water and wastewater management strategies between Johnston County and Raleigh Water could be advantageous given they are in the same basin and their proximity to each other. There could be advantages to forming a Neuse River water partners group including Raleigh, Johnston County, Goldsboro, and Kinston.
- The LTWSP considered the City of Wilson's Buckhorn Reservoir as a potential water supply source. While it was not deemed feasible by Johnston County to pursue as an option in lieu of

the Lower Neuse intake and new water treatment facility, it should be considered a potential water supply source outside the Study Area that may warrant consideration in the future.

6.1.2 Wastewater Treatment

The wastewater treatment facilities and associated service areas within Johnston County, with the exception of the Town of Benson, are central to the county. Our study does not identify viable regionalization alternatives for addressing wastewater treatment needs in collaboration with neighboring systems. Refer to Figure 6-2 for an illustration of the wastewater treatment facilities within Johnston County. Regionalization opportunities within Johnston County could be considered for the Towns of Kenly and Princeton to determine the advantages of collaboration within the county.

Due to Benson's proximity to Dunn, and the likelihood that Dunn may provide water to Benson, regionalization opportunities between Dunn and Benson warrant consideration. We understand Benson is currently considering effluent discharge locations, and the suitability of streams for discharge of treated wastewater from Benson, may also influence the water source given IBT considerations.



Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**2050 WATER SUPPLY SCENARIO JOHNSTON COUNTY AREA**	Figure 6-1 April 2024
North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel	

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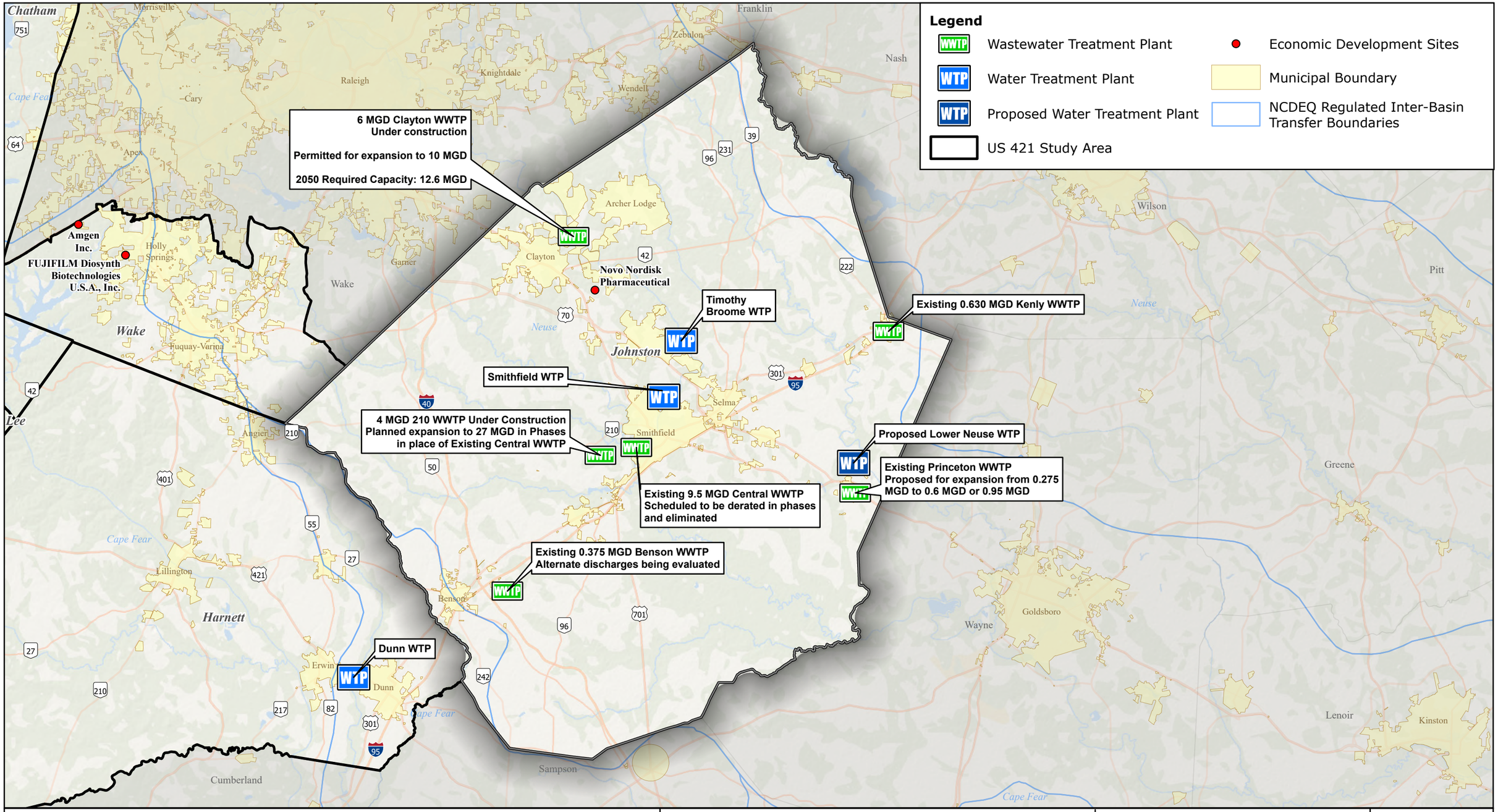

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Regional Water and Wastewater Infrastructure Master Plan
US 421 Corridor

2050 WASTEWATER REGIONALIZATION SCENARIO JOHNSTON COUNTY AREA

Figure 6-2

April 2024

North Carolina Department of Environmental Quality

Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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6.2 Harnett County

6.2.1 Water Supply and Treatment

Harnett Regional is an existing regional provider of water throughout Harnett County and to systems to their north and south. Within this study area, Harnett County is the primary source of water for Holly Springs, where they are under contract to provide 10 MGD to Holly Springs. They are also under a long-term contract to provide 2 MGD of water to Fuquay-Varina and Johnston County. Refer to Figure 6-3 for an illustration of the regional facilities related to the Study Area.

A review of Harnett Regional's water capacity and projected needs in 2050 reveals that Harnett Regional does not have excess capacity to meet other needs within the region beyond the regional commitments that currently exist. Harnett County has recently declined to grant requests by neighboring communities seeking to increase supply received from Harnett County. It is recommended that further evaluation of the planned yields on the Cape Fear River be completed and compared to the projected needs.

The A.B. Uzzle WTP in Dunn can be expanded from the existing 8 MGD capacity to 10 MGD to meet the regional needs for Dunn and Benson.

6.2.2 Wastewater Treatment

Harnett Regional is an existing provider of wastewater treatment services within the county and to neighboring systems. Related to this Study Area, Harnett Regional is an important wastewater treatment provider for Fuquay-Varina. The ongoing North WWTP expansion provides Fuquay-Varina 6 MGD of wastewater capacity, nearly 50% of its required capacity. Refer to Figure 6-4 for an illustration of the wastewater treatment capacity within Harnett County and the transfer of wastewater from Fuquay-Varina.

A review of the wastewater projections for Harnett Regional wastewater treatment needs, reveal that little excess wastewater capacity is projected to be available within its facilities in 2050.

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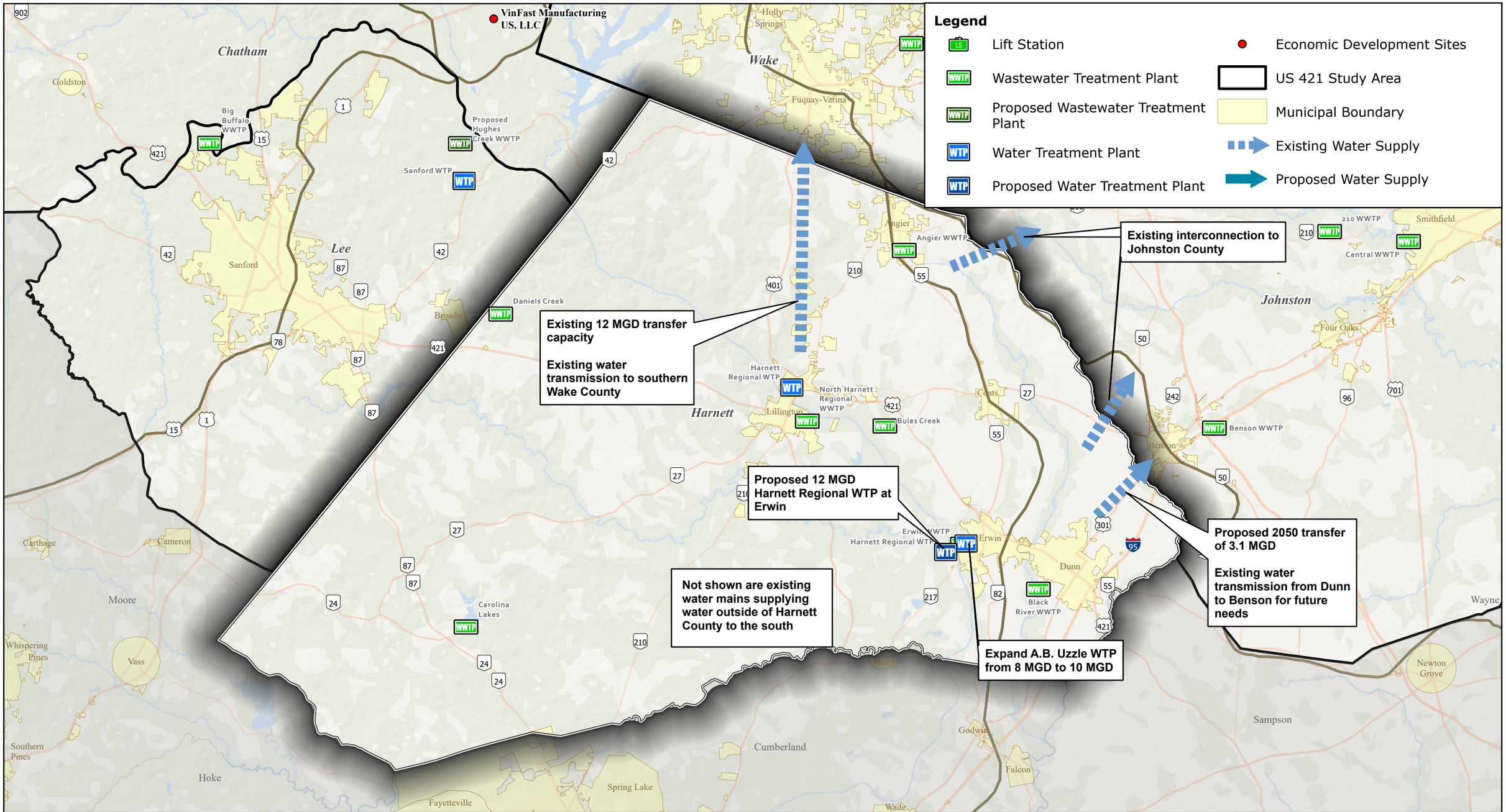

	Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**2050 Water Supply Regionalization Harnett County**
		Figure 6-3
		April 2024
	North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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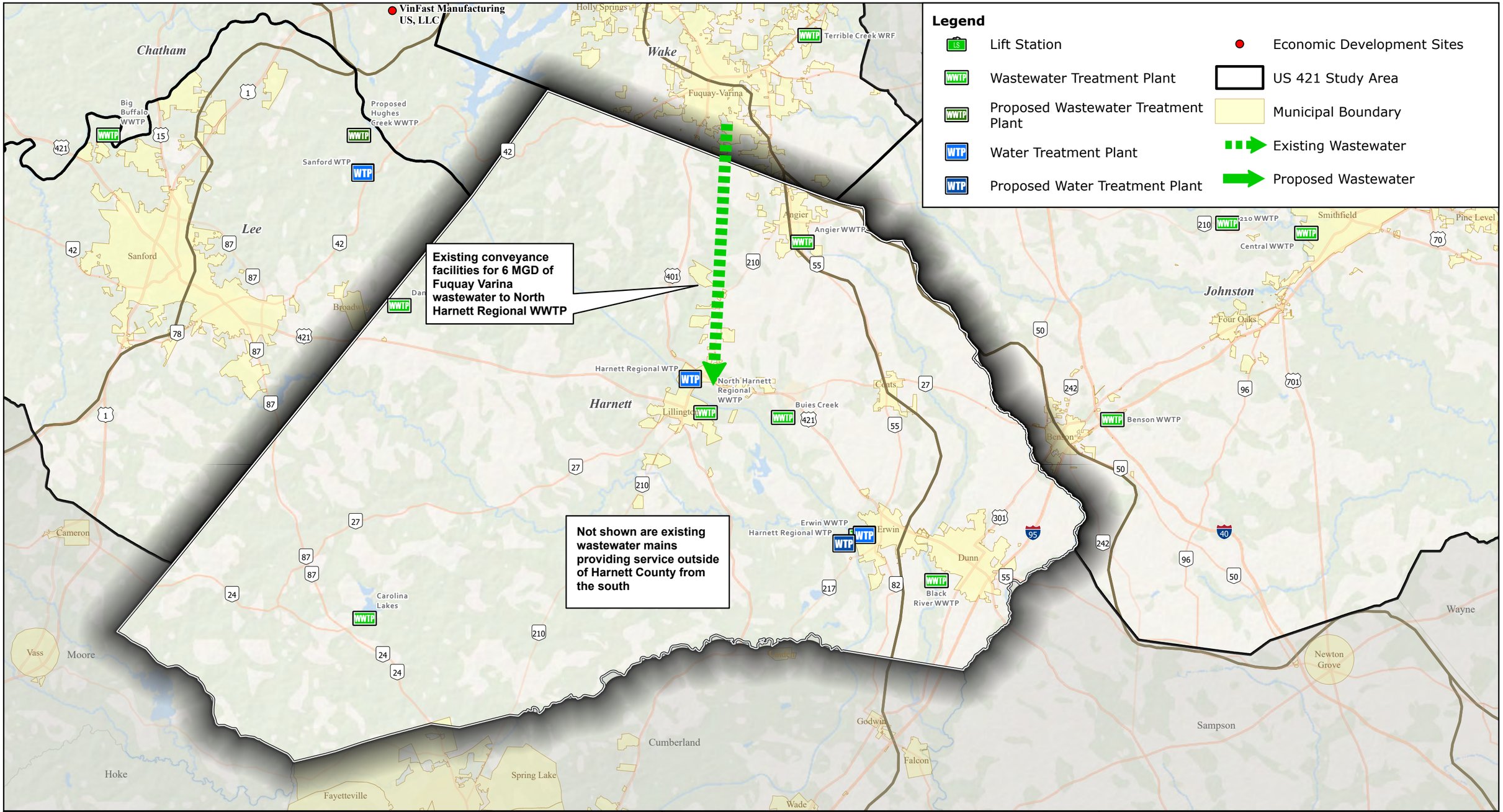

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Regional Water and Wastewater Infrastructure Master Plan
US 421 Corridor

2050 Wastewater Regionalization
Harnett County

Figure 6-4

April 2024

North Carolina Department of Environmental Quality

Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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6.3 Southern Wake County

6.3.1 Water Supply and Treatment

Holly Springs and Fuquay-Varina do not have their own water supply and treatment facilities and are dependent upon the regional providers Harnett Regional and Sanford for water supply. Consequently, there are no opportunities for them to deliver water supply solutions to others. Figure 6-5 illustrates the water supply for Southern Wake County.

6.3.2 Wastewater Treatment

Holly Springs and Fuquay-Varina each have wastewater treatment facilities for their respective service areas. In the case of Fuquay-Varina, the combination of the regionalization with Harnett Regional and the Terrible Creek WWTP, its wastewater service needs are potentially met with about 2 MGD remaining, pending permitting. Thus, there is limited opportunity for Fuquay-Varina to offer wastewater service for others. The Town of Cary (via the Western Wake Partnership) is currently studying its own long-term wastewater needs. The Town of Cary does anticipate a wastewater plant expansion in the future, but the timeline could be impacted should regionalization efforts proceed. DEQ recognizes that this could be an appropriate time to discuss options among providers in Southern Wake County.

If it is determined that additional wastewater return is warranted to the Cape Fear River basin, pursuit of additional capacity, beyond the existing 6 MGD, for discharge to the Harnett Regional North WWTP should be considered.

Holly Springs has options to collaborate with the Town of Cary and the City of Sanford. Should Holly Springs and Cary reinitiate negotiations for collaborative efforts, there could be great opportunity to address the wastewater capacity and industrial treatment needs for Holly Springs with less capital investment than other alternatives. There might also be opportunities and benefits to specific businesses being served by Western Wake, depending on the waste characterization.

Both Holly Springs and Fuquay-Varina contemplate working with the City of Sanford on a joint discharge permit to the Cape Fear River given the possible need for a new facility for Sanford discharging to the Cape Fear River. As outlined in Section 5, options for discharge of treated wastewater from the Utley Creek WWTP to the Cape Fear River exist. Sending 11.5 MGD to the Cape Fear from Utley Creek is more expensive than sending 3.5 MGD due to the size of the main transmission line required for the permitted flow; however, the environmental and economic development challenges would be lessened.

Figure 6-6 illustrates the arrangement for wastewater treatment needs for Southern Wake County and includes the three options noted above for addressing Holly Springs' wastewater need through 2050.

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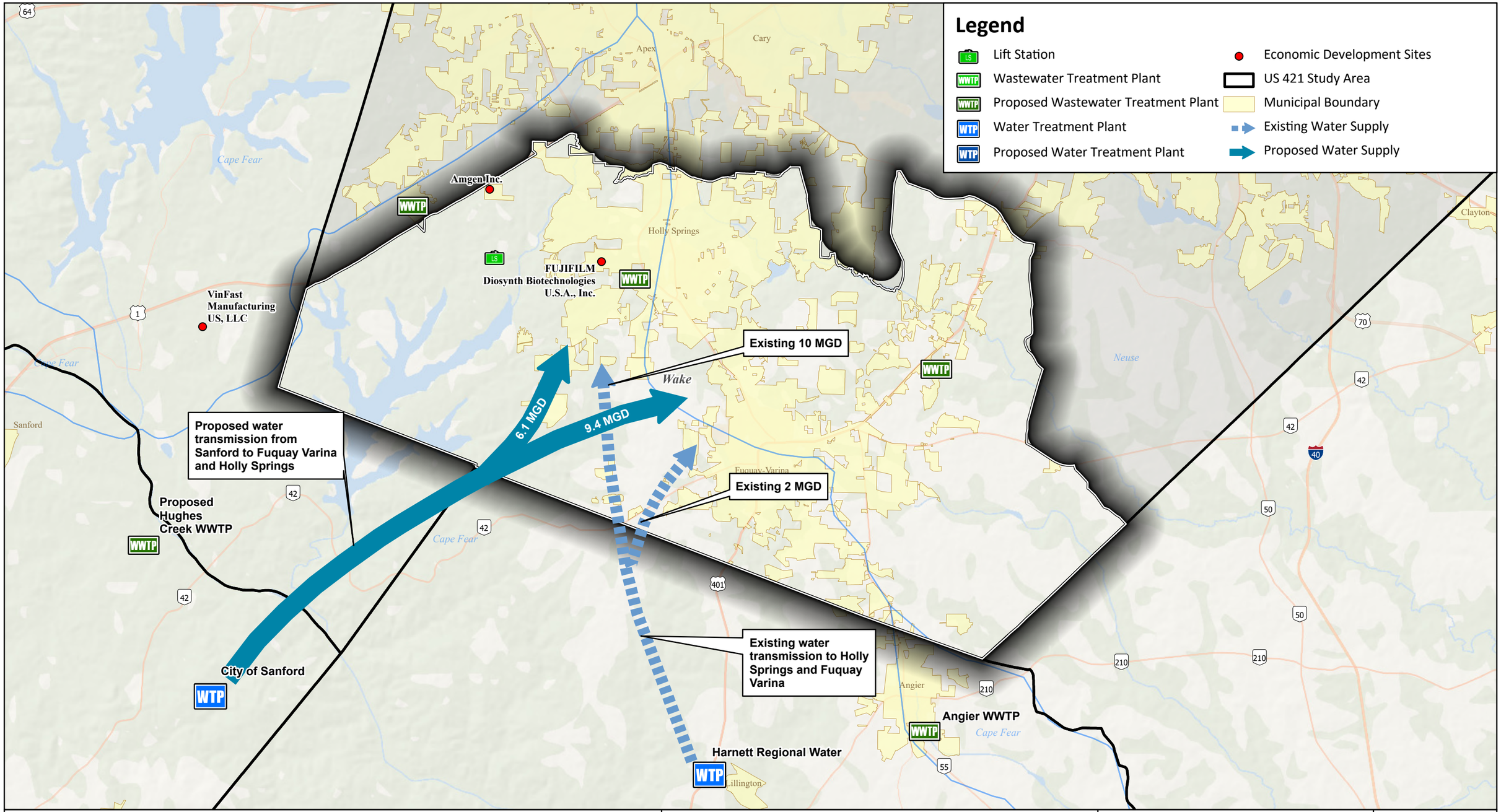

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Regional Water and Wastewater Infrastructure Master Plan
US 421 Corridor

2050 WATER SUPPLY SCENARIO- WAKE COUNTY AREA

Figure 6-5

April 2024

North Carolina Department of Environmental Quality

Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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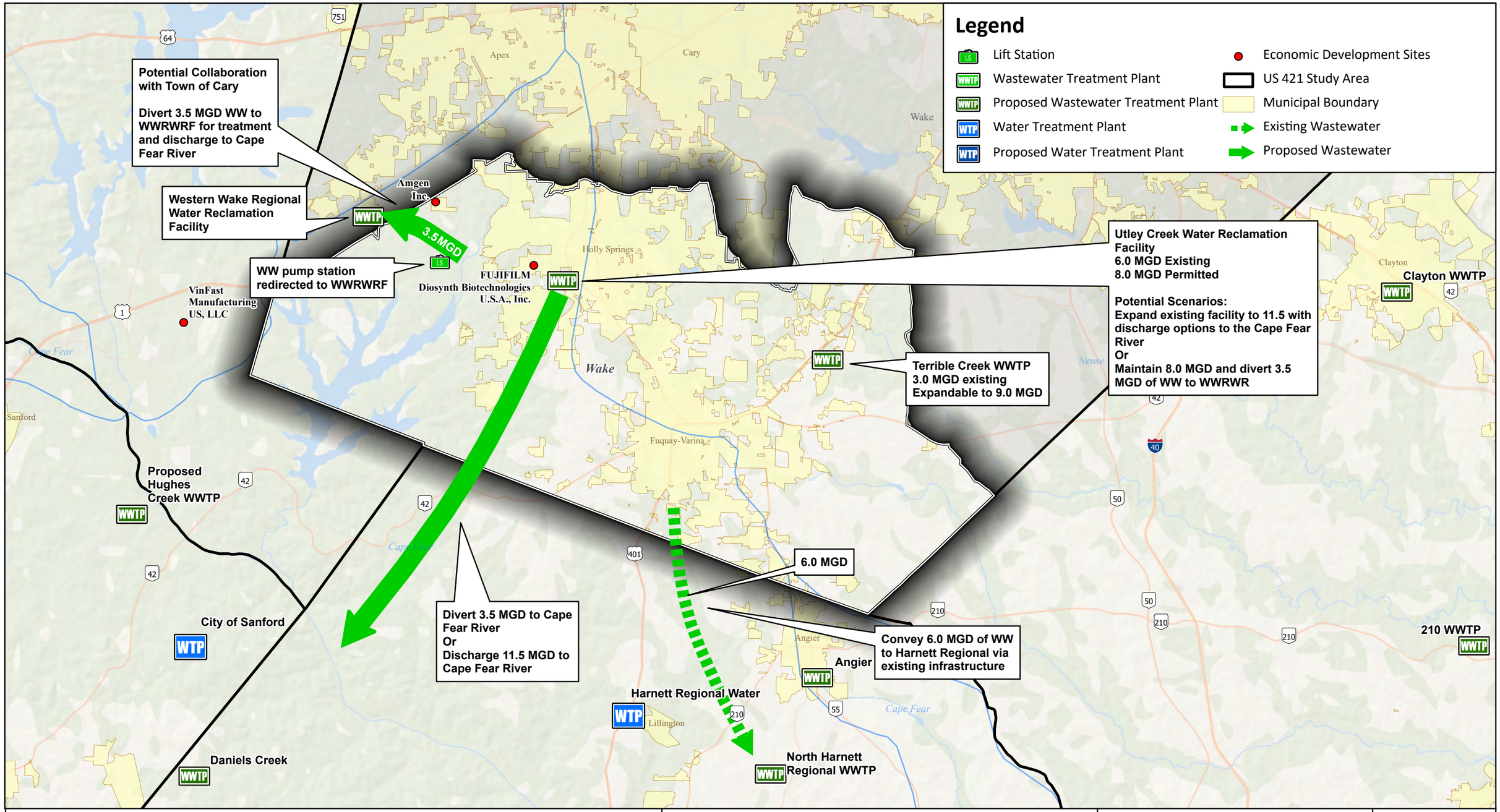

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Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**2050 WASTEWATER SUPPLY SCENARIO- WAKE COUNTY AREA**	Figure 6-6 April 2024
North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel	

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6.4 Lee and Chatham County

6.4.1 Water Supply and Treatment

The City of Sanford and the Town of Pittsboro are in the process of merging their facilities and ownership of Pittsboro's water and wastewater infrastructure will be transferred to Sanford by June 30, 2024. Sanford is rebranding as Tri River Water as it transitions to a regional water and wastewater service provider. The proximity of the combined Sanford and Pittsboro systems offers significant synergies with Chatham County and Siler City to meet the growing collective needs within the Lee and Chatham County areas. As a result, the concepts presented for this area reflect a broad regionalization of all of the systems. Within this concept for water supply, there are two scenarios presented. In the first scenario (Figure 6-7), the water supply is regionally split between Sanford's withdraw from the Cape Fear River, Chatham County's WTP on Jordan Lake, the Western Intake Partnership (WIP) Facility on Jordan Lake, and Siler City's WTP on the Rocky River. This approach provides access to the Pittsboro and Chatham County Jordan Lake allocations via the WIP facility.

An alternate approach (Figure 6-8) is to access the allocations of Pittsboro, Chatham County and Holly Springs below the Jordan Lake dam at the Sanford Intake. This alternative has some advantages from a water management perspective; however, one of its primary disadvantages is the lack of distributed water treatment capacity from a reliability and redundancy perspective. Consolidating nearly all of the water treatment capacity at the Sanford WTP presents risks.

6.4.2 Wastewater Treatment

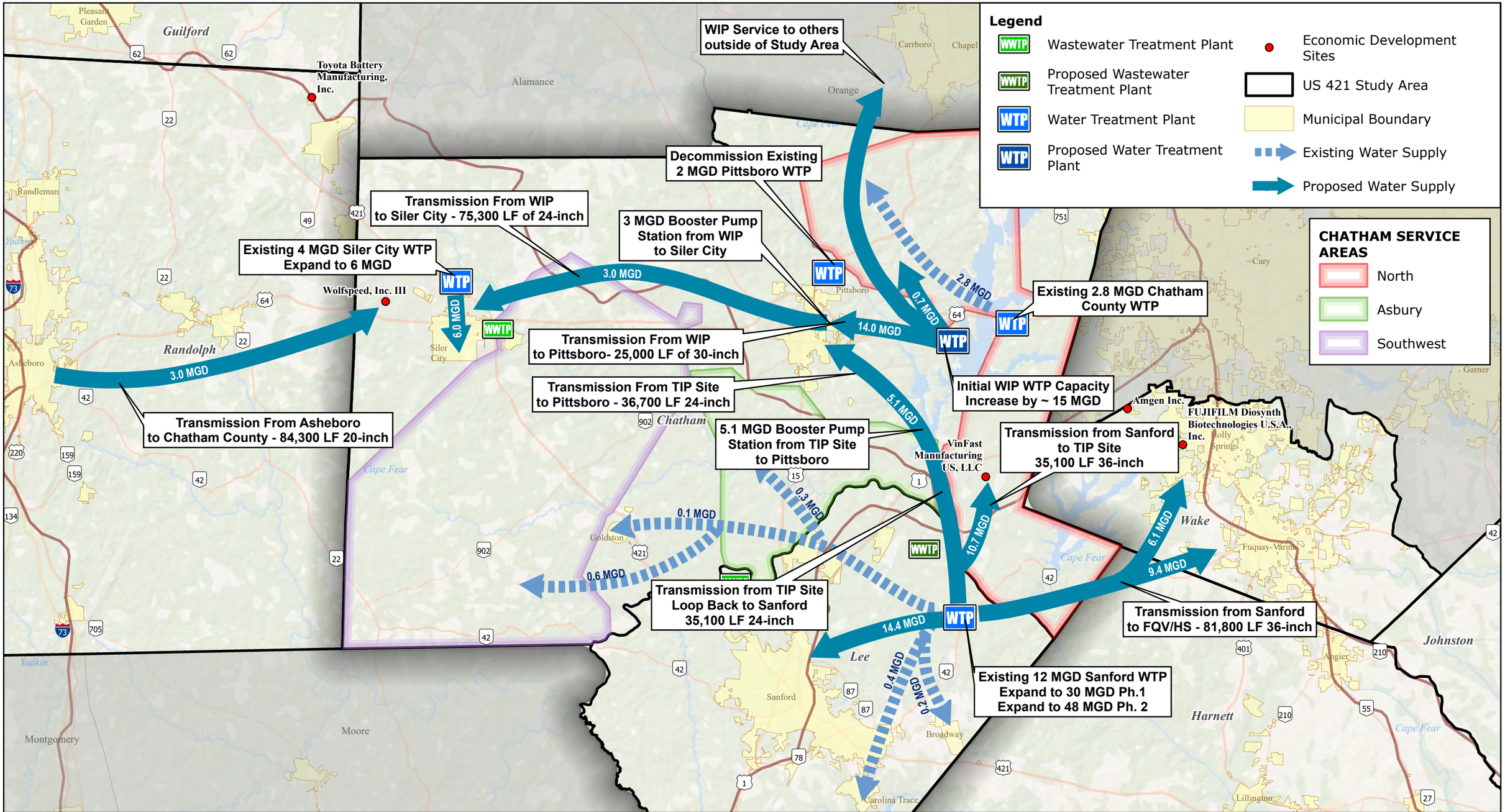
As Sanford becomes a more regional provider, the benefits of a more regional approach for wastewater service are realized. Figure 6-9 and Figure 6-10 present two regional concepts where the wastewater needs within Lee and Chatham County are met collectively. Figure 6-9 presents Scenario 1, which includes wastewater treatment at an expanded Big Buffalo WWTP, an expanded Siler City WWTP and a new Hughes Creek WWTP in the northern portion of the Sanford service area. This regional approach affords opportunities to manage phasing and flows as they develop, as well as to manage the nutrient loading amongst the facilities given the challenges presented on that front.

