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Engineering Report / Environmental Information Document
**Davie County Public Utilities Department and
Town of Mocksville
Water Supply Improvements Project**

**Project Nos: WIF2018 & SRP-D-0203
PWSID NC0230015**

Davie County and Town of Mocksville, NC
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Appendix E: Financial Analysis Tables

Appendix F: NCDEQ ER-EID Comments and Responses

List of Acronyms

Abbreviation	Definition
AWWA	American Water Works Association
BMP	Best Management Practice
cfs	Cubic feet per second
C	Class C waters
CO	Carbon monoxide
CU	Cataloging Units
CWA	Clean Water Act
DAQ	North Carolina Division of Air Quality
DEQ	North Carolina Department of Environmental Quality
DENR	North Carolina Department of Natural Resources
DIP	Ductile iron pipe
DWI	Davidson Water, Inc.
DWR	North Carolina Division of Water Resources
E	Endangered
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Administration
FRP	Fiberglass reinforced plastic
ft/s	Feet per second
gpm	Gallons per minute
gpm/sf	Gallons per minute per square foot
HDPE	High density polyethylene
IBT	Interbasin transfer
LWSP	Local Water Supply Plans
MG	Million gallon
mgd	Million gallon per day
MIDSA	Minority and Income Demographic Study Area
MSL	Mean sea level

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Abbreviation	Definition
MOR	Monthly Operation Report
NAAQS	National Ambient Air Quality Standards
NC	North Carolina
NCAC	North Carolina Administrative Code
NCNHP	North Carolina Natural Heritage Program
NOx	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O&M	Operation and maintenance
OSBM	NC Office of State Budget and Management
PAC	Powdered activated carbon
PER	Preliminary Engineering Report
PM-10	Particulate matter – coarse dust particles
PM-2.5	Particulate matter – very small particles
Psi	Pounds per square inch
PTRC	Piedmont Triad Regional Council
RW	Raw water
SA	Service area
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SFHA	Special Flood Hazard Area
SHPO	State Historic Preservation Office
SOx	Sulfur oxides
SRF	State Revolving Fund
T	Threatened
U.S.	United States
USFWS	United States Fish and Wildlife Service

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Abbreviation	Definition
USGS	United States Geological Service
UV	Ultraviolet
UVT	Ultraviolet Transmittance
VOC	Volatile organic compound
WS	Water supply waters
WTP	Water treatment plant

1. Executive Summary

The Davie County Public Utilities Department (County) currently owns and operates two Water Treatment Plants (WTPs), the 2.6-mgd Cooleemee WTP located in the southern portion of the county and the 3.0-mgd Sparks Road WTP, located in the northern portion of the county. The Town of Mocksville (Town) owns and operates the 2.0-mgd Hugh A. Lagle WTP, which is located west of the Town and treats raw water pumped several miles from Hunting Creek. The combined capacity of these WTPs is not adequate to meet the projected system demands over the next 20-year planning period. In addition, the County's Cooleemee WTP and the Town's Lagle WTP are both aging facilities and in need of either major upgrades or decommissioning.

A vicinity map is presented in Figure 1-1 illustrating municipal and county limits, waterbodies, location of source water, major water mains, as well as WTP location. A project location map in Figure 1-2 illustrates the project area, roadways, municipal limits, and waterbodies, including the South Yadkin River (source water) in the vicinity of the WTP.

1.1 Project Description

The Davie County Cooleemee WTP is located at 246 Main St. in Cooleemee, NC, and was originally constructed in the 1930s to serve the adjacent mill and surrounding communities. The proposed near-term project to replace the existing 2.6-mgd Cooleemee WTP with a new 3.5-mgd facility consists of the following components:

- Upgrades to the existing intakes and raw water pump stations to supply the new Cooleemee WTP
- Demolition of the existing Cooleemee WTP upon successful start-up and continuous operation of the new Cooleemee WTP
- Decommissioning of the existing Lagle WTP
- Construction of the new Cooleemee WTP, which includes the following components:
 - One (1) rapid mix chamber
 - Six (6) flocculation basins equipped with variable-speed vertical flocculators
 - Two (2) sedimentation basins
 - Four (4) multi-media filters
 - One (1) clearwell
 - Continued use of silo style finished water tanks
 - High service pump station
 - Chemical building

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- One (1) backwash equalization tank
- One (1) standby generator
- Miscellaneous yard piping
- Construction of 18,500 LF of 12-inch and 16-inch transmission mains parallel to existing water lines, which includes the following components:
 - Fittings and valves
 - Fire hydrants
 - Bore and Jack trenchless crossings
 - Erosion and sedimentation control and other miscellaneous restoration

1.2 Reasons for Proposed Project

The County's Cooleemee WTP and the Town's Lagle WTP both have reached the end of their useful lives and require significant financial investment to remain as viable water treatment resources. Without the 2.6-mgd provided by the Cooleemee WTP and the 2.0-mgd provided by the Lagle WTP, neither the County nor the Town would be able to meet their current water supply demands. Additionally, the existing interconnections between the County and Town are undersized and cannot hydraulically accommodate the Town of Mocksville's distribution system.

1.3 Results of Alternatives Analysis

Five different alternatives and three phasing options were evaluated for the Davie County Water Supply Improvements. The alternatives evaluated include the following:

- No-Action Alternative
- Alternative 1 – Replace existing Cooleemee WTP with new 6-mgd WTP
- Alternative 2 – Expand Sparks Road WTP to 4.5-mgd and purchase 4.5-mgd from Davidson Water, Inc. (DWI)
- Alternative 3 (Preferred) – Construct new 3.5-mgd Cooleemee WTP, demolish existing Cooleemee WTP, decommission 2.0-mgd Lagle WTP, expand Sparks Road to 4.5 mgd, and limited bulk water purchase from DWI
 - Phasing Option 1: construct new 3.5-mgd Cooleemee WTP (2021), decommission 2.0-mgd Lagle WTP and demolish existing Cooleemee WTP (2023), bulk water purchase 1.0-mgd from DWI (2030), and expand Sparks Road WTP to 4.5-mgd (not required until after 2040)
 - Phasing Option 2 (Preferred): construct new 3.5-mgd Cooleemee WTP (2021), decommission 2.0-mgd Lagle WTP and demolish existing Cooleemee WTP (2023),

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expand Sparks Road WTP to 4.5-mgd (2030), and bulk water purchase 1.0-mgd from DWI (not required until after 2040)

- Phasing Option 3: bulk water purchase 3.5-mgd from DWI (2021), decommission both the Cooleemee and Lagle WTPs (2023), and expand Sparks Road to 4.5-mgd (2030)
- Alternative 4 – expand Sparks Road WTP to 9-mgd

A present worth analysis on a 20-year life cycle was performed for all feasible alternatives, which includes Alternative 2 and all phasing options for Alternative 3. It is notable that only near-term construction phases were included in the present worth analyses for each feasible alternative. Cost opinions were not developed for infeasible project alternatives (No-Action, Alternative 1, and Alternative 4) as these alternatives did not meet the project purpose and need. The selected alternative, Alternative 3 with phasing option 2, is the most favorable in terms of rate impacts to Davie County and the Town of Mocksville. The total present worth of the life cycle costs for the preferred alternative (Alternative 3, Phasing Option 2) is approximately \$71.6 million, and capital costs are \$25.3 million. It is anticipated that Drinking Water State Revolving Funds (SRF) will finance \$20 million, including \$2 million in principal forgiveness, the State Reserve Project Grant will cover \$1,123,807, and revenue bonds will cover the remaining \$4.2 million of project costs.

1.4 Summary of Direct, Secondary, and Cumulative Impacts and Mitigation

A summary of the anticipated direct, secondary, and cumulative impacts as a result of the proposed project is provided in Table 1-1 and also includes a summary of mitigation measures to offset both direct and indirect impacts. Local programs and ordinances have been developed for the project site that guide current and future development and ensure compliance with state and federal standards. These ordinances include provisions to limit direct and indirect adverse impacts from stormwater runoff, floodplain development, and development related erosion and sedimentation.

1.5 Project Funding and User Fee Increases

The proposed project will be funded using a combination of Drinking Water SRF loans and principal forgiveness, a State Reserve Project Grant, and revenue bonds. Significant impacts are not anticipated to the monthly utility bill and user rates from the proposed project.

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Table 1-1: Summary of Direct Impacts, Secondary and Cumulative Impacts, and Mitigation for the Cooleemee WTP Expansion Project

Resource Category	Potential Direct Impacts	Measures to Mitigate Direct Impacts	Potential Secondary and Cumulative Impact	Local Ordinances to Mitigate Secondary and Cumulative Impacts 1
Topography and Floodplains	Erosion and sedimentation during construction Addition of fill material Excavation and grading	Disturbed areas returned to original grade No new structures in floodway or floodplain Erosion and Sedimentation Plan	Potential future growth may lead to modification of topography for construction	Local erosion and sedimentation ordinances Local floodplain ordinances
Soils	Erosion and sedimentation Impact to water resources from construction runoff and spillage	Erosion and Sedimentation Plan Waste material storage plan	Potential increase in surface water turbidity	Local erosion and sedimentation ordinances
Prime and Unique Farmland	No impact	N/A	Potential loss of prime and unique farmland due to urban growth	Davie County Comprehensive Plan and Davie County Zoning Code
Land Use	Conversion of maintained lawn to WTP facility	Davie County Comprehensive Plan	Potential loss of open space, forested lands, or agricultural areas to urban uses Potential for overuse of parks, greenways, and natural areas from growth	Davie County Comprehensive Plan and Town of Cooleemee Zoning Ordinance
Forest Resources	Forest clearing minimized for construction of the project components	Minimal clearing of mature forest or significant forest resources	Potential loss of forested land for urban growth	Future land use plans

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Resource Category	Potential Direct Impacts	Measures to Mitigate Direct Impacts	Potential Secondary and Cumulative Impact	Local Ordinances to Mitigate Secondary and Cumulative Impacts 1
Wetlands and Streams	No direct wetland impacts from construction Temporary, minor impacts to a stream during waterline installation	Erosion and Sedimentation Plan BMPs used for protection of surface waters	Potential for increase in silt and sediment from development activities Potential for loss or disturbance of wetlands from future development	State stream buffer ordinances Local erosion and sedimentation ordinances Local stormwater ordinances
Water Resources	Water quality degradation from runoff and sedimentation during construction	Erosion and Sedimentation Plan	Potential increase in surface water turbidity	Local erosion and sedimentation ordinances
Shellfish and Fish	Water quality degradation from runoff and sedimentation during construction	Erosion and Sedimentation Plan	Potential habitat degradation from development	Local erosion and sedimentation ordinances
Wildlife and Natural Vegetation	Habitat degradation during construction	Erosion and Sedimentation Plan Construction areas mostly limited to existing maintained grassed areas	Potential habitat degradation from development	Davie County Comprehensive Plan
Public Lands and Scenic, Recreational and State Natural Areas	No impacts	N/A	No impacts	N/A
Areas of Archaeological or Historic Value	No impacts	Coordinate with SHPO if significant cultural resources are identified during construction.	No impacts	Davie County Comprehensive Plan
Air Quality	Increase in emissions during construction	Proper vehicle maintenance Wetting of exposed soil and soil stabilization	Potential increase in air emissions due to growth	Local and state air quality standards
Noise Levels	Noise generated during construction Occasional and temporary noise from emergency generators	Construction hours limited to M-F, 6:00 am to 7:00 pm to maximum extent practicable.	Increase in traffic noise from growth	Unified Development Ordinance
Introduction of Toxic Substances	Exhaust emissions and oil, fuel, or other vehicle fluid leaks	Proper maintenance and collection and disposal of fluid containers	No impacts	N/A

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Resource Category	Potential Direct Impacts	Measures to Mitigate Direct Impacts	Potential Secondary and Cumulative Impact	Local Ordinances to Mitigate Secondary and Cumulative Impacts ¹
Environmental Justice – Minority Population	No impacts expected as the block group has a minority population below threshold	N/A	Negligible impacts due to positive result of ensuring adequate, quality water service	N/A
Environmental Justice – Low Income Population	No impacts expected as the block group has a low-income population below threshold	N/A	Negligible impacts due to positive result of ensuring adequate, quality water service	N/A

¹ Refer to Table 5-4 for stormwater, floodplain, erosion control, buffer, and open space ordinances for the WTP service area.

2. Existing Facilities and Project Planning

2.1 Overview

The Davie County Public Utilities Department and the Town of Mocksville, located in central Davie County, have evaluated water supply alternatives to meet the future water supply needs of both the County and the Town. Davie County owns and operates two WTPs: the 2.6-mgd Cooleemee WTP located in the southern portion of the county and the 3.0-mgd Sparks Road WTP, located in the northern portion of the county. The Town of Mocksville owns and operates the 2.0-mgd Hugh A. Lagle WTP, which is located west of the Town and treats raw water pumped several miles from Hunting Creek. The combined capacity of these WTPs is not adequate to meet the projected system demands over the next 20-year planning period. In addition, the County's Cooleemee WTP and the Town's Lagle WTP are both aging facilities and in need of either major upgrades or decommissioning. A vicinity map is presented in Figure 2-1 illustrating municipal and county limits, waterbodies, location of source water, major water mains, as well as the WTP location. A project location map in Figure 2-2 illustrates the project area, roadways, municipal limits, and waterbodies, including the South Yadkin River (source water) in the vicinity of the WTP.

2.2 Cooleemee WTP Rehabilitation and Replacement

This section provides an overall assessment of the extent of structural, electrical, and process mechanical issues related to the current condition of the existing Cooleemee WTP. The information presented in this section provides part of the basis for why it is recommended to rehabilitate and replace all of the process equipment.

2.2.1 Overview of System

The Davie County Cooleemee WTP is located at 246 Main St. in Cooleemee, NC and was originally constructed in the late 1920s to serve the adjacent mill and surrounding community. The County purchased and began operating the facility in 1976, and subsequently expanded it in several phases to its current capacity of 2.6 mgd. The existing facility is not equipped with a pre-settling reservoir, has treated raw water from the South Yadkin River successfully for more than 90 years to meet drinking water quality standards, and has been expanded and upgraded several times in the interim.

2.2.2 Cooleemee WTP Condition

The Cooleemee WTP utilizes a conventional treatment process and is fed by two raw water pump stations. Both pump stations pump directly to the rapid mix basins, as the existing WTP is not equipped with a pre-settling reservoir. The WTP is currently equipped with two rapid mix/flocculation trains operating in parallel. Each rapid mix tank feeds a single flocculation tank upstream of the combined influent to the facility's four sedimentation basins. Settled water flows through six mixed-media filters and free chlorine follows the filters for further disinfection. The WTP is also equipped with caustic, fluoride, and orthophosphate feed pumps. Finished water is transferred via two (2) transfer pumps from

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one 345,000-gallon concrete clearwell to two (2) onsite silo-style storage tanks. These tanks supply backwash water to the filters, and also provide high pressure on the suction side of the high service pumps that supply the elevated tanks within the County’s distribution system. The Cooleemee WTP complies with all existing Safe Drinking Water Act (SDWA) regulations. The WTP is not under a Special Order by Consent. The WTP has also not received any Notice of Violations. Figure 2-3 illustrates a site layout of the existing WTP infrastructure including yard piping, and Figure 2-4 provides a conceptual schematic of existing processes.

2.2.2.1 *Current Water Demand*

The Cooleemee WTP is currently rated at a capacity of 2.6 mgd and the average day WTP production over the last 12 months of available data was approximately 1.53 mgd. Table 2-1 provides a summary of the average and maximum daily demands for the past two years based on Monthly Operation Report (MOR) flow data provided in Appendix A.

Table 2-1: Cooleemee WTP Historical Water Demand Data

Year	Annual Average Demand (mgd)	Maximum Daily Demand (mgd)
2019	1.55	2.08
2020	1.51	2.66
Q_{2-yr}:	1.53	2.66

The following sections provide a description, age, and condition of each unit process.

2.2.2.2 *Raw Water Intake Screens and Pump Stations*

Raw water for the Cooleemee WTP is withdrawn via two existing raw water intakes and pump stations. The primary (dam) intake and pump station withdraws raw water directly from the South Yadkin River and the secondary (raceway) raw water intake and pump station withdraws raw water from a canal that is tributary to the South Yadkin River and feeds a downstream hydroelectric plant. Both pump stations pump directly to the rapid mix basins, as the existing WTP is not equipped with a pre-settling reservoir. Design parameters of the existing intake screens are summarized in Table 2-2, and design criteria for the existing raw water pumps are summarized in Table 2-3.

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Table 2-2: Summary of Existing Intake Screen Design Criteria

Parameter	Primary (Dam) Screen	Secondary (Raceway) Screen
Year installed	2005	1975
Rated capacity of each screen	5.8 mgd (9.0 cfs)	31 mgd (48 cfs)
Slot opening size	0.50 inch	0.50 inch
Screen length	3 ft	8 ft
Screen width	3 ft	8 ft
Screen height	3 ft	6 ft
Total surface area	45 sf (5 sides with perforations)	192 sf (4 sides with perforations)
Operable surface area	18 sf (40% free area)	96 sf (50% free area)
Inlet pipe diameter	16-inch	(2) 10-inch
Velocity at design flow	0.26 ft/s	0.05 ft/s
Condition	Good	Fair

Table 2-3: Summary of Design Parameters for Existing Raw Water (RW) Pumps

Pump	Year Installed	Design Flow Rate	Design Head	Motor Horsepower	Condition
Primary (Dam) RW Pump No. 1	2005	2,100 gpm	116 feet	100	Fair
Primary (Dam) RW Pump No. 2	2005	2,100 gpm	116 feet	100	Fair
Secondary (Raceway) RW Pump No. 1	1987	2,800 gpm	60 feet	60	Poor

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Pump	Year Installed	Design Flow Rate	Design Head	Motor Horsepower	Condition
Secondary (Raceway) RW Pump No. 2	1987	2,083 gpm	43 feet	60	Poor

2.2.2.3 *Rapid Mix and Flocculation*

The Cooleemee WTP is equipped with two rapid mix/flocculation trains that operate in parallel. Each rapid mix tank feeds a single flocculation tank upstream of the combined influent to the sedimentation basins. The major design criteria of the existing rapid mix and flocculation processes are summarized in Table 2-4.

The existing coagulation process provides a larger detention time and lower mixing velocity gradient than recommended by design standards. This can minimize the effectiveness of chemical mixing and dispersion. The existing flocculation design provides sufficient detention time and mixing energy. However, the ineffective design of the current coagulation limits optimized floc formation.

Table 2-4: Summary of Existing Rapid Mix and Flocculation Processes

Parameter	Rapid Mix	Flocculation
Year installed or last upgraded	1939	1975
Number of tanks	2 (parallel)	2 (parallel)
Approximate volume per tank	1,250 cf	4,620 cf
Maximum flow per tank	1.5 mgd	1.5 mgd
Detention time at maximum flow ¹	9 min	33 min
Mixer rated output power	3.0 HP	1.5 HP
Maximum velocity gradient provided ²	240 s ⁻¹	90 s ⁻¹
Condition	Poor	Fair

¹Maximum of 30 seconds for rapid mix per 10 State Standards; minimum of 30 min for flocculation per NCAC Standards.

²At least 750 s⁻¹ for rapid mix per 10 State Standards.

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2.2.2.4 Sedimentation

The Cooleemee WTP is equipped with four sedimentation basins. Each basin was constructed during different expansion projects; therefore, the dimensions of each vary slightly. The major design criteria of the existing rapid mix and flocculation processes are summarized in Table 2-5, including the year each basin was constructed and the average dimensions of all four. None of the basins are equipped with sludge collection equipment, so each basin is drained and cleaned out monthly with a fire hose for residuals management. As such, the WTP commonly operates with one basin out of service.

Table 2-5: Summary of Existing Sedimentation Basins

Parameter	Sedimentation Basins	
Year installed or last upgraded	1929 (No. 1), 1939 (No. 2), 1953 (No. 3), 1987 (No. 4)	
Number of basins in service	4	3
Approximate basin dimensions	62' length 21' width 11' side water depth	
Weir length per basin	42 ft	
Maximum flow per tank	0.75 mgd	1.0 mgd
Detention time at maximum flow ¹	3.4 hours	2.6 hours
Surface overflow rate a maximum flow	0.40 gpm/sf	0.53 gpm/sf
Weir overflow rate at maximum flow ²	17,900 gpd/ft	23,800 gpd/ft
Flow-through velocity at maximum flow	0.30 fpm	0.40 fpm
Condition	Poor	

¹Minimum detention time of 4 hours per NCAC, unless case-specific engineering evidence is presented

²Maximum overflow rate of 20,000 gpd/ft

The structural condition of each sedimentation basin is poor, with the concrete past the end of its useful life in several locations. Multiple structural repairs have been undertaken at the facility, most notably in 2005 when a cast-in-place concrete wall was constructed on a portion of the south side of the oldest sedimentation basin to shore up the failing concrete and anchored to the existing structure. The existing sedimentation basin wall is marked by significant surface delamination and structural cracking.

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Additionally, the sedimentation basin detention time and weir overflow rate are outside of the ranges required in NC Public Water Supply Rules.

2.2.2.5 *Filtration*

The Cooleemee WTP is equipped with six, dual media filters. Dimensions and design criteria are summarized in Table 2-6 below. The filters are operated at approximately 2.5 gpm/sf. Filter runtimes average 50-60 hours in the summer, but only approximately 30 hours in the winter.

Table 2-6: Summary of Existing Filters

Parameter	Filters	
Year installed or last upgraded	1929 (Nos. 1 & 2), 1939 (Nos. 3 & 4), 1953 (Nos. 5 & 6)	
Number of filters in service	6	5
Surface area per filter	125 sf	
Filter dimensions	12'-6" length 10' width	
Media and effective sizes	12" support gravel 9" sand (0.50 mm) 14" anthracite (0.95 mm)	
Total calculated L/d	832	
Maximum flow per filter	0.5 mgd	0.6 mgd
Hydraulic loading rate at maximum flow	2.8 gpm/sf	3.3 gpm/sf
Condition	Poor	

¹Maximum of 4 gpm/sf per NCAC

The existing filters operate at a loading rate well below the regulatory maximum of 4 gpm/sf. However, the L/d ratio (a dimensionless value that can indicate filtration effectiveness) is lower than the design standard recommendation of 1000. There is structural damage is apparent in the filter gallery and chemical dosing room, where aggregate is visible in large quantities. Additionally, the backwash sludge holding tank wall is marked by significant surface delamination and structural cracking.

The existing filter backwash procedure includes the following steps:

- Drain water from the filter
- Low-rate backwash at 400 gpm for approximately two minutes and surface wash for three minutes
- Medium-rate backwash at 1400 gpm for two minutes
- High-rate backwash at 2500 gpm for four minutes

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- Medium-rate backwash at 1400 gpm for two minutes
- Rewash for at least 15 minutes until effluent turbidity is less than 0.095 NTU

2.2.2.6 *Disinfection*

The existing Cooleemee WTP achieves CT credit from free chlorine contact in both the filter and clearwell volumes. The existing clearwell has an operational volume of 228,000 gallons to 380,000 gallons (at overflow). The clearwell is equipped with baffles and has a baffling factor of approximately 0.24, indicating a less desirable baffle wall installation according to the Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems using Surface Water Sources. From 2016 to 2019, Davie County achieved on average 3.5-log removal for Giardia and a minimum of 1.03-log removal from the filter and clearwell volumes. Dimensions and design criteria are summarized in Table 2-7 below.

Table 2-7: Summary of Existing Finished Water Clearwell

Parameter	Filters
Year installed or last upgraded	1939
Type	Concrete
Volume	380,000 gallons
Dimensions	75'0" length 45'0" width 10'0" corner curve radius
Interior area	3,290 sf
Baffling	Baffle walls
Condition	Poor

The existing Cooleemee WTP has been capable of treating the high levels of total and fecal coliforms in the raw water. Within the past five years, Davie County has detected total coliforms within the distribution system on two occasions. Fecal coliforms/E. Coli have not been detected.

The structural condition of the existing clearwell is marked by significant surface delamination and structural cracking. The existing clearwell will be decommissioned and replaced with a new clearwell.

2.2.3 Proposed WTP

Davie County owns and operates two WTPs, the 2.6-mgd Cooleemee WTP located in the southwestern portion of the county with an intake on the South Yadkin River, and the 3.0-mgd Sparks Road WTP, located in the northeastern portion of the county near the Yadkin River. The existing Cooleemee WTP is at the end of its useful service life and will be replaced with a new, co-located 3.5-mgd WTP as part of the Water Supply Improvements Project undertaken by Davie County and the Town of Mocksville. Upon construction of the new WTP, the existing Cooleemee WTP will be decommissioned. The combined

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WTP capacity of Cooleemee WTP, Sparks Road WTP, and Lagle WTP is currently 8.6-mgd. Replacing the Cooleemee WTP and decommissioning the Lagle WTP will provide a reduction in total WTP capacity from 8.6-mgd to 6.5-mgd. Table 2-8 summarizes the current and future capacity following the proposed near-term construction.

Table 2-8: Total WTP Capacity

Facility	Current Capacity (mgd)	Capacity at Near-Term Project Completion (mgd)
Sparks WTP	3.0	3.0
Cooleemee WTP	2.6	3.5
Lagle WTP	2.0	0
Total Capacity	7.6	6.5

The County’s daily maximum demand is 4.72-mgd and the Town of Mocksville’s daily maximum demand is 1.29-mgd, for a combined maximum day demand of 6.01-mgd. Therefore, the proposed project will meet the current maximum day demands. A future expansion of the Sparks WTP will be planned to meet future demands.

The North Carolina Rules Governing Public Water Systems (15A NCAC 18C .0601) requires:

“(a) Construction of a pre-settling reservoir shall be required if wide and rapid variations in turbidity, bacterial concentrations, or chemical qualities occur, or where the following raw water quality standards are not met: turbidity - 150 NTU, coliform bacteria - 3000/100 ml, fecal coliform bacteria - 300/100 ml, or color - 75 CU. If impoundment of the water supply stream does not or will not provide raw water of acceptable quality, a pre-settling reservoir located outside the watershed or catchment area shall be required.”

The existing conventional WTP is not equipped with a pre-settling reservoir, has treated raw water from the South Yadkin River successfully for more than 90 years to meet drinking water quality standards, and has been expanded and upgraded several times in the interim.

A technical memorandum was published in 2020 (Hazen and Sawyer) that presented water quality data for the South Yadkin River at the Cooleemee intake and the preliminary design for the proposed replacement of the Cooleemee WTP in accordance with 15A NCAC 18C .0502. Hazen and Sawyer evaluated historical South Yadkin raw water quality data and determined the total coliform and fecal coliform levels exceed the water quality criteria in 15A NCAC 18C .0601. However, raw water turbidity data from 2019 SCADA data was evaluated and this dataset demonstrates raw water turbidity variations are moderate in magnitude and frequency and fall below the criteria established in 15A NCAC 18C .0601. Hazen has developed a process design for the new Cooleemee WTP design that will protect finished water quality and provide a superior solution to a pre-settling reservoir or other pretreatment. This proposed design utilizes an ultraviolet (UV) disinfection system to provide a multiple barrier approach for pathogen inactivation for a resilient and reliable solution for treating high source water coliform levels.

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The proposed WTP will be equipped with two parallel rapid mix basins (duty/standby) to provide redundancy. Two trains of 3-stage tapered flocculation are proposed with mixers equipped with variable frequency drives (VFDs) to provide operational flexibility to optimize floc formation. The proposed WTP will be equipped with two sedimentation basins, which will include sludge collectors for automatic sludge removal without having to take a basin out of service. Four filters are proposed with a media profile consisting of anthracite and sand overlaying a stainless steel underdrain system. UV disinfection will be an additional treatment to current operations located downstream of the filters. Free chlorine disinfection will immediately follow the UV reactor. The existing clearwell will be decommissioned and replaced with a new, 900,000-gallon clearwell. The improved treatment processes for the new Cooleemee WTP along with the addition of UV disinfection will provide a rugged treatment process capable of treating South Yadkin water and continued compliance with regulatory water criteria.

The new Cooleemee WTP will include a Chemical Facility for all chemical storage and feed systems. Ferric sulfate, sodium hydroxide, and sodium hypochlorite storage and feed systems will be provided in separate rooms with sunken chemical containment to include a bulk storage tank, a day tank, and metering pumps. Coagulant aid polymer, orthophosphate, and fluoride storage feed systems will include totes and metering pumps. Coagulant aid polymer and orthophosphate will be in a shared room with containment and fluoride will be in a separate room with containment.

2.3 Transmission Main Expansion

This section provides an overall assessment of potential issues related to the current condition of the existing water transmission mains needed to provide water from the Cooleemee WTP to the distribution system. The information presented in this section provides part of the basis for why the existing interconnections between Davie County and the Town of Mocksville's systems cannot hydraulically accommodate the proposed WTP modifications.

2.3.1 Overview of System

Davie County and the Town of Mocksville require significant investments in water treatment infrastructure to meet their near-term water supply needs. The County's Cooleemee WTP and the Town's Lagle WTP both have reached the end of their useful lives and require significant financial investment to remain as viable water treatment resources. Without the 2.6-mgd provided by the Cooleemee WTP and the 2.0-mgd provided by the Lagle WTP, neither the County nor the Town would be able to meet their current water supply demands. With both water utilities in the County requiring significant investment in their water treatment infrastructure, a water supply alternative that combines resources and meets both utilities needs is being undertaken. In addition to the WTP portion of the project described previously, construction of 18,500 LF of 12-inch and 16-inch transmission main parallel to existing undersized water lines is required to serve the Town of Mocksville. Table 2-9 summarizes the County and Town's existing distribution systems. Figure 2-5 illustrates the existing distribution system including the location of the proposed transmission mains, locations of the existing and future Cooleemee WTP, roadways, municipal limits, and waterbodies. Additionally, Figure 2-5 provides the location of Lee Jeans Tank and pump station, locations of fire hydrants, and size of the existing distribution lines near the project area.

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Table 2-9: Water Transmission and Distribution System Description

Water Distribution System	Davie County ¹	Town of Mocksville
Number of current connections	11,413	2,743
Approved number of connections	11,413	2,743
Average day demand	3.2 mgd	0.85 mgd
Maximum day demand	4.7 mgd	1.3 mgd
Current maximum daily treated water supply (produced/purchased) of existing system	5.6 mgd	2.0 mgd (produced) 1.0 mgd (purchased)

¹Davie County owns and operates the 2.6-mgd Cooleemee WTP and the 3.0-mgd Sparks Road WTP

²The Town of Mocksville owns and operates the 2.0-mgd Hugh A. Lagle WTP and purchases water from Davie County

2.3.2 Distribution System Condition

The existing Cooleemee WTP water transmission mains are 12-inch finished water lines connecting to Davie County’s distribution system. An existing interconnection between the Cooleemee WTP and Lee Jeans Tank distributes water to the Town of Mocksville. Preliminary hydraulic modeling was performed to simulate projected flow through the existing distribution system following the replacement of the Cooleemee WTP and the decommissioning of the Lagle WTP. The modeling showed excessive pressure at the proposed Cooleemee WTP caused by high head losses between the WTP and Lee Jeans Tank. This determined the current sizing of the existing transmission mains cannot hydraulically accommodate the Town’s current demands once the Lagle WTP is decommissioned. After the new WTP and transmission mains are completed, the County will be able to satisfy the entire public health need of the Town.

Hydraulic modeling was performed to determine optimum pipe sizes for the proposed interconnection between the Town of Mocksville and Davie County. Without replacing existing transmission mains, the predicted flow to Mocksville was 0.65 mgd (450 gpm) through the existing pumps at Lee Jeans Tank, which would not meet the Town’s current water supply demand displayed in Table 2.3. Modeling showed new 12-inch pipes are needed north of Cooleemee WTP to distribute the proposed plant capacity of 3.5 mgd without excessive discharge pressures and large pressure swings when the pumps turn on and off. Although a 12-inch diameter pipe was sufficient in the model to reduce the pressures, 16-inch pipe was also modeled and ultimately recommended for a portion of the new mains to allow for higher pumping rates from the new WTP. The proposed project includes installation of 12-inch transmission mains along Nolley Road and Gladstone Road and the northern segment along US 601, as well as installation of 16-inch transmission main along the western side of Main Street from the Cooleemee WTP to Junction Road. The total length of proposed 12-inch and 16-inch transmission main parallel to undersized water lines is approximately 18,500 LF. Figure 2-6 provides a map of existing pipe condition history including pipe breaks and year of installation.

2.4 Project Planning

2.4.1 Current Population and Water Demand

To provide a basis for Davie County and the Town of Mocksville’s current and future water treatment capacity needs, historical populations and current water demands were determined. Table 2-10 summarizes historical census information based on United States Census data, provided in Appendix B, for Davie County and the Town of Mocksville.

Table 2-10: Current Population Data

US Census Year	Davie County Population ¹	Mocksville Population ²
2000	34,835	4,178
2010	40,581	4,952

¹Cooleemee WTP’s service area is approximately 33% of Davie County’s total population

²The Town of Mocksville is located in Davie County

The current water demands for Davie County and the Town of Mocksville are based on the most recently completed Local Water Supply Plans (LWSPs) and MORs from the three drinking water plants in the county: Cooleemee, Sparks Rd, and Lagle WTPs. Current water demands were separated into different customer usage categories of residential, commercial, industrial, institutional, process demand, and peak demand. Maximum daily demands were calculated based on an average peaking factor of 1.5 developed from a peak day analysis from historical data. Table 2-11 summarizes current average and maximum daily water demand (metered) by service category for Davie County and the Town of Mocksville.