Figure 6-10 presents Scenario 2, which includes the construction of a new wastewater treatment facility in Pittsboro as opposed to conveying all of the flow south to Sanford. The Big Buffalo WWTP would be upgraded as opposed to expanded. This approach includes discharging wastewater to the Haw River which would have its challenges from a water quality front, however, it has the benefits of returning the water to Jordan Lake and would allow Sanford/Pittsboro to take advantage of the existing total nitrogen load allocated to Pittsboro to the Haw River.

Nutrient Management for both Scenarios

A preliminary nutrient mass balance indicates that under both regionalization scenarios (with wastewater flows increasing over time) the total nitrogen loading to the Cape Fear River basin will increase by the year 2050 even if facilities treat to the conventional treatment limits of technology for total nitrogen, 3 mg/L. Currently, DEQ is "holding the load" for nutrients, although the Cape Fear River basin is not subject to specific nutrient TMDLs at this time. The results of the watershed and water quality modeling

being conducted by EPA may suggest that TMDLs are required with nutrient reductions. Therefore, it is anticipated the best available technology with conventional activated sludge may be required to meet total potential nitrogen and phosphorus targets and also potentially provide additional capacity. Cape Fear River basin stakeholders and public water and wastewater providers will need to collectively explore strategies to ensure nutrient allocations are appropriately assigned to meet the growth needs of the region. Without coordination among stakeholders and water and wastewater providers regarding the level of treatment required across the region, there is potential that there would not be enough allocations available to complete other recommended projects.



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Regional Water and Wastewater Infrastructure Master Plan
US 421 Corridor

North Carolina Department of Environmental Quality

2050 WATER SUPPLY SCENARIO 1
Lee and Chatham County Area

Figure 6-7

April 2024

Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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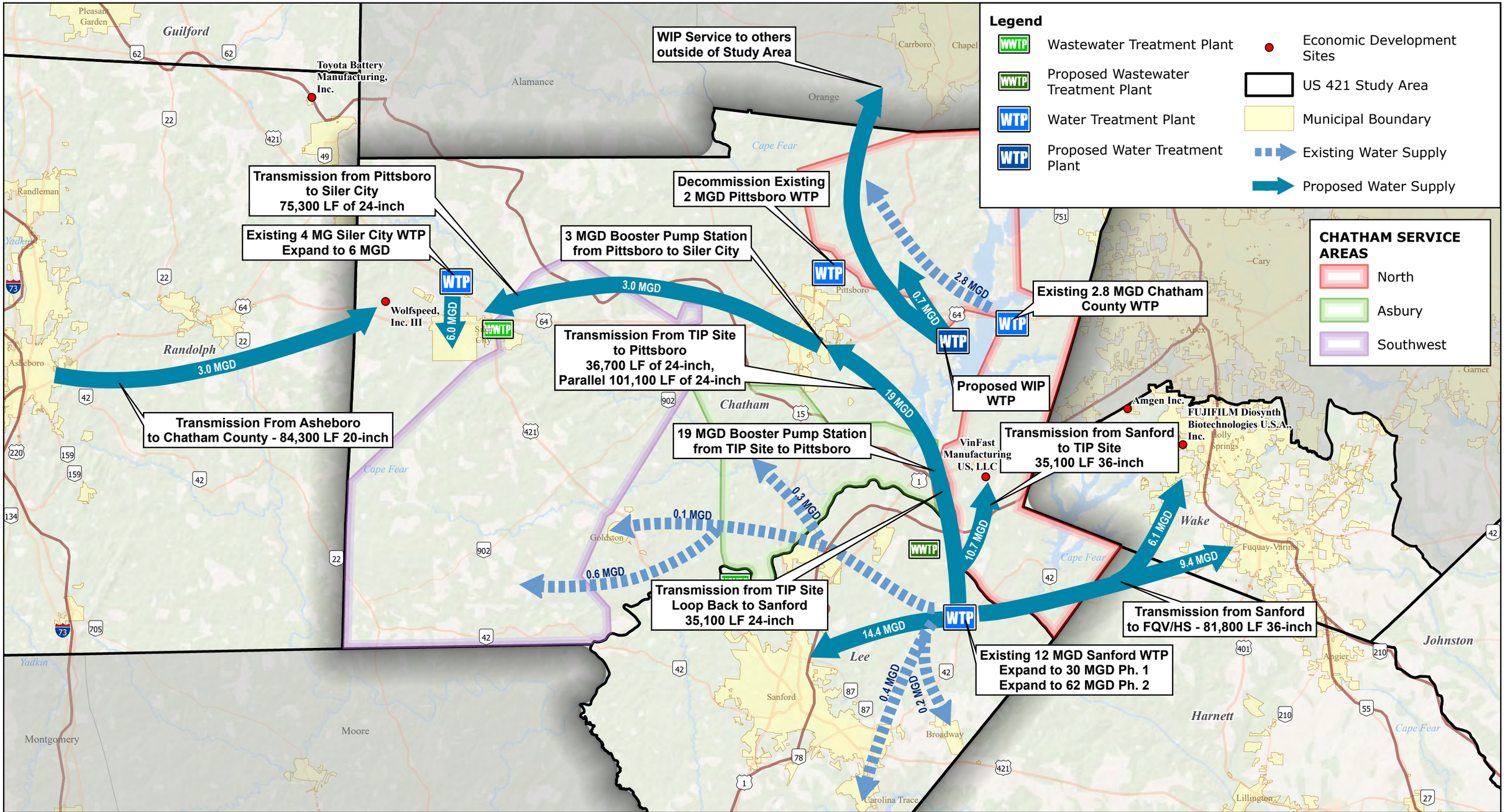

	Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**2050 WATER SUPPLY SCENARIO 2** **Lee and Chatham County Area**
		Figure 6-8
		April 2024
	North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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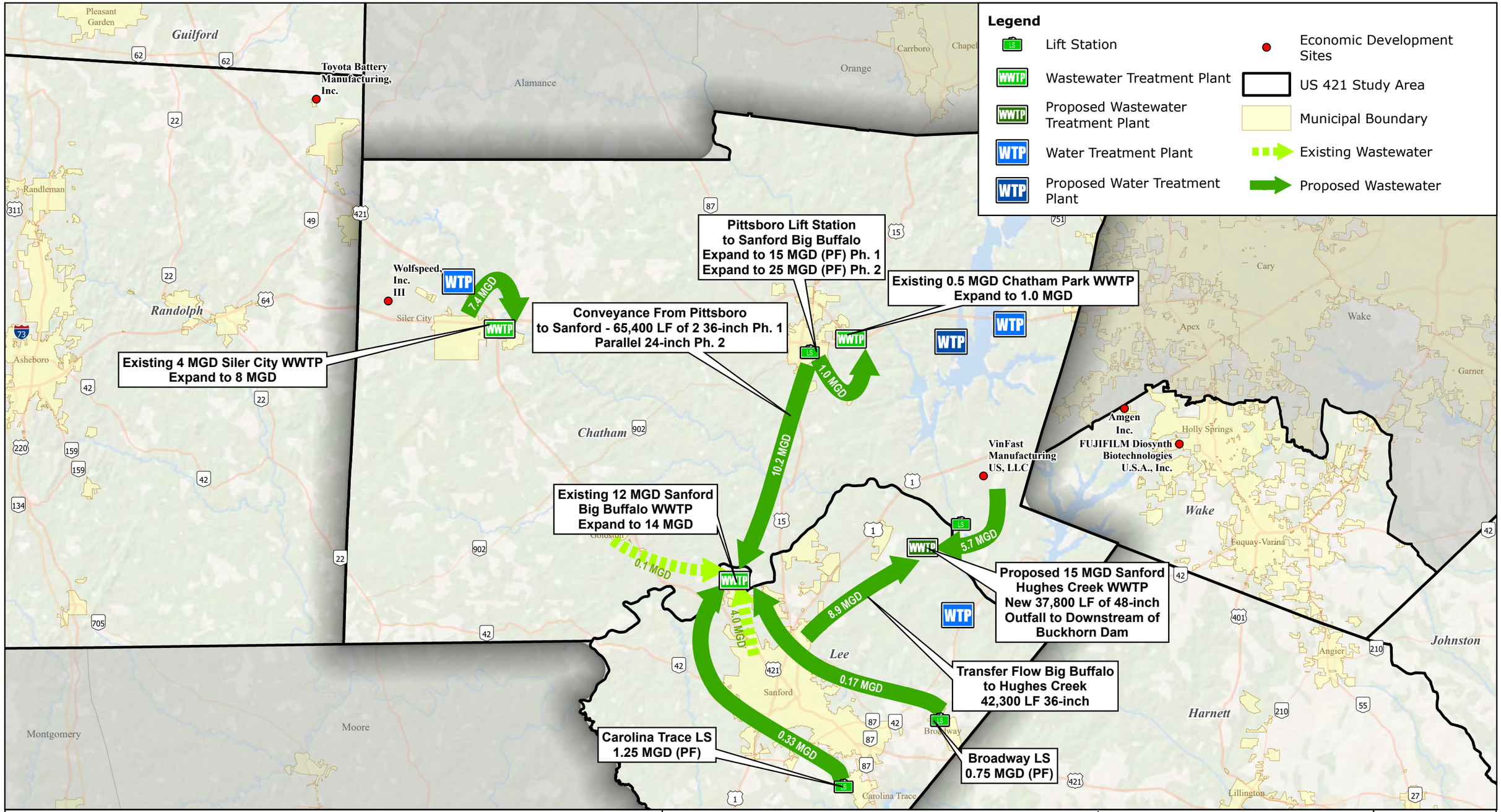

	Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**2050 WASTEWATER REGIONALIZATION SCENARIO 1 - LEE AND CHATHAM COUNTY AREA**
		Figure 6-9
		April 2024
	North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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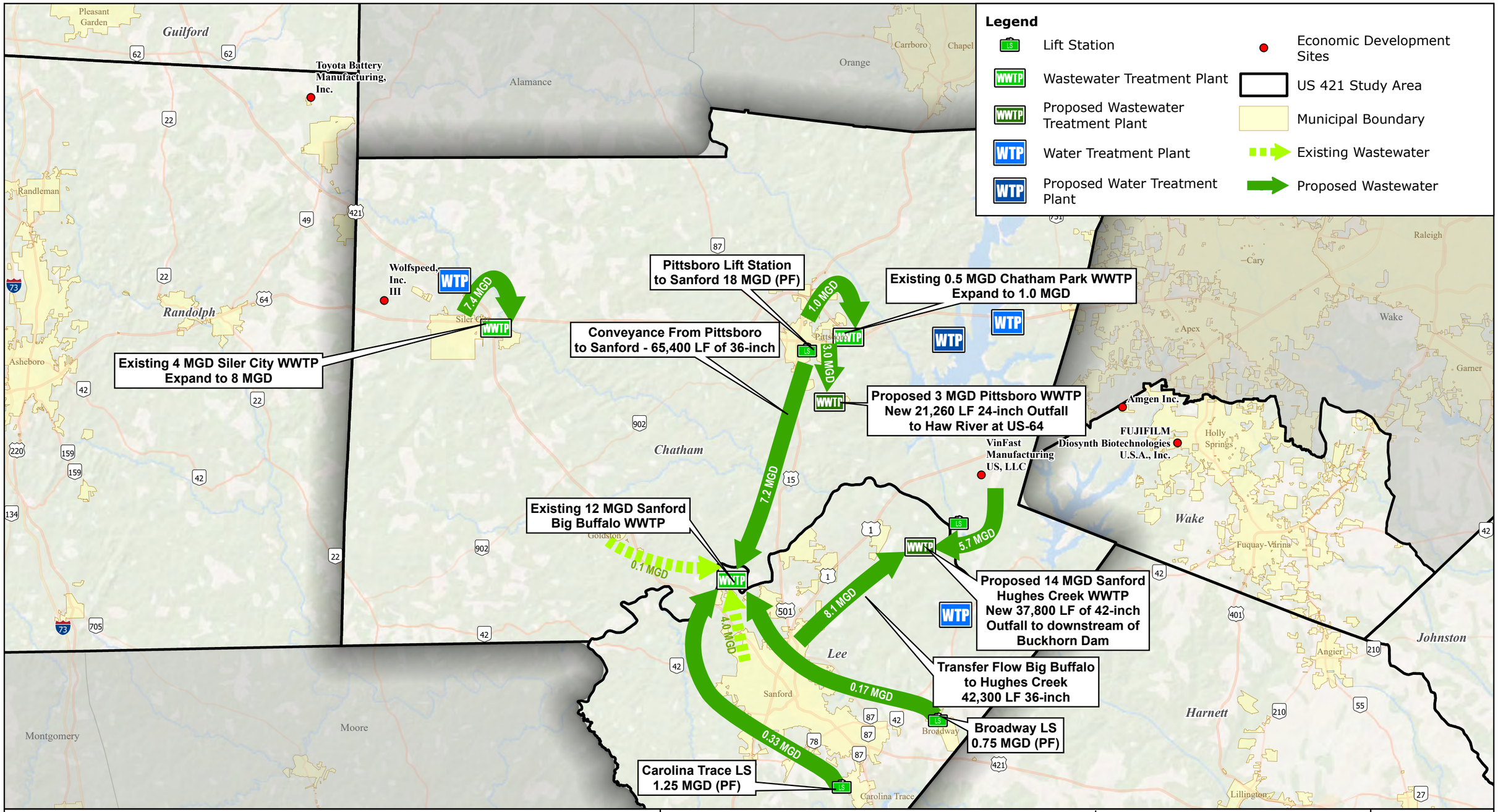

	Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**2050 WASTEWATER REGIONALIZATION SCENARIO 2 - LEE AND CHATHAM COUNTY AREA**
		Figure 6-10
		April 2024
	North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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6.5 Piedmont Triad (Guilford and Randolph Counties)

6.5.1 Water Supply and Treatment

The Triad Region is facing concerns regarding future water demands due to future development and like many others, the challenge of aging infrastructure. Fortunately, a regional solution already exists for the water supply in the Triad. PTRWA, who has the available supply to provide additional flow to the partners in the region, is currently under contract to expand their facility to an effective capacity of 24 MGD. PTRWA will be a primary participant in the regionalization efforts in the Triad for both water and wastewater as described in the scenarios below.

It is important to note that many projects already planned and funded have been included in the scenario development for both the water and wastewater solutions to fully capture how those funded projects are being integrated into the regionalization plan. For some planned projects, exceptions have been noted where our team believes there may be other, more suitable solutions that offer greater overall regional value.

Water Supply – Scenario 1

Scenario 1 considers the regional solution to water supply, leverages current relationships amongst water utility providers and takes advantages of projects that are already underway. The items below do not capture the water solutions already in place and are proposed to not change in the future. The projects, alternatives and contractual agreements described below are shown in Figure 6-11.

Project ID	Project Description
Project T-W1	Expand PTRWA to 27 MGD to meet the 2050 MDD. The existing facility at 14.7 MGD is currently planning a 12 MGD expansion but anticipates losing some final capacity to the reject quantity in the RO process proposed to treat contaminants of emerging concern. The final capacity with the upcoming upgrade is anticipated to be 24 MGD, therefore a small additional upgrade will be required by 2050 to meet the demand.
Project T-W2	A project to extend an 18” water line from PTRWA to the Asheboro water system is currently funded by Randolph County and under design.
Project T-W3	Asheboro will become a distribution center for the overall regional facility but due to a grandfathered IBT, the facility is not anticipated to expand. The Asheboro WTP will be rehabilitated and upgraded to reliably provide 12 MGD to the region and will join the Authority as a partner to meet their demands to Eastern Randolph County. Asheboro will distribute water to Franklinville, Ramseur, the Chatham Advance Manufacturing Site (Wolfspeed) and to the Town of Liberty.
Project T-W4	A water line to provide water service to the Town of Liberty from Ramseur will be installed to provide both water in Scenario 1 and 2.
Project T-W5	Due to the concerns regarding water quality and resiliency of the single source supplies in eastern Randolph County, the Town of Liberty’s water system is also proposed to be tied into the City of Greensboro at the Toyota facility as an emergency interconnection.

	A connection to the City of Greensboro will require a policy change and review by the City Council, thus, the resilient connection is contingent upon approval.
Project T-W6	Includes the water line to convey flow from Asheboro to the Chatham Advanced Manufacturing site through Franklinville and Ramseur. This project is currently funded by the State to provide 3 MGD, however, this alternative includes additional infrastructure to provide 7 MGD to the eastern portion of Randolph County.

Water Supply – Scenario 2

Scenario 2 is a more decentralized solution, leaving the eastern portion of Randolph County heavily reliant on Ramseur WTP, and includes the following projects as shown on Figure 6-12:

Project ID	**Project Description**
Project T-W2	A project to extend an 18" water line from PTRWA to the Asheboro water system is currently funded by Randolph County and under design.
Project T-W3	Asheboro will become a distribution center for the overall regional facility but due to a grandfathered IBT, the facility is not anticipated to expand. The Asheboro WTP will be limited to 9.36 MGD due to the grandfathered IBT and will join the Authority as a partner to meet their demands to Eastern Randolph County. Asheboro will distribute water to Chatham Advanced Manufacturing Site (Wolfspeed).
Project T-W4	A water line to provide water service to the Town of Liberty from Ramseur will be installed to provide both water in Scenario 1 and 2.
Project T-W5	Due to the concerns regarding water quality and resiliency of the single source supplies in eastern Randolph County, the Town of Liberty's water system is also proposed to be tied into the City of Greensboro at the Toyota facility as an emergency interconnection for resiliency. A connection to the City of Greensboro will require a local policy change and review by the City Council, thus, the resilient connection is contingent upon approval
Project T-W7	Expand PTRWA to 24 MGD to meet the 2050 MDD. The existing facility at 14.7 is currently planning a 12 MGD expansion but anticipates losing some final capacity to the reverse osmosis process proposed to treat contaminants of emerging concern. The final capacity with the upcoming upgrade is anticipated to be 24 MGD.
Project T-W8	Includes the water line to convey flow from Asheboro to the Chatham Advanced Manufacturing site through Franklinville and Ramseur. This project is currently funded by the State to provide 3 MGD.
Project T-W9	Upgrade the Ramseur WTP to 4 MGD to provide water to Franklinville, Ramseur and Liberty.

6.5.2 Wastewater Treatment

The wastewater scenarios in Guilford and Randolph County are best addressed in sections with the systems along the US 220 corridor (known as Scenarios 1A and 2A) and a second section, those systems in Eastern Randolph County (known as 1B and 2B).

Scenario 1A and Scenario 2A focus on the regionalization solutions for wastewater treatment along the US 220 corridor, these solutions address the utility concerns for Greensboro, High Point, Archdale, Jamestown, Randleman, Asheboro and Seagrove/Ulah Metro Water District.

Wastewater Solutions – Scenario 1A
Scenario 1A includes the conversion of the Asheboro WWTP to a regional facility supporting anticipated growth. While governance is not a direct focus of this study, some discussion on this topic has occurred with the primary water and wastewater providers. The Piedmont Triad Regional Water Authority bylaws were written to allow the Authority to also operate as a wastewater utility. The public water and wastewater providers believe this could be a successful scenario to regionalize the area since they serve successfully in this capacity providing water to the region. The initial conversations around Scenario 1A have been accepted positively by many of the included area water and wastewater providers. Scenario 1A can be found on Figure 6-13 and includes:

Project ID	Project Description
Project T-WW 1	The Seagrove/Ulah Metro Water District WWTP will be decommissioned and a lift station to convey all flow will be installed.
Project T-WW2	Greensboro's T.Z Osborne WRF will look to expand to the 60 MGD capacity previously discussed with DEQ, however, additional capacity will be opened up at the facility by installing a new transfer lift station on the South Buffalo Creek interceptor that will allow the transfer of 12 MGD to the Asheboro Regional Facility.
Project T-WW3	Related to Project T-WW2, this project is for the gravity section of the transfer line from the end of the force main in T-WW2 to the junction with High Point's force main.
Project T-WW4	High Point Eastside WWTP will remain a 26 MGD facility but will install a lift station capable of conveying 6 MGD to the Asheboro Regional Facility to handle their future demand and required expansion. Eastside WWTP will update its treatment processes to reduce their TN from a concentration of 6 mg/L to 4.68 mg/L and a TP of 0.4, consistent with the speculative limit issued by DEQ.
Project T-WW5	Related to project T-WW2, 3, and 4, this project is the gravity section from the High Point/Greensboro junction box to the Asheboro WWTP.
Project T-WW6	The Randleman WWTP will be decommissioned, and its flow conveyed to the outfall of the Asheboro Regional Facility with a transfer lift station and force main.

Project T-WW7	The Asheboro WWTP will be rehabilitated and expanded from a 9MGD facility to a 30 MGD facility to accept the flows from Greensboro, High Point, Randleman and Seagrove.
Project T-WW7-1	The upgrade of High Point Eastside WWTP to meet more stringent TN and TP limits.

The regionalization of the Greensboro, High Point Eastside, and Asheboro facilities would likely decrease the investment required in the removal of 1,4-Dioxane at the individual facilities. If the transfer lift stations can be positioned strategically downstream of the problem dischargers, the flow could be redirected to the regional facility that will include the required technology to address the concern.

Wastewater Solutions – Scenario 2A

Scenario 2A includes an option to remove Asheboro WWTP discharge from the Deep River sub-basin by pumping the discharge back to the Uwharrie River sub-basin, however, this will limit the size of the regional facility proposed at the Randleman WWTP due to the available footprint. Scenario 2A can be found on Figure 6-14 and includes:

Project ID	**Project Description**
Project T-WW1	The Seagrove/Ulah Metro Water District WWTP will be decommissioned and a lift station to convey all flow will be installed.
Project T-WW8	Greensboro's T.Z Osborne WRF will look to expand to the 60 MGD capacity previously discussed with DEQ, however, additional capacity will be opened up at the facility by installing a new transfer lift station on the South Buffalo Creek interceptor that will allow the transfer of 12 MGD to the Randleman Regional Facility.
Project T-WW9	The Randleman WWTP will require rehabilitation and expansion from 1.745 MGD to 14 MGD to treat flows from Greensboro and Randleman.
Project T-WW10	The Asheboro WWTP will require rehabilitation and expansion to 11 MGD to treat flows from the anticipated growth in the City. The effluent from the facility will then be pumped back to the Uwharrie River sub-basin in the Yadkin and the nutrient loading allocation released to the other facilities requiring expansion.
Project T-WW11	Archdale and Trinity have planned together to build a WWTP in the Yadkin River basin and will work toward that solution in this scenario. This option isn't mutually exclusive to Scenario 2A but with Archdale planning to be a part of the PTRWA through at least 2050, a commitment to the regional partnership allows them to share in the benefits of regionalization in lieu of decentralization of their wastewater challenges. In addition, Trinity would remain in the Westside WWTP service area where flows are anticipated to remain under the permitted capacity.
Project T-WW12	High Point's Eastside WWTP would expand to 32 MGD and treat the flow from Jamestown and High Point under the speculative limits issued by DEQ.

Drawbacks of Scenario 2A include the expansion of High Point's Eastside facility to 32 MGD, increasing the effluent to Randleman Lake due to the limited potential to take advantage of the smaller Randleman WWTP and its existing infrastructure.

Wastewater Solutions – Scenario 1B

Scenario 1B includes the regionalization of the Ramseur WWTP to treat the flow from Franklinville and Ramseur. The solutions for eastern Randolph County are mostly independent of the solutions selected for the central sections of the county along US-220. Therefore, they are described in Scenarios 1B and 2B. Scenario 1B can be found on Figure 6-13 and includes:

Project ID	Project Description
T-WW13	Franklinville's WWTP would be decommissioned in this scenario and replaced with a transfer lift station.
T-WW14	The Town of Liberty would decommission their WWTP, an irrigation sprayfield facility, and would pump their wastewater through a transfer lift station to the Greensboro transfer lift station at the Toyota facility. The Hazen Team believes this will reduce the capital expenditure for transferring wastewater due to anticipated growth for the Town, as compared to the current projects funded by Randolph County to convey flow back to the Town of Ramseur included in Scenario 2B. The Greensboro lift station has available capacity due to a reduced wastewater flow from Toyota below what was originally anticipated. However, any planned regionalization connection with the City of Greensboro should be discussed with Greensboro water resources to confirm policies with the City have been changed to allow access to their wastewater utilities to others outside of Greensboro's jurisdiction.
T-WW15	The Ramseur WWTP would be upgraded to 1 MGD to treat the 2050 wastewater demand for Franklinville and Ramseur.

Wastewater Solutions – Scenario 2B

Scenario 2B includes the regionalization of the Ramseur WWTP to treat flow from Franklinville, Liberty and Ramseur. The project to include Liberty is planned and identified to be funded by Randolph County, however this should be re-evaluated in our opinion if the City of Greensboro is an option. Scenario 2B can be found on Figure 6-14 and includes:

Project ID	Project Description
T-WW13	Franklinville's WWTP would be decommissioned in this scenario and replaced with a transfer lift station.
T-WW16	The Town of Liberty would decommission their WWTP and send all flow to the Town of Ramseur, therefore reducing the capital expenditure to upgrade, maintain, and operate their irrigation sprayfield treatment facility. Currently, Randolph County has funded projects to convey flows from three interchanges on the 421 corridor near Liberty back to the Town of Ramseur. This study encourages the wastewater providers to reconsider that investment for the option

discussed in Scenario 1B or the option to build the infrastructure to convey all flow from the Town of Liberty in the future if the facility is decommissioned.

T-WW17 The Ramseur WWTP would be upgraded to 2 MGD and receive flow from Liberty and Franklinville.

Nutrient Management for both Scenarios

While Scenarios 1A and 1B and 2A and 2B aren't required to be selected together, it was important to conceptually join two of the scenarios across the Deep River sub-basin in the Triad to understand if a regional solution could be successful by redistributing the conceptual allocation of nutrients amongst participants. The two tables below are illustrative of two situations with conceptual nutrient concentrations that could be a successful solution to attaining additional wastewater flow capacity in the basin without increasing the total nutrient load to the Deep River. The concentrations below are theoretical concentrations for all of the facilities in question. Actual allocation of nutrient load would vary upon future modeling and assessment of the river basin.

Table 6–1 - Scenario 1A and 1B Nutrient Budgeting

Facility Status	Flow (MGD)		Current TN Load (lbs/yr)	Current TP Load (lbs/yr)	2050 TN Conc. (mg/L)	2050 TN Load (lbs/yr)	2050 TP Conc. (mg/L)	2050 TP Load (lbs/yr)
	Current	Proposed (2050)						
High Point Eastside WWTP	26	26	474,865	39,420	4.68	370,406	0.40	31,659
Randleman WWTP Decommissioned	1.745	0	15,936	4,974	-	0	-	0
Asheboro WWTP Expanded	9	30	205,645	13,698	3.56	324,893	0.32	29,208
Franklinville WWTP Decommissioned	0.1	0	2,795	1,311	-	0	-	0
Ramseur Expanded	0.48	1	6,255	2,148	5.00	15,221	0.50	1,522
Liberty Decommissioned	0.55	0	5,023	837	-	0	-	0
Seagrove Decommissioned	0.036	0	329	55	-	0	-	0
Total Flow (MGD) and Total Load (lbs/yr)	**37.91**	**57**	**710,848**	**62,444**		**710,848**		**62,444**

Table 6–2 - Scenario 2A and 2B Nutrient Budgeting

Facility Status	Flow (MGD)		Current TN Load (lbs/yr)	Current TP Load (lbs/yr)	2050 TN Conc. (mg/L)	2050 TN Load (lbs/yr)	2050 TP Conc. (mg/L)	2050 TP Load (lbs/yr)
	Current	Proposed (2050)						
High Point Eastside WWTP	26	32	474,865	39,420	4.68	455,884	0.40	38,964
Randleman WWTP Expanded	1.745	14	15,936	4,974	5.26	224,593	0.48	20,435
Asheboro WWTP Expanded[1]	9	11	205,645	13,698	-	0	-	0
Franklinville WWTP Decommissioned	0.1	0	2,795	1,311	-	0	-	0
Ramseur Expanded	0.48	2	6,255	2,148	5.00	30,441	0.50	3,044
Liberty Decommissioned	0.55	0	5,023	837	-	0	-	0
Seagrove Decommissioned	0.036	0	329	55	-	0	-	0
Total Flow (MGD) and Total Load (lbs/yr)	**37.91**	**59**	**710,848**	**62,444**		**710,848**		**62,444**

[1]Asheboro effluent will be pumped to the Uwharrie River sub-basin in the Yadkin, therefore the nutrient load is not included in this analysis for the Deep.