Table 2-11: Current Water Demand

Service Category	Davie County ¹ Average Daily Demand (mgd)	Davie County ¹ Maximum Daily Demand (mgd)	Mocksville Average Daily Demand (mgd)	Mocksville Maximum Daily Demand (mgd)
Residential	1.85	2.78	0.38	0.57
Commercial	0.17	0.26	0.089	0.13
Institutional	0.075	0.11	0.054	0.081
Industrial	0.048	0.072	0.071	0.11
Process Demand	0.56	0.84	0.16	0.24
Total Current Metered Demand	2.70	4.05	0.75	1.13

¹Cooleemee WTP’s service area is approximately 33% of Davie County’s total population

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2.4.2 Population and Flow Projections

To evaluate Davie County and the Town of Mocksville’s water treatment capacity needs through 2040, future population and flow projections were developed based on data from the NC Office of State Budget and Management (OSBM) and the County and Town’s LWSP data. The majority of water demand in the County is residentially based, so population projections are vitally important to the development of useful water demand planning projections. Future residential flow projections were calculated based on the previously described current average usage (gallons per day) and future residential population projections detailed in this section.

2.4.2.1 Davie County

The population of Davie County has grown from approximately 35,000 in 2000 to approximately 43,000 in 2019, representing an annual average growth rate of approximately 1.2% over the nineteen-year period (US Census, 2019). Over the next 20-year period, from 2020 to 2040, OSBM projects a similar moderate annual average growth rate of approximately 1.1%. Based on this projected growth rate, OSBM currently projects a County population of approximately 55,000 people in 2040.

While the overall County population provides a good estimation of growth trends in the area, the population that is most relevant to the projection of water needs is the portion of the County population that is served by Davie County Public Utilities. For this analysis, the residential water service customer population projections were determined by growing current customer populations at the same growth rate as the previously mentioned OSBM countywide population projections as well as an allocation for service population growth occurring from the conversion of current well users to the County water system.

The current Davie County Public Utilities residential service population was estimated using LWSP data provided by the NC Division of Water Resources (DWR). Based on the most recently available LWSP from 2019, there were approximately 11,500 residential water connections being served by the County. Using the most recent census estimation of an average of 2.55 persons per household in Davie County, this translates to an estimated current residential service population of 29,325. Service population projections through 2040 were developed by growing the current population at the same growth rate as the OSBM projected County growth rate, to estimate new customer growth, and adding an annual allowance for households in the County that will transfer from well water to County provided water. The rate of growth of conversion from well to County water was taken directly from the 2012 Master Plan Update, which estimated 350 well customers converting to County water every five years, for the entire 20-year planning period. A summary of the estimated Davie County Public Utility residential water service population and demand through 2040 is provided in Table 2-12.

Table 2-12: Davie County Public Utility Residential Water Customer Population Projections

Year	Service Population Increase Due to Growth in New Customers ¹	Service Population Increase Due to Conversion of Well Customers ²	Davie County ¹ Public Utilities Total Projected Service Population	Davie County ¹ Public Utilities Future Residential Demand
2019	N/A	N/A	29,325	1.85 mgd
2020	352	179	29,856	1.91 mgd

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Year	Service Population Increase Due to Growth in New Customers ¹	Service Population Increase Due to Conversion of Well Customers ²	Davie County ¹ Public Utilities Total Projected Service Population	Davie County ¹ Public Utilities Future Residential Demand
2025	1,836	893	32,407	2.07 mgd
2030	1,901	893	34,307	2.24 mgd
2035	1,903	893	36,210	2.41 mgd
2040	1,904	893	38,115	2.58 mgd

¹Service population estimated to grow at same rate as OSBM projected countywide growth rate.

²Conversion of well customers anticipated to occur at a rate of 350 connections/5-year period based on 2012 Master Plan Update. This converts to a service population increase of 893 people/5-year period (350 x 2.55 people per household).

2.4.2.2 Town of Mocksville

The Town of Mocksville grew from approximately 4,200 persons in 2000 to approximately 5,250 persons in 2019 (US Census, 2019). This represents an average annual growth rate of approximately 1.5% over the nineteen-year period. OSBM does not have projected population data for the Town of Mocksville, but the Piedmont Triad Regional Council (PTRC) is currently developing a Comprehensive Plan for Davie County, which includes growth projections through 2050 for the Town of Mocksville. Based on their December 2018 presentation, the PTRC is estimating growth of nearly 1,100 residential housing units in the Town between 2016 and 2050. This rate of growth is approximately the same as the 1.5% average annual growth observed from 2000 to 2019. For this evaluation, an average annual residential growth rate of 1.5% was maintained through the entire planning period. Table 2-13 provides a summary of the Town of Mocksville residential water service population projections based on this methodology and calculated flow projections using current average demand and future population estimates.

Table 2-13: Town of Mocksville Water Customer Population Projections

Year	Town of Mocksville Total Projected Service Population ¹	Town of Mocksville Future Residential Demand
2019	5,252	0.38 mgd
2020	5,331	0.46 mgd
2025	5,743	0.50 mgd
2030	6,187	0.54 mgd
2035	6,665	0.58 mgd
2040	7,180	0.62 mgd

¹Based on average annual growth of 1.5%.

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2.4.3 Future Design Demand

To determine the adequacy of current WTP capacities to meet anticipated future demand, projections of future design demand were developed for both Davie County and the Town of Mocksville. Future design demand was calculated by adding the combined current demand, future demand due to residential, commercial, industrial, and institutional growth, and future demand due to existing and proposed process demand. Table 2-14 provides a summary of future design demand for the County and Town.

Table 2-14: Design Flow Analysis for 2040

Service Category	Design Flow¹ (Year 2040)	% Change from the Current Flow
Residential	3.20 mgd	35.1%
Commercial	0.35 mgd	25.9%
Institutional	0.17 mgd	27.7%
Industrial	0.77 mgd	50.6%
Unaccounted-for	0.45 mgd	36.5%
Average Daily Total	4.95 mgd	36.6%
Maximum Daily Total	7.38 mgd	34.1%

¹Davie County and the Town of Mocksville’s combined design flow

2.4.3.1 Davie County Future Design Demand

Residential demand projections through 2040 were developed for Davie County based on the estimated service population and a residential per capita day water use rate. Historic residential water use, per residential water customer, show that in the previous three years, water usage rates ranged between 54.5 and 58.7 gallons per capita day (gpcd). A conservative estimate of residential demand of 58.7 gpcd was used in the projection of future residential demands. Commercial demand is estimated to grow at a rate similar to that of residential growth. In 2018, the average commercial water demand was 0.148 mgd, based on water billing data. Accordingly, commercial water demand was projected to grow from the 2018 baseline usage at a rate equaling the anticipated growth in residential accounts. An additional allocation for commercial demand was added to account for a planned future 120-room hotel in the service area. The demand associated with this hotel was calculated using an assumption of full occupancy, two guests per room, and a 70 gal/guest-day demand rate. Similar to the commercial demand projections, institutional demand was also grown at the residential growth rate in accordance with the methodology used in the 2012 projections.

Industrial demand is largely independent of residential growth and is more dependent upon anticipated changes to the current industrial customer makeup. Based on the information available from the PTRC in progress planning documents and the 2012 demand projections, it is not anticipated that Davie County will experience a large change in industrial customer demand over the planning period. Therefore, industrial demand was estimated as a combination of existing industrial demand along with an additional

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demand allocation that could be utilized by a currently unknown industrial user. For these projections, an additional planning allocation for future industrial use of 0.49 mgd on average with 0.70 mgd peak day demand was used for the Davie County service area. Unbilled flow, includes unaccounted for water or water used for system flushing was estimated to be 10% of the sum of the other categories. Process water use within the water treatment plant was not included in the projections as the demand projections were developed to estimate the finished water pumped into the distribution system. The Cooleemee WTP design accounts for about 8% process water use within the facility.

2.4.3.2 *Mocksville*

Residential demand projections through 2040 were developed for the Town of Mocksville based on the estimated service population and a residential per capita day water use rate. Historic residential water use, per residential water customer, show that in the previous three years, water usage rates ranged between 76.7 and 84.0 gallons per capita day (gpcd). A conservative estimate of residential demand of 84.0 gpcd was used in the projection of future residential demands. Using the similar methodology as the demand projections for Davie County, commercial and institutional demand were grown at the same rate as residential demands. Based on the discussions with County and Town planning and utilities staff, an allocation for industrial demand was included based on current as well as anticipated and future industrial growth in the near term. Unbilled flow, includes unaccounted-for water or water used for system flushing, was estimated to be 10% of the sum of the other categories. Process water use within the water treatment plant was not included in the projections as the demand projections were developed to estimate the finished water pumped into the distribution system. The Cooleemee WTP design accounts for about 8% process water use within the facility.

3. Project Purpose and Need

Davie County and the Town of Mocksville require significant investments in water treatment infrastructure to meet their near-term water supply needs. The County's Cooleemee WTP and the Town's Lagle WTP both have reached the end of their useful lives and require significant financial investment to remain as viable water treatment resources. Without the 2.6 mgd provided by the Cooleemee WTP and the 2.0 mgd provided by the Lagle WTP, neither the County nor the Town would be able to meet their current water supply demands. With both water utilities in the County requiring significant investment in their water treatment infrastructure, a water supply alternative that combines resources and meets both utilities needs is being undertaken. The proposed project includes replacing the existing Cooleemee WTP, decommissioning the Lagle WTP, and constructing 18,500 LF of 12-inch and 16-inch transmission main parallel to existing undersized water lines to hydraulically accommodate the Town of Mocksville's distribution system.

The proposed design for the new Cooleemee WTP consists of many process design enhancements including the addition of UV disinfection and will provide Davie County with a more robust treatment process capable of treating South Yadkin water and continued compliance with regulatory water criteria. Water distribution system improvements included as part of the proposed project consist of constructing a new 16-inch transmission along Main Street downstream of the Cooleemee WTP to distribute the proposed plant capacity of 3.5 mgd without excessive discharge pressures and large pressure swings when the pumps turn on and off. Additionally, installation of a 12-inch transmission main along Nolley Road, Gladstone Road, and the northern segment along US 601 is required to distribute water to the Town of Mocksville. After the new WTP and transmission mains are completed, the County and Town will be able to satisfy the entire public health need of the Town.

4. Alternatives Analysis

Due to the aging infrastructure of the Davie County Cooleemee WTP and the Town of Mocksville Lagle WTP, consideration has been given to decommissioning both facilities and combining the water systems of the County and the Town. This would ensure a reliable water supply for Davie County and Mocksville. The County commissioned Hazen and Sawyer (Hazen) in 2018 to develop a Water Supply Alternative Evaluation, which included a feasibility study of water supply alternatives. Alternatives were developed to assess additional water supply from the South Yadkin River at the Cooleemee WTP, and the Yadkin River at the Sparks Road WTP. In addition, bulk purchases from DWI were considered. For each alternative, WTP infrastructure needs were evaluated, and hydraulic modeling was conducted to develop a preliminary understanding of water transmission needs. The water supply alternatives from the original evaluation include the following:

- Alternative 1 – replace existing Cooleemee WTP with New 6-mgd WTP
- Alternative 2 – expand Sparks Road WTP to 4.5 mgd and purchase 4.5 mgd from DWI
- Alternative 3 (preferred alternative) – construct new 3.5-mgd Cooleemee WTP, expand Sparks to 4.5 mgd, and limited purchase from DWI
- Alternative 4 – expand Sparks Road WTP to 9-mgd

The preferred alternative selected from the original water supply evaluation, Alternative 3, includes three major capital projects required to ensure sustainable water supply for the County and Town for the 20-year planning horizon:

- Replacing the existing Cooleemee WTP with a new 3.5 mgd facility
- Establishing an interconnection with DWI for bulk purchase
- Expanding the Sparks Road WTP

It was initially anticipated that the Cooleemee WTP upgrade and DWI interconnection projects would be completed simultaneously in the near term, while the Sparks Road WTP expansion would occur around 2028 to provide the needed water supply through 2040. However, projected water demands were refined during the Preliminary Engineering Report (PER) phase. An analysis of industrial demands within the Town of Mocksville revealed a reduction in projected demand as compared to previous projections. Moreover, system-wide peaking factors were evaluated and determined to be lower than originally thought. Therefore, based on the updated water demand projections, three new capital project phasing options were considered.

The following sections first summarize the original water supply alternatives evaluated in 2018 and then detail the recently considered capital project phasing options for the selected alternative.

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4.1.1 No-Action Alternative

The no-action alternative does not address the current water supply needs of both Davie County and the Town of Mocksville. Both the County's Cooleemee WTP and Lagle WTP have reached the end of their useful service lives and would require significant capital investment to meet the current water supply demand discussed in previous sections of this report. Preliminary hydraulic modeling was performed to simulate projected flow through the existing distribution system following the replacement of the Cooleemee WTP and the decommissioning of the Lagle WTP. The modeling showed excessive pressure at the proposed Cooleemee WTP caused by high head losses between the plant and Lee Jeans Tank. This determined the current sizing of the existing transmission mains cannot hydraulically accommodate the Town's current demands once the Lagle WTP is decommissioned. Therefore, the no-action alternative was removed from consideration from this analysis as construction of a new WTP and transmission mains are required to satisfy public health needs.

4.1.2 Alternative 1 – Replace Existing Cooleemee WTP with New 6-mgd WTP

Alternative 1 includes the simultaneous decommissioning of the existing Cooleemee and Lagle WTPs, along with the construction of a new 6-mgd WTP in Cooleemee to replace the existing Cooleemee WTP. Expansion of the Sparks Road WTP would be needed by 2035 to meet demands through 2040.

Alternative 1 presents three significant issues. The first is interbasin transfer (IBT). As this alternative would result in a transfer of more than 2 MGD from the South Yadkin River basin to the Yadkin River basin, an IBT study would need to be conducted and an IBT Certificate issued by NC Department of Environmental Quality (DENR) permitting this transfer. This process is anticipated to take approximately five years and would result in a significant cost to the County. Consequently, it is anticipated that the earliest the new Cooleemee plant could be brought online is 2026.

The second issue presented by Alternative 1 is the lack of capacity in Davie County's existing transmission mains. Significant upgrades to these pipes would be required to pump 6 MGD from a new Cooleemee facility to the northern portions of the County without generating excessive pressures, on the order of approximately 260 psi at the proposed plant.

The third issue presented by Alternative 1 is the lower yield of the South Yadkin River relative to the Yadkin River. The safe yield of the South Yadkin River at Cooleemee is estimated to be 13.1 mgd, while the safe yield of the Yadkin River at the Sparks Road WTP intake is estimated to be 65.7 mgd. As such, it would provide a less robust system to supply the majority of the County's water from the more limited source of supply.

After a careful evaluation of the issues associated with Alternative 1, it was deemed infeasible and not considered further.

4.1.3 Alternative 2 – Expand Sparks Road WTP to 4.5-mgd and Purchase 4.5-mgd from Davidson Water

Alternative 2 includes the simultaneous decommissioning of the existing Cooleemee and Lagle WTPs, along with an expansion of the existing Sparks Road WTP to 4.5 mgd. Additionally, a connection to DWI

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would be constructed, enabling bulk water purchases up to 4.5 mgd. Figure 4-1 shows the locations of the WTPs, the waterlines to accommodate the Sparks Road WTP expansion, and the connection to DWI.

As Alternative 2 involves abandoning the raw water intake on the South Yadkin River, it will result in an interbasin transfer from the Yadkin River basin to serve southern Davie County. However, a transfer from the Yadkin River basin to the South Yadkin basin is not anticipated to exceed 2 mgd within the 20-year planning window, and so an IBT Certificate would not be required within this timeframe.

Alternative 2 results in a combined peak day withdrawal of 9 mgd from the Yadkin River (4.5 mgd at the Sparks Road WTP intake and 4.5 mgd at the DWI intake). The safe yield of the Yadkin River at these locations is estimated to be 65.7 mgd and 70.2 mgd, respectively. Therefore, the safe yield of the Yadkin River is more than sufficient to meet the water supply needs of all of Davie County. However, the loss of supply from the South Yadkin River would result in a less resilient water supply system as compared to existing conditions.

4.1.3.1 Sparks Rd WTP Modifications

The proposed Alternative 2 improvements at the Sparks Road WTP to upgrade the facility capacity to 4.5-mgd include the following:

- Addition of one (1) raw water vertical turbine pump
- Addition of one (1) reservoir vertical turbine pump
- One (1) in-line mechanical mixer for rapid mix
- Three (3) flocculation basins equipped with variable-speed vertical mixers
- One (1) sedimentation basin
- Two (2) multi-media filters
- Miscellaneous yard piping
- One (1) high service vertical turbine pump
- Chemical building expansion
- Addition of one (1) standby generator

4.1.3.2 Distribution System Modifications

Improvements to the distribution system associated with Alternative 2 include the following:

- Improvements to Interconnect with DWI
 - New 4.5-mgd high service pump station at the DWI WTP
 - 24-inch horizontal directional drill across the Yadkin River

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- Replacement of the existing pumps within the Deadmon Pump Station
- 16-inch pipe along US 64 from Yadkin River to Cornatzer Road
- 12-inch pipe along US 64 and John Crotts Road from Cornatzer Road to Bethel Church Road
- 16-inch pipe in Deadmon Road from US 64 to Deadmon Road Pump Station
- Improvements to Accommodate Expansion of the Sparks Road WTP
 - 16-inch pipe along Sparks and Spillman roads from the Sparks Road plant to NC 801
 - 12-inch pipe along NC 801 from Spillman Road to the Yadkin Valley Tank
 - 12-inch pipe extending south along Farmington Road and US 158 from NC 801 to Campbell Tank.

With these improvements in service, the hydraulic modeling predicted 148 psi at the Sparks Road WTP, 167 psi at the Davidson Water Pump Station (located at the river), and existing condition pressures in Mocksville. Predicted water levels were acceptable at all tanks except the Yadkin Valley Tank, where the predicted system HGL was again higher than the overflow because of its proximity to the Sparks Road WTP.

4.1.3.3 *Capital Costs*

Cost estimates for feasible alternatives were developed as Class 4 estimates as defined in the Association for the Advancement of Cost Engineering (AACE) Recommended Practice (RP) Manual 18R-97. A Class 4 estimate is appropriate for feasibility studies where the level of project definition/completion is between 1% to 15%. As such, the expected level of accuracy for this cost estimating effort is typically anticipated between -15% to +50%. Capital costs for Alternative 2 are summarized in Table 4-1.

Table 4-1: Alternative 2 Capital Costs

Item	Capital Cost
Sparks Rd. WTP upgrades	\$6,375,000
High service pump station at DWI WTP	\$2,583,000
Horizontal directional drill across Yadkin River	\$2,000,000
Replacement of Deadmon PS pumps	\$250,000
Transmission piping improvements ¹	\$15,469,000
Total Construction Cost	\$26,677,000
Construction Contingency Cost	\$2,667,700

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Item	Capital Cost
Project Administration Cost	\$1,333,850
Total Capital Cost	\$30,678,550

¹Cost opinion for this line item includes all transmission main piping and appurtenances, fire hydrants, trenchless crossings, erosion and sedimentation control, and surface restoration.

4.1.4 Alternative 3 (Preferred Alternative) – Construct new 3.5-mgd Cooleemee WTP, Expand Sparks to 4.5-mgd, and limited Purchase from Davidson Water

Alternative 3, as shown in Figure 4-2, includes the simultaneous decommissioning of the existing Cooleemee and Lagle WTPs, along with the construction of a new 3.5-mgd Cooleemee WTP and a connection to DWI, enabling limited bulk water purchase from Davidson County. Additionally, this alternative includes expansion of the Sparks Road WTP to 4.5-mgd.

Alternative 3 is not anticipated to result in an interbasin transfer, as southern Davie County would generally be served by the new Cooleemee WTP and the rest of the County would be served by the Sparks Rd. WTP in conjunction with the DWI interconnect. Moreover, this alternative enables the existing raw water intake on the South Yadkin River to be maintained.

Alternative 3 was selected as the preferred long-term water supply alternative for Davie County and the Town of Mocksville. This alternative would result in a combined peak day withdrawal of 3.5-mgd from the South Yadkin River and 5.5-mgd from the Yadkin River (4.5-mgd at the Sparks Road WTP intake and 1 MGD at the DWI intake). The safe yields of the South Yadkin River and the Yadkin River at these locations are more than sufficient to meet the water supply needs of the County.

4.1.4.1 Sparks Rd WTP Modifications and Cooleemee WTP Construction

The proposed improvements at the Sparks Road WTP to upgrade the facility capacity to 4.5-mgd are identical to the Alternative 2 proposed improvements.

The proposed facilities at the new 3.5-mgd Cooleemee WTP include the following:

- Upgrades to the existing raw water pump stations
- Demolition of the existing Cooleemee WTP upon successful start-up and continuous operation of the new Cooleemee WTP
- Decommissioning the existing Lagle WTP
- One (1) rapid mix chamber
- Six (6) flocculation basins equipped with variable-speed vertical flocculators
- Two (2) sedimentation basins
- Four (4) multi-media filters

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- One (1) clearwell
- Continued use of silo style finished water tanks
- High service pump station
- Chemical building
- One (1) backwash equalization tank
- One (1) standby generator
- Miscellaneous yard piping

4.1.4.2 *Distribution System Modifications*

Improvements to the distribution system associated with Alternative 3 include the following:

- Improvements to Accommodate the New Cooleemee WTP
 - 12-inch pipe in Gladstone Road from Junction Road to US 601
 - 16-inch pipe along Main Street north of Cooleemee plant
- Improvements to Interconnect with Davidson Water, Inc.
 - New 4.5 MGD high service pump station at the DWI WTP
 - 24-inch horizontal directional drill across the Yadkin River
 - 16-inch pipe along US 64 from Yadkin River to Cornatzer Road
 - 12-inch pipe along US 64 and John Crotts Road from Cornatzer Road to Bethel Church Road
- Improvements to Accommodate Expansion of the Sparks Road WTP
 - 16-inch pipe along Sparks and Spillman roads from the Sparks Road plant to NC 801
 - 12-inch pipe along NC 801 from Spillman Road to the Yadkin Valley Tank
 - 12-inch pipe extending south along Farmington Road and US 158 from NC 801 to Campbell Tank

With these improvements in place, the hydraulic modelling predicted discharge pressure of 149 psi at the Sparks Road WTP, 160 psi at the Cooleemee plant, and 113 psi at the Davidson Water Pump Station at the river. Predicted tank levels and pressures in Mocksville were acceptable.

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4.1.4.3 *Project Phasing and Capital Costs*

As discussed previously, three major capital projects were identified as part of the selected water supply alternative (Alternative 3):

- Replacing the existing Cooleemee WTP with a new 3.5-mgd facility
- Establishing an interconnection with DWI for bulk purchase
- Expanding the Sparks Road WTP

Based on demand projections, phasing options were considered for these three major capital projects, as outlined below. It is notable that only near-term construction phases were included in the cost analyses for each phasing option.

4.1.4.3.1 Phasing Option 1

Under Option 1, the new Cooleemee WTP would be constructed with a capacity of 3.5-mgd in the immediate term, while the DWI interconnection could be delayed for approximately 7 years to 2030. Expansion of the Sparks Road WTP would not be required until after 2040. Table 4-2 below outlines the phasing of this option.

Table 4-2: Alternative 3, Phasing Option 1

Facility	Begin Construction	In Service	Notes
Existing Cooleemee WTP	N/A	N/A	Decommissioned in 2023
New Cooleemee WTP	2021	2023	3.5-mgd capacity
Lagle WTP	N/A	N/A	Decommissioned in 2023
DWI Interconnection	2028	2030	Bulk purchase arrangement with 1.0-mgd firm capacity
Sparks Road WTP Expansion	N/A	N/A	Not required until after 2040 based on revised demand projections

Capital costs for Option 1 over the near-term planning period is approximately \$25.3 million in 2020 dollars (Table 4-3).

Table 4-3: Alternative 3, Phasing Option 1 Capital Costs

Option	Capital Costs (2020 USD)
New Cooleemee WTP	\$ 17,219,000
Primary Raw Water Pump Station and Main Upgrades	\$ 657,000

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Raceway Raw Water Pump Station Upgrades	\$ 720,000
Existing Cooleemee WTP Demolition	\$ 910,000
Cooleemee Transmission Mains ¹	\$ 2,483,000
Total Construction Cost	\$21,989,000
Construction Contingency Cost	\$2,198,900
Project Administration Cost	\$1,099,450
Total Capital Cost	\$25,287,350

¹Cost opinion for this line item includes all transmission main piping and appurtenances, fire hydrants, trenchless crossings, erosion and sedimentation control, and surface restoration.

4.1.4.3.2 Phasing Option 2 (Preferred)

Under Option 2, the new Cooleemee WTP would be constructed with a capacity of 3.5 mgd in the immediate term, while an expansion of Sparks Road WTP would be needed by 2030. The DWI interconnection could be delayed until after 2040. Table 4-4 below outlines the phasing of this option.

Table 4-4: Alternative 3, Phasing Option 2

Facility	Begin Construction	In Service	Notes
Existing Cooleemee WTP	N/A	N/A	Decommissioned in 2023
New Cooleemee WTP	2021	2023	3.5-mgd capacity
Lagle WTP	N/A	N/A	Decommissioned in 2023
DWI Interconnection	N/A	N/A	Not required until after 2040 based on revised demand projections
Sparks Road WTP Expansion	2028	2030	To 4.5-mgd capacity

Capital cost for Option 2 over the near-term planning period is \$25.3 million in 2020 dollars (Table 4-5).

Table 4-5: Alternative 3, Phasing Option 2 Capital Costs

Option	Capital Costs (2020 USD)
New Cooleemee WTP	\$ 17,219,000
Primary Raw Water Pump Station and Main Upgrades	\$ 657,000

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Raceway Raw Water Pump Station Upgrades	\$ 720,000
Existing Cooleemee WTP Demolition	\$ 910,000
Cooleemee Transmission Mains ¹	\$ 2,483,000
Total Capital Cost	\$21,989,000
Construction Contingency Cost	\$2,198,900
Project Administration Cost	\$1,099,450
Total Capital Cost	\$25,287,350

¹Cost opinion for this line item includes all transmission main piping and appurtenances, fire hydrants, trenchless crossings, erosion and sedimentation control, and surface restoration.

4.1.4.3.3 Phasing Option 3

Under Option 3, bulk purchase from DWI would begin in the immediate term, while the Sparks Road WTP expansion would be delayed for approximately 7 years to 2030. The Cooleemee WTP would not be upgraded or expanded under this option. Table 4-6 below outlines the phasing of this option.

Table 4-6: Alternative 3, Phasing Option 3

Facility	Begin Construction	In Service	Notes
Existing Cooleemee WTP	N/A	N/A	Decommissioned in 2023
New Cooleemee WTP	N/A	N/A	Not required
Lagle WTP	N/A	N/A	Decommissioned in 2023
DWI Interconnection	2021	2023	Bulk purchase arrangement with 3.5-mgd firm capacity
Sparks Road WTP Expansion	2028	2030	4.5-mgd capacity

Capital costs for Option 3 over the near-term planning period is \$21.5 million in 2020 dollars (Table 4-7).

Table 4-7: Alternative 3, Phasing Option 3 Capital Costs

Option	Capital Costs (2020 USD)
Davidson Water Interconnection ¹	\$ 14,510,000
3.5-mgd Davidson Water Pump Station	\$ 3,523,000

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Deadmon Road PS Upgrades	\$ 656,000
Total Capital Cost	\$18,689,000
Construction Contingency Cost	\$1,868,900
Project Administration Cost	\$934,450
Total Capital Cost	\$21,492,350

¹Cost opinion for this line item includes all transmission main piping and appurtenances, fire hydrants, trenchless crossings, erosion and sedimentation control, and surface restoration.

4.1.4.3.4 Summary

Water Supply Option 2 is the most favorable in terms of rate impacts to Davie County and the Town of Mocksville based on near-term and future construction phases. In Option 2, a new Cooleemee WTP would be constructed in the near term with a capacity of 3.5-mgd allowing for the abandonment of the existing Cooleemee and Lagle WTPs. The interconnection with Davidson Water would not be required for water supply until after 2040. However, the County and Town could decide to proceed with this project earlier to provide additional resiliency in the water supply system or if demand patterns dictate that additional water supply is needed before 2040.

4.1.5 Alternative 4 – Expand Sparks Road WTP to 9-mgd

A fourth alternative was considered, which involved upgrading the Sparks Road WTP to 9-mgd and decommissioning the Cooleemee WTP. In this alternative, there was no emergency interconnection to DWI. While the safe yield of the Yadkin River at the Sparks Road WTP intake location is ample to meet the County’s needs and the IBT associated with this alternative is less than 2-mgd for the 20-year planning window, the County’s existing transmission piping does not have sufficient capacity for water to be pumped to southern Davie County from the Sparks Road WTP. Moreover, this alternative results in a loss of redundant water supply, as the intake at Cooleemee would be abandoned. It was determined that the transmission piping upgrades required under this alternative would be cost-prohibitive, and this alternative was not considered further.

4.2 Present Worth Analysis

To evaluate the full implementation costs, a present worth analysis on a 20-year life cycle was performed for all feasible water supply alternatives. Cost opinions were not developed for infeasible project alternatives as these alternatives did not meet the project purpose and need. Table 4-8 provides a summary of the opinion of construction cost for each of the major components of the project, the annual and intermittent operation and maintenance (O&M) costs, and the total present worth on a 20-year life cycle for each of the feasible alternatives evaluated. The total present worth of the life cycle costs for the

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preferred alternative (Alternative 3, Phasing Option 2) is approximately \$71.6 million. The present worth calculations are provided in Appendix C.

Assumptions for preparing the present worth analyses for the feasible alternatives are as follows:

- The 20-year evaluation period is 2020 to 2040.
- Replacement and intermittent O&M costs were not included in the estimate. All structures, equipment, and systems will be designed for a 20-year useful life cycle.
- O&M costs are based on treated water costs incurred by the County including personnel to operate the WTPs, chemicals, supplies, etc. Annual O&M costs are assumed to be \$1.50/1,000 gallons for water produced by Davie County.
- A wholesale of \$2.55/1,000 gallons for water purchased from Davidson Water, Inc. based on information provided by DWI. This is the 2019 DWI quoted rate with a 3% escalation factor added for an estimate of 2020 rates.
- Escalation of production costs and bulk water purchase costs occurring at the rate of inflation at approximately 3% per year.
- EPA discount rate of 4.875%

Table 4-8: Summary of Opinion of Probable Construction Costs, Operation and Maintenance Costs, and Total Present Worth of Feasible Alternatives

Project Alternative	Capital Costs	Present Worth of Replacement	Present Worth of O&M Costs			Total Present Worth
			Annual	Intermittent	Total	
Alternative 2	\$30,678,550	\$0	\$111,050,552	\$0	\$111,050,552	\$141,729,102
Alternative 3 (Phasing Option 1)	\$25,287,350	\$0	\$46,271,063	\$0	\$46,271,063	\$71,558,413
Alternative 3 (Phasing Option 2)	\$25,287,350	\$0	\$46,271,063	\$0	\$46,271,063	\$71,558,413
Alternative 3 (Phasing Option 3)	\$21,492,350	\$0	\$78,660,808	\$0	\$78,660,808	\$100,153,158

4.3 Alternatives Analysis Summary

A summary of the water supply alternatives included in the detailed analysis is provided in Table 4-9. The near-term capital costs (defined as capital costs within the next 5 years) for Alternative 2 are approximately \$30.7 million. The near-term capital costs for the preferred alternative, Alternative 3, Phasing Option 2, are \$25.3 million. However, Alternative 3, Phasing Option 2, has a much lower 20-year lifecycle cost of \$71.6 million compared to \$141.7 million for Alternative 2. This analysis was conducted based on the wholesale rate from Davidson Water being \$2.55 per 1,000 gallons (starting in 2020) and subject to the same rate increases on a percentage basis as their retail rate. Although

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Alternative 3 Phasing Option 2 has the same present worth as Phasing Option 1 due to having the same near-term plan to construct a new 3.5-mgd Cooleemee WTP, Phasing Option 2 is the most favorable in terms of rate impacts to Davie County and the Town of Mocksville when evaluating future construction phases (i.e. Sparks Road WTP expansion and DWI interconnection).

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Table 4-9: Alternative Analysis Summary

Alternative	Feasible	Capital Cost	Reasons for Accepting / Rejecting Alternative	Environmental Impact Comparison
No-Action	No	Not evaluated	The alternative does not provide the required infrastructure improvements to meet the current water demand or health needs of the service area.	The no-action alternative could potentially result in environmental impacts during extreme low-flow events, which are currently a concern noted by both the County and Town's staff at their respective intakes and treatment facilities.
Alternative 1	No	Not evaluated	This alternative requires a time-consuming and costly IBT, does not include upgrades to transmission mains lacking capacity, and it would provide a less robust system to supply the majority of the County's water from the more limited source of supply.	This alternative would require significant water transmission improvements to supply potable water from southern to northern Davie County, resulting in widespread land-disturbing activities. Additionally, this alternative would require an IBT process with an extensive environmental evaluation of both the source and receiving basins as well as upstream and downstream users.
Alternative 2	Yes	\$30,678,550	This alternative could meet the project purpose and need. However, it does not provide the highest level of ownership over the water supply system, which could result in uncertainty in operating costs in the future. Additionally, the loss of supply from the South Yadkin River would result in a less resilient water supply system.	This alternative would require more water transmission main improvements compared to the preferred alternative increasing land-disturbing activities. The loss of supply from the South Yadkin River could potentially result in environmental impacts during extreme low-flow events.
Alternative 3 with Phasing Option 1	Yes	\$25,287,350	This alternative could meet the project purpose and need. However, it has the highest capital costs of the three phasing options and does not provide the highest level of ownership over the water supply system compared to phasing option 2.	This alternative would require more water transmission main improvements compared to the preferred alternative increasing land-disturbing activities.
Alternative 3 with Phasing Option 2 (Preferred Alternative)	Yes	\$25,287,350	This alternative addresses the project purpose and need. Environmental impacts were fully evaluated. The alternative is preferred due to minimal rate impacts to Davie County and the Town of Mocksville while providing resiliency in the water supply system.	Refer to Section 5 for a detailed discussion of the anticipated environmental impacts of the preferred alternative.