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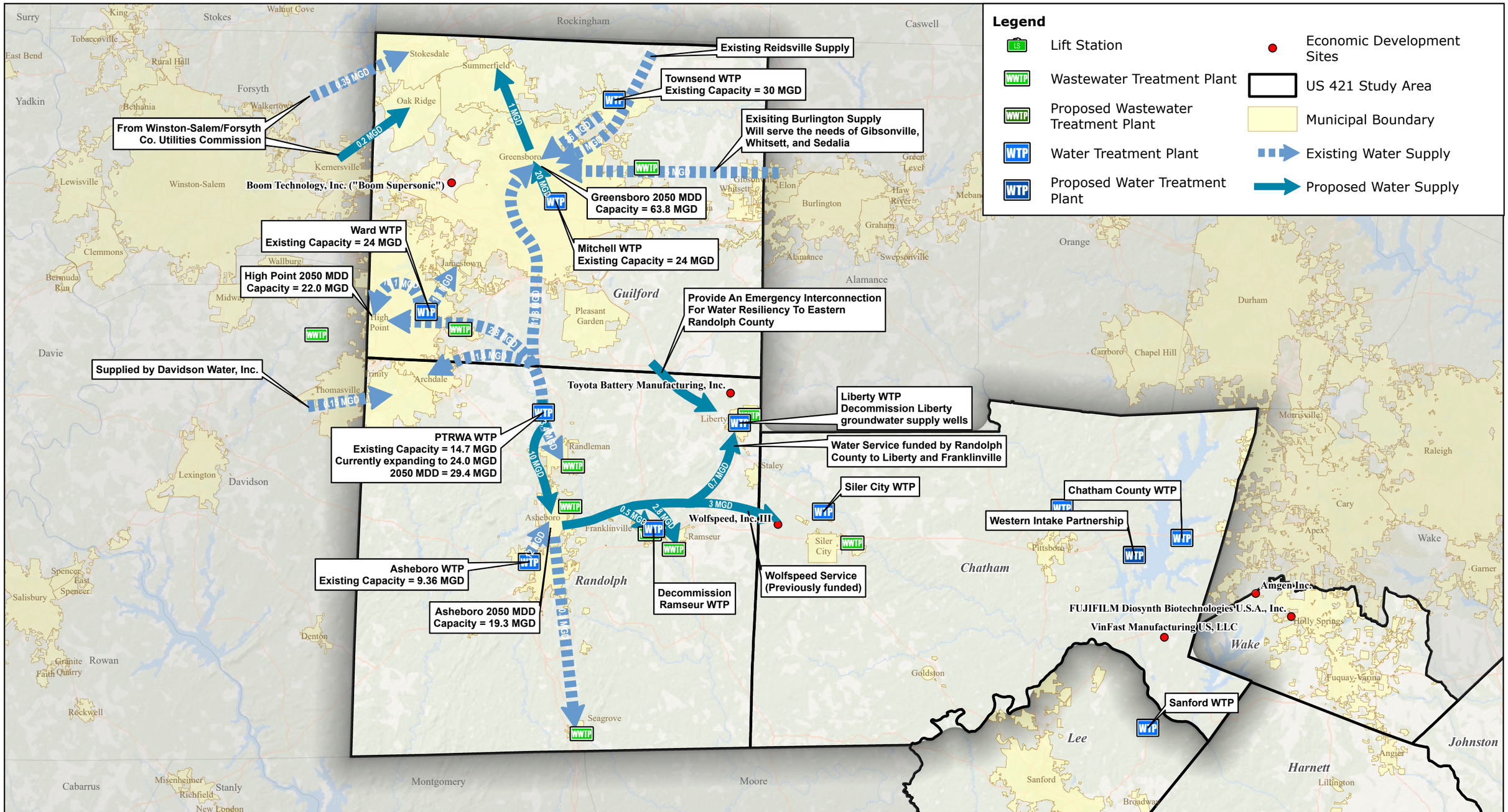

Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**2050 WATER REGIONALIZATION SCENARIO 1** **TRIAD AREA**	Figure 6-11 April 2024
North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel	

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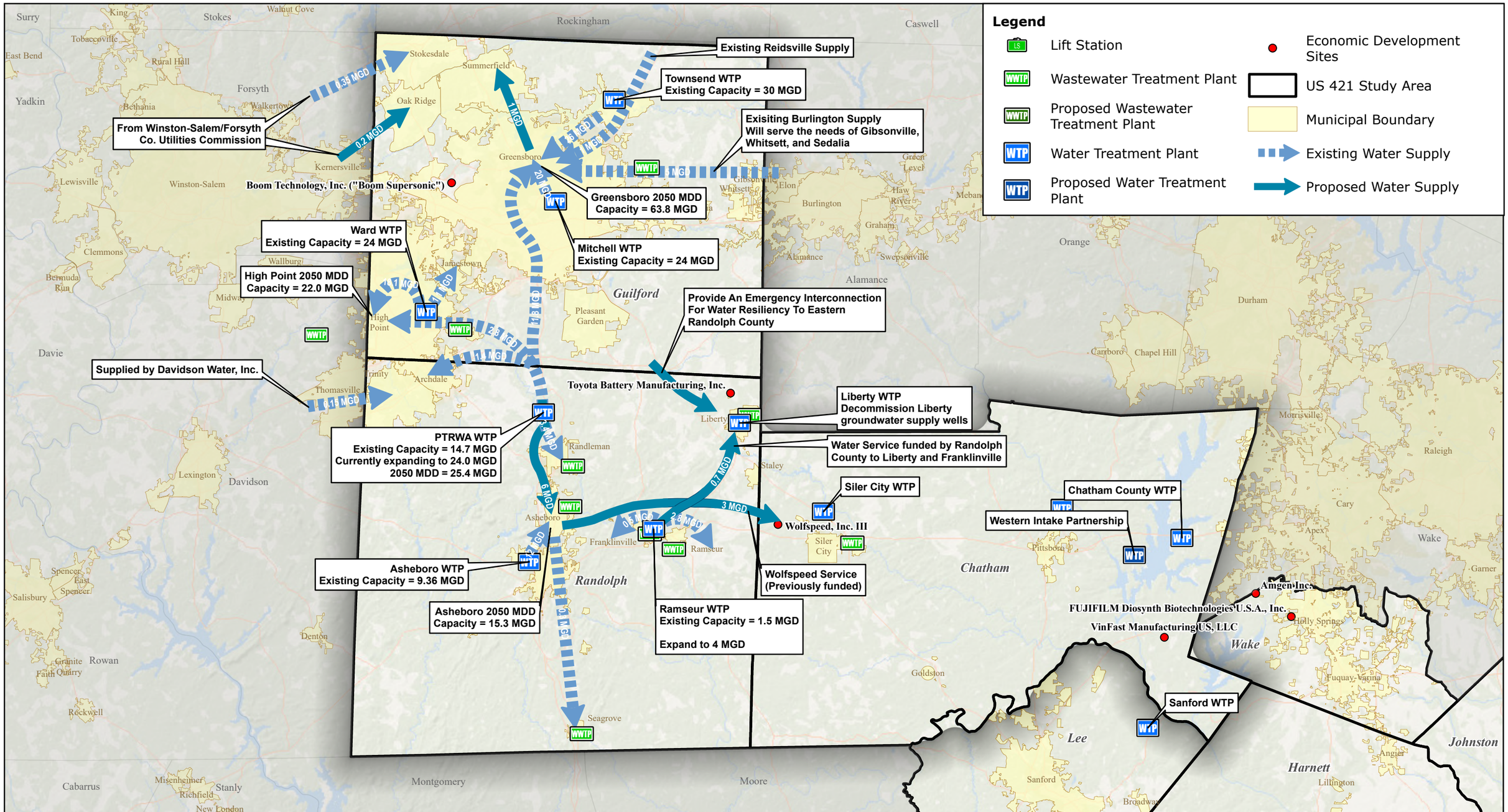

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Regional Water and Wastewater Infrastructure Master Plan
US 421 Corridor

2050 WATER REGIONALIZATION SCENARIO 2

TRIAD AREA

Figure 6-12

April 2024

North Carolina Department of Environmental Quality

Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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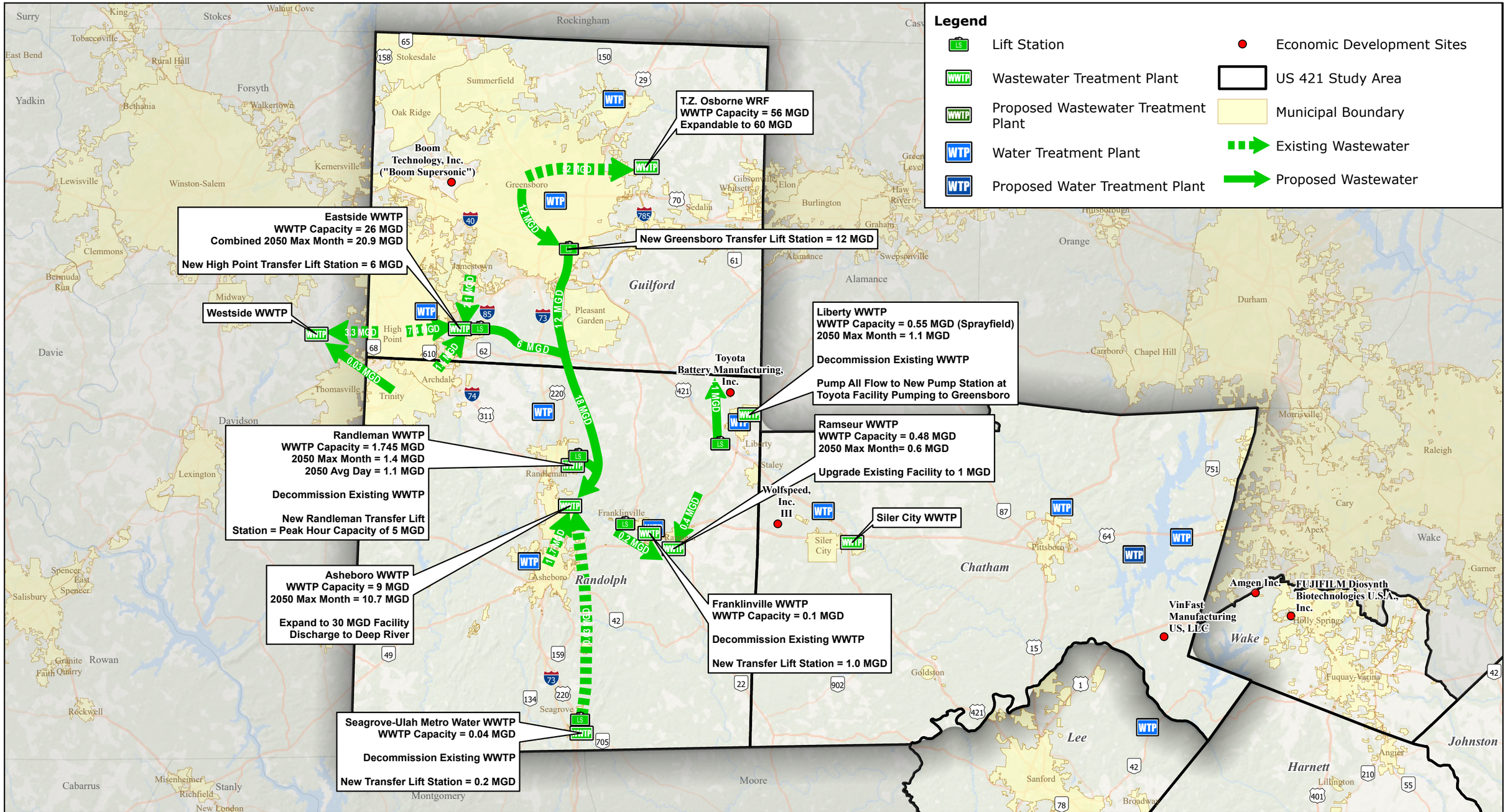

	Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**2050 WASTEWATER REGIONALIZATION SCENARIO 1** **TRIAD AREA**
	North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

Figure 6-13

April 2024

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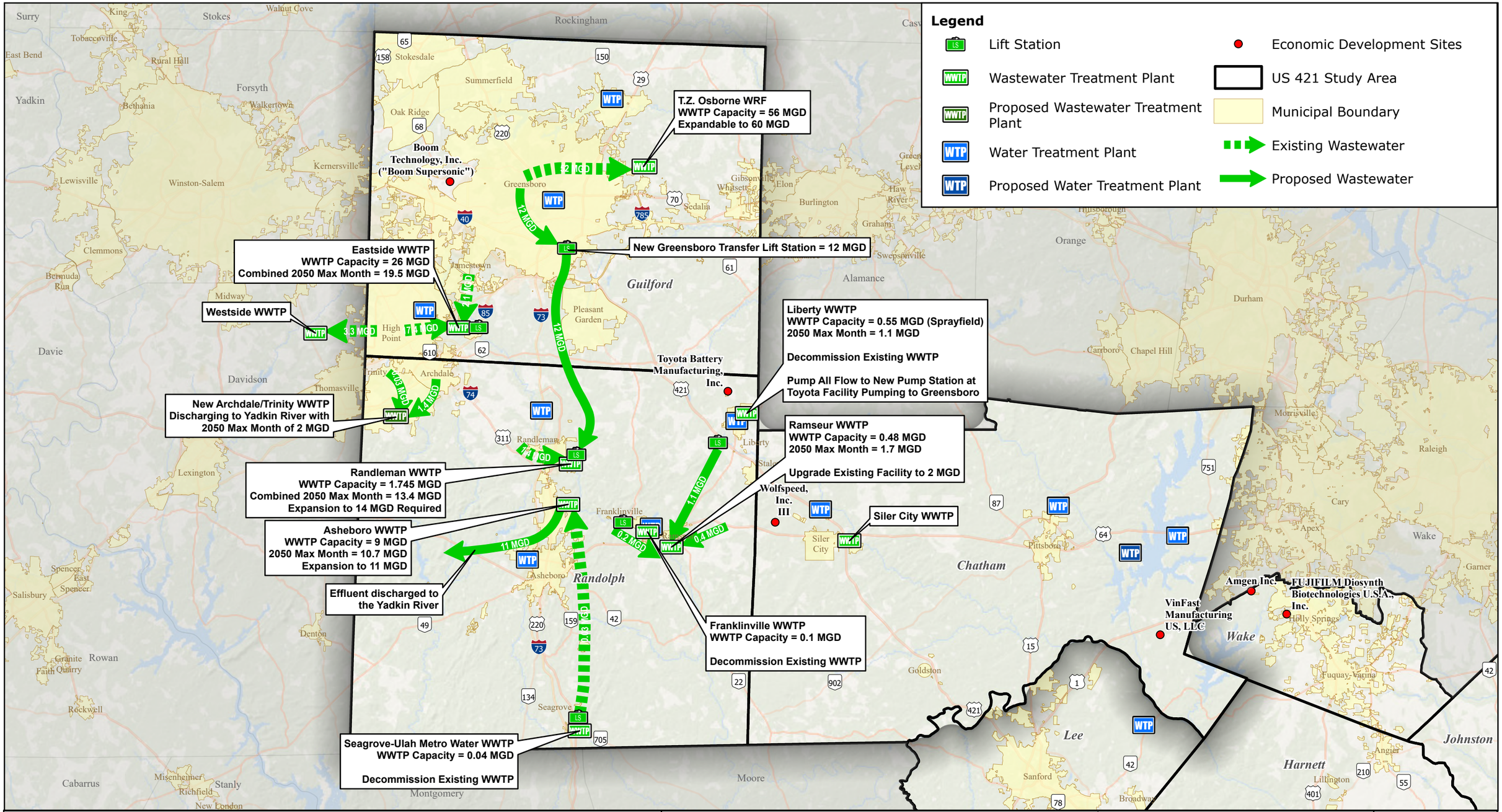

	Regional Water and Wastewater Infrastructure Master Plan US 421 Corridor	**2050 WASTEWATER REGIONALIZATION SCENARIO 2** **TRIAD AREA**
		Figure 6-14 April 2024
	North Carolina Department of Environmental Quality	Prepared By: The Team of Hazen and Sawyer, Freese and Nichols, WithersRavenel

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7. Financial Review of Water and Wastewater Providers

Raftelis Financial Consultants, Inc. (Raftelis) was engaged to develop a methodology to evaluate the overall financial strength of the entities identified in the Study Area. Raftelis developed a Utility Health Scorecard (Scorecard) which provides a high-level overview of the health of each entity considering various system characteristics and both financial and affordability metrics. Specifically, the Scorecard developed for this study leveraged the Environmental Protection Agency's (EPA) Financial Capability Assessment (FCA) Guidance as well as commonly used financial metrics and metrics related to the overall strength of the subject utilities. The FCA provides a framework to assess the degree of economic and social impact of regional water and wastewater system decisions, which was augmented by financial and system metrics to numerically value holistic information gleaned from publicly available census data and financial reports. The Scorecard provides a snapshot analysis of individual utilities' systems, financial position, and affordability of services.

The goal of the analysis was to create an analytical framework that would provide insights into the strength of the systems and particular areas of stress within the Study Area, and to understand what, if any, problems could arise from adding additional leverage to the systems in the Study Area. However, it should be noted that, due to a limited timeframe to complete the analysis, this evaluation was based only on publicly available data and did not include detailed discussions or in-depth examination of the overall financial condition of water and wastewater utilities in the data set. This represents a "snapshot" in time based on publicly available data (including audits, data, from the EFC and the EPA, etc.) A more thorough analysis of each individual utility using the most recent data is warranted.

The analysis reveals that larger water and wastewater providers often benefit from economies of scale which can lower the average cost of water services. With larger customer bases across which to spread fixed costs, such as infrastructure maintenance, administrative expenses, and capital investments, larger water and wastewater utilities can achieve greater efficiencies in resource utilization and cost management. These efficiencies can translate into lower average costs for customers, contributing to improved affordability.

The smaller communities in the study area have higher average annual costs for water and wastewater services as a percent of the lowest quintile income while also having lower overall system financial health. These findings underscore the challenges smaller communities can face in providing affordable services to an already vulnerable population that lacks the economies of scale to stabilize future costs. The addition of significant debt for ongoing system maintenance or regionalization efforts will have an outsized impact on both affordability and each system's overall financial health.

The yearly cost as a percentage of the lowest quintile income is the study's most essential measure of affordability because it directly reflects the financial burden that water and wastewater services impose on the most economically vulnerable segment of the population. This measure provides a clear indication of the proportion of income that low-income households must allocate to cover essential utility expenses. Additional debt from regional infrastructure solutions would exacerbate affordability challenges for smaller systems. While regional solutions, such as shared treatment facilities or interconnectivity with neighboring systems, can offer cost savings and operational efficiencies, they may also entail significant upfront costs and debt obligations. If the burden of this debt must be disproportionately borne by

ratepayers, already economically strained communities will see significant impacts on affordability and water insecurity.

Affordability and equitable access to clean water are the core motivations behind the overarching study and this metric provides a distinctive snapshot of the financial impact monthly utility bills have on the most economically vulnerable. Figure 7-1 below presents the lowest quintile cost percentage values for the utilities with available data, compared to a regularly used target maximum of 4%. As shown, many communities are already being pressured by current monthly bills; further debt obligations to fund projects in this report or for other projects would only exacerbate these affordability concerns. A more comprehensive discussion is contained in Appendix C.

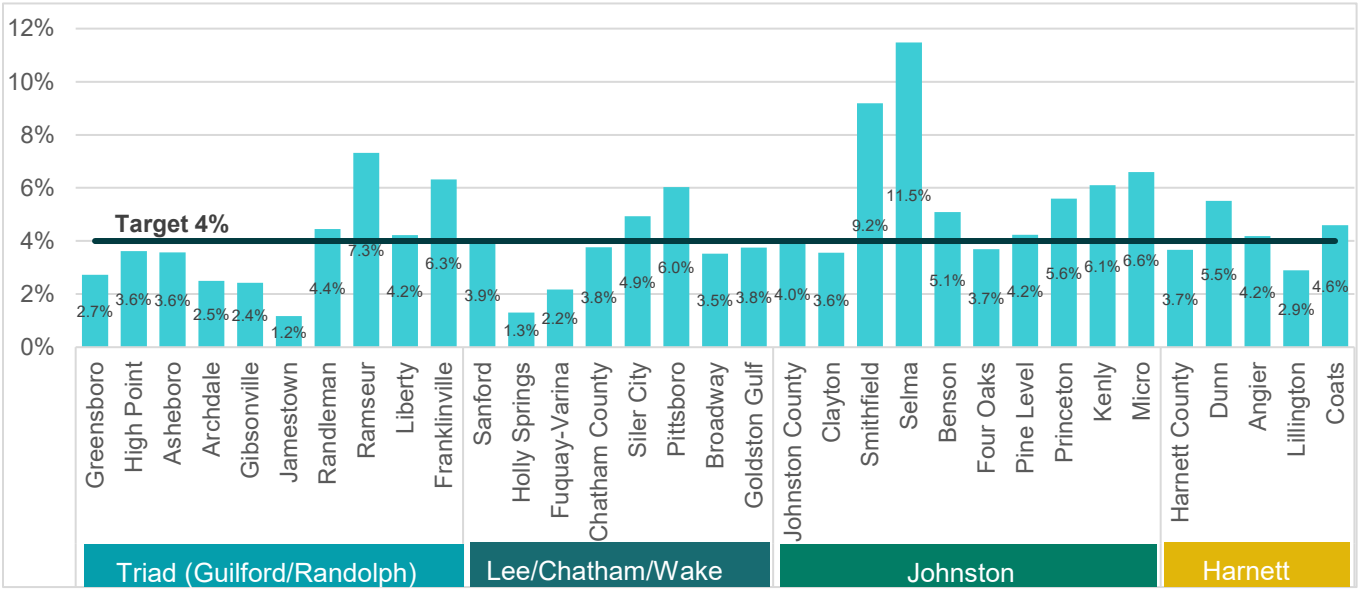

Figure 7-1: Yearly Cost as a Percent of Lowest Quintile Income

To support the affordability objectives of the study a supplemental analysis was performed to examine the effects of hypothetical additional debt amounts on the customer populations of the water and wastewater utilities in the study group. The yearly cost of water and sewer service as a percent of the Lowest Quintile Income (LQI) was identified as the most appropriate metric to analyze the magnitude to which additional debt service has on the utility bill of the most vulnerable portion of the population. To associate projected debt service by utility, cost estimates for projects by geographic group were weighted to individual utility by portion of customers in that geographic grouping. The number of customers served by individual water and wastewater utilities was based on water connection totals provided by the North Carolina Division of Water Infrastructure.

To approximate the structure of debt schedules for each individual utility, an interest rate of 3.5% over 25 years was used, along with a 2% cost of issuance and a required 1.5 debt service coverage ratio. 3.5% is a conservative estimate of interest rates offered by most state and federal loans for infrastructure projects by public water and wastewater utilities. It is assumed that revenues by utility will need to increase by the amount of the newly calculated debt service and that the current cost of utility services reflected on a customer's bill will increase by the same percentage to meet the revenue requirements. The analysis

presumes that all utilities are already meeting any revenue and coverage requirements and that all loans would be approved for issuance. It should be noted that the debt service schedules calculated in this analysis are representative of an average cost of capital for the regional solutions proposed and not a recommendation for how funding should be executed.

The project costs defined in Section 8 reflect the estimates for facilities required to meet a 2050 scenario. In practice, these investments will not be required in one single phase at the beginning of the planning horizon. For the purposes of this study, the costs of these proposals were considered to be funded by rate payers entirely. DEQ anticipates that costs of these projects will be offset by direct allocations or other grants and could be impacted by phasing of the project. To account how varying degrees of grant funds can impact customer rates, three hypothetical scenarios for the level of funding were analyzed. They equal 25%, 50% and 100% of the project costs defined in Section 8. It is important to note this analysis does not account for costs for improvements, renewal, and extensions of water and wastewater systems internal to each provider. These are not defined at this time, and area thus not included.

This debt analysis acknowledges that significant funding has been provided to North Carolina under the Bipartisan Infrastructure Law and that the legislature has granted over $600 million in directed grant infrastructure funding to communities in the Study Area over the past three (3) legislative sessions. While we know that a portion of this funding will be used for projects covered in this report, the exact amount is currently not known. The following analysis and discussion do not reflect the impact of this funding on potential future debt issuance.

According to fiscal year 2022 data just over half of the water and wastewater utilities in the study group are already over the 4% LQI threshold used as an indicator for potential affordability issues. The analysis illustrates that funding only 25% of the estimated project costs defined in this study using user rate revenue pushes all but 7 water and wastewater utilities above this 4% threshold and several above 10% of LQI. A more comprehensive discussion is contained in Appendix C.

Key conclusions that can be drawn from the analysis are the following:

- Larger water and wastewater utilities with larger customer bases are typically best equipped to handle the investments and operating costs required to meet the needs of the Study Area. This suggests that meeting the needs of the Study area by leveraging the capacity of larger providers will be most financially viable.
- Without funding assistance (e.g., grants), which can come from a number of sources, and even with the economies of scale realized through regionalization, the existing customer bases within the Study Area will be burdened with utility rates that are not affordable.
- Further study of the required projects, their associated costs, other provider costs beyond what is captured in this study, regionalization and governance arrangements and funding sources is needed to better define the actual rate impacts to providers.
- The Division of Water Infrastructure's existing Viable Utility Program (VUP) can be leveraged to help ensure that local governments are poised to effectively regionalize, by administering grant funding and providing other value-added technical assistance and outreach to promote the financial and overall viability of government-owned water utilities within the study area.

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8. Capital Cost Summary and Cost Implications of Regionalization

8.1 Basis for Cost Estimates

Costs are developed for the alternatives for meeting the regional water supply, treatment and conveyance needs within the Study Area. There are other investments specific to public water and wastewater providers' individual distribution and collection systems that are common to all alternatives, thus are not reflected in this study and associated costs. However, these investments will impact a government unit's ability to fund regional improvements if warranted.

In general, DEQ understands that the cost of water and wastewater has not universally been captured in water utility rates as governmental enterprise funds receive grants and transfers from other sources. As this concept plan contemplates additional infrastructure it is anticipated that several sources of investment will be needed, including utility rates. The Bipartisan Infrastructure Law has provided additional water and wastewater funding since 2022, but this analysis was not able to integrate them due to ongoing grant distributions.

The costs developed for the regional alternatives reflect project costs, thus include assumptions for planning, engineering, and construction. The costs relied upon for this study are unit prices based on recent costs observed for similar projects in the region. Each individual project will have characteristics and nuances they may not be consistent with the typical costs applied, and further study and cost considerations will be necessary as a follow-up to this study. The costs provided are considered a Class 5 Concept Screening cost per the Association for the Advancement of Cost Engineering (AACE). The project definition for this level of cost is 0% to 2% complete, and the expected accuracy range is -20% to -50% and +30% to +100%. Cost estimates developed for concept screening-level project descriptions are routinely based on engineering judgement and a capacity-factored basis, such as the cost per gallon of treatment capacity. The costs presented in the following sections are expressed in 2024 dollars.

Table 8–1: Summary of Cost Assumptions

Construction Cost Assumptions	Unit	Construction Unit Cost	Total Project Unit Cost
Water Transmission and Wastewater Force Mains			
</= 30 inches in diameter	$/in-dia/ft	$20.00	$31.80
>/= 36 inches in diameter	$/In-dia/ft	$30.00	$47.70
Wastewater Pump Stations			
</= 7 MGD	$/gpd	$3.00	$4.50
> 7 MGD	$/gpd	$2.00	$3.00
Water Booster Pump Stations			
</= 10 MGD	$/gpd	$1.00	$1.50
>10 MGD	$/gpd	$0.75	$1.13
Water Treatment Plants			
Conventional Greenfield	$/gpd	$13.00	$19.50
Conventional Upgrade	$/gpd	$10.40	$15.60
Advanced Treatment for Contaminants of Emerging Concern	$/gpd	$1.50	$2.25
Wastewater Treatment Plants			
Limits of Technology Greenfield (</= 7 MGD)	$/gpd	$35.00	$52.50
Limits of Technology Greenfield (> 7 MGD)	$/gpd	$30.00	$45.00
Limits of Technology Upgrade (</= 7 MGD)	$/gpd	$28.00	$42.00
Limits of Technology Upgrade (> 7MGD)	$/gpd	$24.00	$36.00
Neuse River Basin Nitrogen Credit Purchase	$/pound	n/a	$525.00

Project Cost Adders	
A-1: Pipeline Easements	7.5% of Pipeline Construction Cost
A-2: Planning, Design and Construction Administration	15% of Construction Cost
A-3: Permits, Approvals, Regulatory Support	5% of Construction Cost
A-4: Legal and Administrative Support	5% of Construction Cost
Project Contingency	20% of Construction Costs Including Cost Adders A-1 Through A-4

8.2 Project Cost Estimates

Total project capital costs are estimated for each regionalization scenario using the cost assumptions provided in Table 8-1 and the following general engineering assumptions regarding infrastructure sizes and capacities:

- Water and wastewater transmission pipelines assume a maximum month peaking factor of 2.5 over average demands and a velocity of five feet per second or less. Pipe lengths are estimated using GIS to follow general corridors and not defined roadway or other rights of way.
- Water and wastewater treatment facilities are sized assuming a maximum day demand.

- Greenfield (i.e., new) treatment facilities are assumed to include complete liquid and solids treatment trains and typical ancillary facilities such as administration/operations buildings. Upgrades are estimated at 80 percent of greenfield facilities.
- Treatment facility and pipeline locations are presented as general concepts and are not intended to reflect specific recommendations or defined routes. Further study would be needed to determine the most practicable alternatives that consider project objectives and environmental considerations.
- Potential costs associated with the treatment of emerging contaminants in drinking water to meet EPA driving water standards was contemplated in this report. The costs of meeting these treatment standards will be influenced by what happens upstream, including reducing contamination at the industrial source and treatment for emerging contaminants in wastewater. This study does not quantify costs of treatment of emerging contaminants at wastewater treatment facilities, but facilities should contemplate costs associated with this treatment and prioritize source reduction.

Table 8-2 provides a summary of the Total Project Cost developed for each regional scenario by project area.