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Alternative	Feasible	Capital Cost	Reasons for Accepting / Rejecting Alternative	Environmental Impact Comparison
Alternative 3 with Phasing Option 3	Yes	\$21,492,350	This alternative could meet the project purpose and need. However, the dependency on the interconnection with DWI could result in uncertainty in future rates and operating costs. Additionally, this phasing option does not provide the County and Town the most resiliency in the water supply system.	This alternative would require more water transmission main improvements compared to the preferred alternative increasing land-disturbing activities.
Alternative 4	No	Not evaluated	This alternative would require costly transmission main upgrades as the County's existing transmission piping does not have sufficient capacity for water to be pumped to southern Davie County from the Sparks Road WTP and also would be a loss of redundant water supply, as the intake at Cooleemee would be abandoned.	Similar to Alternative 1, this alternative would require significant water transmission improvements to supply potable water from Sparks Rd WTP to southern Davie County, resulting in widespread land-disturbing activities. Additionally, this alternative results in a loss of redundant water supply, as the intake at Cooleemee would be abandoned and could potentially result in environmental impacts during extreme low-flow events.

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The selected alternative, Alternative 3 with phasing option 2, is the most favorable in terms of rate impacts to Davie County and the Town of Mocksville. Construction of a new 3.5-mgd Cooleemee WTP in the near term will allow for the immediate decommissioning of the aging Cooleemee and Lagle WTPs. The interconnection with Davidson Water would not be required for water supply until after 2040, which significantly lowers the total 20-year net present value of this water supply alternative. However, the County and Town could decide to proceed with this project earlier to provide additional resiliency in the water supply system or if demand patterns dictate that additional water supply is needed prior to 2040.

4.4 Proposed Project Description

The recommended alternative is for Davie County Public Utilities Department and the Town of Mocksville to partner to construct a 3.5-mgd Cooleemee WTP and decommission the existing Cooleemee WTP and Lagle WTP because both WTPs have reached the end of their useful service lives and would require significant capital investment to meet the current water supply demand. Another component of the selected alternative includes construction of 18,500 LF of 12-inch and 16-inch transmission main parallel to existing water lines to supply water to the Town of Mocksville as the existing interconnections between the systems cannot hydraulically accommodate the WTP modifications.

4.4.1 Cooleemee WTP Preliminary Design

This section provides the preliminary design for replacement of the existing Cooleemee WTP on a site adjacent to the existing WTP. Figure 4-3 provides a flow schematic for major treatment processes for the proposed Cooleemee WTP.

4.4.1.1 Raw Water Pump Stations

The proposed improvements include upgrades to the existing raw water pump stations to supply the new Cooleemee WTP. There are two existing raw water intakes and pump stations – the primary (dam) intake and pump station withdraws raw water directly from the South Yadkin River and the secondary (raceway) raw water intake and pump station withdraws raw water from a canal that is tributary to the South Yadkin River and feeds a downstream hydroelectric plant. The primary RWPS will have two new identical raw water pumps to provide a firm capacity of 3.8-mgd (2,640 gpm) and the secondary RWPS will have a single new raw water pump with a capacity of 3.8-mgd. Flow from both stations will be combined upstream of a new meter vault equipped with a modulating valve for flow control to the water treatment process.

A hydraulic model of both raw water pump stations and transmission mains was developed using the KYPIPE modeling software and record drawings of the existing pump stations and transmission mains. This hydraulic model was used to assess the new pumping requirements for both pump stations, and used the following assumptions regarding Hazen-Williams roughness coefficient:

- C = 140 for new C-900 PVC piping.
- C = 130 for new ductile iron piping.

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- C = 120 for existing ductile iron piping installed in 2005.
- C = 100 for existing cast iron piping installed in 1975.

4.4.1.1.1 Primary (Dam) South Yadkin Raw Water Pump Station

The primary raw water pump station will reuse the existing intake. Table 4-10 summarizes the major design criteria of the existing intake screen. At a flow of 3.8 mgd, the resulting screen velocity is 0.33 fps through the primary intake screen, which is below the required maximum of 0.5 fps.

Table 4-10: Primary RWPS Intake Screen

	Primary RWPS Intake Screen
Surface area of intake screen, sf	45
Estimated percentage of open screen area	40%
Maximum screen velocity, fps	0.33

The existing pumps and motors at the primary RWPS will be replaced to provide a firm pumping capacity of 3.8 mgd. Table 4-11 summarizes the major pump design criteria. The individual suction lines to each pump will be upsized from 10-inch to 12-inch, and the individual discharge lines from each pump will be upsized from 8-inch to 10-inch. The discharge header will also be upsized from 12-inch to 16-inch. All the new piping in the pump station will be ductile iron piping. The existing 12-inch cast iron raw water transmission main will be replaced with a new 16-inch C-900 PVC raw water main to the WTP to accommodate the increased flow rate.

Table 4-11: Primary RWPS Pump Design Criteria

	Primary RWPS
Number of pumps	2 (duty/standby)
Pump design	Horizontal split-case
Capacity per pump, mgd	3.8
Capacity per pump, gpm	2,640
Total dynamic head per pump, ft	121
Pump speed, RPM	1750
Motor horsepower	125
Efficiency at design point, %	82%
Motor speed control	Constant speed

To accommodate the new 125 horsepower raw water pumps, the existing electrical distribution system needs to be updated. The existing RWPS does not have a standby power source. The new electrical distribution equipment will include two (2) 125 horsepower motor soft starters, one (1) 600 amp panelboard with new circuit breakers, a fusible service-entrance rated heavy-duty double-throw switch, a heavy-duty quick connect switch for generator connection, and associated wire, conduit, and connectors.

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A new 200 kilowatt portable generator will be included and stored on the premises of the new WTP for protection against theft and vandalism at the RWPS site.

4.4.1.1.2 Secondary (Raceway) Raw Water Pump Station

The secondary raw water pump station will reuse the existing intake. Table 4-12 summarizes the major design criteria of the existing intake. At a flow of 3.8-mgd, the resulting screen velocity is 0.06 fps through the secondary intake screen, which is well below the required maximum of 0.5 fps.

Table 4-12: Secondary RWPS Intake Screen

	Secondary RWPS Intake Screen
Surface area of intake screen, sf	192
Estimated percentage of open screen area	50%
Maximum screen velocity, fps	0.06

The existing pumps at the secondary RWPS will be removed and replaced with a single pump with a capacity of 3.8 mgd. This does not provide a firm capacity of 3.8 mgd to the plant, but it allows raw water to be delivered from the raceway to the WTP in situations where withdrawing raw water from the South Yadkin River at the primary RWPS is not desirable. Table 4-13 summarizes the major pump design criteria. The existing 10-inch pump discharge piping along the length of the pump station structure will be replaced with 12-inch ductile iron piping and tie into the existing 16-inch raw water transmission main. The existing 12-inch raw water transmission main from the point of entry at the existing WTP to the tie-in with the new 16-inch transmission main from the primary RWPS at the new WTP will be reused to convey flow from the secondary RWPS to the new WTP. A new 16-inch ductile iron main will carry flow from the point where the secondary RWPS transmission main ties in with the primary RWPS transmission main to the new rapid mix.

Table 4-13: Secondary RWPS Pump Design Criteria

	Secondary RWPS
Number of pumps	1
Pump design	Vertical turbine
Capacity per pump, mgd	3.8
Capacity per pump, gpm	2,640
Total dynamic head per pump, ft	121
Pump speed, RPM	1775
Motor horsepower	125
Efficiency at design point, %	81%
Motor speed control	Constant speed

To accommodate the new 125 horsepower raw water pump and to address concerns with the condition of the existing electrical equipment, the existing electrical distribution system needs to be updated. A new pump starter for the new raw water pump will be installed near the pump station structure. A new

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electrical feed will be installed from the new WTP to the existing RWPS and new disconnects and wiring for the pump will be installed.

The existing secondary RWPS structure is cantilevered over the raceway. The cantilevered design is an unusual approach to support rotating equipment. The existing steel structure requires rehabilitation. Due to the cantilever design and condition of the steel structure, it is unlikely the pump station can support larger loads or thrust. It has been confirmed that the weight and loads for the one new 3.8 mgd pump are less than the combined weights and thrust loads for the existing pumps, so the existing structure is planned to be repaired and rehabilitated. The single new pump and discharge piping will be centered on the existing cantilevered structure. The existing strainer basket will be reused. The structural steel on the secondary RWPS structure will be resurfaced and repainted.

4.4.1.2 *Coagulation, Flocculation, and Clarification*

Because the existing Cooleemee WTP is not equipped with a pre-settling reservoir and total and fecal coliform levels exceed the raw water quality criteria outlined in 15A NCAC 18C .0601, Hazen and the County met with NC Public Water Supply and presented an alternative to additional pretreatment for the proposed Cooleemee WTP. The proposed design incorporates UV disinfection for a multiple barrier approach to pathogen inactivation.

The preliminary design for the proposed rapid mix and flocculation process facilities is summarized in Table 4-14. Two parallel rapid mix basins (duty/standby) will be provided to provide resiliency. Two trains of 3-stage tapered flocculation are proposed with mixers equipped with VFDs to provide operational flexibility to optimize floc formation.

Table 4-14: Proposed Rapid Mix and Flocculation Processes

	Rapid Mix	Flocculation
Number of trains	2 (parallel)	2 (parallel)
Number of stages per train	1	3
Maximum flow per train, mgd	3.8 (fully redundant)	1.9
Detention time at maximum flow ¹	30 seconds	30 minutes
Mixer rated output power, HP	7.5	1.0
Velocity gradient(s) provided ² , s ⁻¹	750	20 – 80

¹Maximum of 30 seconds for rapid mix per *Ten State Standards*; minimum of 30 min for flocculation per NCAC

²At least 750 s⁻¹ for rapid mix per *Ten State Standards*

The proposed sedimentation basins will have a shorter detention time than 4 hours but will include plate settlers for increasing the effective settling area of the basin. A baffle wall located along the length of the basin directs water underneath the baffle to allow the upflow of the water through the plate settlers. Settled water is then collected via effluent launders.

Additionally, the basins will be equipped with sludge collectors for automatic sludge removal without having to take a basin out of service. Table 4-15 summarizes the design of the proposed sedimentation basins.

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Table 4-15: Proposed Sedimentation Basins

	Sedimentation Basins
Number of basins in service	2
Weir length, ft	120
Maximum flow per basin, mgd	1.9
Detention time at maximum flow ¹ , hrs	2.0
Surface overflow rate at maximum flow, gpm/sf	<0.30
Weir overflow rate at maximum flow ² , gpd/ft	16,000
Flow-through velocity at maximum flow, fpm	0.50

¹Minimum detention time of 4 hours per NCAC, unless case-specific engineering

²Maximum overflow rate of 20,000 gpd/ft

4.4.1.3 Filters

Four filters are proposed and sized for a maximum hydraulic loading rate of 4 gpm/sf with one out of service for backwash or maintenance. Firm filtration capacity will ensure that the Cooleemee WTP can meet peak water demands even if filter runtimes are impacted by water quality, algae, or process upsets. The proposed media profile consists of anthracite and sand overlaying a stainless steel underdrain system. Fiber reinforced plastic backwash troughs will be used to convey waste backwash water to a residuals equalization tank. A positive displacement blower and dedicated backwash pump will be provided for backwashing, with a backup connection to system pressure in the event the backwash pump is out of service. Table 4-16 summarizes the design of the proposed filters.

Table 4-16: Proposed Filters

Parameter	Filters	
Number of filters in service	4	3
Surface Area per Filter, sf	220 sf	
Media and effective sizes	12" sand (0.50 mm) 24" anthracite (0.85 mm)	
Calculated L/d	1,330	
Maximum forward flow per filter, mgd	0.95	1.27
Hydraulic loading rate at maximum flow ¹ , gpm/sf	3.0	4.0
Design backwash rates, gpm/sf	5 - 20	
Design media expansion	30%	

¹Maximum of 4 gpm/sf per NCAC

4.4.1.4 Ultraviolet Disinfection

UV disinfection is recommended post-filtration to address concerns with high raw water coliform levels and to provide an additional barrier for pathogens as discussed in Section 3. UV disinfection effectively inactivates chemically-resistant pathogens such as *Cryptosporidium* and *Giardia*. Based on the Cooleemee WTP's classification as Bin 2 per the EPA's Long Term 2 Enhanced Surface Water

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Treatment Rule, the water treatment process will be required to achieve a total of 3.0-log treatment of *Cryptosporidium*. The proposed treatment process will claim 2.0-log removal of *Cryptosporidium* through the filters and 1.0-log inactivation of *Cryptosporidium* using UV disinfection. The UV disinfection system will be designed to achieve 3.0-log inactivation of *Cryptosporidium*. This approach provides multiple barriers for pathogens and operational flexibility for the WTP. It should be noted that the existing WTP is currently able to claim an additional 1.0 log removal of *Cryptosporidium* for maintaining both their individual and combined filter effluent turbidity at <0.15 for 95% of the time (0.5 log removal granted for each). Disinfection with free chlorine in the clearwell will be maintained to satisfy virus inactivation requirements and provide multiple treatment barriers.

Both medium pressure (MP) and low pressure high output (LPHO) lamp technologies were evaluated for use at the Cooleemee WTP. In general, medium pressure systems incur less headloss, require a smaller footprint, and have fewer components that require replacement and maintenance compared with LPHO UV systems. LPHO UV lamps are more energy efficient and operate at lower temperatures, which reduces the fouling tendency for the UV lamp quartz sleeves. The County selected LPHO based on a review of the conceptual reactor design configurations, consideration of the maintenance and operations of each alternative, and a life cycle cost analysis.

Hazen performed an analysis of the filtered water UV 254 transmittance (UVT) data from the existing Cooleemee WTP between March 2018 and February 2020 to determine the UVT design value for the new WTP equipment. A summary of the UVT data is presented in Table 4-17, below. A design value of 90% UVT was selected based on the results of the analysis.

Table 4-17: Summary of Filtered Water UVT at Cooleemee WTP

Parameter	Value
Max UVT, %	99.8
Mean UVT, %	96.8
1 st Percentile UVT, %	93.6
Minimum UVT, %	91.2
Number of Data Points, count	63

A summary of the design criteria for the Cooleemee WTP UV disinfection system is provided in Table 4-18.

Table 4-18: Proposed UV System Design Criteria

Parameter	Design Criteria
Design <i>Cryptosporidium</i> Inactivation	3.0-log
Design UV Transmittance, %	90
Number of Reactors	2 (1 duty / 1 standby)
Combined lamp aging and fouling factor	0.9
Headloss, inches	22

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4.4.1.5 Clearwell

Filtered water will flow to the clearwell after passing through the UV process. Free chlorine will be used for additional disinfection, consistent with current operations. The existing clearwell will be decommissioned and replaced with a new clearwell. Design criteria for the new clearwell are provided in Table 4-19.

Table 4-19: Proposed Clearwell

	Clearwell
Type	Cast-In-Place (CIP), rectangular, partially below grade, dual-cell
Volume, gal	900,000
Dimensions, ft	85'0" length 85'0" width
Sidewater Depth, ft	17'-0" at maximum capacity
Baffling	CIP baffle walls

The proposed Cooleemee WTP will include post-filter chlorine feed to achieve the desired chlorine residual for CT. The clearwell will be equipped with CIP baffle walls with a target baffling factor of 0.7 based on similar designs for other WTPs. Table 4-20 details anticipated Giardia log removal at the maximum future WTP flow rate of 3.5 mgd and varying clearwell operational levels. Historical minimum and average free chlorine residuals were evaluated at worst-case conditions of 5 °C and pH of 8.

Table 4-20: Anticipated CT and Giardia Inactivation

Free Chlorine Residual (mg/L)	CT _{req} ¹	50% Clearwell Volume		75% Clearwell Volume		100% Clearwell Volume	
		CT _{calc} ²	Inactivation	CT _{calc} ²	Inactivation	CT _{calc} ²	Inactivation
1.5	94	167	2.2-log	250	3.2-log	333	4.3-log
3.5	77	389	4.1-log	583	6.2-log	778	8.3-log

¹Based on 5 degrees C and pH of 8 from 2016-2019 MORs; 1-log Giardia removal table from Appendix E of *Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources*

²0.7 baffling factor.

The additional clearwell volume will afford Davie County significant flexibility in meeting CT log removal requirements while also providing additional on-site storage volume for the distribution system. The yard piping will include a bypass around the clearwell to avoid a full plant shutdown for clearwell maintenance. However, bypassing the clearwell will require advanced planning to ensure sufficient finished water is available throughout the distribution system. This can include timing the bypass to occur during lower water demands (time of day or seasonal).

4.4.1.6 High Service Pump Station

The High Service Pump Station will be located adjacent to the Clearwell. Can-type vertical turbine pumps will be utilized for the High Service and Backwash Supply pumps, with a pre-engineered metal superstructure protecting the pump motors and exposed discharge piping. The discharge piping will be

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configured with valving such that the filters can be backwashed from system pressure in the event the Backwash Supply pump is out of service. All pumps will be equipped with VFDs and flowmeters for flow control. Table 4-21 summarizes the design of the proposed High Service Pump Station.

Table 4-21: Proposed High Service Pump Station

	High Service Pumps	Backwash Supply Pump
Number of pumps	2 (duty/standby)	1
Pump design	Vertical turbine (can)	Vertical turbine (can)
Capacity per pump, gpm	2,430	4,400
Firm station capacity, mgd	3.5	6.3 ¹
Total dynamic head, ft	350	40
Minimum hydraulic efficiency, %	80%	80%
Rated output power, HP	300	75
Drive	VFD	VFD

¹Backup connection to system pressure for firm capacity

4.4.1.7 *Chemical Systems*

A new chemical storage and feed facility will house ferric sulfate, sodium hydroxide, coagulant aid polymer, sodium hypochlorite, fluoride, and orthophosphate chemical systems. The site plan includes space allocation for a future powdered activated carbon (PAC) system should the source water have future taste and odor challenges. The application points for each chemical are listed in Table 4-22.

Table 4-22: Chemical Systems - Application Points

Chemical	Purpose	Application Points
Ferric Sulfate	Coagulation	Pre-Rapid Mix
Sodium Hydroxide	pH Adjustment	Pre-Rapid Mix, Pre-Filter, Pre-Clearwell, Post-Clearwell
Coagulant Aid Polymer	Coagulant Aid	Post-Rapid Mix
Sodium Hypochlorite	Disinfection	Pre-Filter, Pre-Clearwell, Post-Clearwell
Fluoride	Fluoridation	Pre-Clearwell
Orthophosphate	Corrosion Inhibition	Pre-Clearwell
Powdered Activated Carbon (Future)	Taste and Odor Control	Raw Water

Design flows and doses used for sizing of the new chemical storage and feed equipment are listed below in Table 4-23.

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Table 4-23: Chemical Systems - Flow and Doses

Item	Maximum	Average	Minimum
Plant Flow, mgd	3.8	2.7	0.90
Ferric Sulfate Dose ¹ , mg/L	612	64	23
Sodium Hydroxide Pre-Rapid Mix & Pre-Filter Dose ² , mg/L	144	27	3.9
Sodium Hydroxide Pre-Clearwell & Post-Clearwell Dose, mg/L	54	23	8.4
Coagulant Aid Polymer Dose ³ , mg/L	0.50	0.30	0.10
Sodium Hypochlorite Dose ¹ , mg/L as Cl	6.0	3.1	1.5
Fluoride Dose ^{1,4} , mg/L as F	0.91	0.67	0.29
Orthophosphate Dose ^{1,5} , mg/L	7.1	3.6	2.1
Powdered Activated Carbon Dose (Future) ⁶ , mg/L	10	5.0	5.0

¹Dose based on 2018 – 2021 MORs

²5th percentile for minimum dose

³Dose based on 2003 jar testing, to be verified with bench-scale testing

⁴99th percentile for maximum dose

⁵1st percentile for minimum dose

⁶Based on experience at similar WTPs

The chemical storage and feed systems sizing is based on NC Administrative Code, 10 State Standards, and Hazen experience on many previous chemical system designs. The following guidelines were considered in sizing equipment:

- Bulk Storage:** Sizing is generally provided for 30 days while assessing volume needs at the maximum dose and average treated water flow, or the average dose and maximum treated water flow; tanks should also be sized for 150% of a full bulk shipment of chemical. Bulk storage tanks will be constructed of fiberglass-reinforced plastic (FRP), high-density polyethylene (HDPE), or steel, as outlined below for each chemical, and will be provided with overfill protection.
- Day Tanks:** Day tanks are provided for chemicals stored in bulk storage tanks. The day tanks are sized to provide at least 125% of the daily requirement at the maximum dose and average treated water flow, or the average dose and maximum treated water flow. This provides operators with a means to store existing chemical that has already been diluted to a smaller day tank prior to a delivery of undiluted chemical. Day tanks will be constructed of FRP, HDPE, or steel and will be provided with overfill protection.
- Metering Pumps:** Chemical metering pumps will be sized for the current design capacity and maximum chemical dose, and equipment will have adequate turndown capability for the minimum capacity and minimum chemical dose. Redundant metering pumps and accessories will be provided for each chemical system, and a spare chemical feed line will be provided for each chemical in its respective feed conduit. All chemical feed system controls will provide for flow pacing. Diaphragm metering pumps will be provided for the liquid chemical systems as described below.

The new chemical storage and feed facilities will be provided in a pre-engineered metal building north of the WTP process building. The building will be designed with a separate enclosed room for each

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chemical with the exception of a shared room for coagulant aid polymer and orthophosphate. Each chemical room will be provided with secondary containment sized to hold 110% of the contents of the largest bulk storage tank (or tote), plus 20 minutes of sprinkler water. Secondary containment will be provided for buried chemical piping, consisting of hoses inside PVC casing pipes, and redundant chemical feed hoses will be provided in the containment piping. Secondary containment will also be provided for the chemical delivery area and will include a loading dock. The floor of each chemical room will slope down to a sump, provided with a level switch, for pumping out spills or washdown water, and a sump pump will be provided in each sump. The sump pump will allow plant staff to send washdown water to sanitary while a second connection out of the sump would allow a chemical vac truck to remove spilled chemical. Chemical rooms will be provided with tempered emergency shower/eyewash stations as shown on the Drawings, and continuous ventilation will also be provided. A skylight will be installed in the ceiling for each bulk storage tank and larger day tanks to allow for future removal and replacement.

The following sections describe the storage and feed equipment proposed for the individual chemicals.

4.4.1.7.1 Ferric Sulfate

Ferric sulfate will be delivered to the plant at a concentration of 46% with an effective density of 5.64 lb/gallon. The following equipment is proposed for ferric sulfate storage and feed:

- One (1) 9,000-gallon HDPE bulk storage tank, sized to hold a 30-day supply of 8,700 gallons,
- One (1) 400-gallon HDPE day tank and
- Two (2) diaphragm metering pumps provided for feed to pre-rapid mix (1 duty / 1 standby).

4.4.1.7.2 Sodium Hydroxide

Sodium hydroxide (caustic) will be delivered to the plant in bulk at a concentration of 50% with an effective density of 6.36 lb/gallon. The caustic will be immediately diluted to a concentration of 25% with an effective density of 2.61 lb/gallon. The following equipment is proposed for caustic storage and feed:

- One (1) 10,000-gallon carbon steel bulk storage tank, sized to hold a 30-day supply of 4,000 gallons, as well as full deliveries of 3,500 gallons diluted to 9,200 gallons,
- One (1) 1,000-gallon carbon steel day tank,
- Two (2) magnetic drive centrifugal pumps for dilution, and
- Five (5) diaphragm metering pumps provided for feed to pre-rapid mix, pre-filter, pre-clearwell, and post-clearwell (4 duty / 1 standby).

4.4.1.7.3 Coagulant Aid Polymer

Coagulant aid polymer will be delivered to the plant in totes. The following equipment is proposed for coagulant aid polymer storage and feed:

- Two (2) 330-gallon totes, sized to hold a 30-day supply of 40 gallons, and

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- Two (2) diaphragm metering pumps provided for feed to mixed water after rapid mix (1 duty / 1 standby).

4.4.1.7.4 Sodium Hypochlorite

Sodium hypochlorite will be delivered to the plant in bulk at a concentration of 12% (by trade) and with an effective density of 1.00 lb chlorine/gallon. The hypochlorite will be immediately diluted to a concentration of 7% (by trade) with an effective density of 0.58 lb chlorine/gallon. The following equipment is proposed for hypochlorite storage and feed:

- One (1) 14,000-gallon FRP bulk storage tank, sized to hold a 30-day supply of 7,700 gallons, as well as full deliveries of 4,500 gallons diluted to 13,500 gallons,
- One (1) 2,000-gallon HDPE day tank,
- Two (2) magnetic drive centrifugal pumps for dilution, and
- Four (4) diaphragm metering pumps provided for feed to pre-filter, pre-clearwell, and post-clearwell (3 duty / 1 standby).

4.4.1.7.5 Fluoride

Fluoride will be delivered to the plant in totes at a concentration of 23% and an effective density of 1.86 lb F/gallon. The following equipment is proposed for fluoride storage and feed:

- Two (2) 330-gallon totes, sized to hold a 30-day supply of 340 gallons, and
- Two (2) diaphragm metering pumps provided for feed to pre-clearwell (1 duty / 1 standby).

4.4.1.7.6 Orthophosphate

Orthophosphate will be delivered to the plant in totes. The following equipment is proposed for orthophosphate storage and feed:

- Two (2) 330-gallon totes, sized to hold a 30-day supply of 280 gallons, and
- Two (2) diaphragm metering pumps provided for feed to pre-clearwell (1 duty / 1 standby).

4.4.1.7.7 Powdered Activated Carbon (Future)

Future accommodations for a PAC storage and feed system have been allocated in the event of changing source water quality. PAC would be delivered to the plant in 900-pound SuperSacks. The following equipment is proposed for future PAC storage and feed:

- Four (4) 900-pound SuperSacks, to hold a 30-day supply of 3,300 pounds,
- Two (2) SuperSack unloaders and eductors, and
- A 50,000-gallon contact tank to allow for 20 minutes of detention time prior to rapid mix.

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4.4.1.8 *Residuals Management*

Settled sludge will be removed automatically by sludge collection systems within each sedimentation basin and discharged directly to an existing sanitary sewer line. This line flows by gravity to the Cooleemee WWTP located across the South Yadkin River. The existing sewer line has an estimated working capacity of 450 gpm based on current operations. The sludge collection systems will be operated so that the instantaneous flowrate to the sanitary sewer is less than 450 gpm and does not coincide with a filter backwash. Periodic draining of the sedimentation basins will also be directed to the sanitary sewer in this manner. It is recommended that during preliminary design the condition and capacity of the existing sanitary sewer line is confirmed. This will include subcontracting with an outside utility inspection firm if needed, to determine if the line needs to be upsized or replaced during construction.

Backwash waste flowrates can be as high as 4,400 gpm (20 gpm/sf), well in excess of the capacity of the existing gravity sewer line. Therefore, a new Backwash Equalization Tank will be constructed to receive backwash waste and limit discharge to the sewer to approximately 450 gpm. This tank is sized to store the full volume of one backwash in the event immediate discharge to the sewer is not possible. Table 4-24 summarizes the design of the proposed Backwash Equalization Tank.

Table 4-24: Proposed Backwash Equalization Tank

	Backwash Equalization Tank
Volume	70,000 gallons
Geometry	Circular, open top
Diameter	34'-0"
Side water depth	10'-6"
Time to drain	2.6 hours

4.4.1.9 *Support Systems*

4.4.1.9.1 *Electrical*

The electrical distribution equipment for the treatment plant will consist of an assembly of low-voltage switchgear with integral automatic transfer controls constructed in a Main-Tie-Main (two bus) configuration. The electric utility service will be connected to one bus through a main circuit breaker, and a standby generator will be connected to a second bus through another circuit breaker. The buses will be capable of being connected via a tie circuit breaker. This two bus configuration provides equipment redundancy as well as the ability to de-energize part of the switchgear to provide an electrically safe working condition and eliminate arc flash hazards while working on the switchgear. The treatment plant will be able to continue operating via just one switchgear bus when needed.

The electric utility service along Main Street will supply the proposed treatment plant. A diesel-fueled standby engine-generator set will be provided to serve as the alternate electrical source. The generator will be provided with a 36-hour sub-base fuel tank and a sound-attenuated weatherproof enclosure. The preliminary size of the generator is expected to be 800kw.

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Distribution circuit breakers will be provided in the switchgear to serve stand-alone VFDs for the finished water pumps as well as a motor control center that serves the other treatment processes in the plant. Redundant supplies will be provided to the motor control center from the switchgear to provide not only additional treatment process reliability but also the same arc flash hazard mitigation discussed above.

4.4.1.9.2 Heating, Ventilation, and Cooling and Plumbing

The HVAC design will be based on the 2018 North Carolina Mechanical Code and designed to meet the minimum requirements of the Energy Conservation Code, ASHRAE 90.1 - 2007 Weather data and design conditions will be based upon ASHRAE 99% winter and 0.4% summer conditions for Winston Salem, North Carolina. The plumbing design will be based on the 2018 North Carolina Plumbing Code.

Potable water hose bibbs and freeze-proof hydrants and will be provided in and around the Chemical Building, Administration Building, and the Finished Water Pump Building.

Administrative Area

The Administration Building will be air-conditioned using a packaged electric/gas rooftop unit. Air distribution will be by supply and return ductwork. Roof-mounted exhaust fans will be used for bathroom and laboratory hood exhaust. The Administration Building HVAC system will be sized based on 68-degree indoor winter and 75-degree/50% relative humidity indoor summer conditions. Separate cooling units will be provided for the electrical and elevator equipment rooms. The electrical room system(s) will be sized based on an 85-degree indoor design condition.

The administrative area will include toilet rooms with an adjacent locker and shower area. Toilet, sink, and shower fixtures will be low-flow fixtures. The fixtures will be provided to comply with the accessibility code. Sinks shall be provided within the laboratory and breakroom. Roof drainage will be provided in accordance with the required codes and include overflow drains.

The Administration Building will be a B occupancy and will not require an NFPA 13 compliant fire sprinkler system.

Chemical Storage and Feed Facility

The Chemical building will include the following rooms: Fluoride, Polymer – Orthophosphate, Ferric Sulfate, Sodium Hydroxide, Sodium Hypochlorite, and Corridor. All the spaces except for the Sodium Hypochlorite room will be continuously ventilated at a rate of 1 cfm/sf. Exhaust will be provided by inline exhaust fans. Make up air will be provided by wall-mounted louver/dampers. Natural gas heat will be provided for freeze protection to maintain a minimum 50 degrees F room temperature. The Sodium Hypochlorite room will be ventilated and conditioned to maintain the space above 50 degrees F and below 75 degrees F. HVAC equipment will be constructed from corrosion protection coated aluminum.

Chemical rooms and the laboratory will be required to have an emergency eyewash/shower system. To comply with ANSI Z 358.1 a tempered water system will be provided to deliver water to each of the emergency eyewash/shower systems.

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The chemical storage building will be an H-4 occupancy and will require an NFPA 13 compliant fire sprinkler system. Where the installation is required within a space that is considered wholly non-combustible, a conversation will be held with the local fire official to determine if a fire detection system can be installed in lieu of the fire sprinkler system.

High Service Pump Station

The Finished Water Pump Building pump room will be ventilated with exhaust fans and fresh air intakes. Heat will be provided by gas unit heaters. A HVAC system will be provided for the electrical room and will be sized based on an 85-degree indoor design condition.

The Finished Water Pump building will be a F occupancy and will not require an NFPA compliant fire sprinkler system.

4.4.1.9.3 Architectural

The new Cooleemee WTP will include the following new facilities:

- New Administrative Building
- New High Service Pump Station
- New Chemical Storage and Feed Facility

The new administrative building will be designed with a masonry cavity wall with a brick veneer. The roof will be a low slope roof with a membrane roof with a perimeter parapet. The new high service pump station and chemical storage and feed facility will be pre-engineered metal buildings. The new facilities will be designed in accordance with current N.C. Building Codes. The administrative building will be designed to meet accessibility codes. Process areas will be considered work areas or equipment spaces in accordance with the Accessibility Codes and will not be fully accessible.

Hazen met with Davie County staff to discuss future administrative, laboratory, and office space needs at the WTP including:

- A control room, preferably with capabilities to observe process operations through windows,
- A SCADA / PLC room adjacent to the control room,
- An integrated break room/conference room,
- Three offices,
- Separate men's and women's restrooms to accommodate current and future staff needs,
- A janitorial closet, and
- A laboratory that accommodates all analytical needs and includes adequate storage

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4.4.2 Transmission Main Expansion Preliminary Design

Hydraulic modeling was performed to determine the optimum sizes for the pipes that will distribute water from the expanded Cooleemee WTP as well as the interconnections between the County and the Town of Mocksville. Without replacing existing transmission mains, the predicted flow to Mocksville was 0.65 mgd (450 gpm) through the existing pumps at Lee Jeans Tank, which would not meet the Town’s current water supply demand as discussed in previous sections. Modeling indicated new 16-inch pipes are needed north of Cooleemee WTP along Main Street to distribute the proposed plant capacity of 3.5 mgd without excessive discharge pressures and large pressure swings when the pumps turn on and off. Completing a loop by installing a 12-inch pipe in Nolley Road and Gladstone Road and the northern segment along US 601 following the construction of the new Cooleemee WTP and decommission of Lagle WTP is needed to supply the system. The total length of proposed 12-inch and 16-inch transmission main parallel to undersized water lines is approximately 18,500 LF. Preliminary design information for the proposed transmission main is provided in Table 4-25.