Table 8–2 Total Project Cost by Project Area

Project Area	Total Project Cost ($ Millions)	
	Water System	Wastewater System
Harnett County Area	$417	$26
Johnston County Area	$885	$1,712
Lee-Chatham Area		
Scenario 1	$1,539	$1,879
Scenario 2	$1,599	$1,799
Triad Area		
Scenario 1	$465	--
Scenario 2	$451	--
Scenario 1A	--	$2,532
Scenario 1B	--	$78
Scenario 2A	--	$2,754
Scenario 2B	--	$155
Southern Wake County Area		
Scenario 1	--	$720
Scenario 2	--	$879
Scenario 3	--	$564

8.3 Funding Resources and Recently State Awarded Grants

There are various funding options through DEQ's Division of Water Infrastructure that could be utilized to achieve the needs of North Carolina's utilities. Some of these funds might also be leveraged to achieve some of the recommendations in this report, when appropriate. The Division provides low-interest loans and grants for local governments and certain other non-profit entities for water infrastructure through the following programs:

- Clean Water State Revolving Fund (CWSRF): Provides low-interest loans to local government units to fund wastewater collection and treatment facilities as well as programs associated with estuary and non-point sources.
- Drinking Water State Revolving Fund (DWSRF): Provides low-interest loans to local government units, non-profit water corporations and investor-owned drinking water companies for projects to provide safe drinking water.
- Community Development Block Grant – Infrastructure Provides grants to local government units to address water and wastewater infrastructure needs in HUD qualified low-to-moderate income communities.
- State Wastewater & Drinking Water Reserve Programs: Provides grants for technical assistance and for construction of critical needs for wastewater collection systems, wastewater treatment works, and public water system projects.
- Merger/Regionalization Feasibility Grant Program: Provides grants for studies to evaluate the potential consolidation of two or more systems into one system and the potential physical interconnection with another system for regional wastewater treatment or regional water supply.
- Asset Inventory and Assessment Grant Program: Provides grants for developing asset inventories, condition assessment of critical assets, and other components of a comprehensive asset management program.
- Viable Utilities Program: Provides grant funding to build a path toward viable utility systems using long-term solutions for distressed water and wastewater units in North Carolina.

The Bipartisan Infrastructure Law/Infrastructure Investment and Jobs Act provides supplemental low-interest loans and principal forgiveness loans to local government units, non-profit water corporations and investor-owned drinking water companies for CWSRF and DWSRF projects. It is anticipated that the Bipartisan Infrastructure Law will provide North Carolina over $500 million over five years to supplement the DWSRF and CWSRF programs (excluding the amount available for PFAS and Lead Service Line Replacements), 49% of which will be offered as principal forgiveness. The Bipartisan Infrastructure Law provides transformational funding to address PFAS remediation, lead service line inventorying and replacement, resiliency, and prioritizes infrastructure needs in disadvantaged communities and disadvantaged areas.

- Bipartisan Infrastructure Law Emerging Contaminants (PFAS) Funding: Provides funding opportunities for planning/design and for construction of infrastructure projects to address

PFAS contamination in drinking water systems, publicly owned treatment works, and publicly owned landfills. It is anticipated that the Bipartisan Infrastructure Law will provide North Carolina over $120 million over five years to be administered by the State Revolving Fund program specifically to address emerging contaminants (i.e., PFAS); which will be offered as 100% principal forgiveness. Other state funding may also be offered to address PFAS contamination in the form of grant funding and low-interest loans with or without principal forgiveness. In addition, the Bipartisan Infrastructure Law Emerging Contaminants for Small and Disadvantaged Communities funding program will provide approximately $140 million over five years to address emerging contaminants in other small and disadvantaged communities' drinking water systems that are not eligible for DWSRF funds. Projects addressing PFAS vary and some examples include: planning and design to determine feasible alternatives to address PFAS contamination, extending water lines to connect homes and replace their PFAS-contaminated wells, interconnecting to purchase PFAS-free water from another water system, and installing granular activated carbon or reverse osmosis treatment processes. This is not an exhaustive list.

- Bipartisan Infrastructure Law DWSRF Lead Service Line Replacement Funding: Provides low-interest loans and principal forgiveness loans to inventory and/or replace lead service lines in drinking water systems of local government units, non-profit water companies, and investor-owned drinking water companies. In the first two of five years of funding, over $170 million in federal funds are available to North Carolina, 49% of which will be offered as principal forgiveness. The amount of federal funding available to North Carolina for the remaining three years of the federal funding program was not yet determined at the time of writing this report.

Other state and federal programs may also be available to local governments under certain circumstances. These include USDA-Rural Development, NC Commerce Utility Account and Golden LEAF Infrastructure Grants. This is not an exhaustive list.

In three session laws between 2021 and 2023, the State of North Carolina appropriated over $4.2 billion for drinking water, wastewater, and stormwater projects statewide, in addition to other federal and state funding made available for infrastructure projects. This includes the $600 million+ in directed grant infrastructure funding. As of early 2024, DWI is administering $702 million of grants and loans in planning and capital projects that are active in the study area. Other federal, state, and local funds are also being invested in the study area on infrastructure projects in addition to the funds being administered by DWI.

As NC develops and employs a strategy to regionalize water and wastewater opportunities, directed grants and other funding sources might be leveraged to ensure that infrastructure projects create regional value to meet the goals and address the challenges outlined in this report.

8.4 Cost and Implications of Not Regionalizing

As noted throughout this report and detailed in Table 8-1 the cost of implementing these regional recommendations is substantial and the impact on rate payers—without state or federal funding partners—could result in significant challenges. State coordination and funding are likely important factors to the success of these recommendations.

A qualitative discussion is necessary to consider the costs of not making regional infrastructure investments. As noted in Section 3, the Study Area has significant residential and industrial water and wastewater capacity demands. These water and wastewater demands are expected to grow as a result of the State's recent investment in transformative economic development projects. Stakeholders anticipate that in addition to the direct jobs associated with these recently announced projects, additional indirect and induced industries would positively impact these economic development investments and offer new tax revenue and utility rate payers.

Without addressing the challenges associated with stream impairments, limited water and wastewater capacities, and other issues that are addressed with regionalization, the State may not be able to realize the potential of its recent economic investment. If industries are not able to locate in the Study Area due to limited capacity and treatment issues, local communities can lose both general funds and enterprise funds that are relied upon to support current and future investment.

Section 9.2.1.1 discusses some of the financial drivers of consolidation and regionalization. Municipal partners can benefit from economies of scale in operational costs, beyond the initial capital investment. It is often less expensive for larger, more efficient plants to expand capacity and implement quality treatment to meet the needs because they can spread these costs across a larger customer base. Also, from a state investment perspective, it could be more cost effective to make a larger capital investment in a regional facility for certain treatment needs than implementing smaller, but similar capital investments in multiple smaller facilities with varying results.

9. Regionalization Governance Approaches

The role of governance for water and wastewater utilities provides the framework for how public water and wastewater providers offer effective, efficient and equitable services to the communities they serve, considering defined policies and regulatory requirements. There is a myriad of reasons that water and wastewater utilities decide to collaborate and coordinate services or consider a regional approach to accomplish their service goals. Emerging contaminants, affordability, and environmental justice must also be considered as part of the complexity of operating a water and wastewater utility. The governance structure must be defined to identify water and wastewater providers and consider options for service delivery and funding capacity. DEQ does not offer specific recommendations on how various regions identified in the Study Area should approach regional governance. DEQ remains willing to assist and provide technical assistance to local governments and entities wishing to engage in regionalization efforts.

Water and wastewater services are highly regulated by a complex body of federal, state and local rules and are overseen by multiple institutions and agencies, including the EPA, DEQ, NC Department of Health and Human Services (DHHS) and local agencies. These regulations have three primary goals: public health, environmental resource protection and protection of consumer rights.

In North Carolina, water and wastewater services have historically been provided by local governments, where governance often falls to the local elected bodies. This has allowed for high levels of public accountability, and it continues to be a successful model in most parts of the state. In North Carolina, water and wastewater utilities can also be governed by special authorities or districts, as defined by North Carolina General Statute (NCGS) Chapter 162A. Under the Authority Governance model, the utility organization owns assets and the organization's governing board approves contracts, adopts budgets, establishes rates and authorizes debt. As a state-chartered public entity, authorities or districts operate under the laws of the State of North Carolina concerning the conduct of business and their responsibilities and accountabilities. In other areas of the country, authorities are formed to de-politicize utility governance. In North Carolina, drivers, such as capacity, regulatory or financial, have in some cases led to a shift to form a different public entity. Unlike many other states, which have large numbers of separate water and wastewater authorities, the provision of public services by local governments is consistent with a culture that has developed since the 1930s. North Carolina local governments have a national reputation for being well-run and providing essential public services in a businesslike manner. Much of this can be attributed to the early adoption of the Council-Manager form of government that is now found in many cities in the state and in all 100 counties. The Local Government Commission, established within the Department of the State Treasurer in the 1930s due to the Great Depression, helps ensure the financial viability of local governments and utility systems.

Proposed and existing regulatory requirements, aging infrastructure, water resource adequacy and workforce capacity have posed great challenges for water and wastewater utilities to provide abundant, affordable and equitable services to their respective communities. Rising costs of commodities such as chemicals, equipment and technology add to the overall increase of maintenance and capital expenditures. Due to these pressures and the risks and consequences of critical infrastructure failures, water and wastewater utilities are considering regional options for service delivery and governance that may provide more economical benefits and increased levels of service and resilience. Further, ensuring equity of

service and reaching underserved communities are all part of the mission of water and wastewater providers in their efforts to protect public health and the environment.

The State of North Carolina has crafted enabling laws to establish and support regionalization efforts to suit a variety of local government needs, from fostering cooperation to allowing for the incorporation of separate local authorities. For example, jurisdictions may take advantage of inter-local agreements to develop partnerships and joint utilities, while still maintaining some separate governance responsibilities. A recent example is the Stowe Regional Water Resource Recovery Facility being constructed in the Charlotte region, which will serve three municipalities with one regional facility providing a high level of protection to the environment as well as providing economic benefits to the communities at large. In its most basic form, a regionalization effort may be a bulk water or wastewater purchase contract. More elaborate regional models have been established where utility systems have been combined, with either one governmental unit or a separate board governing the system.

9.1 Regional Organizational Structures

There are several approaches to regional collaborations for water and wastewater enterprises. Approaches include:

- Inter-local Agreements
- Consolidation
- Regional Agreements

Determining an approach requires a thoughtful process with consideration of both local and regional drivers that affect the community at large and will best meet service level needs into the future.

With cities as the primary providers of water and wastewater services in North Carolina, most systems are organized around political boundaries and vary in size and scope based on the population and development characteristics of the governmental unit. Many providers have found it advantageous to use some method of interlocal cooperation or regionalized approach for providing water and wastewater services to address issues surrounding financial sufficiency, adequate treatment capacity, and regulatory compliance. Models of cooperation range from emergency interconnections to complete consolidation. Ultimately, the benefit of the type of regionalization model selected should be considered when evaluating the costs and potential revenues associated with implementing a regional model. Many regionalization arrangements that exist today in North Carolina were accomplished by instituting inter-local agreements, which generally are less complex and costly to implement.

Many cities operate their systems pursuant to the public enterprise statutes found in Article 12 of NCGS Chapter 160A, which specifically allows a municipality to provide service beyond its corporate limits with no agreement other than a bulk sale agreement needed. This default statutory model contemplates regional service with the city as the provider and sole governing entity and is another way that utility service can be regionalized. Not every regional system is organized pursuant to an inter-local agreement or an authority. These organizational structures, along with their enabling statutes and their financial management authority are summarized in Table 9-1.

Table 9–1: Organizational Structures

Owner/Model	Enabling Statutes	Financial Management Authority
Municipality	G.S. 160A, Art.16	Municipal council/mayor
County	G.S. 153A, Art. 15	County board of commissioners
County water and sewer district	G.S. 162A, Art. 6	County board of commissioners
Water and sewer authority	G.S. 162A, Art. 1	Varies – typically appointed representatives from participating governments
Inter-local agreement	G.S. 160A; 460-462 G.S. 160A, Art. 20 G.S. 153A-278	Varies – typically elected officials from participating governments
Sanitary district	G.S. 130A, Art. 2, Pt. 2	Officials elected to sanitary district board by citizens within the district
Metropolitan water or sewer district	Water: G.S. 162A, Art. 4 Sewer: G.S. 162A Art. 5	Varies – typically appointed representatives from participating governments

Though many water and wastewater systems in the state now benefit from some form of regional cooperation and partnership, few are considered truly regionalized, with one system and a single governing body serving multiple jurisdictions.

9.2 Establishing Regionalized Systems

There are a number of options and tools to consider when evaluating regional systems. These include inter-local agreements, wholesale water/wastewater sales/purchase contracts, and consolidation. Drivers for regionalization include: 1) financial, 2) capacity, 3) regulatory, 4) environmental and 5) environmental justice considerations. There are several different legal structures from which regionalization efforts can evolve as discussed above, with the most common being municipal/county wholesale service agreements (also referred to as inter-local agreements) in North Carolina.

Table 9-2 highlights key regionalization considerations that will be discussed further below.

Table 9–2: Drivers and Regionalization Models

Drivers	Regionalization Models
Financial	Interconnection
Capacity	Shared Services
Regulatory	Wholesale Purchase
Environmental	Purchasing Treatment Capacity
Environmental Justice and Service Delivery Equity	Joint Ownership
	Full Consolidation

9.2.1 Drivers for Regionalization

9.2.1.1 Financial Drivers

The primary reason for consolidation is usually financial. The provision of water and wastewater services benefits economies of scale. This is best evidenced in treatment costs, where more than 90% of the cost elements are fixed. Capital and labor costs are partially fixed costs and are not directly related to the

amount of product treated. The variable cost of chemicals and electricity can be a large aggregate expense but not a significant cost per gallon treated. Siting, permitting, and constructing treatment plants is a process that is expensive and time-consuming. Therefore, it is often less expensive for water and wastewater utilities to expand treatment capacity at larger, more efficient plants and spread the fixed costs over a larger customer base. Assuming that enough water supply exists, and the assimilative capacity is available in a receiving stream, larger treatment facilities are much more economical than smaller facilities. The economies of scale found in the mix of fixed and variable costs when operating treatment plants, and the relatively low incremental cost of expanding an existing plant, yield the greatest potential for financial benefit in a utility consolidation overall. This is especially true in consideration of ensuring equitable and affordable water and wastewater services.

The other areas of expense are in the water distribution and/or wastewater collection systems and administration. While some savings can be realized in these areas, they are not as significant as the potential treatment savings. Distribution and collection costs are generally based on labor, materials and the geographic extents of the system needed to reach customers. Administrative cost savings are based on some personnel efficiency, but do not have large capital costs that can be avoided.

9.2.1.2 Capacity Drivers

A second significant reason for consolidations to take place is due to capacity needs. As already discussed, expanding an existing plant is typically more cost-effective than building a new plant. In addition, all cities and counties are not equal with regard to their supply of raw water and the ability for streams to receive wastewater without causing impairment. For regional growth and development to take place, water and wastewater capacity may need to be provided without regard for political jurisdictions. For both economic and availability reasons, regional or shared approaches to capacity issues are major consolidation drivers.

9.2.1.3 Regulatory Drivers

A third reason for water and wastewater utilities to consolidate is for planning and regulatory reasons. Meeting regulatory requirements for the provision of drinking water, treated wastewater, and disposal of biosolids from treatment facilities is expensive and takes a great deal of expertise and technical knowledge. Larger water and wastewater providers have the technical resources and benefit of economies of scale to meet these challenges. Regional approaches are particularly effective in water supply planning and for understanding the complexity of river systems interbasin transfer issues. Protecting drinking water sources involves upstream point and non-point discharges that transcend political boundaries. At some level, cooperation, consolidation and regional approaches to the planning and provision of water and wastewater services are always appropriate to consider and often cross multiple jurisdictions. A great example of a successful regional coordination is the Catawba Wateree Water Management Group (CWWMG). The CWWMG has 18 members each representing 17 public water utilities in North and South Carolina that have water intakes along the Catawba River, and one member representing Duke Energy who operates and owns the hydroelectric plant. The members work together to develop strategies and projects to address the Catawba River basin’s water challenges.

9.2.1.4 Environmental Drivers

In some cases, water and wastewater utilities choose to consolidate to mitigate environmental hazards, such as the byproducts of failing wastewater plants. This argument for consolidation is often considered with either the financial or regulatory drivers, as these hazards could be resource-intensive for smaller water and wastewater utilities to handle appropriately. Current examples are the regulations and potential regulations related to PFAS, revisions to the Lead and Copper Rule, and aging infrastructure. It is challenging for public water and wastewater providers to not only fund improvements for these regulatory drivers but also ensure that they are meeting growth needs in an environmentally acceptable fashion. Sometimes more environmentally sustainable solutions require new technologies that in the long run will be of greater benefit but may be difficult to initially fund through a capital program.

9.2.1.5 Environmental Justice and Service Delivery Equity Drivers

Environmental Justice is defined by EPA as "…the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws regulations and policies." In practical terms, this means that people have the right and are invited to participate in decisions or provide input regarding the environment they live in and their public health. In addition, this generally means that decision makers will intentionally seek out stakeholders from the community to gain their perspectives and incorporate them into the decisions being made.

Access to clean, safe and reliable water should be a fundamental human right for all people. Issues of affordability and rate increases impact underserved communities more than wealthier communities. Due to aging infrastructure and lack of funding to rehabilitate or replace these assets, there are communities in North Carolina that do not have the same quality and access to water and sanitary sewer service. Lack of access to clean water and safe water causes underserved communities to face more health and economic challenges. DEQ is committed to ensuring that underserved and disadvantaged communities are considered in funding for infrastructure improvements. DEQ receives state and federal funding that is distributed through grants and loans. Many federal funding programs include requirements that prioritize investment in projects that serve underserved communities. Regional approaches can provide a more holistic and strategic path to ensuring that funding is utilized effectively to meet the needs of underserved communities.

9.2.2 Regionalization Models

9.2.2.1 Interconnection

The interconnection of water or wastewater systems is a common method of cooperation that has helped to ensure the safe and continuous provision of essential services. Interconnections are encouraged by regulatory agencies and have resulted in adjacent utility systems across the state being physically connected to one another. Connecting to a neighboring utility's water supply is most often done to provide redundancy in cases of emergency. In times when there may be water quality issues, supply problems due to drought, peak needs due to emergencies or other episodic necessities, connecting public water systems can help mitigate potential problems.

9.2.2.2 Shared Services

While not yet formalized on a large scale, shared services have emerged as an effective way to address objectives for achieving cost reduction. Purchasing, insurance and risk management, equipment maintenance, information technology and many other internal services can be provided by one governmental entity to another. This cooperation often allows for reduced costs for both organizations. The existing Winston-Salem/Forsyth County joint consolidation agreement established a commission for dealing with water/wastewater projects. In this particular example, governance is in the form of a City/County Utility Commission. The utility operates as an enterprise fund. The facilities are owned by the City, the City pays the utility debt of the County and the City provides water and wastewater service to the consolidated areas.

9.2.2.3 Wholesale Purchases

The wholesale purchase of treated water and wastewater services is one of the most common cooperative models, which is advantageous when a regional provider has ample supply or capacity. Water supplies and wastewater collection and treatment systems do not naturally follow city or county boundaries. There is not always an adequate water supply or entire sewage drainage basin located completely within a governmental entity's jurisdiction. Purchasing these services as a wholesale customer, while remaining a retail provider to citizens within a city or county, is an approach that enables public water and wastewater providers to benefit from economies of scale, alternate locations for discharge points, natural water availability and drainage flows. There are several examples of this type of model in North Carolina. One specific one is the agreement between Charlotte Water and the Water and Sewer Authority of Cabarrus County (WSAAC) to purchase wastewater treatment capacity for a portion of Mecklenburg County's service area in the Rocky River sub-basin. Cabarrus County is better positioned to provide wastewater services to these areas than the existing Charlotte Water system. The Stowe Water Resource Recovery Facility along the Catawba River is another example of a regional agreement that utilizes this model. Purchasing Treatment Capacity.

Cooperation can also take the form of purchasing treatment capacity in water and wastewater facilities. The same natural limitations ameliorated through wholesale purchase can also be mitigated through a more formalized contractual arrangement, wherein one utility is guaranteed some level of capacity in another's treatment facility. This arrangement stipulates the conditions under which additional capacity may be purchased and provides a financial formula for calculating rates, operating costs, and capital costs.

9.2.2.4 Joint Ownership

While purchases of wholesale services or treatment capacity involve a single entity owning a facility and contractually selling some services, joint ownership of an entire treatment facility is another method of cooperation. Such an arrangement provides additional guarantees and accountability to all entities, but can complicate regulatory, legal, and governance issues.

9.2.2.5 Full Consolidation

While interconnections, shared services, and wholesale purchase agreements involve discussion and negotiation among willing participants, these arrangements exist free of the complexity of ownership, control, and governance issues that are present when systems are consolidated. There are several reasons for local governments to bypass these efforts and move to a utility consolidation, which would typically result in a change of ownership and governance. This consolidation can take place as either a cooperative arrangement with inter-local agreements between governmental bodies or by forming a separate entity in accordance with enabling legislation. Such consolidations or regional approaches are more complicated to implement and carry significant upfront costs to fully integrate technology systems, workforce, facilities, etc., but they do have advantages in the form of cost savings and equitable service levels for all communities served, and they allow regions to address capacity and regulatory issues on a larger scale. Agreement on ownership and governance models becomes critical to the success of these efforts. Truly regional approaches based on natural drainage patterns that may cross jurisdictional boundaries can be very successful with cooperation and collaboration across all public entities involved.

9.3 Transitioning to a Regionalized System

In evaluating the experiences of a number of water and wastewater utilities that have transitioned to become regional service providers, there are several common elements to examine and compare. These elements include the drivers for regionalization, the legal structure of the regional utility, governance models, asset ownership, and financial authority of the expanded utility. Over the last few years, there is much greater recognition of the need to find solutions that maintain affordable rates and water access for all people, which adds a driver of environmental justice and service delivery equity to the existing financial, capacity, regulatory, and environmental drivers.

Moving forward requires some intentional steps for determining the most appropriate approach and which model makes sense in evaluating a specific region's goals. In the particular geography where this report is focused, there may be multiple approaches to consider as a whole or as subsets. In order to effectively determine a regional model and technical approach, it is recommended that the following steps be followed:

- Convene a coalition of interested jurisdictions.
- Develop a memorandum of understanding (MOU) that provides a structured agreement for undertaking a process to develop a broad list of scenarios.
- Evaluate and assess drivers and considerations to develop workable and reliable regional scenarios.
- Develop a formal and binding agreement outlining the chosen regional governance model(s), and plan for implementation.

9.4 Governance

Water and Wastewater utilities in North Carolina tend to be governed in one of two ways. The first is by elected bodies, such as a city council or a county commission. Water and wastewater utilities operated as

separate authorities tend to be governed by a board of directors, where members of the board are either elected by the general population or appointed by one or several local governments. Neither of these governance structures is inherently superior to the other—the level of effectiveness of governance is more dependent on the specific circumstances of each utility. Asset ownership tends to follow the legal governance structure, with assets being primarily owned by the controlling jurisdiction (city- or county-elected bodies), authorities or districts. Governing bodies have a combination of two major types of authority: debt issuance on behalf of the organization and rate setting authority. Some water and wastewater utilities also have additional citizen groups that serve in an advisory capacity. Authority boards tend to have debt issuance and rate setting authority, while water and wastewater utilities that operate under a city council or county commissioners' governance structure often appoint advisory boards to work on utility-specific issues.

Both models can contribute to North Carolina's utility performance. Regional solutions provide a benefit to ensuring that the most sustainable solutions are considered to meet regulatory and environmental requirements while ensuring support of economic growth and affordable services to the community at large.

9.4.1 City and County Governance

Today, there are more than 500 city- or county-operated systems and some special districts throughout the state. In North Carolina, cities and counties are authorized to operate water and wastewater systems and to enter into inter-local agreements or form joint management agencies to work cooperatively with each other. Most consolidations have taken this form when two or more government units agree that one entity will own, manage, or operate a consolidated system on behalf of all participating government units. The legal governing body is the city council or the board of county commissioners; however, boards may be established that will take on various governance responsibilities.

This model is also consistent with a belief that water and wastewater services should be linked to the public values and philosophies that are part of a community's vision and often expressed in overall strategic plans. Incorporating water and wastewater services into community development, economic development, sustainability, affordability and other community plans is more easily accomplished with the governmental model. Conversely, this model is not as effective in areas where there is a lack of professional management or a lack of support from what is often a highly politicized governing board. This situation is often seen in other areas of the country and can lead to the adoption of alternate governance models.

The overarching philosophy for this type of local governance is accountability through a political process. Owing credit to the state's strong, well-managed local governments, this model has remained extremely effective, as indicated by utility performance, financial sufficiency, and environmental quality in North Carolina. As a result, separate authorities and privately-run water and wastewater utilities are rare in North Carolina, as compared to other parts of the country.

9.4.2 Authority Governance

The authority model mimics that of a business, generally with an independent Board of Directors. The focus of this model is financial sustainability, in addition to public accountability, and the desire that the

water and wastewater utilities operate more like a private business than a governmental entity. It is believed that rate setting and establishing service levels is more easily accomplished through an independent body that is not subjected to the kind of political pressures that elected officials may experience. Successful examples of an authority governance in North Carolina are:

- Cape Fear Public Utility Authority with a board that consists of 11 seats, with four of those being elected officials.
- Neuse Regional Water and Sewer Authority – active metered accounts are the basis for board representation, so it is one of the only water and wastewater utilities in the state where the board composition may change if population shifts.

9.5 Regionalization Resources

The University of North Carolina's School of Government (SOG) provides expertise and resources to assist local governments in exploring, planning and implementing regionalization of services. The SOG, and its Environmental Finance Center (EFC) can facilitate groups of stakeholders representing different local governments to help select appropriate governance models and to develop legal agreements that reflect their specific interests.

- The Division of Water Infrastructure's Viable Utility Program coordinates and helps to facilitate several developing regional water and wastewater partnerships across the state. Formal partnerships have received grant funding from DWI to conducts Merger and Regionalization Feasibility (MRF) studies, have coordinated asset assessments of partner local governments, and have funded infrastructure projects of mutual benefit to the partnership needs.

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10. Recommendations

10.1 General

10.1.1 Outreach to Stakeholders to Build Consensus for Technical Solutions

The work completed for this study was informed by a variety of sources, including dialogue with various stakeholders within the Study Area to better understand their needs and future plans. Although discussions occurred with representatives of various stakeholders, the report is not intended to suggest or imply there is a consensus opinion of stakeholders for any scenarios or recommendations. Therefore, where there is a technical basis for scenarios or improvements, outreach to the impacted stakeholders is necessary to further develop and consider the planning approaches outlined in the study.

In addition to the technical evaluations related to water and wastewater service, there are financial, political and governance considerations that warrant further consideration.

10.1.2 Review of Ongoing Projects that may Conflict with Regional Solutions

The scenarios and improvements presented in this study do not necessarily coincide with the ongoing work or planning being completed by various stakeholders. Where there appears to be a basis for consideration of solutions that differ from current planning, a review of the plans and the concepts presented herein is warranted.

10.1.3 Study and Modeling of Hydrologic Implications for 2050 Conditions

The water supply capacities relied upon for this study are based on the best available information from a variety of sources and with a varying degree of certainty. Given this study is a forward-looking evaluation through 2050, we recommend this planning effort be followed by a comprehensive hydrologic study of the concepts proposed. Some of the yield determinations relied upon, especially for run-of-river supplies, are based on USGS statistical results based on historical data collected by USGS. In some cases, the values presented are based on statistical analyses conducted many years ago and therefore do not represent the current conditions.

Continued population and economic growth throughout the study corridor will place additional demands on the region's water supplies. It is imperative that informed decisions are made that balance allowable withdrawals from public water supplies with environmental protection. For run-of-river supplies especially, the 7-day, 10-year low-flow metric, statistically referred to as the 7Q10, is a powerful determinant of the maximum rate of withdrawal allowed for public water systems. Total design withdrawal is typically limited to one-fifth of the 7Q10 of the contributing stream as specified in 15A NCAC 01C.408(2)(b). Higher rates of withdrawal require additional in-stream flow studies to determine appropriate withdrawals that are mindful of impacts to the environment. As such, the determination or estimation of the 7Q10 itself is consequential. Currently, these statistical determinations are made by the USGS, as they are the owners and managers of the gages and data collected. Conditions which existed in

the historical record will not necessarily continue in the future. Aware of this fact, the USGS, working in coordination with DWR, has refined the period of records for the statistical analyses to better represent the current operational conditions and constraints. We recommend careful and prudent use of the DWR-managed OASIS hydrologic model for comprehensive planning evaluations. The OASIS model is built on an unimpaired streamflow record which reasonably accounts for the above-mentioned operational factors, while integrating existing datasets for historical withdrawals and discharges. The OASIS hydrologic model is a powerful analytical tool for planning purposes including estimating impacts resulting from regulatory decisions; however, it is not intended to replace or supersede the existing methodologies for withdrawal limitation decisions. It is advisable to use caution when applying this model to make regulatory decisions, as it is currently not allowed for that purpose.

10.1.4 Integration of Water Reuse Programs to Reduce on Water Supply Sources

Water reuse should be actively pursued to address both water supply demands and increased wastewater loadings. The potential growth forecasted by the 421 Study Project will significantly increase water demands and wastewater discharges. Water reuse could provide a buffer if growth exceeds expectations by supplementing the available surface water supply and reducing wastewater returns and associated pollutant loadings. This results in less withdrawal and discharge pressures on surface water resources (i.e., rivers, streams, and reservoirs) extending the length of time for conventional wastewater treatment systems to meet existing nutrient loading targets while adding resilience to the water resource supplies during drought periods due to the steady nature of wastewater supply. Water reuse is used in North Carolina, but education and incentives may be required for more widespread adoption. It is significantly more cost-effective to incorporate reuse into infrastructure as it is being built versus trying to retrofit afterwards.

10.1.5 Site-Specific Studies of Water Quality Implications for Recommended Scenarios

The scenarios developed as part of this study are based on the assumption that site-specific studies will support the discharge of wastewater at the general locations defined. Many factors influence the suitability of surface waters for the assimilation of treated wastewater discharges. These include both instream conditions and the quality and characteristics of the treated effluent.

Given the scope of this study and its limited duration, a broad assumption that wastewater treatment to Limits of Technology as discussed in Section 4 would be suitable for future wastewater treatment and discharges. Influent pollutant characteristics and loads will impact the required treatment.