Table 4-25: Proposed Transmission Mains

	Main Street	Nolley Rd/ Gladstone Rd/ US Hwy 601
Length (LF)	1,700	16,800
Diameter (in.)	16	12
Pipe Material	Ductile Iron	Ductile Iron

5. Environmental Information Document

5.1 Introduction

This section provides an assessment of the existing conditions of the areas in which the project components are located, the predicted environmental impacts associated with implementation of the Preferred Alternative, and measures that will mitigate the potential for indirect and cumulative impacts from implementation of the Preferred Alternative. The environmental assessment of the project components is discussed per resource.

Potential direct, indirect, and cumulative impacts that may result from the proposed project are discussed herein. Direct impacts are immediate impacts related to the construction of the proposed project. Indirect impacts result from the proposed project later in time or further removed in the distance but are still reasonably foreseeable. Cumulative effects result from the incremental impact of the proposed activity when added to other past, present, and reasonably foreseeable future activities regardless of the constituents originating from any other activity.

5.2 Background Information

The proposed project includes decommissioning the existing Cooleemee WTP and constructing a new 3.5-mgd facility. The new facility will be constructed on a parcel abutting the existing facility and will use components of the existing facility. The proposed improvements include upgrades to the existing intake and raw water pump stations to supply the new Cooleemee WTP. The project also includes construction of 18,500 feet of 12-inch and 16-inch transmission main parallel to existing water lines to supply water to the Town of Mocksville as the existing interconnections between the systems cannot hydraulically accommodate the WTP modifications.

A detailed description of the project components is provided in previous sections of this report. Due to the interconnection between the County's WTPs, the service area (SA) encompasses the entire county, approximately 267 square miles, and is depicted in Figure 5-1. The project areas consist of the existing WTP site and its associated infrastructure, the abutting parcel on which the new WTP will be constructed, and two waterline segments as shown in Figure 5-2.

The existing Cooleemee WTP is within an approximately 3-acre parcel and the new WTP will be constructed on a portion of the adjacent approximately 10.5-acre parcel. The corridor of the proposed 16-inch waterline along Main Street is approximately 1,700 feet long, is located within the road, and encompasses approximately 1.9 acres. The proposed 12-inch waterline along Gladstone Rd to US-601 encompasses approximately 19 acres of corridor along approximately 16,800 feet of existing roadways. The land within the WTP areas and the water line corridors has been modified including clearing, grading, and existing construction or installation of infrastructure.

5.3 Topography and Floodplains

5.3.1 Existing Conditions

Davie County is situated in the Piedmont physiographic province, which is characterized by gently rolling, long low ridges and well-rounded hills. Topography in the County varies from approximately 1,736 feet mean sea level (msl) to 620 feet msl with the average elevation being 817 feet msl.

Topography varies from approximately 835 feet msl to 770 feet msl at the north and south termini of the proposed 12-inch waterline on Gladstone Rd to US-601. The topography of the north and south termini of the proposed 16-inch waterline on Main St varies from approximately 730 feet msl to 740 feet msl.

Topography on the WTP site and area of expansion varies from approximately 680 to 750 feet.

Topography in the project site and abutting areas is depicted on Figure 5-3.

Geologically, the project site is within the Charlotte Belt, which is comprised of plutonic rocks and metavolcanic rocks, with a small number of metasedimentary rocks. The proposed 12-inch waterline on Gladstone Rd to US-601 and the southernmost portion of the proposed 16-inch waterline on Main St is underlain by intrusive rocks consisting of metamorphosed mafic rock comprised of metagabbro, metadiorite, and mafic plutonic-volcanic complexes. The proposed 16-inch waterline on Main St corridor, except for the southernmost portion, is underlain by intrusive rocks consisting of metamorphosed granitic rock with well-foliated megacrystic and hornblende. The geology of the Piedmont province in the project area is composed of deposits of metamorphosed mafic and granitic rock of the Later Proterozoic-Paleozoic Era/Late Proterozoic-Cambrian Era and the Paleozoic Era/Permian Period. No significant geological features are present in the project areas or vicinity.

The Federal Emergency Management Agency (FEMA) defines and maps the Special Flood Hazard Areas (SFHAs), which consist of the lands that are covered by the floodwaters of the base flood. The SFHA includes the 100-year floodplain and the regulatory floodway. The South Yadkin River is located approximately 80 to 100 feet west of the Cooleemee WTP and parallels a portion of the proposed 16-inch waterline on Main St 700 to 1,800 feet to the southwest. The SFHA associated with the South Yadkin River is not present within or adjacent to the corridor of the proposed 16-inch waterline on Main St, and is not within, but abuts, the western boundary of the Cooleemee WTP parcel. The South Yadkin River SFHA abuts and encompasses approximately 1,000 square feet of the WTP expansion parcel. The SFHAs in the project area are depicted on Figure 5-3. None of the project components or activities will occur within or affect the SFHA of the South Yadkin River.

5.3.2 Direct Impacts

The proposed waterline installation and construction of components of the WTP expansion will result in minor alterations to the existing topography, most of which has been previously modified for construction of the adjacent roadways and previous grading of the WTP areas. No topographic alterations are anticipated to result from the waterline installations, and the topographic alterations in the WTP areas will consist of site grading to provide a level surface for construction of proposed structures. No topographic alterations are anticipated relative to rehabilitation or modification of existing structures. The topographic changes will be limited to the minimum needed to accommodate the proposed rehabilitation, modification, or construction of project components and will be confined to areas within the existing

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project site. Direct impacts to topography from the proposed activities will be temporary and permanent minor impacts.

Activities associated with the WTP expansion will occur in the easternmost portion of the WTP area and not within or abutting the mapped SFHA. However, due to the presence of the South Yadkin River SFHA adjacent to the project area, a Flood Plain Development Permit will be obtained from the Davie County Development & Facilities Services Department for construction activities associated with the WTP expansion, as required. No change in the flood elevation or the capacity of the floodplain to contain and convey flood waters will result from implementation of the proposed activities.

5.3.3 Secondary and Cumulative Impacts

Secondary and cumulative impacts to topography and floodplains may result from growth and associated development in the SA. Grading to accommodate construction of new homes, commercial developments, institutional facilities such as schools, roadways, and community services is expected to have temporary and permanent impacts on topography. Development is likely to lead to the removal of soils along the crests of ridges and the placement of fill material in lower elevations bordering streams and tributaries.

Construction of structures and other impervious surfaces will result in alterations to the existing stormwater runoff patterns. Development is likely to lead to encroachment into the SFHA with the placement of fill material within lower elevations bordering streams and tributaries. Secondary and cumulative impacts are expected to be insignificant due to the strength of the existing Davie County Code of Ordinances, Chapter 153, Flood Damage Prevention program, as described in Section 1-4.

5.4 Soils

5.4.1 Existing Conditions

The process of soil development depends on both biotic and abiotic influences. These influences include past geologic activities, nature of parent materials, environmental and human influences, plant and animal activity, time, climate, and topographic position. Per information obtained from the Natural Resources Conservation Service Web Soil Survey, the project area consists of approximately 34 percent Cecil sand clay loam, 21 percent Lloyd clay loam, 21 percent Enon fine sandy loam, 19 percent Urban land, and 5 percent Rowan sandy loam.

Cecil soils consist of very deep, well-drained, moderately permeable soils typically found on ridges and side slopes in the Piedmont region of North Carolina. Cecil soils are prevalent throughout the Piedmont and are commonly found in cultivated, pasture, and forested areas. Lloyd soils consist of very deep, well-drained, moderately permeable soils in upland areas of the Piedmont. Enon soils consist of very deep, well-drained, slowly permeable soils typically found on ridges and side slopes in the Piedmont. Rowan soils consist of very deep, well-drained, moderately permeable soils.

Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation (Cowardin et al., 1979). Hydric A soils are map units that are either entirely or dominantly comprised of hydric soils whereas Hydric B soils are map units with inclusions of hydric soils or wet spots. Within the

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project and abutting areas, no hydric soils are present. Soils within the project areas and the project site are depicted on Figure 5-4. The soils within the project site are not anticipated to present any constraints to the project. No known areas of soil contamination are present within the project site.

5.4.2 Direct Impacts

Soils will be disturbed during construction due to grading and excavation activities. Excess excavated material may be created by the project. No contaminated soils are known to be present on the project site. Proper disposal of excess soil or any material that is found to be contaminated is the responsibility of the contractor. Within the existing and proposed WTP sites, soils in the areas of proposed land disturbance have previously been disturbed. The waterline corridors are located along roadways in area in which soil disturbance has previously occurred. Increased erosion due to construction activities associated with the proposed project is anticipated. A sedimentation and erosion control plan will be implemented along with best management practices to minimize impacts to soil within the construction areas. Direct impacts to soils from the proposed project will not be significant.

5.4.3 Secondary and Cumulative Impacts

Indirect and cumulative impacts to soils are anticipated to result from future development in the SA. Urban development associated with continued growth is likely to lead to soil disturbance, including site grading, clearing, and leveling. The South Yadkin River within the SA has not experienced turbidity violations resulting from high levels of erosion. Secondary and cumulative impacts are expected to be minor due to the strength of the existing local programs and ordinances, including erosion and sedimentation control requirements and the Davie County Watershed Protection Ordinance, as described in Section 1-4.

5.5 Prime and Unique Farmland

5.5.1 Existing Conditions

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland may be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables.

Information relative to the presence of prime and unique farmlands was obtained from the Natural Resources Conservation Service Web Soil Survey (2021). Ninety-seven (97) percent of the pipeline corridors are underlain by prime farmland soils, and approximately 35 percent of the Cooleemee WTP site is underlain by prime farmland soils. The Soil Survey of Davie County, North Carolina states that nearly 57 percent of Davie County is underlain by prime farmland soils (SCS 1995).

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Per the information obtained, soils designated as prime farmland soils, prime farmland soils if drained, or farmland of statewide or unique importance are present in the SA. These soils within the project site and in the SA are depicted on Figures 5-5 and 5-6. Some of the areas underlain by prime, unique, or important farmland soils in the SA are presently in use other than agriculture. The Davie County Voluntary Agricultural District includes numerous farms north of I-40, two farms west of Mocksville, and one site east of Cooleemee. There are no voluntary Agricultural Districts within four miles of the proposed pipe corridors.

5.5.2 Direct Impacts

Prime and unique farmland soils and soils of statewide importance are present along the pipe corridors. The proposed pipelines will be buried, allowing the land over the pipe to return to present uses. Additionally, the pipelines will be installed immediately adjacent to existing, maintained roadways, avoiding encroachment into currently farmed areas. Current farming operations will not be impacted by construction or operation of the proposed project. Therefore, no direct impacts to prime or unique agricultural lands will occur from implementation of the proposed project.

5.5.3 Secondary and Cumulative Impacts

Loss of prime and unique farmland and soils of statewide importance to urban development in the Davie County is likely to occur regardless of the proposed project. Areas within the SA are identified in the *Davie County Comprehensive Plan: A Development Guide to 2040 (Comprehensive Plan)* as primary, secondary, and rural growth areas (Davie County, 2019). The *Comprehensive Plan* encourages retention of traditional agricultural operations, primarily in the rural growth areas. Development of prime and unique farmland is not anticipated to be induced by the proposed project. Indirect impacts to prime or unique farmlands from the proposed project are anticipated to be insignificant and will be mitigated via the Davie County Zoning Code (Chapter 155) detailed in Section 1-4.

5.6 Land Use

5.6.1 Existing Conditions

The major land cover categories in the Cooleemee WTP service area, project vicinity, and project areas are described as forest and woodland, agriculture and cleared land, developed, and water and riparian habitats. The primary land uses in proximity to the project area are suburban and rural residential developments. Agricultural and forested lands are generally present beyond the areas developed for residential use. The Cooleemee WTP site is presently in use as a WTP. Other light industrial uses are present in the project vicinity and the Cooleemee WTP service area. An aerial photograph depicting existing land use is provided as Figure 5-7.

The project is located within the municipal boundary of the Town of Cooleemee and in unincorporated portions of Davie County. The zoning districts within which the project is proposed to be located include residential-agricultural district, residential district, highway business district, and community shopping district in unincorporated Davie County and in the single-family residential district and light industrial district in Cooleemee. The Cooleemee WTP is located within the light industrial district, and the

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conveyance components of the project are proposed within the remaining aforementioned zoning districts in the Town of Cooleemee and Davie County.

5.6.2 Direct Impacts

Direct impacts to land use within the pipeline corridors will be insignificant. The corridors follow existing roadways and are generally located within the maintained portion of the roadway rights-of-way. Direct impacts to land use from the Cooleemee WTP will be insignificant as the proposed project components associated with the WTP will be constructed within the immediate proximity of existing facilities and in areas that are maintained as lawn around the existing facilities.

The Cooleemee WTP is located within a zoning district in which public utility facilities are permitted. The conveyance components of the project comprise a permitted use in the existing zoning districts. The proposed project is consistent with the future land use presented in the *Comprehensive Plan* (Davie County, 2019). No change to the current zoning districts is needed for the project to comply with the Davie County or Town of Cooleemee zoning ordinances.

5.6.3 Secondary and Cumulative Impacts

The most significant indirect impact of growth in the SA will be land use changes within currently undeveloped areas, which include forested lands, agricultural properties, and other open spaces or vacant lands. Impacts of land use changes may include the direct loss of the resources from conversion to urban uses. Potential impacts may occur from allowing incompatible land uses adjacent to recreational and natural areas and overusing parks and open spaces. Recent and projected growth trends in Davie County are in the range of 1.1 to 1.2 percent. Minor changes to land use across the county are anticipated as a result of projected growth. Much of the growth is expected to be concentrated in or adjacent to areas of existing residential development, limiting the conversion of agricultural or forested areas to residential developments. Compliance with zoning and other local ordinances will minimize the effects of new development projects.

5.7 Forest Resources

5.7.1 Existing Conditions

A majority of the Cooleemee WTP and expansion sites consists of maintained areas with the northwestern portion of the WTP and expansion areas containing a forested area. The corridor of the proposed 16-inch waterline on Main St is in a developed area and does not traverse areas containing forest resources. The proposed corridor of the 12-inch waterline on Gladstone Rd to US-601 does not contain forested areas; however, several small, forested areas abut the project corridor. The forested areas within the expansion site and abutting the corridor of the proposed 12-inch waterline on Gladstone Rd to US-601 are comprised mainly of mixed upland hardwoods intermingled with pines with a moderate understory. The forested areas in proximity to the project areas are mainly comprised of mature trees. The forested areas within the project areas are depicted on Figure 5-8.

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5.7.2 Direct Impacts

Minor impacts to forest resources may result from implementation of the proposed project.

Approximately 0.57 acres of trees from the upland forested area in the WTP and expansion sites may be cleared of trees to accommodate construction of the treatment plant components; however, a majority of the proposed WTP and expansion activities will occur in non-forested portions of the WTP and expansion site. Construction of the proposed 16-inch pipe on Main St. and 12-inch pipe on Gladstone Rd to US-601 will mainly occur in non-forested areas.

5.7.3 Secondary and Cumulative Impacts

Secondary and cumulative impacts to forest resources in the SA are anticipated to occur as a result of continued growth and development in Davie County as a whole. Per the *Davie County 2040 Comprehensive Plan*, development will be encouraged within the existing urban and suburban areas of Davie County, as well as within existing rural areas that are proposed to be developed as suburban residential areas to support the predicted growth in the County. Indirect impacts to forest resources from the proposed project are anticipated to be insignificant in the presently developed portions of the SA and moderate in the presently undeveloped and rural portions of the SA.

5.8 Wetlands and Streams

5.8.1 Existing Conditions

A wetland and stream assessment of the project site was performed by Hazen natural resource biologists in May 2021. No jurisdictional wetlands and only one stream, the upper reach of Peeler Creek, was identified within or abutting the project areas. The head waters of Cody Creek are depicted on the mapping to abut the proposed 12-inch pipe on Gladstone Rd to US-601; however, the head waters of Cody Creek were not found to extend to the project area or the abutting area. The South Yadkin River is located approximately 80 to 100 feet west of the Cooleemee WTP parcel boundary, and the river parallels a portion of the proposed 16-inch waterline on Main St approximately 700 to 1,800 feet to the southwest. Jurisdictional wetlands, per National Wetland Inventory mapping, and streams located in proximity to the project site are depicted on Figure 5-9.