In addition, the EPA is currently completing a basinwide water quality study. Pending the outcome of that study, the Team recommends an overall review of the findings of this study to ensure the nutrient strategy remains applicable to the Cape Fear River basin.

Where scenarios and improvements are recommended that appear feasible, favorable and garner the support of the stakeholders and regulatory community, site-specific studies are recommended to further assess the receiving stream and likely wastewater characteristics to better understand the suitability of the option and the level or treatment required to achieve the necessary water quality goals.

10.1.6 Detailed Review of Financial Implications on Stakeholders for Recommended Scenarios

The scenarios developed as part of this study are conceptual and the costs assumed for each are based on consistent high-level unit prices developed from recent costs observed for similar facilities. The site-specific studies recommended above will better inform what facilities are required and should be relied upon for a more detailed evaluation of project costs.

In addition to project costs, the financial condition of the individual stakeholders and their ability to take on additional investments while maintaining affordable utility rates will be important for individual stakeholders and the region as a whole. DEQ anticipates that many of these recommendations will require support from State and Federal funding partners. The financial review completed as part of this study was limited and based on publicly available data and does not capture changes in their financial outlook since the data was published. There is also wide variability amongst stakeholders related to the impacts of future improvements and associated costs specific to their systems that will need to be captured in their financial planning and rates studies. While this study provided a general view of the individual stakeholders' and provides some perspective on the impacts of the facilities required to meet the needs of the Study Area through 2050, a more detailed financial assessment is required to ensure current data and comprehensive future costs for individual stakeholders are accounted for.

Given that affordability varies both between and within the various communities in the study area, decision-makers should consider whether and how direct customer subsidies could be used to address the ability of the most vulnerable populations to pay a greater share of their income to support regional water and wastewater services. For example, the Low-Income Household Water Assistance Program (LIHWAP)[1] was an emergency program designed to assist households with paying for drinking water and/or wastewater services in response to needs precipitated by the COVID-19 pandemic administered through the U.S. Department of Health & Human Services.

10.1.7 Incorporation of Phasing and Timing of Improvements for Recommended Scenarios

The study identifies the facilities required through 2050 and conceptual-level costs are estimated for those improvements required throughout the planning horizon. These costs are defined as the total costs in 2024 dollars for the recommended facilities needed over the planning horizon. In practice, these facilities will be constructed in phases as the water demands and wastewater flows develop.

Many of the projects' present challenges to their implementation, even if desired by stakeholders and the regulatory community, and can take years to plan, design, permit and construct. While the planning horizon of 2050 is nearly 25 years out, implementation durations on the order of 10 years are not unreasonable for some of these projects. Based on recent economic activity, we would expect much of the growth anticipated to be contemplated within the next decade.

Where this conceptual-level study identifies favorable scenarios and solutions, it is recommended that further study of the needs and implementation schedule for specific project elements be completed. This additional study will help better define the timing of expenditures and ensure the project elements are completed in a sequence that meets the needs of the area.

[1] https://www.acf.hhs.gov/ocs/programs/lihwap

10.1.8 Detailed Project Planning and Cost Development

The projects defined in this study are large and complex. Therefore, it is recommended that more detailed engineering studies be conducted for each project element to better define the scope of the projects and their associated costs. This will lead to a more precise cost estimation and identification of factors that could potentially impact their feasibility and implementation.

10.1.9 Consideration of Flood Exposure for Existing and Proposed Facilities

Some existing facilities within the Study Area are within or adjacent to flood prone areas. It is recommended that prior to finalizing plans for additional investments in water and wastewater facilities, the flood potential is examined further to ensure the long-term resiliency is incorporated into the proposed planning and design of new or improved facilities.

10.2 Study Area Recommendations for Water and Wastewater Facilities Through 2050

10.2.1 Johnston County

10.2.1.1 Water Supply and Treatment

As part of ongoing long-term water supply studies being completed by Johnston County Public Utilities, a broad range of water supply options were considered. The study assumes that Johnston County continues to be a regional provider for water to nearly all of the county and its municipalities. While there is some existing regionalization with water providers to the north and south of Johnston County, the location of the Johnston County relative to the river basin boundaries makes the water supply option within the Neuse River basin favorable. DEQ's recommends consideration of the following water supply and treatment alternatives for the 2050 planning horizon:

- Construct a new intake, raw water pump station and 21 MGD water treatment facility (Lower Neuse WTP) for supply of Johnston County and its regional partners. The project includes the incorporation of an 0.8 billion gallon (BG) quarry currently owned by Johnston County, increasing the yield above what could be sustained from a run-of-river intake alone.
- Finished water piping is required to supply the increased water demands between the proposed Lower Neuse WTP and the existing water system supplying Johnston County and its regional customers.
- The potential exists for Johnston County to secure an additional quarry near the proposed WTP that has a volume on the order of 8 billion gallons (BG). While the timing of this storage is uncertain, and the study does not predict it is needed before 2050, this is a noteworthy consideration in the near-term decisions related to supplying Johnston County. The recommended facility positions Johnston County to significantly increase its yield from the source in future years.

- The Town of Benson is currently supplied primarily by the City of Dunn, with plans to continue into the future. Given the proximity of the two towns and the fact that Dunn appears to have sufficient water supply to meet its needs as well as those of Benson, no change to that approach appears warranted. However, it should be noted, the yields from other run-of-river intakes on the Cape Fear River have been reduced from prior estimates, as statistics change over time when more data is added. The above recommended hydrologic studies will determine whether the anticipated yield for Dunn will need to be lowered. If Dunn's yield is decreased and supplying Benson becomes problematic, supplying Benson from the Johnston County regional facilities should be considered.

10.2.1.2 Wastewater Treatment

Wastewater treatment in the County is provided by the Town of Clayton, Johnston County Public Utilities, the Town of Kenly, the Town of Princeton and the Town of Benson. Given the proximity of the systems within Johnston County, there does not appear to be a driver or benefits for broad changes to where the wastewater flows are treated.

- The Town of Clayton is currently constructing a new WWTP facility with an initial capacity of 6 MGD, and they have an NPDES permit for expansion to 10 MGD. Further expansion of the facility to 12.6 MGD in 2050 is recommended to accommodate the projected flows. Expansion beyond 10 MGD will require approximately 25,225 lbs of additional nitrogen allocation for Clayton's wastewater facility based on meeting a total nitrogen concentration of 3.0 mg/L.

- Johnston County operates the existing Central WWTP with a capacity of 9.5 MGD and is constructing the new 210 WWTP with an initial capacity of 4 MGD, for a combined capacity of 13.5 MGD. Plans to expand the 210 WWTP to 8 MGD are ongoing. The Central WWTP is an older facility and is subject to flooding. It is recommended Johnston County proceed with its plans to progressively reduce the capacity at the Central WWTP and increase the capacity at the new 210 WWTP. The 2050 projection for wastewater capacity in Johnston County is 26.6 MGD. Therefore, an expansion of the 210 WWTP to an ultimate capacity of 27 MGD is assumed for 2050. Additional nitrogen allocation will be required for the expansion of the 210 WWTP facility for the 2050 conditions. With a doubling of the permitted flow from the current 13.5 MGD to 27 MGD, 123,300 lbs of additional nitrogen are required if the facility achieves a total nitrogen concentration of 3.0 mg/L.

- The Town of Kenly wastewater projections indicate a required wastewater facility capacity of 0.6 MGD by 2050, and its current permitted WWTP capacity of 0.630 MGD. Therefore, depending on how wastewater flows increase with time, it may be necessary to consider expansion of that facility toward the end of the planning horizon. While the potential exists to send wastewater from the Kenly facility to the Johnston County 210 WWTP, given the projected flows and the long distance between the two facilities, there does not appear to be a driver at this level of study to redirect Kenly's wastewater to the 210 WWTP.

- The Town of Princeton wastewater projections indicate a required wastewater facility capacity of 0.42 MGD by 2050. Since speculative limits were issued for potential expansion to 0.6 and 0.95 MGD, for the purpose of this study, it is assumed their WWTP is expanded to 0.6 MGD.

Like Kenly, there is a possibility of sending wastewater to the 210 WWTP, however, the proximity of the facilities to Johnston County facilities may not be favorable for conveyance of wastewater, therefore, expansion is assumed for this study.

- The Town of Benson wastewater flows are expected to exceed the plant's existing permitted limit of 1.9 MGD by 2050 and we recommend the Town evaluate options for additional wastewater capacity and effluent discharge locations for the 2050 projected flow of 3.1 MGD. The suitability of effluent discharge options may influence the water supply source for Benson to address IBT concerns.

10.2.2 Harnett County

10.2.2.1 Water Supply and Treatment

Harnett County, and many regional customers outside of the County, are supplied from the Cape Fear River, via the Harnett Regional WTP and Dunn's A.B. Uzzle WTP. The stated supply capacity from each is adequate to meet the needs of Harnett County through 2050; however, there is virtually no excess supply capacity. As noted previously, the yield at the Lillington intake for Harnett Regional will likely be reduced from prior estimates, and it is unclear if the stated yields for the future intake at Erwin and the Dunn supply warrant reduction as well. For the purpose of this study, it is assumed the yields remain as reported. Recommended water supply and treatment facilities through 2050 are the following:

- Additional water treatment capacity will be required in Erwin for Harnett Regional. The planned capacity is 12 MGD.
- Expansion of Dunn's A.B. Uzzle WTP from 8 MGD to 10 MGD is recommended.
- For the purpose of this study, advanced treatment for PFAS removal is assumed for the existing and future water treatment capacities.
- DEQ encourages proactive water reuse for economic development projects and municipal purposes, when possible.
- Given that Harnett County has marginally adequate yield reported for its combined supply requirements, and hydrologic studies are recommended to determine whether the stated yields warrant revision, we offer the following recommendations for addressing a deficit should it occur.
    - Harnett Regional is under contract to supply Johnston County 2 MGD of water. If a deficit with the Harnett Regional supply is projected, consideration should be given to eliminating that transfer and having Johnston County increase capacity to meet that need.
    - If further reductions in supply from the Cape Fear River are warranted, Johnston County could supply the Town of Benson in lieu of the City of Dunn.
    - Harnett Regional has several significant contracts outside the Study Area. If a deficit in supply occurs, a review of those contracts and their amounts is recommended to

determine if any reductions in the contract amounts are warranted based on actual usage.

10.2.2.2 Wastewater Treatment

This study shows that with the pending expansion of Harnett Regional North WWTP, and the existing capacity at its South WWTP, there is adequate capacity to meet Harnett Regional's projected wastewater flows.

DEQ anticipates a future request for the City of Dunn's WWTP facility will require expansion in addition to the ongoing facility improvement. If possible, the parties should consider an expansion of the facility by 0.5 MGD to address the projected needs within Dunn. It is noted in prior sections that substantial plant capacity is projected to be recovered via collection and treatment facility improvements.

10.2.3 Lee/Chatham Counties

10.2.3.1 Water Supply and Treatment (Scenario 1)

The City of Sanford is currently expanding its water treatment facilities and will be a major water provider for Lee, Chatham and Southern Wake Counties. If future studies confirm this assertion, DEQ anticipates that Sanford's ongoing regionalization approach will include the following next steps for the planning horizon through 2050:

- Expand the Sanford WTP to 48 MGD, from the current planned expansion from 12 MGD to 30 MGD. The facility should include advanced treatment for removal of contaminants of emerging concern.
- Expand the Siler City WTP from 4 MGD to 6 MGD to access the full yield of the existing water supply reservoir.
- Maintain the 2.8 MGD of water treatment capacity at the Chatham County WTP.
- Maintain the 3 MGD of supply to Wolfspeed from the Asheboro WTP.
- Additional water supply required, beyond what is available from Sanford, Chatham County WTP Siler City WTP and Asheboro for Wolfspeed, 15 MGD, could be supplied from the Western Intake Partnership (WIP) facility. This option could offer solutions to improve connectivity and reliability of the water supply. Another option would include accessing the existing Jordan Lake Allocations for Pittsboro and Chatham County at the Sanford intake and WTP.
- Decommission the 2 MGD Pittsboro WTP. The facility requires significant additional improvements, beyond the granular activated carbon facilities installed, to address other pollutants in the Haw River. Improved water quality is available downstream in Jordan Lake and in the Cape Fear River.

10.2.3.2 Wastewater Treatment (Scenario 2)

The City of Sanford is currently planning for regional wastewater facilities to serve Lee County and much of Chatham County. If additional review confirms the need, DEQ anticipates Sanford's plans could address the project need for the area. Sanford's plan includes the following through the 2050 planning horizon:

- Develop new Pittsboro WWTP facilities with a combined capacity of 4 MGD with the Chatham Park WWTP.
- Maintain Big Buffalo WWTP at 12 MGD.
- Develop a new Hughes Creek WWTP in the north portion of Lee County with a capacity of 14 MGD. The facility will discharge its effluent to the Cape Fear River below Buckhorn Dam. DEQ has requested modeling for this option, as of the date of this report.
- Expand the Siler City WWTP from 4 to 8 MGD as planned. Additional wastewater generated that cannot be treated by the Siler City WWTP is proposed to be conveyed to the Sanford wastewater treatment facilities.
- Pump 7.2 MGD wastewater from the Pittsboro system to Big Buffalo WWTP.
- This scenario preserves Pittsboro's total nitrogen allocation to the Haw River, limiting the total nitrogen transferred to the Big Buffalo and new Hughes's Creek WWTPs.

10.2.4 Southern Wake County (Holly Springs and Fuquay-Varina)

10.2.4.1 Water Supply and Treatment

The existing and planned treatment facilities and supply from Sanford and Harnett County are available to meet the 2050 water supply needs and a continuation of these regionalization efforts is recommended.

The regionalization of water supply from Harnett County to Holly Springs is existing and should remain as water supply sources for each system.

10.2.4.2 Wastewater Treatment

Additional wastewater treatment capacity is anticipated for Holly Springs. Previous negotiations between the Town of Cary at the Western Wake Regional Water Reclamation Facility (WWRWRF) have not been previously successful for the northwestern portion of Holly Springs' service area, but there is indication that collaboration may be possible. The proximity of the Holly Springs' service area is favorable for the WWRWRF to accept a portion of Holly Springs' flow; thus, this option warrants further consideration from a financial and environmental perspective. This could be a viable long-term strategy for Holly Springs or an option to accommodate certain economic development projects should capacity or treatment needs present challenges.

Since an expanded discharge to Utley Creek would be problematic for continued industrial growth in the area, an alternative to sending wastewater to Cary's WWRWRF is to expand the Utley Creek WWTP and

send all of the effluent to the Cape Fear River (CFR). This alternative would also address DWR concerns over the long-term viability of the existing discharge location.

10.2.5 Triad (Randolph and Guilford Counties)

10.2.5.1 Water Supply and Treatment (Scenario 1)

The recommended scenario for additional water supply for the Triad includes expanding the existing PTRWA to supply much of the area. the Study points to the following potential improvements:

- Scenario 1 is the preferred scenario identified by Hazen for the Piedmont Triad area. The Piedmont Triad Regional Water Authority (PTRWA) is an existing Authority operating on Randleman Lake and providing water to utility partners in the area. The regional scenario will take advantage of an ongoing upgrade to the facility to expand to 24 MGD and install reduction technology to remove 1,4-Dioxane in their raw water supply.
- PTRWA would continue providing water to the customers they currently serve in Guilford County and expand their supply to the City of Greensboro to meet future demand.
- Asheboro WTP will maximize their 9.36 MGD supply from the Yadkin River basin and to support the Randolph County region and purchase any additional supply required to feed eastern Randolph County from PTRWA.
- Franklinville, Ramseur, and Liberty would be supplied from a water line installed along US Hwy 64 to supply water from Asheboro to Chatham County. The State of North Carolina has committed funds for a water line from Asheboro to Wolfspeed in Chatham County.
- Liberty would be connected to the City of Greensboro's water system near the Toyota facility to be an emergency interconnection for the eastern communities in Randolph County.
- Asheboro and PTRWA would become the primary drinking water providers in Randolph County and by 2050, the Ramseur and Liberty water systems would be decommissioned.

There are projects that are currently in progress that could be impacted by these recommendations. We recognize that due to project timing some alterations might be required, but we do encourage parties to consider the values created in these options. The specific projects that warrant review in light of this project include:

- The $55 million investment in infrastructure for Asheboro to provide 3MGD supply to Chatham County. For Scenario 1 to succeed, the size of the pipeline along US Hwy 64 should be reassessed to convey at least 7 MGD as far as Franklinville, 6 MGD from Franklinville to Ramseur and 3 MGD from Ramseur to Chatham County.
- Randolph County has committed funds to design the upgrades to the Ramseur WTP, this project should be reevaluated if these recommendations are followed. This additional work and associated expenses related to the project would be required if they do not interconnect as proposed.

- Randolph County completed a master plan to effectively use $85 million of investment to infrastructure to accommodate anticipated growth by economic development sites. The plan includes water supply to Liberty from the Ramseur WTP. This could be eliminated if Liberty could be supplied by the City of Greensboro/PTRWA supply on NC Hwy 62. This option may require improvements to the Greensboro distribution system. A study is ongoing to determine what may be required under a separate contract with the City and is not complete, therefore these costs are not included herein.

10.2.5.2 Wastewater Treatment (Scenario 1A/1B)

Regionalize systems as described and shown in Scenario 1 for the Triad. Key elements include the following:

- The Plan includes a recommendation for a regional strategy to address the future capacity concerns for the City of Greensboro and the smaller communities anticipating growth in eastern Randolph County. The City of Greensboro will face capacity limitations in the next 20 years at the T.Z. Osborne WRF and has reached their effluent capacity limitations in the Haw River sub-basin at 60 MGD. To promote future growth, regional opportunities were developed in this Plan for Greensboro to partner with facilities in the Deep River sub-basin. Since Greensboro received a significant portion of their water supply from the Deep River sub-basin through their partnership with PTRWA, an interbasin transfer is not anticipated to be a concern for this solution.

- Through conversations with stakeholders, the Team learned the City of Asheboro may be interested in participating in a regional solution. As presented in Scenario 1A/2A, the City of Greensboro, High Point, Randleman and Asheboro would partner to expand the Asheboro WWTP. The project would include infrastructure to pump 6 MGD from High Point, 12 MGD from Greensboro to the expanded Asheboro WWTP, planned for a capacity of 30 MGD.

- Upgrades would be required to the High Point - Eastside WWTP and the Ramseur WWTP. For Eastside WWTP, the upgrade will be to meet more stringent nutrient limits, however, an expansion to 32 MGD would be avoided. The Ramseur WWTP would be expanded to treat waste from Ramseur and Franklinville.

- The Liberty WWTP would be decommissioned and all sewer sent to the new Greensboro transfer pump station at the Toyota Manufacturing facility. In addition, this solution would also include the decommissioning of the Randleman WWTP, Seagrove-Ulah Metro Water District WWTP, and the Town of Franklinville WWTP.

- Projects currently in progress that warrant reconsideration under these recommendations include: Randolph County completed a master plan to effectively use $85 million of investment to infrastructure to accommodate anticipated growth by economic development sites. The plan includes sewer conveyance infrastructure to convey flow due to growth in Liberty to the Ramseur WWTP. The Plan’s proposed solutions would decrease the investment required by partnering with the City of Greensboro, potentially freeing up these funds for other beneficial projects for the region.

DEQ believes that the proposed scenario for water and wastewater solutions offer the best value for the region and, should additional studies confirm these assertions, it a viable option that, on balance, offers the greatest environmental, financial, and economic value for the entire region. We identify alternatives that will offer regional improvements and, if implemented, would likely have positive impacts on the region, albeit to some lesser degree. This study acknowledges that in order for improvements to be made, coordination and buy-in from local governments are necessary and there could be other significant factors in those decisions not discussed in this report.

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Appendix A: Detailed Cost Estimates

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NC Department of Environmental Quality
Regional Water and Wastewater Infrastructure Concept Plan
Total Cost of Recommended Upgrades - SUMMARY
April 30, 2024 Update

Water/Wastewater Provider	Scenario	Water	Wastewater	Total W/WW Costs
Johnston County	As Recommended for Water and Wastewater	$ 884,500,000	$ 1,711,900,000	$ 2,596,400,000
Harnett County	As Recommended for Water and Wastewater	$ 417,000,000	$ 26,300,000	$ 443,300,000
Lee/Chatham/Southern Wake County	Scenarios LC-W1, LC-WW1, SW-WW1	$ 1,539,300,000	$ 2,519,300,000	$ 4,058,600,000
Triad	Scenarios T-W1, T-WW1, T-WW1B	$ 465,700,000	$ 2,610,000,000	$ 3,075,700,000
			Total for Study Area	**$ 10,174,000,000**

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Regional Water and Wastewater Infrastructure Concept Plan
Total Project Cost - Harnett County Area
April 30, 2024 Update

Item No.	Description of Improvement	Pipe Length (ft)	Pipe Diameter (in)	Facility Size (mgd)	Unit	Unit Cost	Total Project Cost	Notes
Water Improvements								
H-W1	New HRW WTP at Erwin	-	-	12	$/gal	$ 19.50	$ 234,000,000	
H-W2	Advanced Treatment for CEC at HRW Erwin WTP	-	-	12	$/gal	$ 2.25	$ 27,000,000	
H-W3	Advanced Treatment for CEC at HR WTP	-	-	42	$/in-dia	$ 2.25	$ 94,500,000	
H-W4	Expansion of Dunn's A.B. Uzzle WTP from 8 MGD to 10 MGD	-	-	2	$/gal	$ 19.50	$ 39,000,000	
H-W5	Advanced Treatment for CEC at Dunn's A.B. Uzzle WTP	-	-	10	$/gal	$ 2.25	$ 22,500,000	
				Subtotal of Water Improvements:			**$ 417,000,000**	
Wastewater Improvements								
H-WW1	Expanded Capacity for Dunn Black River WWTP	-	-	0.50	$/gal	$ 52.50	$ 26,300,000	
				Subtotal of Wastewater Improvements:			**$ 26,300,000**	

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NC Department of Environmental Quality
Regional Water and Wastewater Infrastructure Concept Plan
Total Project Cost - Johnston County Area
April 30, 2024 Update

Item No.	Description of Improvement	Pipe Length (ft)	Pipe Diameter (in)	Facility Size (mgd)	Unit	Unit Cost	Total Project Cost	Notes
Water Improvements								
Johnston County Public Utilities								
J-W1	New Lower Neuse WTP Capacity	-	-	21	$/gal	$ 19.50	$ 409,500,000	Capacity based on a total MDD=45.2, less 6.5 mgd of purchases and 18 mgd at the TGB WTP
J-W2	Advanced Treatment for CEC at Lower Neuse WTP	-	-	21	$/gal	$ 2.25	$ 47,300,000	
J-W3	Raw Water Piping - Lower Neuse to New WTP	62,500	42	-	$/in-dia	$ 47.70	$ 125,200,000	Ref Hazen LTWSP for Johnston County
J-W4	Raw Water Intake and Pump Station - Lower Neuse	-	-	30	$/gal	$ 1.13	$ 33,800,000	Capacity in excess of 21 MGD required to maximize yield using the 0.8 BG quarry
J-W5	Quarry Pump Station - Lower Neuse	-	-	21	$/gal	$ 1.13	$ 23,600,000	
J-W6	Advanced Treatment for CEC at Existing WTP	-	-	18	$/gal	$ 2.25	$ 40,500,000	
J-W7	Finished Water Piping from WTP to System Connection	71,000	16	-	$/in-dia	$ 31.80	$ 36,100,000	Ref Hazen LTWSP for Johnston County
J-W8	Finished Water Piping from WTP to System Connection	157,000	30	-	$/in-dia	$ 31.80	$ 149,800,000	Ref Hazen LTWSP for Johnston County
Town of Smithfield								
J-W9	Advanced Treatment for CEC at Existing Smithfield WTP	-	-	8.3	$/gal	$ 2.25	$ 18,700,000	
				Subtotal of Water Improvements:			**$ 884,500,000**	
Wastewater Improvements								
Johnston County Public Utilities								
J-WW1	Expanded Capacity for 210 WWTP (4 to 27 mgd)	-	-	23	$/gal	$ 45.00	$ 1,035,000,000	To be completed in phases over time. Eventually replaces the Central WWTP
J-WW2	Additional Nitrogen Allocation for 210 WWTP	-	-	123,300	$/lb	$ 525	$ 64,700,000	
J-WW3	Increase Effluent PS Capacity at 210 WWTP	-	-	58	$/gal	$ 1.13	$ 65,300,000	Increased PS capacity assumed to be 2.5 times additional Max Month @ of 23 mgd (23 mgd *2.5 = 58 mgd)
J-WW4	Parallel Effluent Outfall from 210 to Neuse River	30,000	60	-	$/in-dia	$ 47.70	$ 85,900,000	Total Effluent capacity = 27 mgd*2.5 = 69 mgd, existing capacity in 30" line = 13 mgd, additional capacity = 56 mgd, assume max V = 5 fps
Town of Clayton								
J-WW5	Expanded Capacity for Clayton WWTP (6 to 13)	-	-	7	$/gal	$ 52.50	$ 367,500,000	
J-WW6	Additional Nitrogen Allocation for Clayton WWTP			25,225	$/lb	$ 525	$ 13,200,000	Based an assumed additional TN allocation
Town of Princeton								
J-WW7	Expanded Princeton WWTP from 0.275 mgd to 0.6 mgd			0.33	$/gal	$ 52.50	$ 17,300,000	Assumed in lieu of pumping WW to Johnston County Facilities
Town of Benson								
J-WW8	Expanded Benson WWTP from 1.9 mgd to 3.1 mgd			1.20	$/gal	$ 52.50	$ 63,000,000	
				Subtotal of Wastewater Improvements:			**$ 1,711,900,000**	

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NC Department of Environmental Quality
Regional Water and Wastewater Infrastructure Concept Plan
Total Project Cost - Lee-Chatham Area
April 30, 2024 Update

Item No.	Description of Improvement	Pipe Length (ft)	Pipe Diameter (in)	Facility Size (mgd)	Unit	Unit Cost	Total Project Cost	Notes
Water Improvements								
Scenario LC-W1								
LC-W1.1	Expand Sanford WTP (12 MGD -> 30 MGD)	-	-	18	$/gal	$19.50	$ 351,000,000	
LC-W1.2	Advanced Treatment for Sanford WTP			30	$/gal	$2.25	$ 67,500,000	
LC-W1.3	Expand WIP WTP (Option 1 10 MGD Pittsboro/3 MGD Siler City)			15	$/gal	$19.50	$ 292,500,000	
LC-W1.4	Advanced Treatment for CEC at WIP WTP (13 MGD)			15	$/gal	$2.25	$ 33,800,000	
LC-W1.5	Finished Water Piping from WIP to Pittsboro (Opt.1 -13.0 MGD)	25,000	30	-	$/in-dia	$31.80	$ 23,900,000	
LC-W1.6	Expand Siler City WTP (4 MGD -> 6 MGD)			2	$/gal	$19.50	$ 39,000,000	
LC-W1.7	Advanced Treatment for CEC at Siler City WTP (6 MGD)			6	$/gal	$2.25	$ 13,500,000	
LC-W1.8	Transmission from Sanford to TIP site	35,100	36	-	$/in-dia	$47.70	$ 60,300,000	
LC-W1.9	Transmission from Sanford to FQV/HS	81,800	36	-	$/in-dia	$47.70	$ 140,500,000	
LC-W1.10	Transmission from TIP site to Pittsboro	36,700	24	-	$/in-dia	$31.80	$ 28,000,000	includes EST
LC-W1.11	Booster Pump Station from TIP site to Pittsboro			6	$/gal	$1.50	$ 9,000,000	
LC-W1.12	Transmission from Pittsboro to Siler City	75,300	24	-	$/in-dia	$31.80	$ 57,500,000	includes EST
LC-W1.13	Booster Pump Station from Pittsboro to Siler City			3	$/gal	$1.50	$ 4,500,000	
LC-W1.14	Transmission from TIP site to loop back to Sanford	35,100	24	-	$/in-dia	$31.80	$ 26,800,000	
LC-W1.15	Expand Sanford WTP (Opt. 1 - 30 MGD ->48 MGD)			18	$/gal	$19.50	$ 351,000,000	
LC-W1.16	Advanced Treatment for CEC at Sanford WTP (30 -> 48 MGD)			18	$/gal	$2.25	$ 40,500,000	
			Subtotal of Water Improvements - Scenario LC-W1:				**$ 1,539,300,000**	
Scenario LC-W2								
LC-W2.1	Expand Sanford WTP (12 MGD -> 30 MGD)	-	-	18	$/gal	$19.50	$ 351,000,000	
LC-W2.2	Advanced Treatment for CEC at Sanford WTP (55 MGD)			30	$/gal	$2.25	$ 67,500,000	
LC-W2.3	Expand Siler City WTP (4 MGD -> 6 MGD)			2	$/gal	$19.50	$ 39,000,000	
LC-W2.4	Advanced Treatment for CEC at Siler City WTP (6 MGD)			6	$/gal	$2.25	$ 13,500,000	
LC-W2.5	Transmission from Sanford to TIP site	35,100	36	-	$/in-dia	$47.70	$ 60,300,000	
LC-W2.6	Transmission from Sanford to Pittsboro (Opt 2 - Parallel Line)	101,100	24		$/in-dia	$31.80	$ 77,200,000	
LC-W2.7	Transmission from Sanford to FQV/HS	81,800	36	-	$/in-dia	$47.70	$ 140,500,000	
LC-W2.8	Transmission from TIP site to Pittsboro	36,700	24	-	$/in-dia	$31.80	$ 28,000,000	
LC-W2.9	Booster Pump Station from TIP site to Pittsboro			14	$/gal	$1.13	$ 15,800,000	
LC-W2.10	Transmission from Pittsboro to Siler City	75,300	24	-	$/in-dia	$31.80	$ 57,500,000	
LC-W2.11	Booster Pump Station from Pittsboro to Siler City			3	$/gal	$1.50	$ 4,500,000	
LC-W2.12	Transmission from TIP site to loop back to Sanford	35,100	24	-	$/in-dia	$31.80	$ 26,800,000	
LC-W2.13	Expand Sanford WTP (Opt. 2 - 30 MGD -> 62 MGD)			32	$/gal	$19.50	$ 624,000,000	
LC-W2.14	Advanced Treatment for CEC at Sanford WTP (30MG -> 62 MGD)			32	$/gal	$2.25	$ 72,000,000	
LC-W2.15	Expand WIP WTP (+1 MGD to Chat Co North)			1	$/gal	$19.50	$ 19,500,000	
LC-W2.16	Advanced Treatment for CEC at WIP WTP (1 MGD)			1	$/gal	$2.25	$ 2,300,000	
			Subtotal Water Improvements - Scenario LC-W2:				**$ 1,599,400,000**	

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Regional Water and Wastewater Infrastructure Concept Plan
Total Project Cost - Lee-Chatham Area
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Item No.	Description of Improvement	Pipe Length (ft)	Pipe Diameter (in)	Facility Size (mgd)	Unit	Unit Cost	Total Project Cost	Notes
Wastewater Improvements								
Scenario LC-WW1								
LC-WW1.1	Siler City WW Treatment Plant Expansion (4 MGD ->8 MGD)			4	$/gal	52.50	$ 210,000,000	
LC-WW1.2	Pittsboro Lift Station to Big Buffalo WWTP (15 MGD)			15	$/gal	3.00	$ 45,000,000	
LC-WW1.3	Conveyance from Pittsboro to Sanford	65,400	36	-	$/in-dia	47.70	$ 112,300,000	
LC-WW1.4	Expand Sanford Big Buffalo WWTP (12 MGD -> 14 MGD)	-	-	2	$/gal	52.50	$ 105,000,000	
LC-WW1.5	Upgrade Big Buffalo WWTP (0 MGD -> 12 MGD)			12	$/gal	36.00	$ 432,000,000	
LC-WW1.6	New Sanford WW Treatment Facility (Hughes Creek WWTP)	-	-	15	$/gal	45.00	$ 675,000,000	Assume construct new WWTF
LC-WW1.7	Hughes Creek Outfall to Cape Fear (Downstream of Buckhorn Dam)	37,800	48		$/in-dia	47.70	$ 86,500,000	
LC-WW1.8	Transfer flows	42,300	36	-	$/in-dia	47.70	$ 72,600,000	Assume transfer from Big Buffalo to new WWTF
LC-WW1.9	Pittsboro Lift Station to Big Buffalo WWTP Expansion (15MGD -> 25 MGD)	-	-	10	$/gal	3.00	$ 30,000,000	
LC-WW1.10	Parallel conveyance from Pittsboro to Sanford	65,400	24	-	$/in-dia	31.80	$ 49,900,000	Includes LS
LC-WW1.11	Chatham Park WWTP Expansion (0.5 MGD -> 1 MGD)	-	-	0.5	$/gal	52.50	$ 26,300,000	
LC-WW1.12	Chatham Park WWTP Upgrade (0 -> 0.5 MGD)			0.5	$/gal	42	$ 21,000,000	
LC-WW1.13	Carolina Trace Lift Station to Big Buffalo (1.25 MGD)			1.3	$/gal	4.5	$ 5,600,000	
LC-WW1.14	Conveyance Carolina Trace to Big Buffalo	10,000	8		$/in-dia	31.8	$ 2,500,000	
LC-WW1.15	Broadway Lift Station to Big Buffalo (0.7 MGD)			0.7	$/gal	4.5	$ 3,200,000	
LC-WW1.16	Conveyance Broadway to Big Buffalo	10,000	8		$/in-dia	31.8	$ 2,500,000	
					Subtotal of Wastewater Improvements - Scenario LC-WW1:		**$ 1,879,400,000**	
Scenario LC-WW2								
LC-WW2.1	Siler City WW Treatment Plant Expansion (4MGD -> 8 MGD)	-	-	4	$/gal	52.50	$ 210,000,000	
LC-WW2.2	Pittsboro Lift Station to Big Buffalo WWTP (18 MGD)			18	$/gal	3.00	$ 54,000,000	7.2 mgd peaked at 2.5
LC-WW2.3	Conveyance from Pittsboro to Sanford	65,400	36	-	$/in-dia	47.70	$ 112,300,000	
LC-WW2.4	New Pittsboro WWTP (3 MGD)	-	-	3	$/gal	45.00	$ 135,000,000	
LC-WW2.5	Pittsboro Outfall to Haw River - US 64	21,260	24		$/in-dia	31.80	$ 16,200,000	
LC-WW2.6	New Sanford WW Treatment Facility (Hughes Creek WWTP)	-	-	14	$/gal	45.00	$ 630,000,000	
LC-WW2.7	Hughes Creek Outfall to Cape Fear (Downstream of Buckhorn Dam)	37,800	42		$/in-dia	47.70	$ 75,700,000	
LC-WW2.8	Transfer flows	42,300	36	-	$/in-dia	47.70	$ 72,600,000	
LC-WW2.9	Chatham Park WWTP Expansion (0.5 MGD -> 1 MGD)			0.5	$/gal	52.50	$ 26,300,000	
LC-WW2.10	Chatham Park WWTP Upgrade (0 -> 0.5 MGD)			0.5	$/gal	42	$ 21,000,000	
LC-WW2.11	Big Buffalo WWTP Upgrades (0 -> 12 MGD)			12.0	$/gal	36	$ 432,000,000	
LC-WW2.12	Carolina Trace Lift Station to Big Buffalo (1.25 MGD)			1.3	$/gal	4.5	$ 5,600,000	
LC-WW2.13	Conveyance Carolina Trace to Big Buffalo	10,000	8		$/in-dia	31.8	$ 2,500,000	
LC-WW2.14	Broadway Lift Station to Big Buffalo (0.7 MGD)			0.7	$/gal	4.5	$ 3,200,000	
LC-WW2.15	Conveyance Broadway to Big Buffalo	10,000	8		$/in-dia	31.8	$ 2,500,000	
					Subtotal of Wastewater Improvements - Scenario LC-WW2:		**$ 1,798,900,000**	

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Total Project Cost - Southern Wake Area
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Item No.	Description of Improvement	Pipe Length (ft)	Pipe Diameter (in)	Facility Size (mgd)	Unit	Unit Cost	Total Project Cost	Notes
Holly Springs Wastewater Improvements								
Scenario SW-WW1								
Expand Utley Creek to 12 MGD and Discharge Flow > 8 MGD (4 MGD) to Cape Fear River								Scenario 1 - 8 mgd to Utley Creek, 3.5 mgd to Cape Fear River
SW-WW1.1	New WWTP Capacity at Utley Creek WRF	-	-	6	$/gal	$ 52.50	$ 315,000,000	
SW-WW1.2	New Effluent PS	-	-	10	$/gal	$ 3.00	$ 30,000,000	Based on 4 mgd permitted Q with a PF of 2.5 mgd
SW-WW1.3	New Effluent FM	79,200	24	-	$/in-dia	$ 31.80	$ 60,400,000	Assume a WW Max Month Peak of 2.5 for pipe diameter and V</+ 5 fps (4mgd*2.5 = 10 mgd peak)
		Subtotal of Wastewater Improvements - Scenario SW-WW1:					$ 405,400,000	
Scenario SW-WW2								
Expand Utley Creek to 12 MGD and Discharge the Entire Flow to the Cape Fear River								Scenario 2 - 11.5 mgd to Cape Fear River Discharge
SW-WW2.1	New WWTP Capacity at Utley Creek WRF	-	-	6	$/gal	$ 52.50	$ 315,000,000	
SW-WW2.3	New Effluent PS	-	-	30	$/gal	$ 3.00	$ 90,000,000	
SW-WW2.2	New Effluent FM	79,200	42	-	$/in-dia	$ 47.70	$ 158,700,000	Assume a WW Max Month Peak of 2.5 for pipe diameter and V</+ 5 fps (12 mgd*2.5 = 30 mgd peak)
		Subtotal of Wastewater Improvements - Scenario SW-WW2:					$ 563,700,000	
Scenario SW-WW3								
Utley Creek remains at 8 MGD, Excess WW is Conveyed to WWRWRF for Treatment, Discharge								Scenario 3 - 3.5 mgd to common Western Wake discharge in Cape Fear River
SW-WW3.1	New WWTP Capacity at WWRWRF	-	-	4	$/gal	$ 52.50	$ 210,000,000	
SW-WW3.2	New WW Pump Station	-	-	10	$/gal	$ 3.00	$ 30,000,000	
SW-WW3.3	New WW Pump Station for Conveyance to WWRWRF	11,500	24	-	$/in-dia	$ 31.80	$ 8,800,000	Assume a WW Max Month Peak of 2.5 for pipe diameter and V</+ 5 fps (4mgd*2.5 = 10 mgd peak)
		Subtotal of Wastewater Improvements - Scenario SW-WW3:					$ 248,800,000	
Common to All Scenarios								
Fuquay-Varina Wastewater Improvements								
Expand Terrible Creek WWTP to 9 MGD		-	-					
SW-WW1	Expand Terrible Creek WWTP (3 to 9 mgd)	-	-	6	$/gal	$ 52.50	$ 315,000,000	Common to all scenarios
		Subtotal of Wastewater Improvements - Scenario SW-WW1:					**$ 720,400,000**	
		Subtotal of Wastewater Improvements - Scenario SW-WW2:					**$ 878,700,000**	
		Subtotal of Wastewater Improvements - Scenario SW-WW3:					**$ 563,800,000**	

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Total Project Cost - Triad Area
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Item	Description of Improvement	Pipe Length (ft)	Pipe Diameter (in)	Facility Size (mgd)	Unit	Unit Cost	Total Project Cost	Notes
Water Improvements								
Scenario 1 - PTRWA Expansion from 14.7 mgd to 29.4 mgd (29.4 mgd w/CEC treatment) (T-W1)								Project to expand facility to a 24mgd facility with advanced treatment
	PTRWA Capacity expansion	-	-	14.7	$/gal	$ 19.50	$ 286,700,000	
	PTRWA Advanced Treatment Upgrade	-	-	29.4	$/gal	$ 2.25	$ 66,200,000	
Scenario 1/2 - Water service from PTRWA to Asheboro (T-W2)								Project is funded by Randolph County and currently in design @
	18" Water Line and Appurtenances	18,200	18	-	$/in-dia	$ 31.80	$ 10,400,000	Length from Wooten Phase 2 Report (Dec. 2022)
Scenario 1/2 - Upgrade to Asheboro WTP (T-W3)								
	Advanced Treatment Upgrades (9.36 MGD)	-	-	9.36	$/gal	$ 2.25	$ 21,100,000	
Scenario 1/2 - Water service from Ramseur to Liberty (Hwy 421 @ Hwy 49) (T-W4)								Project T-WX and WX are funded by Randolph County at $8,985,800
	Water service from Ramseur to Liberty	37,100	12	-	$/in-dia	$ 31.80	$ 14,200,000	
	Booster Pump Station	-	-	0.7	$/gal	$ 1.50	$ 1,100,000	Assumed 60psi (138ft) system pressure in Ramseur, ~160ft (69psi
Scenario 1/2 - Resilience Upgrade to serve Liberty and Eastern Randolph System (T-W5)								
	Liberty Water Line from Greensboro - Toyota facility	25,000	16	-	$/in-dia	$ 31.80	$ 12,700,000	
Scenario 1 - Water service from Asheboro to Chatham County (T-W6)								
	7mgd water service from Asheboro to Chatham Co (For CAM)	69,800	24	-	$/in-dia	$ 31.80	$ 53,300,000	Project funded by Special Appropriation to Randolph Co. ($55M)
Scenario 2 - PTRWA Expansion from 14.7 mgd to 25.4 mgd (25.4 mgd w/CEC treatment) (T-W7)								Project to expand facility to a 24mgd facility with advanced treatment
	PTRWA Capacity expansion	-	-	10.7	$/gal	$ 19.50	$ 208,700,000	
	PTRWA Advanced Treatment Upgrade	-	-	25.4	$/gal	$ 2.25	$ 57,200,000	
Scenario 2 - Water Service from Asheboro to Chatham County (T-W8)								
	3mgd water service from Asheboro to Chatham Co (For CAM)	69,800	20	-	$/in-dia	$ 31.80	$ 44,400,000	Project funded by Special Appropriation to Randolph Co. ($55M)
Scenario 2 - Upgrade to Ramseur WTP to 4mgd (T-W9)								
	Rehabilitation and Upgrade to existing facility	-	-	1.5	$/gal	$ 15.60	$ 23,400,000	
	Expansion of Existing facility from 1.5mgd to 4mgd	-	-	2.5	$/gal	$ 19.50	$ 48,800,000	
	Advanced Treatment Upgrade	-	-	4	$/gal	$ 2.25	$ 9,000,000	
Total for Water Scenario T-W1							**$ 465,700,000**	
Total for Water Scenario T-W2							**$ 451,000,000**	

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Item	Description of Improvement	Pipe Length (ft)	Pipe Diameter (in)	Facility Size (mgd)	Unit	Unit Cost	Total Project Cost	Notes
Wastewater Improvements								
Scenario 1A/2A - Seagrove Transfer Lift Station (T-WW1)								
	Seagrove Lift Station	-	-	0.80	$/gal	$ 4.50	$ 3,600,000	Avg Day Flow of 0.2mgd, PF of 4 assumed for 0.8mgd capacity
	Seagrove Force Main	25,560	8	-	$/in-dia	$ 31.80	$ 6,500,000	
Scenario 1A - Greensboro Transfer Pump Station (T-WW2)								
	Greensboro Transfer Lift Station	-	-	12	$/gal	$ 3.00	$ 36,000,000	
	Sewer Force Main from Greensboro to Gravity Section	15,840	27	-	$/in-dia	$ 31.80	$ 13,600,000	
Scenario 1A - Gravity Sewer from Greensboro FM to High Point Junction Box (T-WW3)								
	Gravity Sewer from FM to High Point Tie-in	31,680	36	-	$/in-dia	$ 47.70	$ 54,400,000	12mgd at 0.5%, flowing ~half full
Scenario 1A - Transfer 6mgd from High Point to Regional Facility (T-WW4)								
	High Point Transfer Lift Station	-	-	6	$/gal	$ 4.50	$ 27,000,000	
	Sewer Force Main from High Point to Gravity Section	38,200	21	-	$/in-dia	$ 31.80	$ 25,500,000	
Scenario 1A - Gravity Section from GSO/HP Junction to Regional Facility (T-WW5)								
	Gravity Section from GSO/HP to Junction to RF	68,200	42	-	$/in-dia	$ 47.70	$ 136,600,000	18mgd at 0.2%, flowing ~half full
Scenario 1A - Randleman Transfer Lift Station (T-WW6)								
	Randleman Lift Station	-	-	5	$/gal	$ 4.50	$ 22,500,000	Avg Day Flow of 1.1mgd, PF of 4 assumed for 5mgd capacity
	Sewer Force Main	2,500	18	-	$/in-dia	$ 31.80	$ 1,400,000	
Scenario 1A - Asheboro WWTP Expansion and Upgrade (T-WW7)								
	Upgrade of existing 9mgd facility	-	-	9	$/gal	$ 36	$ 324,000,000	
	Expansion of existing facility to 30mgd	-	-	21	$/gal	$ 45	$ 945,000,000	
Scenario 1A - Upgrade High Point's Eastside WWTP (T-WW7-1)								
	Upgrade of existing 26 mgd	-	-	26.0	$/gal	$ 36.00	$ 936,000,000	
Scenario 2A - Transfer 12mgd from Greensboro to a Regional Facility (Randleman) (T-WW8)								
	Greensboro Transfer Lift Station	-	-	12	$/gal	$ 3.00	$ 36,000,000	
	Sewer Force Main from Greensboro to Gravity Section	15,840	27	-	$/in-dia	$ 31.80	$ 13,600,000	
	Gravity Section from GSO to Randleman	82,896	36	-	$/in-dia	$ 47.70	$ 142,300,000	
Scenario 2A - Upgrade Randleman WWTP (T-WW9)								
	Upgrade of existing 1.745 mgd	-	-	1.745	$/gal	$ 42	$ 73,300,000	
	Expansion of Facility to 14 mgd	-	-	12.255	$/gal	$ 45	$ 551,500,000	
Scenario 2A - Asheboro WWTP Expansion and Upgrade and Pump back to Uwharrie River Basin (T-WW10)								
	Upgrade of existing 9mgd facility	-	-	9	$/gal	$ 36	$ 324,000,000	
	Expansion of existing facility to 11mgd	-	-	2	$/gal	$ 45	$ 90,000,000	
	Effluent Pump Station	-	-	35.0	$/gal	$ 3.00	$ 105,000,000	11 MGD Max Month * 3 PF, assumed 35 mgd capacity
	Effluent Force Main	26,200	48	-	$/in-dia	$ 47.70	$ 60,000,000	
Scenario 2A - Archdale/Trinity WWTP (T-WW11)								
	New WWTP for Archdale/Trinity	-	-	2.0	$/gal	$ 52.50	$ 105,000,000	
	Estimate for Infrastructure to Transfer Flow							

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Item	Description of Improvement	Pipe Length (ft)	Pipe Diameter (in)	Facility Size (mgd)	Unit	Unit Cost	Total Project Cost	Notes
	Trinity Lift Station	-	-	1.0	$/gal	$ 4.50	$ 4,500,000	Avg Day Flow of 1.2mgd, PF of 4 assumed for 1mgd capacity
	Archdale Lift Station	-	-	5.0	$/gal	$ 4.50	$ 22,500,000	Avg Day Flow of 1.2mgd, PF of 4 assumed for 5mgd capacity
	Trinity Sewer Piping	5,000	12	-	$/in-dia	$ 31.80	$ 1,900,000	Assumed
	Archdale Sewer Piping	15,000	18	-	$/in-dia	$ 31.80	$ 8,600,000	Assumed
	Scenario 2A - Expand High Point's Eastside WWTP (T-WW12)							
	Upgrade of existing 26 mgd	-	-	26.0	$/gal	$ 36.00	$ 936,000,000	
	Expansion of Facility to 32 mgd	-	-	6.0	$/gal	$ 45.00	$ 270,000,000	
	Total for Wastewater Scenario T-WW1A						**$ 2,532,100,000**	
	Total for Wastewater Scenario T-WW2A						**$ 2,754,300,000**	

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Item	Description of Improvement	Pipe Length (ft)	Pipe Diameter (in)	Facility Size (mgd)	Unit	Unit Cost	Total Project Cost	Notes
Eastern Randolph Subregional Effort								
Scenario 1B/2B - Franklinville Transfer Lift Station (T-WW13)								
	Franklinville Lift Station	-	-	0.75	$/gal	$ 4.50	$ 3,400,000	Avg Day Flow of 0.15mgd, PF of 4 assumed for 0.75mgd capacity
	Franklinville Force Main	15,900	8	-	$/in-dia	$ 31.80	$ 4,000,000	
Scenario 1B - Liberty Transfer Lift Station to Greensboro (T-WW14)								
	Liberty Lift Station	-	-	3	$/gal	$ 4.50	$ 13,500,000	Avg Day Flow of 0.7mgd, PF of 4 assumed for 3mgd capacity
	Liberty Sewer Force Main	25,000	12	-	$/in-dia	$ 31.80	$ 9,500,000	
Scenario 1B - Upgrade Ramseur WWTP to 1mgd (T-WW15)								
	Rehabilitation and Upgrade to existing Ramseur Facility	-	-	0.48	$/gal	$ 42.00	$ 20,200,000	Upgrade of Existing Facility
	Expansion of Facility	-	-	0.52	$/gal	$ 52.50	$ 27,300,000	Expansion
Scenario 2B - Transfer from Liberty to Ramseur (T-WW16)								Projects Planned by Wooten, recosted with their lengths, currently
	Project 1 - Liberty (PS1) to PS 2 - Lift Station	-	-	2.5	$/gal	$ 4.50	$ 11,300,000	Avg Day Flow of 0.64mgd, PF of 4 assumed for 2.5mgd capacity
	Project 1 - Liberty (PS1) to PS 2 - Force Main	9,515	12	-	$/in-dia	$ 31.80	$ 3,600,000	
	Project 2 - PS 2 to PS 3 - Lift Station	-	-	2.5	$/gal	$ 4.50	$ 11,300,000	
	Project 2 - PS 2 to PS 3 - Force Main	10,960	12	-	$/in-dia	$ 31.80	$ 4,200,000	
	Project 3 - PS 3 to Ramseur WWTP - Lift Station	-	-	2.5	$/gal	$ 4.50	$ 11,300,000	
	Project 3 - PS 3 to Ramseur WWTP - Force Main	16,760	12	-	$/in-dia	$ 31.80	$ 6,400,000	
Scenario 2B - Upgrade Ramseur WWTP to 2mgd (T-WW17)								
	Rehabilitation and Upgrade to existing Ramseur Facility	-	-	0.48	$/gal	$ 42.00	$ 20,200,000	Upgrade of Existing Facility
	Expansion of Facility	-	-	1.52	$/gal	$ 52.50	$ 79,800,000	Expansion
Total for Wastewater Scenario T-WW1B							**$ 77,900,000**	
Total for Wastewater Scenario T-WW2B							**$ 155,500,000**	

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Total Project Cost Development
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Unit Cost Assumptions for Water and Wastewater Facilities

Item	Unit	Construction Cost	Easements (% of Const.)	Planning, Design and Construction Administration (% of Const.)	Permits, Approvals, Regulatory Support (% of Const.)	Legal and Admin. (% of Const.)	Project Contingency (% of All project $)	Loaded Project Unit Cost
Water Transmission and Wastewater Force Mains (</= 30 inch)	$/in-dia	$ 20.00	7.5%	15%	5%	5%	20%	$ 31.80
Water Transmission and Wastewater Force Mains (>/= 36 inch)	$/in-dia	$ 30.00	7.5%	15%	5%	5%	20%	$ 47.70
Wastewater Pump Station (</= 7 mgd)	$/gal	$ 3.00	n/a	15%	5%	5%	20%	$ 4.50
Wastewater Pump Station (> 7 mgd)	$/gal	$ 2.00	n/a	15%	5%	5%	20%	$ 3.00
Water Pump Station (</= 10 mgd)	$/gal	$ 1.00	n/a	15%	5%	5%	20%	$ 1.50
Water Pump Station (> 10 mgd)	$/gal	$ 0.75	n/a	15%	5%	5%	20%	$ 1.13
Conventional Water Treatment	$/gal	$ 13.00	n/a	15%	5%	5%	20%	$ 19.50
Upgrade Existing Conventional Water Treatment	$/gal	$ 10.40	n/a	15%	5%	5%	20%	$ 15.60
Advanced Water Treatment for Contaminants of Emerging Concern	$/gal	$ 1.50	n/a	15%	5%	5%	20%	$ 2.25
Wastewater Treatment Capacity - Limits of Technology (</=7 mgd)	$/gal	$ 35.00	n/a	15%	5%	5%	20%	$ 52.50
Wastewater Treatment Capacity - Limits of Technology (>7 mgd)	$/gal	$ 30.00	n/a	15%	5%	5%	20%	$ 45.00
Upgrade Existing Wastewater Treatment - Limits of Technology (</=7 mgd)	$/gal	$ 28.00	n/a	15%	5%	5%	20%	$ 42.00
Upgrade Existing Wastewater Treatment - Limits of Technology (>7 mgd)	$/gal	$ 24.00	n/a	15%	5%	5%	20%	$ 36.00
Nitrogen Allocation in the Neuse Basin	$/lb	$ 500.00	n/a	n/a	n/a	5%	n/a	$ 525.00

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Appendix B: Estimated Available Nutrient Load Within the Study Area with Conventional Treatment Upgrades to Facilities

Utility / Facility Name	Basin/Sub-basin	Capacity (MGD) [1,2]	Current Permit Limits				Theoretical / Permitted Nutrient Loading				Nutrient Loading Based on Limits of Technology (TN = 3.0 mg/L; TP = 0.5 mg/L or TP = 0.18 mg/L in Haw)				Available Load with Limits of Technology Upgrade	
			TN		TP		TN		TP		TN		TP		TN	TP
			mg/L	lbs/yr	mg/L	lbs/yr	mg/L	lbs/yr	mg/L	lbs/yr	mg/L	lbs/yr	mg/L	lbs/yr	lbs/yr	lbs/yr
Johnston Co. - Central Johnston Co. WWTP	Neuse/Upper Neuse	13.5	-	73,477 [4]	2	-	1.8	73,477 [4]	2.0	82,191	3	123,286	0.5	20,548	-	61,643
Clayton - Sams Branch WWTP [2]	Neuse/Upper Neuse	10	-	89,842	2	-	3.0	89,842	2.0	60,882	3	89,842	0.5	15,221	-	45,662
Kenly - Kenly Regional WWTP	Neuse/Upper Neuse	0.63	-	7,096	2	-	3.7	7,096	2.0	3,836	3	5,753	0.5	959	1,343	2,877
Princeton - Princeton WWTP	Neuse/Upper Neuse	0.275	M&R	-	M&R	-	8.9	7,451	2.4	2,037	3	2,511	0.5	419	4,939	1,619
Benson - Benson WWTP	Neuse/Upper Neuse	1.9	-	33,070	2	-	5.7	33,070	2.0	11,568	3	17,351	0.5	2,892	15,719	8,676
Harnett Co. - North Harnett Regional WWTP [2]	Cape Fear/Upper Cape Fear	16.5	-	115,550 lbs/Summer	-	38,517 lbs/Summer	3.3	167,729	1.0	48,948	3	150,683	0.5	25,114	17,046	23,834
Harnett Co. - South Harnett Regional WWTP	Cape Fear/Upper Cape Fear	15	-	105,046 lbs/Summer	-	35,015 lbs/Summer	3.8	171,648	1.2	54,943	3	136,985	0.5	22,831	34,664	32,113
Dunn - Black River WWTP	Cape Fear/Upper Cape Fear	3.75	M&R	-	M&R	-	4.6	52,944	0.7	8,114	3	34,246	0.5	5,708	18,698	2,406
Fuquay-Varina - Terrible Creek WWTP [2]	Neuse/Lower Neuse	6	-	68,489	2	-	3.7	68,489	2.0	36,529	3	54,794	0.5	9,132	13,695	27,397
Holly Springs - Holly Springs WWTP [2]	Cape Fear/Upper Cape Fear	8	5	-	0.5	-	5.0	121,764	0.5	12,176	3	73,058	0.5	12,176	48,706	-
Sanford - Big Buffalo WWTP	Cape Fear/Deep	12	-	64,628 lbs/Summer	-	20,138 lbs/Summer	3.0	109,588 [3]	0.9	33,149	3	109,588	0.5	18,265	-	14,884
Broadway - Broadway WWTP [2]	Cape Fear/Upper Cape Fear	0.16	M&R	-	M&R	-	3.0	1,461 [3]	0.5	244 [3]	3	1,461	0.5	244	-	-
Carolina Trace - Carolina Trace WWTP	Cape Fear/Upper Cape Fear	0.675	M&R	-	M&R	-	3.0	6,164 [3]	1.6	3,336	3	6,164	0.5	1,027	-	2,309
Pittsboro - Pittsboro WWTP	Cape Fear/Haw	1.249 [6]	-	36,202	-	322 lbs/Summer	9.52	36,202	0.15	552	3	11,406	0.18 [4]	684 [4]	24,796	-
Siler City - Siler City WWTP [2]	Cape Fear/Deep	6	-	54,800	0.5 sum / 2 win	-	3.0	54,800	0.5-sum / 2-win	20,466	3	54,794	0.5	9,132	6	11,334
Greensboro - T.Z. Osborne WRF	Cape Fear/Haw	56	-	891,272	-	112,044	5.2	891,272	0.7	112,044	3	511,409	0.18 [4]	30,685 [4]	379,863	81,359
High Point - Eastside WWTP	Cape Fear/Deep	26	6	474,865	0.5	39,420	6.0	474,865	0.5	39,420	3	237,440	0.5	39,420	237,425	-
High Point - Westside WWTP	Yadkin Pee Dee/Lower Yadkin	10	-	159,870	-	13,341	5.3	159,870	0.5	15,221 [3]	3	91,323	0.5	15,221	68,547	-
Liberty - Town of Liberty WWTP	Cape Fear/Deep	0.55	Non-discharge/irrigation facility				3.0	5023	0.5	837	3	5023	0.5	837	5,023	837
Ramseur - Ramseur WWTP	Cape Fear/Deep	0.48	M&R	-	M&R	-	4.3	6,255	1.5	2,148	3	4,384	0.5	731	1,872	1,417
Franklinville - Franklinville WWTP	Cape Fear/Deep	0.1	M&R	-	M&R	-	9.2	2,795	4.3	1,311	3	913	0.5	152	1,882	1,159
Asheboro - Asheboro WWTP	Cape Fear/Deep	9	M&R	-	M&R	-	7.5	205,645	0.5	13,698 [3]	3	82,191	0.5	13,698	123,454	-
Randleman - Randleman WWTP	Cape Fear/Deep	1.745	M&R	-	M&R	-	3.0	15,936 [3]	0.9	4,974	3	15,936	0.5	2,656	-	2,318
Trinity - Trinity American Corp.	Cape Fear/Deep	*Wastewater is sent to High Point Westside WWTP so nutrient loads from this Utility are excluded from this assessment.*														
Seagrove-Ulah Metro Water District WWTP	Cape Fear/Deep	0.036	Non-discharge/irrigation facility				3.0	329 [3]	0.5	55 [3]	3	329	0.5	55	329	55

[1]Maximum Month Facility Capacity from NPDES Permit.
[2]For facilities with tiered flows and nutrient load limits in their current NPDES permit, the future tiered flow and nutrient load limits are listed and used in this Study's nutrient assessment.
[3]The theoretical TN or TP load is based on assumed limits of technology concentrations (TN = 3 mg/L, TP = 0.5 mg/L) at maximum month facility capacity.
[4]For facilities located in the Haw River sub-basin, a TP concentration of 0.18 mg/L was used to calculate the total phosphorus load instead of 0.5 mg/L.
[5]Johnston County is in the process of trying to purchase additional nitrogen allocation.
[6]Capacity includes Outfall 001A (Pittsboro) and Outfall 001B (Chatham Park). Additional 1.971 MGD effluent capacity available in permit if effluent pipe to Haw River (002) is constructed.

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Appendix C: Financial Review of Stakeholders

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North Carolina Department of Environmental Quality

Financial Review of Stakeholders

April 1, 2024

RAFTELIS

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1. Introduction

1.1 Background of the Study

The NC Department of Environmental Quality engaged a team of consultants, including Raftelis and led by Hazen and Sawyer, to conduct a financial evaluation of the utility systems in the seven-county Study Area and analyze the additional financial and rate impacts associated with potential regional water and wastewater solutions. The Study Area includes Johnston County, Harnett County, Lee County, Southern Wake County (Holly Springs and Fuquay-Varina) Chatham County, Randolph County and Guildford County. The framework used to assess the current financial health of the communities in the study area was generally adapted from the Environmental Protection Agency's FCA Guidance along with the Moody's Municipal Utility Revenue Debt Scorecard. This report documents the results of the analysis.

Regional and Utility Background

The communities involved in the study comprise 39 utilities across seven counties in the eastern portion of the Piedmont region. There are several utilities for which data was not available for various reasons and could not be included in the analysis, this there are 39 utilities referenced here versus 43 listed in the main report. This area was designated as a high-priority corridor in the Infrastructure Investment Act of 2021 and, therefore, has been the attention of needed water and wastewater infrastructure improvements. Many of the communities served by the utilities in this study are small, rural towns that, like the rest of North Carolina, are seeing rising trends in household growth and commercial investment. However, the rising capacity needs and cost of utility services driven by this demand and the amount of investment in infrastructure that follows is outpacing any additional realized revenues from customer increases for some of these smaller communities. This, historically, has forced some utilities to either raise rates to meet their revenue requirements or neglect important infrastructure rehabilitation, resulting in an aging system at risk of failure.

Not all utilities in this study group are seeing an increasing trend in their customer bases; some are being equally strained by a lack of revenues and the inability to raise rates any higher on an already financially stressed population. It is possible that achieving economies of scale by leveraging regional strategies can benefit both a utility's viability and affordability while achieving equitable access to sustainable water and wastewater services.

Our analysis has been grouped by size and geographic location to highlight opportunities for interconnections and resource consolidation among the 39 utilities in this study. The geographic groupings can be seen below by selected counties.

Table 1. Regional Groupings

Group 1	Group 2	Group 3	Group 4
Triad (Guilford/Randolph)	**Lee/Chatham/Southern Wake Counties**	**Harnett County**	**Johnston County**
Greensboro	Sanford	Harnett County	Johnston County
High Point	Holly Springs	Dunn	Clayton
Asheboro	Fuquay-Varina	Angier	Smithfield
Archdale	Chatham County	Lillington	Selma
Gibsonville	Siler City	Coats	Benson
Jamestown	Pittsboro		Four Oaks
Randleman	Broadway		Pine Level
Ramseur	Goldston Gulf		Princeton
Liberty	Carolina Trace *		Kenly
Franklinville			Micro
PTRWA *			Wilson's Mills *
Randolph County *			
Randolph County Water Districts*			
Seagrove *			

During the study, several public utilities were identified as having limiting factors, such as a lack of publicly available data or not being recognized to provide water or sewer services to a retail customer base, and therefore could not be assessed equitably. These few utilities have been marked with an asterisk in Table 1.

To assess the individual utilities' financial capability to support these required improvements and potential regional solutions and identify areas that may require further support, Raftelis chose to examine several indicators used commonly throughout the utility industry. These indicators aim to cover three facets that are reasonable measures of a utility's overall financial health and are readily available to calculate from public data sources. The three areas include general system characteristics, financial metrics related to debt and liquidity, and the affordability of services in consideration of the utility residential customer population. The individual metrics to be assessed are shown below in Table 2 and will be explained in Section 2 of this report. Please note that the impact of Sanford's acquisition of the Pittsboro system and significant expansion of Sanford's facilities (and impacts on other utilities within Group 2) have not been factored into the analysis. A logical next step for this region would be a comprehensive review of this study area taking into account these changes, any additional debt that has been used to move forward with this expansion and what changes, if any have been/will be made to the rate structure of each party to support these efforts.

Several utilities within the survey area have been previously designated by the North Carolina State Water Infrastructure Authority and the Local Government Commission as "Distressed" utilities. They include Benson, Franklinville, Liberty, Micro, Pittsboro, Princeton and Ramseur.

Per the DEQ, in order to qualify as a distressed utility, four criteria have been established. They are:

- Units that the LGC has formally taken financial control of.
- Units that have not submitted an annual audit for the past two (2) fiscal years.
- Units that qualify based on the DEQ's Assessment Criteria (which leverages 20 separate parameters).
- Units that qualify due to additional information becoming available.

Clearly, the methodology outlined above will differ from the criteria used in this analysis. As will be outlined within this report, the Raftelis methodology leverages nine (9) metrics versus the 20 DEQ Assessment Criteria indicated above. These differences may lead to slight variation in the results between this analysis and the DEQ's distressed utility listing. Although there may be slight variations, the results of this analysis are consistent with the results of the DEQ's distressed utility analysis.

Table 2: Utility Strength Category and Metrics

System Characteristics	Financial Metrics	Affordability Metrics
Service Population	Debt Service Coverage	LQPI
Remaining Life of System	Days Cash on Hand	Yearly Cost as % of MHI
Household Growth Rate	Total Debt to Plant Assets	Yearly Cost as % of LQI

Each category of indicators serves a specific purpose in evaluating the utility's overall strength and affordability for their community. For instance, the remaining life of the system is an accounting calculation that provides insight into how much reinvestment has been put back into the system and shows the potential need for capital improvements, while debt service coverage assesses the utility's ability to repay its debts. The lowest quintile poverty indicator (LQPI) is a metric used in the EPA's FCA guidelines, which helps determine the severity of poverty in a community's service area. The overarching purpose of conducting a financial capability assessment is to illustrate the overall health of each system and pinpoint potential pressure points for systems within the target area. It does not consider the potential cost of additional debt to support the regionalization effort or any existing issues within the system. Obviously, for systems that are already facing financial or affordability issues, layering on additional debt will increase the stress within those communities. By assessing these metrics, stakeholders can make informed decisions to evaluate regionalization options and the impacts various solutions will have on the target communities.

1.2 Purpose of the Study

As outlined previously, the study area covers nearly 40 unique utilities across the regions, ranging from large, financially stable utilities to smaller, financially challenged systems. Additionally, the demographics of the communities vary greatly and the ability for ratepayers to absorb rate increases in some communities may be limited.

With this in mind, the goal of the study was to provide decision-makers general context related to the overall strength of the utilities in the study area and the affordability of rates currently. Clearly, the projects outlined in the study are going to require a substantial infusion of capital in order to come to fruition. The other goal was to provide decision-makers with a high-level understanding of the impact that additional leverage would have on the affordability of water and sewer services within the survey area.

As has been emphasized, this analysis is a "snap-shot" in time based on publicly available data (including audits, data from the EFC and the EPA, etc). In order for decision-makers to have a full understanding of the impact improvements might have, a much more thorough analysis of each individual utility would need to be conducted.

2. Characterization of Data Sources

This section documents the resources used in building the database for the financial analysis. To acquire all the necessary information used to analyze the indicators stated in the previous section of this report, a combination of census data, audited financial statements, and utility rate dashboards were utilized to inform the selected strength categories in the study.

2.1 System Characteristics

System characteristics such as service population, remaining life of the system, and trends in household growth are important indicators of future viability for utilities. Firstly, understanding the service population provides utilities with insights into the demand for their services, allowing them to reasonably forecast future revenues and plan for infrastructure upgrades or expansions to accommodate growth or changing demographics. Service population is also a key indicator of economies of scale or an ability to distribute fixed costs over a customer base. Secondly, assessing the remaining life of the system enables utilities to anticipate future maintenance and replacement needs, facilitating proactive financial planning to ensure the long-term sustainability of operations. Finally, monitoring trends in household growth helps utilities forecast future demand for services and plan accordingly, ensuring that they can adequately fund investments in infrastructure and maintain financial stability over time. By considering these system characteristics, Raftelis was able to gain insights into the likely future needs for a utility to reliably service its community.

Service population is not generally used by itself as an indicator of utility viability, but rather, the composition of that population is typically examined, particularly the prevalence of poverty and overall wealth of the selected community. However, for this study, the service population is especially indicative of the availability of resources and strength of future revenues, which is recognized by state grant and loan programs that specifically target utilities with service populations under certain thresholds. Data on service populations was gathered from the North Carolina Environmental Finance Center (NCEFC) rate information database. The NCEFC Rate Dashboards are interactive tools designed to assist water, wastewater, and stormwater utility managers and local officials in benchmarking rates/fees and financial performance of the utility. The utility's financial performance is based on comparisons to utilities of similar characteristics. The EFC has surveyed nearly all of the utilities in North Carolina and reported their rates and multiple key financial performance indicators of the Enterprise Funds annually since 2005 and is a common resource for benchmarking that many in the industry are familiar with.

The remaining life of the system is an accounting calculation that takes the net value of system assets and divides that amount by the yearly depreciation expense, which provides an estimation of how long a utility has until its system has fully depreciated. The remaining useful life illustrates the degree to which there is a need for reinvestment in the capital assets. Raftelis reviewed the most recent annual comprehensive financial reports (ACFR) for each utility to obtain financial information on utilities, including the value of system assets and depreciation. Although the remaining life of the system is a reasonable, high-level indicator of the overall system's condition and potential need for upcoming capital investments, it does not take into account the actual condition of the system or known future capital needs.

The trend in household growth is a statistic used as a part of the EPA's FCA guidelines and has been broken out on its own in this study as an indicator of increasing or decreasing utility service populations. In order to calculate this trend according to the EPA guidelines the number of occupied housing units was required for each community. This information was obtained from the US Census Bureau's 2022 American Community Survey (ACS) five-year estimates. The US Census Bureau publishes multiple surveys and programs nearly every year. The decennial 2022 Census is the most commonly known dataset as the survey is intended to be completed by every household in the US. However, the data collected is limited to only a few questions about age, occupancy, rental status, race, etc. The ACS data is a much more comprehensive survey conducted each year. The ACS is sent to roughly 3.5 million addresses and asks about many topics not in the 2022 Census, including income, employment, transportation, etc. The ACS data is used to inform decisions at the national and local level related to specific programs to serve communities. The ACS five-year estimates are data collected over 60 months and normalized to a single year, resulting in smaller margins of error and less volatility year-to-year. At the time this analysis was performed, the 2022 information was the most recently published by the US Census Bureau.

2.2 Financial Metrics

The Financial metrics analyzed in the study are calculated from information obtained in the audited financial statements within each utility's ACFR 1. The water and sewer fund financial statements are typically found as Exhibits 6 through 8 in the audits. Debt service coverage ratio measures a utility's ability to meet its debt obligations, indicating its financial health and ability to repay debt obligations. A higher ratio suggests better financial stability and a lower risk of default. Days cash on hand (DCOH) assesses a utility's liquidity and ability to cover operating expenses and emergencies without relying on external funding or future revenues. It reflects the financial flexibility and resilience of the utility, allowing it to withstand unexpected challenges. Total debt to plant assets ratio evaluates the proportion of debt relative to the value of the utility's infrastructure assets, providing insight into its leverage and financial sustainability. By monitoring these financial metrics, utilities can assess their fiscal strength, make informed decisions about borrowing and investment, and ensure the long-term viability of providing essential water and wastewater services to their communities.

Debt Service coverage is calculated in this study by taking the net revenues, which is total yearly revenues minus the operating expenses, divided by the principal and interest payments which make up the annual debt service. When possible, to avoid abnormally skewed ratios, utilities with large, non-recurring revenues such as state grants were noted and had those amounts removed from the calculation. While debt service coverages may change year to year as utilities reinvest in their systems and add debt, the resulting value is a reasonable indicator of how easily a utility can cover their annual principal and interest obligations.

DCOH measures how long a utility can cover its operating expenses without any additional revenues before requiring external funding. A higher number of days cash on hand reflects a utility's ability to weather unexpected challenges or periods of revenue volatility and is a metric that is commonly considered by rating agencies and regulatory agencies. In North Carolina, many utilities operate with a very high DCOH compared to utilities in other states. In this analysis, DCOH is calculated by dividing the utility's unrestricted net position by their operating expenses (excluding depreciation) and multiplied by 365 to get the number of days.

Total debt to plant assets is calculated by dividing the total outstanding debt obligations by the net value of existing system assets. A high total debt to plant asset ratio indicates that a significant portion of the utility's assets are financed through debt rather than equity. While some level of debt is often necessary for financing capital projects and expansion, a high ratio may indicate limited flexibility with regard to funding additional capital needs and suggest elevated financial risk. This metric is particularly useful for assessing the financial risk and leverage of organizations with significant capital-intensive operations like water and wastewater utilities.

2.3 Affordability Metrics

Affordability of water and sewer services has been increasingly recognized as a critical issue in recent years. As awareness grows about the importance of ensuring access to clean and secure water for all communities, there has been greater emphasis on understanding and addressing affordability challenges. Affordability indicators such as the lowest quintile poverty indicator, yearly cost as a percentage of median household income, and yearly cost as a percentage of the lowest quintile income are crucial measures for assessing the affordability of water and wastewater utilities. These indicators help gauge the financial burden that water and wastewater services can impose on households, particularly those with lower incomes.

It should also be noted that, in communities that are currently facing affordability challenges, the addition of large infrastructure projects funded by an existing and small customer base will only amplify these challenges within a community.

The lowest quintile poverty indicator (LQPI) is a measure that originated in the EPA's FCA Guidance, which combines the results of six indicators to benchmark the prevalence of poverty, building a thorough estimation of the number and severity of low-income households and economic pressures in the service area. The six poverty metrics calculated to determine the LQPI are:

1. Upper Limit of Lowest Quintile Income (Weighted 50%)
2. Percent of Population with Income Below 200% of Federal Poverty Level (FPL) (Weighted 10%)
3. Percentage of Population Receiving Food / SNAP Benefits (Weighted 10%)
4. Percent of Vacant Households (Weighted 10%)
5. Trend in household Growth (Weighted 10%)
6. Percentage of Unemployed Population 16 and Over in Civilian Labor Force (Weighted 10%)

The local values for these metrics are compared to the national values as a benchmark. When the local values are more than 25% better than the national metric, the result is a strong rating. A local value 25% worse than the national average is considered weak. Values within 25% of the national metric are considered mid-range. The individual ratings are averaged by assigning a value of 3 for a strong result, 2 for mid-range, and 1 for weak. This composite score is the LQPI. The demographic information required to calculate the LQPI was obtained from the US Census Bureau's 2022 American Community Survey (ACS) five-year estimates.

While the LQPI score is effective at assessing the prevalence of poverty, it does not consider the relationship between income and the cost of water and sewer services. Certain communities may have a prevalence of poverty but also relatively affordable rates. While this is often not the case, the other two affordability metrics assessed in this study reveal the share of customer's yearly income that goes to water and sewer services. Both yearly utility costs as a percent of income at Median Household Income ("MHI") and Lowest Quartile Income ("LQI") are calculated using income data obtained from the (ACS) five-year estimates and divided by the average yearly bill. Estimated yearly billings were obtained from the North Carolina Environmental Finance rate tables at an average of 5,000 gallons per month for a household. Versions of the utility services cost as a percent of MHI and LQI are used by both the EPA and American Water Works Associations to measure the economic burden that relatively low-income households in a community face in paying their water and wastewater bills.

3. Utility Strength Evaluation Methodology

To achieve the objectives of the study in the aggressive timeline and to provide analyses based on publicly available information for all communities in the dataset, elements from the EPA's FCA Guidance were best fit to examine the overall strength of individual utilities. The nine indicators identified in the previous section deemed best suited to furnish a holistic view of a system's financial capability and affordability were applied to the general framework of the FCA guidance. This section explains the intended methodologies of the FCA guidance along with the approach adapted from its structure.

3.1 EPA's Financial Capability Assessment Guidance

CSO Guidance for Financial Capability Assessment and Schedule Development was published by the EPA in 1997 and provided a framework for utilities to evaluate their ability to finance capital improvements related to combined sewer overflow consent orders. The document, known as the 1997 Guidance, builds on previous EPA publications and indicates that, for regulatory and compliance scheduling purposes, financial capability can be assessed with a two-phase evaluation of a municipality. The first phase determines the Residential Indicator (RI), and the second phase is an assessment of six additional parameters indicative of overall financial strength of the community.

Phase 1 RI reflects the residential share of the total costs of the CSO program and any other existing operational costs and existing debt obligations of the wastewater system. The RI is reported as the average cost per customer as a percent of median household income in the service area. A low financial impact is expected for this ratio to be less than 1.0%, a mid-range impact occurs when this metric is between 1.0% and 2.0%, and a high financial impact is expected with this metric greater than 2.0%. According to the 1997 Guidance, this evaluation should be performed with consideration for wastewater and stormwater costs; however, recently, some utilities have expanded this analysis to include drinking water costs and doubled the thresholds. Due to some of the more intimate knowledge of a system's future capital plans required to accurately calculate RI, yearly water and sewer costs as a percent of MHI and LQI have been used in this study to achieve the same insight into the residential economic burden of utility services.

Phase 2 examines six parameters intended to measure the underlying financial strength of the community, collectively called the Permittee Financial Capability Indicator (FCI). Two of these indicators address existing debt obligations, two consider socio-economic conditions, and two relate to property tax data. These six parameters are compared with benchmark figures (nationwide data, for example) or against specific criteria provided by the EPA. Thus, the RI is intended to represent a prospective household affordability, and the FCI is intended to represent existing financial capacity of the community to accommodate the financial burden.
Table 3 below summarizes the financial capability matrix scoring.

Table 3. 1997 FCA Guidance Matrix

Financial Capability Indicator	Residential Indicator		
	Low Impact (Below 1%)	Mid-Range (1.0% to 2.0%)	High Impact (Above 2%)
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden
Mid-Range (1.5 to 2.5)	Low Burden	Medium Burden	High Burden
Weak (Below 1.5)	Medium Burden	High Burden	High Burden

Several groups have published critiques of the 1997 Guidance, including the US Conference of Mayors, the National Academy of Public Administration, water industry organizations, and municipalities themselves. The primary critique is that using a singular data point (MHI) as the metric upon which a community's financial capability pivots does not consider the myriad of local financial and demographic situations that significantly alter this evaluation.

In February 2023, EPA released the *Clean Water Act Financial Capability Assessment Guidance* (2023 Guidance) as an update to the 1997 FCA Guidance. This 2023 Guidance combines aspects of the 1997 Guidance and 2014 FCA Framework and describes options that communities can use when assessing financial capability to meet CWA requirements while also improving upon the EPA's ability to consistently apply FCA methodologies across the country. Specifically, the 2023 Guidance expands on the previous 1997 Guidance with the inclusion of two alternative approaches for assessing the financial capability to implement CWA control measures.

Under Alternative 1, the 1997 FCA methodology remains as a foundation, but it is expanded to better consider impacts on the low-income population within the service area in a new critical metric called the Lowest Quintile Poverty Indicator (LQPI) Score. It also includes further analysis to consider other feasible alternatives to reduce cost and impacts on low-income households, called the Financial Alternatives Assessment. Alternative 2 allows permittees to develop financial planning models that analyze the impacts of rate increases on utility customer bills over time while evaluating the LQPI Score and performing a Financial Alternatives Analysis similar to Alternative 1. Again, due to the aggressive timeline of the study, analyses based on Alternative 2 was not considered as developing a financial plan for all communities in the dataset was not feasible.

As with the FCA evaluation, the RI and LQPI values are combined in a matrix to evaluate the burden on low-income households in the service area. This represents an improvement to the 1997 Guidance since there is recognition of the prevalence of poverty in the community. Table 4 presents the evaluation matrix for the RI and LQPI.

Table 4. 2023 FCA Guidance Matrix

FCA Score	LQPI Score		
	Low Impact	Medium Impact	High Impact
Low Impact	Low Impact	Low Impact	Medium Impact
Medium Impact	Low Impact	Medium Impact	High Impact
High Impact	Medium Impact	High Impact	High Impact

3.2 Developing the Utility Strength Scorecard

Evaluating the 39 utilities' individual financial capability and household affordability for their overall service areas requires a multi-faceted approach. Using a single approach (i.e., the 2023 Guidance Alternative 1) would fail to provide complete or appropriate resolution given the broad scope of the regionalization objectives of the study. To inform the analyses on the financial, demographic, and physical conditions of the actual utility and not just the community it serves, this analysis explores the 2023 Guidance as well as system characteristics and financial metrics previously mentioned. The RI and LQPI measures of FCA alternative 1 are represented in this study as the affordability metrics.

For the objectives of this study to accurately identify opportunities for regionalization in the US Route 421 corridor based on financial capability and affordability, a singular statistic was required to properly compare utilities' strengths and weaknesses. The weighted calculation of the LQPI in the FCA guidance was aptly suited to use as a framework for compiling the nine selected metrics into a single "score." This score could ideally be used to provide directionally how much impact the cost of regionalization solutions would have on the utility and its serviced community. For instance, like the lowest quintile poverty indicator, a lower score would mean a higher impact would be seen on utilities based on the severity of their financial capability and service affordability. In Table 5 below, the calculation of the LQPI is illustrated with its impact benchmarks and thresholds for strong, mid-range, and weak scoring.

Table 5. Lowest Quintile Poverty Indicator Score Template

Indicator	Strong (Score = 3)	Mid-Range (Score = 2)	Weak (Score = 1)	Weight
LQPI #1 Upper Limit of Lowest Quintile Income	more than 25% above national LQI	± 25% of national LQI	more than 25% below national LQI	50%
LQPI #2 Percentage of population with Income Below 200% of Federal Poverty Limit	more than 25% below national value	± 25% of national value	more than 25% above national value	10%
LQPI #3 Percentage of Households Receiving Food Stamps/ SNAP Benefits	more than 25% below national value	± 25% of national value	more than 25% above national value	10%
LQPI #4 Percentage of Vacant Housing Units	more than 25% below national value	± 25% of national value	more than 25% above national value	10%
LQPI #5 Trend in Household Growth	>1%	0%-1%	<0%	10%
LQPI #6 Percentage of Unemployed Population 16 and Over Civilian Labor Force	more than 25% below national value	± 25% of national value	more than 25% above national value	10%

This weighted scoring framework was the inspiration for the nine-metric utility strength scorecard used to assess communities in the study. Table 6 below outlines the measures categorized by system characteristics, financial metrics, and affordability metrics along with their respective benchmarks and strength scores.

Table 6. Utility Strength Score Template

Strength Metrics	Weak (Score = 1)	Mid-Range (Score = 2)	Strong (Score = 3)
System Characteristics			
SC#1 Service Population	less than 15,000	between 15,000 and 50,000	more than 50,000
SC#2 Remaining Life of System	less than 20 years	between 20 and 30 years	more than 30 years
SC#3 Household Growth Rate	<0%	0%-1%	>1%
Financial Metrics			
FM#1 Debt Service Coverage	less than 1.25	between 1.25 and 2	more than 2
FM#2 Days Cash on Hand	less than 200 DCOH	between 200 and 400 DCOH	More than 400 DCOH
FM#3 Total Debt to Plant Assets	more than 50%	between 20% and 50%	Less than 20%
Affordability Metrics			
AM#1 Lowest Quintile Poverty Indicator	less than 1.5	between 1.5 and 2.5	more than 2.5
AM#2 Yearly Cost as % of MHI	more than 4%	Between 2% and 4%	Less than 2%
AM#3 Yearly Cost as % of LQI	more than 4%	Between 2% and 4%	Less than 2%

The first noticeable deviation aside from the differing metrics is the utility strength score template uses hard benchmarks in ranges that are not relative to a national average. The ±25% benchmarks set by the EPA in the FCA Guidance fall subject to setting thresholds that would satisfy utilities in all areas of the United States. On account of all the communities in this study falling within the boundaries of seven counties in North Carolina, Raftelis utilized its expertise in providing assistance to over 1,700 public agencies and utilities to set benchmarks that are reasonable thresholds for assessing the strength of individual utilities metric in the study area. The household growth rate and affordability metric benchmarks are well-established measurement thresholds used by most industry capability guidelines. The three financial metric benchmarks were informed by common targets many utilities maintain for bond and rate covenants to present ability to service debt obligations. The service population benchmarks are justified generally based on state and grant loan thresholds, indicative of revenue stability. Utilities with less than approximately 15,000 in service population have difficulty garnering revenues to offset increasing operating and capital costs while maintaining affordability. The average remaining life of the system in the utility data set was just over 25 years; as remaining life decreases, the need for reinvestment in the system rises, and capital improvement plans generally follow 10-year timeframes but can take double that to plan and complete, raising concern when this metric falls too low.

Similarly to the FCA's Guidance on calculating LQPI, the utilities were given scores for each of the nine metrics depending on which side of the benchmarks that particular measurement fell, 1 being weak, 2 being mid-range, and 3 being strong. Several utilities for varying reasons had missing or irrelevant data required for an equitable scoring, as noted as such in Table 1. Wilson's Mills, Randolph County Utility, and Piedmont Triad Regional Water Authority (PTRWA) do not operate and directly service a residential population. While they may own water or sewer service infrastructure, they do not have set residential rates and therefore could not be assessed on the affordability metrics leading to a potentially unfair low scoring. The Seagrove-Ulah Metropolitan Water District did not have any publicly available rate schedules for the past 5 years and thus could not be scored properly in the affordability category. Finally, Carolina Trace was identified as a gated country club community with private water services, consequently reliable audited financial statements could not be obtained.

Following metric scoring, the nine financial capability metrics were scaled and weighted to show an achieved score out of 10. The FCA Guidance calculates LQPI by weighting the most important factor, the Lowest Quintile Income, 50% and the rest 10% respectively out of a potential score of 3. The utility strength scoring system used in this analysis weights each metric separately, sums by category, and then weights again by category. The chosen weights are shown in Table 7.

Table 7. Utility Strength Metric Weightings

Strength Metrics	Weight	Score Out Of	Data Average Score
System Characteristics	**30%**	**3.00**	**1.83**
SC#1 Service Population	50%	1.50	0.71
SC#2 Remaining Life of System	25%	0.75	0.53
SC#3 Household Growth Rate	25%	0.75	0.58
Financial Metrics	**30%**	**3.00**	**2.40**
FM#1 Debt Service Coverage	33%	1.00	0.84
FM#2 Days Cash on Hand	33%	1.00	0.79
FM#3 Total Debt to Plant Assets	33%	1.00	0.78
Affordability Metrics	**40%**	**4.00**	**2.47**
AM#1 Lowest Quintile Poverty Indicator	40%	1.60	0.94
AM#2 Yearly Cost as % of MHI	20%	0.80	0.71
AM#3 Yearly Cost as % of LQI	40%	1.60	0.82
Total System Score	**100%**	**10.00**	**6.70**

The weightings were chosen based on Raftelis' understanding of project objectives that value affordability and experience advising utilities throughout the United States. Noticeably the right-most column exhibits the average scoring for the community dataset, which is shown as a whole scoring most poorly in the affordability category and most poorly in the service population metric, with weightings in account. Overall, this demonstrates a trend in the communities assessed in the study, particularly about how the interplay between small populations and poor affordability creates a challenging financial environment for utilities, making it difficult for them to demonstrate strong financial capability in terms of revenue sufficiency, liquidity, debt management, and overall financial stability. Ideally, regional solutions will promote adequate revenue streams and allocation of resources, so utilities may maintain and upgrade their infrastructure, provide reliable services, and meet regulatory requirements, ultimately improving their ability to fulfill their mission of delivering broad and equitable water and wastewater services to their communities.

4. Results and Key Conclusions

In this section, we present the results derived from the application of a comprehensive scorecard system developed to assess the financial capability and affordability of water and wastewater services for designated utilities in the Study Area. The scorecard system represents a novel approach adapted from recommendations by the EPA's FCA Guidance and tailored specifically to the unique objectives and considerations of this particular study. By integrating multiple financial metrics and affordability indicators, the scorecard aims to provide a holistic and nuanced evaluation of utilities' financial health and their ability to provide affordable services to their communities. Through analysis and validation, the results presented here offer valuable insights into the effectiveness and applicability of the Scorecard in evaluating the impacts that proposed regional solutions would have on various utilities and their service populations. These key findings not only shed light on the current state of financial capability and affordability within the region, but also provide a foundation for informed decision-making and strategic planning to address regional infrastructure challenges.

4.1 Scorecard Analysis

Figure 1 shows the average results from the scorecard analysis for the communities grouped by populations over 10,000, between 2,000 and 10,000, and less than 2,000. The chart reveals the most common theme in the analyses and is why the utilities have been grouped by population, larger utilities often benefit from economies of scale, which can lead to lower average cost of production. With larger customer bases to spread fixed costs across, such as infrastructure maintenance, administrative expenses, and capital investments, larger utilities can achieve greater efficiency in resource utilization and cost management. This efficiency can translate into lower average costs for customers, contributing to improved affordability.

Figure 1. Population Group Average Scores

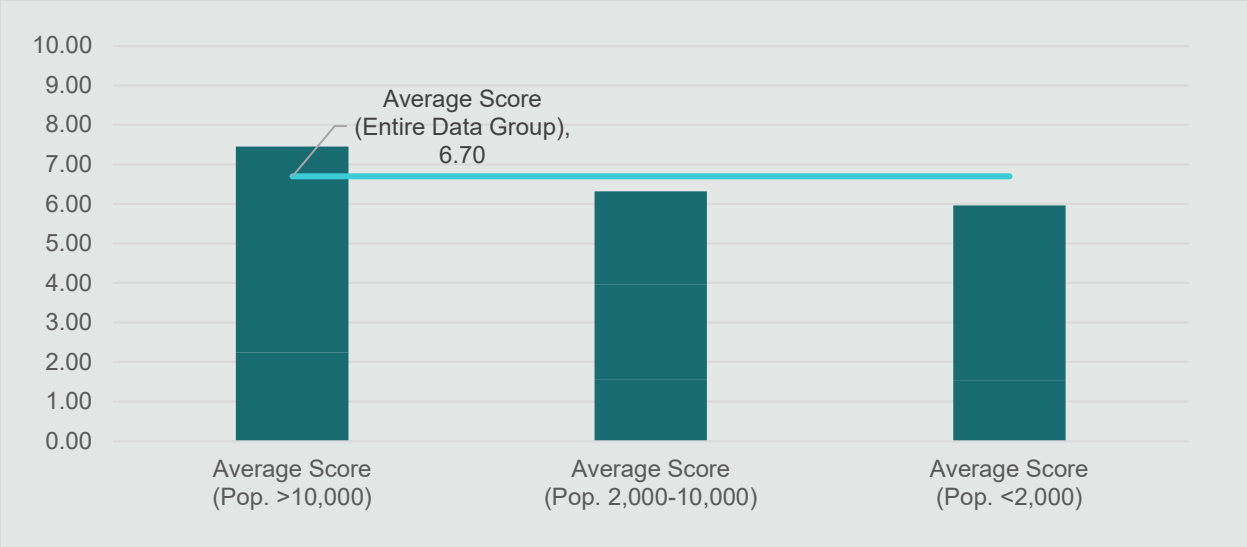


Figure 2. Pop. >10,000 Scores

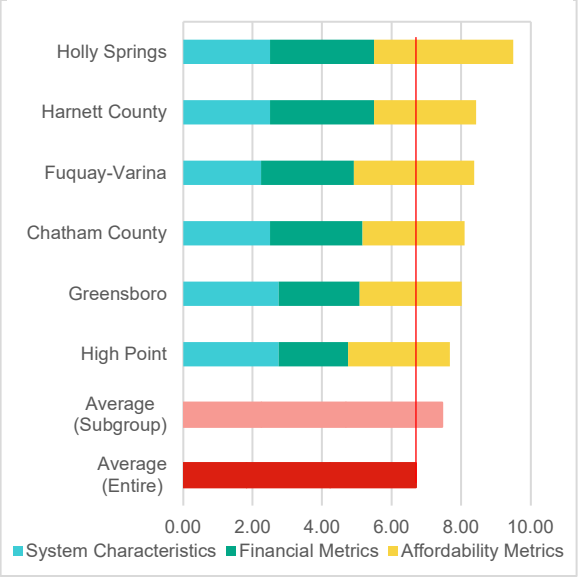
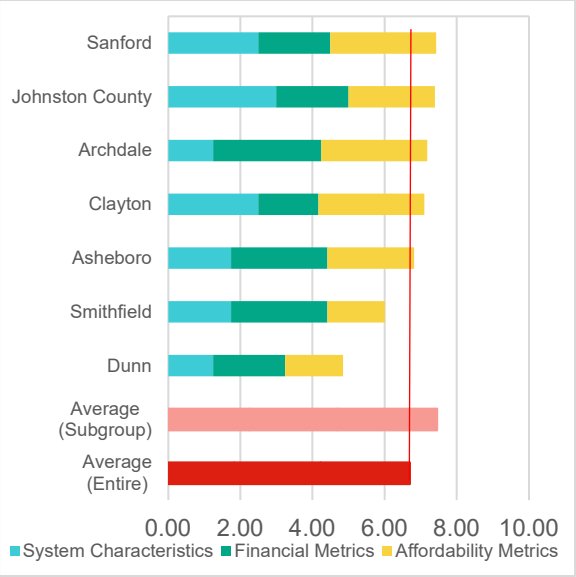


Figure 3. Pop. >10,000 Scores cont.



Figures 2 and 3 show the Utility Strength Scores for the higher population utilities in the data set. The separate colors indicate how well the utility scored in each of the three metric categories. Their average scoring is 7.45, which is unsurprisingly above the average for the entire region at 6.7. Although there are a few utilities in this subset that score below the average, the vast majority of these utilities score at or above the average for the entire survey group. Of the thirteen utilities in this subgroup, eleven score at or above the average with only Smithfield and Dunn being measuarbly below 6.7.

Figure 4. Pop. 2,000-10,000

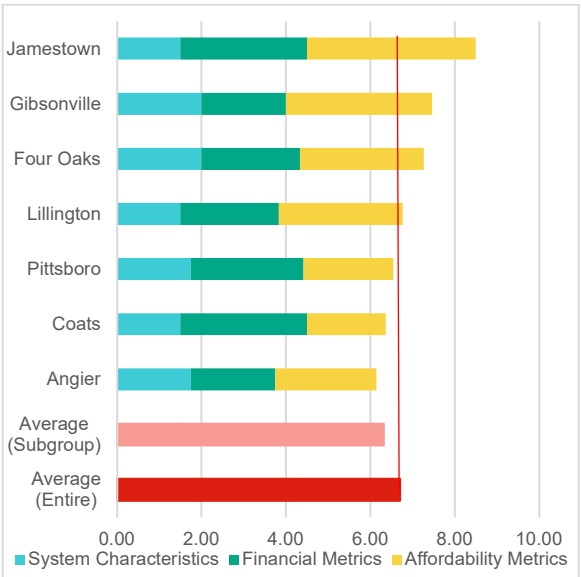
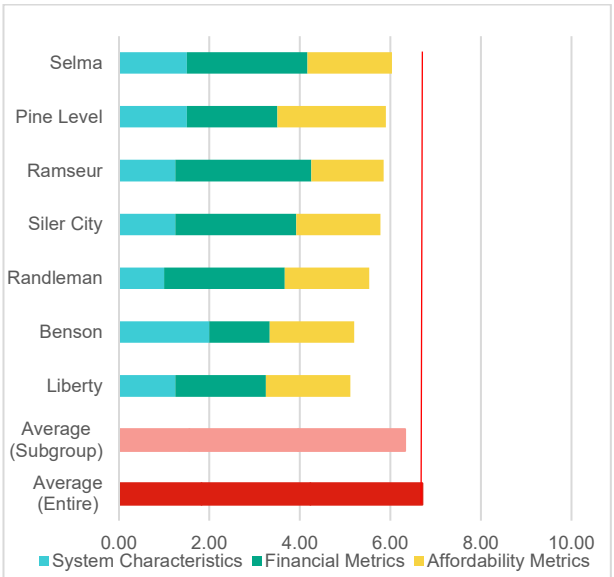


Figure 5. Pop. 2,000-10,000 cont.



The Utility Strength Scores for this population group are shown in Figures 4 and 5. Several communities in this population grouping score very well, and can be seen in Figure 4 with comparably better scores in the affordability category. This is primarily due to the 2 highest-scoring communities in this grouping having lowest quintile incomes above $40,000, signaling wealth in those particular communities. The scoring average of the middle range population subgroup between two and ten thousand is 6.32, which falls below the average for the entire group, indicating a weaker scoring trend as service population decreases. In this subgroup, only three communities score above the overall average, with many communities showing particular stress with regard to affordability metrics.

Figure 6. Pop. < 2,000

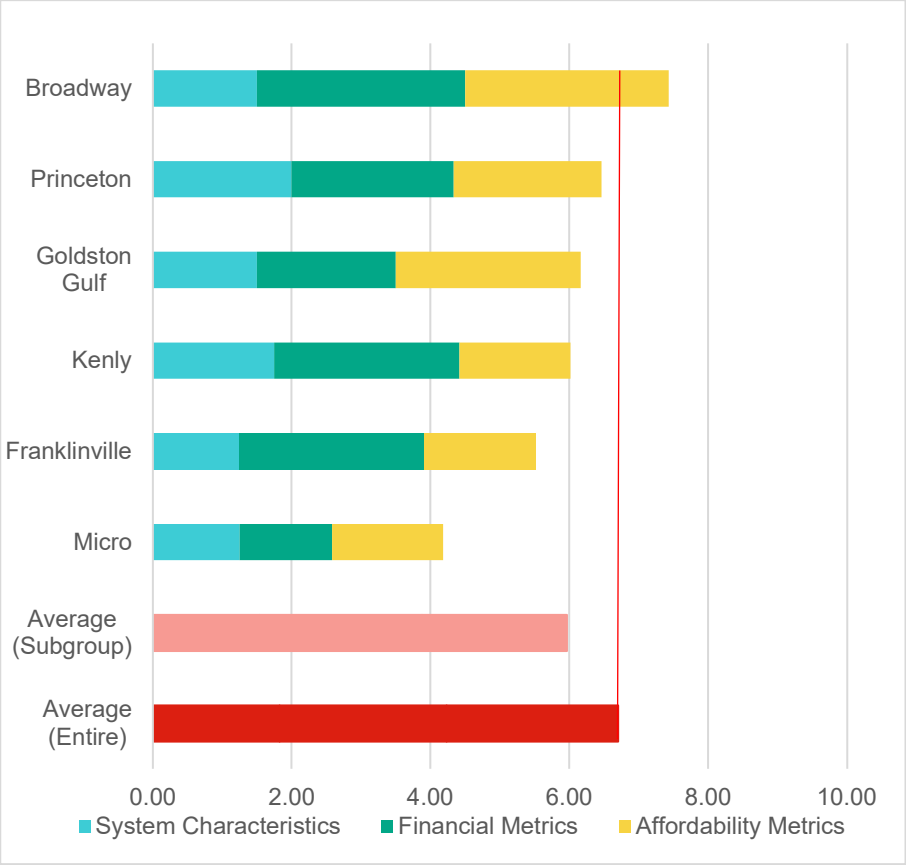
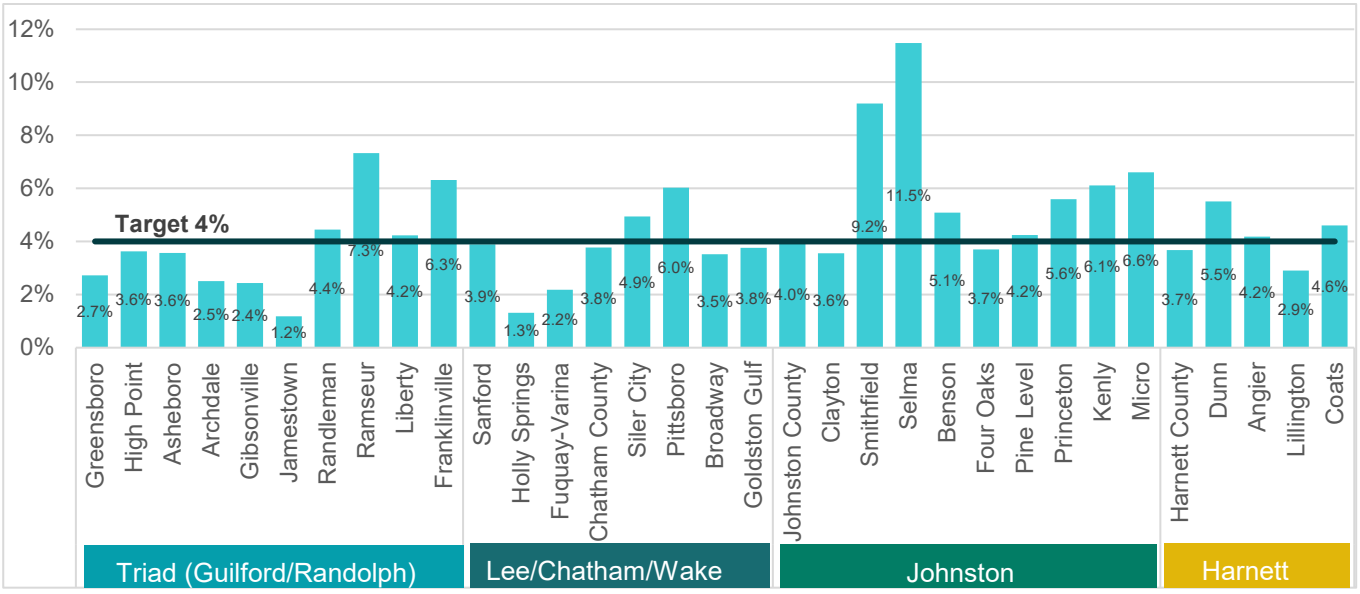


Figure 6 illustrates the scores for the smallest population grouping with a subgroup average of 5.96. Although the average for this subgroup is marginally lower than the prior group (10,000 to 2,000), the similar scores potentially indicate trends that revolve around the 10,000 service population threshold. The communities in this grouping have the highest average yearly cost for water and wastewater services as a percent of the lowest quintile income while also having system scores significantly below average. This reveals the challenges smaller communities can face in providing affordable services to an already vulnerable population that lacks the economies of scale to provide opportunities for stability in the future. The addition of significant debt for ongoing system maintenance or regionalization efforts will have an outsized impact on both affordability and each system's financial score.

The yearly cost as a percentage of the lowest quintile income is the study's most essential measure of affordability because it directly reflects the financial burden that water and wastewater services impose on the most economically vulnerable segment of the population. This measure provides a clear indication of the proportion of income that low-income households must allocate to cover essential utility expenses. Additional debt from regional infrastructure solutions would exacerbate affordability challenges for smaller systems. While regional solutions, such as shared treatment facilities or interconnectivity with neighboring systems, can offer cost savings and operational efficiencies, they may also entail significant upfront costs and debt obligations. If the burden of this debt must be disproportionately borne by ratepayers, already economically strained communities will see significant impacts on affordability and water insecurity.

Figure 7 below shows yearly utility costs as a percent of LQI for all utilities in the study, with available data. The communities are pictured left to right roughly by geographic location (west to east) and then by service population left to right; for example, Greensboro has the largest service population in the Triad group. The figure loosely shows the correlation between affordability and size of service population. As you move right in the groupings, down in population size, the portion of income that goes to utility services generally increases. Similarly, this chart shows a trend in affordability by geography. Households in communities farther east must generally offer up more of their yearly income to pay for essential water and wastewater services.

Figure 7. Yearly Cost as a Percent of Lowest Quintile Income



As was mentioned earlier, the chart above highlights affordability challenges within the survey area. The addition of significant costs (related to maintenance of their current systems or as part of potential regionals solutions) to existing customer bases will only amplify the existing affordability issues.

Figure 8. Utility Strength Scores

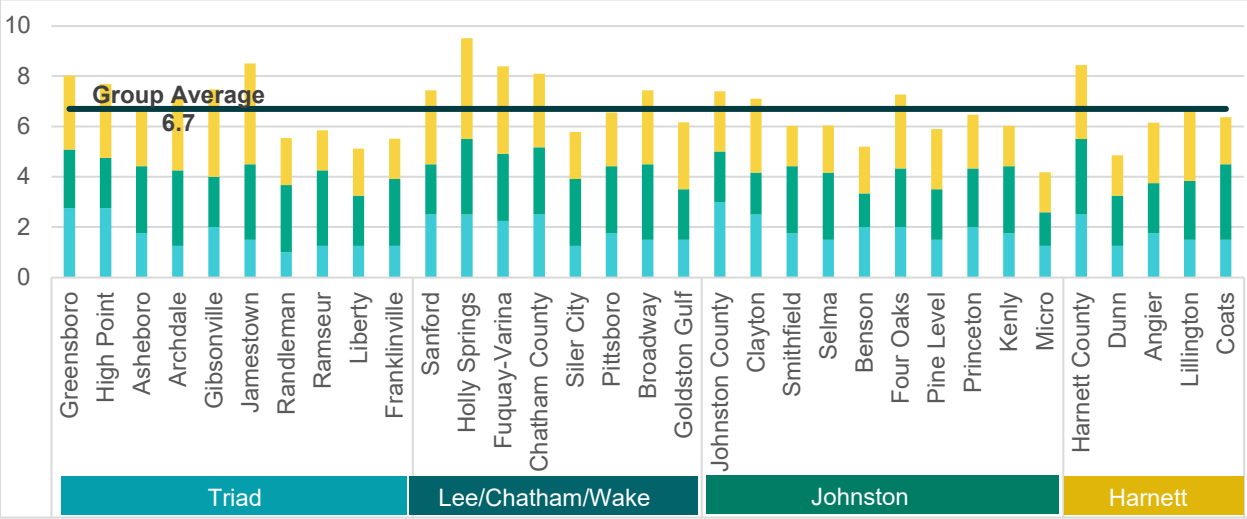


Table 8 and Table 9 present the detailed scorecard results for each utility within the survey area. Table 8 presents that data by service populations, whereas Table 9 provides the data by geographic subgrouping outlined earlier in the report.

Table 8. Utility Strength Scores by Population

City	Service Population	System Characteristics	Financial Metrics	Affordability Metrics	Total Strength Score
Greensboro	290,201	2.75	2.33	2.93	8.02
High Point	115,526	2.75	2.00	2.93	7.68
Harnett County	102,613	2.50	3.00	2.93	8.43
Johnston County	89,604	3.00	2.00	2.40	7.40
Sanford	45,649	2.50	2.00	2.93	7.43
Holly Springs	38,500	2.50	3.00	4.00	9.50
Fuquay-Varina	30,474	2.25	2.67	3.47	8.38
Asheboro	25,852	1.75	2.67	2.40	6.82
Chatham County	24,232	2.50	2.67	2.93	8.10
Clayton	22,967	2.50	1.67	2.93	7.10
Smithfield	13,025	1.75	2.67	1.60	6.02
Archdale	12,700	1.25	3.00	2.93	7.18
Dunn	12,334	1.25	2.00	1.60	4.85
Average: >10,000	**63,360**	**2.25**	**2.44**	**2.77**	**7.45**
Siler City	8,501	1.25	2.67	1.87	5.78
Angier	8,468	1.75	2.00	2.40	6.15
Gibsonville	7,129	2.00	2.00	3.47	7.47
Selma	6,832	1.50	2.67	1.87	6.03
Jamestown	6,543	1.50	3.00	4.00	8.50
Randleman	5,950	1.00	2.67	1.87	5.53
Pittsboro	4,667	1.75	2.67	2.13	6.55
Benson	3,965	2.00	1.33	1.87	5.20
Lillington	3,883	1.50	2.33	2.93	6.77
Four Oaks	2,974	2.00	2.33	2.93	7.27
Ramseur	2,893	1.25	3.00	1.60	5.85
Coats	2,705	1.50	3.00	1.87	6.37
Liberty	2,655	1.25	2.00	1.87	5.12
Pine Level	2,651	1.50	2.00	2.40	5.90
Average: 2-10	**4,987**	**1.55**	**2.40**	**2.36**	**6.32**
Princeton	1,552	2.00	2.33	2.13	6.47
Broadway	1,503	1.50	3.00	2.93	7.43
Kenly	1,400	1.75	2.67	1.60	6.02
Franklinville	1,360	1.25	2.67	1.60	5.52
Goldston Gulf	1,285	1.50	2.00	2.67	6.17
Micro	484	1.25	1.33	1.60	4.18
Average: < 2,000	**1,264**	**1.54**	**2.33**	**2.09**	**5.96**
Average : < 10,000	**3,870**	**1.55**	**2.38**	**2.28**	**6.21**

Table 9. Utility Strength Scores by Geography

Group	City	Service Population	System Characteristics	Financial Metrics	Affordability Metrics	Total Strength Score
Triad	Greensboro	290,201	2.75	2.33	2.93	8.02
Triad	High Point	115,526	2.75	2.00	2.93	7.68
Triad	Asheboro	25,852	1.75	2.67	2.40	6.82
Triad	Archdale	12,700	1.25	3.00	2.93	7.18
Triad	Gibsonville	7,129	2.00	2.00	3.47	7.47
Triad	Jamestown	6,543	1.50	3.00	4.00	8.50
Triad	Randleman	5,950	1.00	2.67	1.87	5.53
Triad	Ramseur	2,893	1.25	3.00	1.60	5.85
Triad	Liberty	2,655	1.25	2.00	1.87	5.12
Triad	Franklinville	1,360	1.25	2.67	1.60	5.52
Triad			**1.67**	**2.53**	**2.56**	**6.77**
Lee/Chatham/Wake	Sanford	45,649	2.50	2.00	2.93	7.43
Lee/Chatham/Wake	Holly Springs	38,500	2.50	3.00	4.00	9.50
Lee/Chatham/Wake	Fuquay-Varina	30,474	2.25	2.67	3.47	8.38
Lee/Chatham/Wake	Chatham County	24,232	2.50	2.67	2.93	8.10
Lee/Chatham/Wake	Siler City	8,501	1.25	2.67	1.87	5.78
Lee/Chatham/Wake	Pittsboro	4,667	1.75	2.67	2.13	6.55
Lee/Chatham/Wake	Broadway	1,503	1.50	3.00	2.93	7.43
Lee/Chatham/Wake	Goldston Gulf	1,285	1.50	2.00	2.67	6.17
Lee/Chatham/Wake			**1.97**	**2.58**	**2.87**	**7.42**
Johnston	Johnston County	89,604	3.00	2.00	2.40	7.40
Johnston	Clayton	22,967	2.50	1.67	2.93	7.10
Johnston	Smithfield	13,025	1.75	2.67	1.60	6.02
Johnston	Selma	6,832	1.50	2.67	1.87	6.03
Johnston	Benson	3,965	2.00	1.33	1.87	5.20
Johnston	Four Oaks	2,974	2.00	2.33	2.93	7.27
Johnston	Pine Level	2,651	1.50	2.00	2.40	5.90
Johnston	Princeton	1,552	2.00	2.33	2.13	6.47
Johnston	Kenly	1,400	1.75	2.67	1.60	6.02
Johnston	Micro	484	1.25	1.33	1.60	4.18
Johnston			**1.92**	**2.10**	**2.13**	**6.16**
Harnett	Harnett County	102,613	2.50	3.00	2.93	8.43
Harnett	Dunn	12,334	1.25	2.00	1.60	4.85
Harnett	Angier	8,468	1.75	2.00	2.40	6.15
Harnett	Lillington	3,883	1.50	2.33	2.93	6.77
Harnett	Coats	2,705	1.50	3.00	1.87	6.37
Harnett			**1.70**	**2.47**	**2.35**	**6.51**

4.2 Debt Analysis

To support the affordability objectives of the study a supplemental analysis was performed to examine the effects of assumed additional debt on the customer populations of the utilities in the study group. The yearly cost of water and sewer service as a percent of the Lowest Quintile Income (LQI) was identified as the appropriate metric to analyze the magnitude to which additional debt service has on the utility bill of most vulnerable portion of the population. To associate projected debt service by utility, cost estimates for projects by geographic group were provided by Hazen and can be seen in Table 10 below. These estimates were then weighted to individual utility by portion of customers in that geographic grouping. The number of customers served by individual utilities was based on water connection totals provided by the North Carolina Division of Water Infrastructure.

This debt analysis acknowledges the legislature has provided over $600 million in infrastructure funding to communities in the study area over the past three (3) legislative sessions. While we know that a portion of this funding will be used for projects covered in this report, the exact amount is currently not known. The following analysis and discussion do not reflect the impact of this funding on potential future debt issuance.

Table 10. Regional Solution Cost Estimates by Geography

Regional Water and Wastewater Infrastructure Master Plan April 22, 2024 Update		
Group	Scenario	Total: Water and Wastewater Costs
Johnston County	As Recommended	$ 2,596,400,000
Harnett County	As Recommended	381,800,000
Lee/Chatham/Southern Wake	Scenarios LC-W1, LC-WW1, SW-WW1	4,125,160,000
Triad	Scenarios T-W1, T-WW1, T-WW1B	3,074,919,960
Total Cost:		$ 10,178,279,960

To approximate the structure of debt schedules for each individual utility an interest rate of 3.5% over 25 years was used, along with a 2% cost of issuance and a required 1.5 debt service coverage ratio. It is assumed that revenues by utility will need to increase by the amount of the newly calculated debt service and that the current cost of utility services reflected on a customer's bill will increase by the same percentage to meet the revenue requirements. The analysis presumes that all utilities are already meeting any revenue and coverage requirements and that all loans would be approved for issuance. It should be noted that the debt service schedules calculated in this analysis are representative of an average cost of capital for the regional solutions proposed and not a recommendation for how funding should be executed.

Per State statute, any additional debt would be required to be approved by the Local Government Commission ("LGC"). This analysis does not opine on the prospects of the approval of future debt by the LGC for the projects outlined by this study or for other purposes.

The estimated changes to each utility's yearly customer bills as a percentage of LQI are presented in Table 11. Scenarios for the level of cost that must be funded by rates are shown at 25%, 50% and 100%. According to the fiscal year 2022 data just over half of the utilities in the study group are already over the 4% LQI threshold used as an indicator for potential affordability issues. The Table illustrates that rate funding only 25% of the estimated project costs pushes all but 7 utilities above this 4% threshold and several above 10% of LQI.

Table 11. Effects of Project Funding to Yearly Cost as a Percent of LQI

City	Number of Connections		Effects of Project Funding to Yearly Cost % of LQI		
		FY22 %LQI	25% Rate Funded	50% Rate Funded	100% Rate
Triad					
Greensboro	108,971	2.7%	3.5%	4.4%	6.0%
High Point	44,452	3.6%	4.6%	5.6%	7.6%
Asheboro	13,592	3.6%	4.7%	5.8%	8.1%
Archdale	5,054	2.5%	3.6%	4.6%	6.8%
Gibsonville	4,212	2.4%	3.4%	4.4%	6.3%
Jamestown	2,691	1.2%	1.5%	1.8%	2.4%
Randleman	2,617	4.4%	6.1%	7.7%	10.9%
Liberty	1,430	4.2%	6.6%	8.9%	13.6%
Ramseur	1,351	7.3%	10.6%	14.0%	20.6%
Franklinville	558	6.3%	8.5%	10.7%	15.0%
Lee/Chatham/Wake					
Sanford	21,438	3.9%	7.9%	11.9%	20.0%
Holly Springs	17,223	1.3%	2.6%	4.0%	6.6%
Fuquay-Varina	15,909	2.2%	3.7%	5.3%	8.4%
Chatham County	12,144	3.8%	10.2%	16.7%	29.6%
Siler City	3,918	4.9%	7.9%	10.9%	16.8%
Pittsboro	2,218	6.0%	8.3%	10.7%	15.3%
Broadway	746	3.5%	10.9%	18.2%	32.9%
Goldston Gulf	500	3.8%	9.1%	14.5%	25.3%
Johnston					
Johnston County	44,268	4.0%	6.5%	9.0%	14.1%
Clayton	11,414	3.6%	4.8%	6.1%	8.6%
Smithfield	4,297	9.2%	12.4%	15.6%	22.1%
Selma	2,868	11.5%	16.8%	22.1%	32.7%
Benson	1,984	5.1%	7.6%	10.1%	15.1%
Four Oaks	1,582	3.7%	5.9%	8.2%	12.7%
Pine Level	1,194	4.2%	8.0%	11.7%	19.2%
Kenly	1,040	6.1%	10.1%	14.1%	22.1%
Princeton	745	5.6%	9.9%	14.2%	22.9%
Micro	299	6.6%	11.7%	16.9%	27.2%
Harnett					
Harnett County	43,592	3.7%	4.2%	4.7%	5.8%
Dunn	4,643	5.5%	6.1%	6.6%	7.8%
Angier	3,694	4.2%	4.8%	5.5%	6.7%
Lillington	1,938	2.9%	3.3%	3.6%	4.4%
Coats	1,129	4.6%	6.3%	8.0%	11.5%

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5. Summary

As part of the larger study, the Scorecard provides a snapshot analysis of individual utilities' systems, financial position, and affordability of services. It provides a balanced view of each utility based on publicly available data. As was outlined previously, the analysis grouped the utilities using two different approaches – by size and location. A more thorough review of each utility would be required to fully understand the impact of new infrastructure and potential regionalization on each utility.

Key Take Away – Affordability for the Lowest Quartile Income population is already a challenge.

The key takeaway from the analysis is that affordability is a challenge across the survey area for the lower quartile of the population and is particularly problematic in smaller entities. Additionally, this issue is more acute in the eastern portion of the survey area. Layering on additional debt for regionalization efforts or maintenance of existing systems will exacerbate this issue – specifically for utilities with service populations below 10,000.

Several other key takeaways are as follows:

- Overall, utilities with a service population below 10,000 scored significantly lower on the scorecard than those with larger populations.
- Utilities with a service population below 10,000 generally scored well below average with regard to affordability.
- Utilities with a service population below 10,000 generally scored well below average with regard to system strength.
- The size of utility did not seem to impact the financial portion of the scorecard. Both above and below 10,000 groups had similar scores. However, it is important to note that an in-depth financial analysis or system condition assessment for each utility was not conducted. A more detailed analysis may reveal significant capital needs that would have a major impact on the overall financial health of some of the systems within the survey area.
- Similar to the takeaways above, utilities in the eastern portion of the survey area (Harnett and Johnston) generally scored lower on the scorecard (specifically on the affordability metrics) than those in the western portion of the survey area. Obviously, within any particular geographic region, there will be outliers (higher or lower than the average), but – on the whole, these trends hold true.
- Smaller utilities across the survey area will be disproportionately impacted by the addition of debt to fund future improvements or expenses related to regionalization. Many of the utilities with a service population below 10,000 have limited debt profiles which increase their financial metrics and their affordability metric. The addition of moderate levels of debt to their financial profiles will significantly decrease their overall scorecard results.

As has been previously outlined, the Scorecard is an analysis at a point in time based on a variety of publicly available data sources. This review was limited to the information available in those sources. It did not have the benefit of direct contact with individual utilities to complete an in-depth analysis of their financials, condition of their system, current capital improvement plans or recent debt issuances. In some instances, the gap between the date of this analysis and the most recent audit is nearly two full fiscal years. Clearly, these additional data points would be critical in providing a more complete review of each system's current condition.

Throughout the study area, individual utilities continue to plan and move forward with adjustments to their rates and debt plans. These developments may have significant impacts on the debt levels, rate structures and affordability for many of the entities outlined above. Clearly, to understand the full impact on affordability for any of the entities or subgroups within the area, a more thorough analysis of all known changes would be needed.