5.8.2 Direct Impacts

The proposed construction, rehabilitation, and modification activities will not impact jurisdictional wetlands or streams within the project areas. The head waters of Cody Creek occur downstream of the project area and Peeler Creek is culverted within and on either side of the project area. No direct permanent or temporary impacts to wetlands or streams will occur from implementation of the proposed project.

Operational impacts of the water treatment facility will not directly impact wetlands; however, negligible impacts to the South Yadkin River will occur from increased withdrawal of water from the river associated with the increased capacity of the Cooleemee WTP. [The South Yadkin River at the point of withdrawal for the Cooleemee WTP drains 564 square miles. In November of 2018 the USGS provided](#)

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an estimated 7Q10 at the point of withdrawal of 102 cfs. Also provided were estimates of the 30Q2 of 254 cfs, and the average annual discharge was estimated to be 649 cfs. Following expansion of the Cooleemee WTP to 3.5 mgd (5.4 cfs), the maximum withdrawals from the South Yadkin River will remain well below 20% of the 7Q10 at the point of withdrawal.

5.8.3 Secondary and Cumulative Impacts

No secondary impacts to streams or rivers in the project vicinity will occur from the proposed project. Design, installation, and regular monitoring of erosion and sediment control devices will occur in association with the project. Secondary and cumulative impacts to wetlands and streams may accrue from development in the SA. However, growth in the SA will not be induced by implementation of the proposed project. Therefore, impacts to wetlands and streams from implementation of the proposed project are anticipated to be negligible.

5.9 Water Resources

5.9.1 Existing Conditions

The Yadkin-Pee Dee River basin is located within and outside of North Carolina and consists of the upper Yadkin River basin and the lower Yadkin River basin. The upper Yadkin River consists of two 8-digit Cataloging Units (CUs) with the upper drainage area, CU 03040101, extending downstream to its confluence with the South Yadkin River basin and the South Yadkin River subbasin, CU 03040102. The SA and the project areas are in the two aforementioned upper Yadkin River basin cataloging units. The SA extends into four subbasins in the watershed, DWR Subbasins 03-07-02, 03-07-04, 03-07-05, and 03-07-06. The project areas are in Subbasin 03-07-06 and 03-07-04 (Figure 5-10). The waters within the SA flow to the Yadkin River and then into High Rock Lake.

DWR classifies surface waters of the state based on ~~their existing or proposed~~ uses of waters. All ~~named the classified~~ streams within the SA are classified as C, WS-III, WS-IV, or WS-V. The WS-V classification is assigned to waters protected as water supplies ~~and which~~ are generally upstream and draining to Class WS-IV waters. ~~Class WS-III and WS-IV waters are also~~ or waters used by industry to supply their employees with drinking water or ~~as water~~ waters formerly used as water supply. ~~Class WS-III and WS-IV waters are waters protected as sources of public water supply, and Class B waters are waters protected for primary recreation. Water~~ Waters classified as B, WS-III, WS-IV, and WS-V are also protected for Class C uses. Class C waters are protected for fishing, ~~boating~~, secondary recreation, aquatic life, and other uses.

A section of the South Yadkin River (and its tributaries) from the Cooleemee WTP intake site to a point upstream ~~for~~ approximately six miles is classified as WS-IV. ~~South Yadkin River~~ Hunting Creek is a tributary ~~and its tributaries~~ to the South Yadkin River, and upstream of the WS-IV ~~classification~~ classified reach of this creek that meets the South Yadkin River, this creek ~~and its tributaries~~ are classified as WS-III. Several sections of the Yadkin River (and ~~it~~ their tributaries) bordering and within the SA are classified as WS-IV, ~~including South Yadkin River upstream of the Cooleemee WTP.~~

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Section 303(d) of the Clean Water Act (CWA) requires states to develop a comprehensive public accounting of all impaired waters. The list includes waters impaired by pollutants, such as nitrogen, phosphorus, and fecal coliform bacteria, and by pollution, such as hydromodification and habitat degradation. The impairment might be due to point sources, nonpoint sources, or atmospheric deposition.

Per the 2018 Integrated Report, one stream in the project area and SA is listed as impaired and one stream is listed as 303(d) waters. South Yadkin River from a point 1.0 mile upstream of SR 1159 to NC Highway 801, which includes the stream at the Cooleemee water intake site, is listed as impaired for total suspended solids and turbidity. Bear Creek from a point 0.2 mile downstream of U.S. 64 to its confluence with South Yadkin River approximately 3 miles upstream of the project area is listed as a 303(d) water for copper exceedances.

Point source dischargers located throughout North Carolina are regulated through the NPDES program and are required to register for a permit. The Cooleemee WWTP facility is reported as having a NPDES discharge permit for municipal wastewater discharge approximately 0.5 mile downstream of the Cooleemee WTP intake location that expired June 30, 2020. Other than the expired permit associated with the WWTP facility, no NPDES wastewater discharge permits are reported in association with South Yadkin River within the SA. There are several active and inactive NPDES wastewater and stormwater dischargers in the service area.

No wild and scenic rivers are listed in the SA. The South Yadkin River in, upstream, and downstream of the SA is not designated as critical habitat for aquatic species, high quality waters or outstanding resource waters. No fish nursery areas, anadromous fish spawning areas, or streams designated as significant aquatic endangered species habitat are documented in, upstream, or downstream of the SA.

Two major aquifer systems that usually interact with each other exist in the Piedmont Province. The surficial aquifer is shallow and is underlain by the fractured bedrock aquifer. The fractured bedrock aquifer is usually drilled into for home, industrial, county, and municipal water supply. There are several private well systems in the service area. The majority of the private well systems also utilize septic for wastewater disposal. There may be individual properties with well water that are connected to the County sewer system. No groundwater withdrawal wells are listed by the United States Geological Society (USGS) in or the project vicinity.

5.9.2 Direct Impacts

The primary sources of water quality degradation in rural areas are runoff and sedimentation from agriculture and construction and in urban areas are runoff and sedimentation from impervious surfaces and construction. Short-term, minor increases in turbidity and sediment loading in and downstream of the Cooleemee WTP may occur during project demolition and construction activities as a result of land clearing and soil disturbance. Precautions will be taken to minimize direct impacts to water resources from construction and demolition by avoiding spillage and controlling runoff. Such measures include an erosion and sedimentation control plan, provisions for waste materials and storage, and appropriate maintenance measures.

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Best management practices will be utilized for the protection of surface waters, and sedimentation control guidelines will be strictly enforced during the construction of the project. Oil, fuel, and emissions from construction vehicles may also create temporary, localized water quality impacts during construction and demolition of infrastructure. These impacts will be minimized by instructing contractors to perform vehicle maintenance in areas away from waters and wetlands and to collect and properly dispose of all used vehicle fluids and containers. Direct operational impacts to water quality from construction of new treatment plant components will be negligible since the percent increase in impervious surfaces in the project site is minimal and stringent stormwater control measures will be in place. The direct impacts to water resources from increased water withdrawal will be minor.

5.9.3 Secondary and Cumulative Impacts

Indirect and cumulative water quality impacts may accrue from development in the project area. Continued growth and urban development in the project area may affect water quality. Short-term declines in water quality from installation of public improvements and changes in land uses due to sedimentation and erosion from construction activities, and long-term declines in water quality from land use activities and increasing amounts of non-point sources of pollution may have significant impacts on water quality and subsequent impacts on aquatic habitat, wetlands, and sensitive aquatic and amphibian species. Implementation of the proposed project will assist in preventing future development in the service area from installing groundwater wells, thereby assisting in reducing potential impact to the quantity of groundwater in the SA.

Changes in land use have a major effect on both the quantity and quality of stormwater runoff. Urbanization and land use development, if not properly planned and managed, may dramatically alter the natural hydrology of an area. Impervious surfaces increase the volume and rate of stormwater runoff that may affect erosion, caving, and sloughing of stream banks; erosion and scouring of streambeds; sediment and severe flooding and lead to degradation of water quality from the various stormwater pollutants that wash off impervious areas during rain events (e.g., nutrients, oils, toxics, sediments, bacteria, etc.). The cumulative effects of stormwater runoff are evident in the frequent correlation between the location of a stream and its water quality, where urban streams overall have poorer water quality than rural streams.

5.10 Shellfish and Fish and their Habitats (including aquatic T&E species)

5.10.1 Existing Conditions

Minimal aquatic habitat is present in the project areas and consists of a narrow segment of intermittent stream associated with Peeler Creek. Aquatic habitat is present in the project vicinity. The South Yadkin River is located approximately 80 to 100 feet west of the Cooleemee WTP parcel boundary, and the river parallels a portion of the proposed 16-inch waterline on Main St approximately 700 to 1,800 feet to the southwest.

In general, streams in the project vicinity provide suitable habitat for fish such as bowfin (*Amia calva*), channel catfish (*Ictalurus punctatus*), largemouth bass (*Micropterus salmoides*) smallmouth bass (*Micropterus dolomieu*), and redear sunfish (*Lepomis microlophus*) (DEQ, 2017). Many benthic macroinvertebrates are expected to inhabit the streams. Benthic invertebrates common in streams are the

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caddisflies (*Nyctiophlax moestus*) and (*Pycnopsyche* sp.) and the mayflies (*Stenonema modestum*), (*Leptophlebia* sp.), (*Caenis* sp.), and (*Eurylophella doris*) (DEQ, 2006).

No streams designated as significant aquatic endangered species habitat are in the SA. No anadromous fish spawning areas or critical habitats are listed in the SA or in proximity to the SA.

As of May 15, 2021, the United States Fish and Wildlife Service (USFWS) identified no aquatic vertebrate species as receiving protection or proposed to receive protection under federal laws in Davie County. The North Carolina Natural Heritage Program (NHP) list as of May 15, 2021, included one aquatic invertebrate species, yellow lampmussel (*Lampsilis cariosa*), listed as endangered; one aquatic vertebrate species, robust redhorse (*Moxostoma robustum*), listed as endangered and a historical occurrence; and no aquatic vegetative species for Davie County.

The robust redhorse is a 10- to 19-inch long fish, weighing up to 10 pounds with a stout body and thick lips. The caudal and dorsal fins are red or slate-colored, and other fins are cream or yellow to red. Preferred habitat for this fish is medium to large creeks and rivers, usually in deep and fast water, over gravel, rock, and boulders. Clean, silt-free, gravel beds in shallow waters are required for breeding, which occurs during May. Per the NHP, there is a historical record from 1869 of the robust redhorse in the Yadkin River downstream of the I-64 bridge along the eastern boundary of the SA.

The yellow lampmussel is a bright yellow, medium-sized freshwater mussel with an inflated shell and smooth periostracum with rays that are restricted to the posterior slope, if present. The shell of the yellow lampmussel is heavy with well-developed dentition. The adults of the yellow lampmussel are essentially sessile, although some passive movement downstream may occur. The yellow lampmussel is typically found in medium to large streams and rivers in areas with good current and in areas underlain by sand, silt, cobble, and gravel. Yellow lampmussel is reported as having last been reported in 2002 from the South Yadkin River in proximity to the Cooleemee WTP.

5.10.2 Direct Impacts

Aquatic communities are acutely sensitive to any changes in their environment, and environmental impacts from construction activities may result in long-term or irreversible effects. Impacts usually associated with in-stream construction alter the substrate and affect adjacent streamside vegetation. Such disturbance within the substrate leads to increased siltation, which can clog the gills and/or feeding mechanisms of benthic organisms, fish, and amphibian species. Siltation may also cover benthos with excessive amounts of sediments that inhibit their ability to obtain oxygen. These organisms are slow to recover and usually do not recover, once the stream has been severely impacted.

Demolition and construction activities associated with the proposed project will occur in the project area boundaries, which is located approximately 80 to 100 feet east of the South Yadkin River. No proposed demolition or construction activities associated with the Cooleemee WTP and expansion sites or waterline will occur in aquatic areas. Installation of the 12-inch pipe on Gladstone Rd to US-601 will temporarily impact the headwaters of a small stream, Peeler Creek. No woody vegetation will be removed from streamside areas to accommodate the proposed project, and no fill material will be placed adjacent to streams.

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The direct impact to the shellfish, fish or their habitats from the proposed project is anticipated to be negligible. Proposed construction activities will involve land disturbance within the project footprint. Therefore, the potential for erosion and sedimentation may increase during demolition and construction. Erosion and sedimentation may carry soils, toxic compounds, trash, and other materials into the aquatic communities. Erosion control during demolition and construction will be important to minimize direct impacts to aquatic resources. Quick re-vegetation of disturbed areas will reduce the impacts by supporting the underlying soils. An erosion and sedimentation control plan will be developed and implemented during demolition and construction associated with the proposed project.

No federally protected aquatic species, no proposed federally protected species, and two NHP listed species are listed for Davie County with one of the NHP listed species being a historical occurrence. In addition to the listed species, numerous aquatic communities are present in the service area. However, with the exception of negligible, temporary impacts to Peeler Creek from installation of the 12-inch pipe on Gladstone Rd to US-601, no direct impacts from the demolition and construction activities or the operation of the treatment plant to aquatic species, habitats, or resources are anticipated to occur in the project area or the service area.

5.10.3 Secondary and Cumulative Impacts

Indirect impacts to aquatic habitats may occur from growth within the service area. Indirect impacts may occur from loss, fragmentation, or degradation of aquatic species and their habitats; degradation of water quality, aquatic resources, fisheries, and wetlands; and from increased erosion, sedimentation, and stormwater runoff. Indirect impacts to aquatic habitat and resources in the project site and the SA from the proposed project are expected to be minimal.

5.11 Wildlife and Natural Vegetation (including terrestrial T&E species)

5.11.1 Existing Conditions

Biologists from Hazen conducted field reconnaissance within the project area in May 2021. The project area is composed of different vegetative communities based on past disturbance, ongoing maintenance, topography, hydrology, and soils.

5.11.1.1 Wildlife Habitat and Natural Communities

Terrestrial communities within the WTP site consist of maintained grass fields and existing structures. Terrestrial communities along the conveyance corridors consists of upland areas that are maintained lawn, paved roadways, agricultural fields and pastures, and pockets of mixed pine-hardwood forest. Within the forested areas along and abutting the project site, the canopy species are generally late successional in age with an understory and shrub layer of moderate density.

Amphibians likely to inhabit or utilize the habitats available in the project vicinity include frogs, toads, and newts. Reptiles in the project vicinity may include a variety of snakes, turtles, lizards, and skinks, such as those species inhabiting upland forested areas. Avian species that may be present in or near the

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project area include a variety of songbirds, vultures, and hawks. Mammals typically found in the habitats available in the project vicinity include squirrels, raccoon, opossum, rodents, and white-tailed deer.

5.11.1.2 *Terrestrial Threatened or Endangered Species*

Some populations of fauna and flora have been, or are, in the process of decline due to either natural forces or their inability to coexist with humans. Federal law, under the provisions of Section 7 of the Endangered Species Act of 1973, as amended, requires that any action likely to adversely affect a species classified as federally protected be subject to review by the USFWS. Other species may receive additional protection under separate state laws. As of May 20, 2021, the USFWS identified two terrestrial species as federally protected in Davie County – northern long-eared bat (*Myotis septentrionalis*) and Michaux’s sumac (*Rhus michauxii*).

As of May 20, 2021, NCNHP identified one terrestrial, state-listed species as endangered and one terrestrial, state-listed species as threatened within Davie County. The state-listed species are the endangered Michaux’s sumac and the threatened narrow-leaved smooth aster (*Symphyotrichum concinnum*). The records of narrow-leaved smooth aster are historical records in Davie County, having not been recently documented in the county.

Habitat in or near the project area can support the northern long-eared bat, Michaux’s sumac, and narrow-leaved smooth aster. Documented occurrences of Michaux’s sumac and narrow-leaved smooth aster are present within the county but in areas that are distant from the proposed project activities. The known populations of listed species are more than ten miles from the disturbance proposed to occur during project construction. Pedestrian surveys in areas of suitable habitat for Michaux’s sumac were performed in May 2021. No specimens of Michaux’s sumac or narrow-leaved smooth aster were observed during onsite investigations.

5.11.1.2.1 *Vertebrates*

Northern long-eared bat is a federally threatened bat. It is a medium-sized bat with a body length of 3 to 3.7 inches with a wingspan of 9 to 10 inches and long ears. The fur color ranges from medium to dark brown on their back to tawny to pale brown on their underside. Northern long-eared bats hibernate in caves and mines through the winter. The hibernacula are characterized by constant temperatures, high humidity, and no air currents. In the summer, the bats roost singly or in colonies under bark, in cavities, or in crevices of live trees and dead trees. The bat may roost in a structure, including barns, sheds, and the substructure of bridges.

5.11.1.2.2 *Vascular Plants*

Michaux’s sumac is a densely pubescent, dioecious, rhizomatous shrub that is listed as endangered by the USFWS and the State of North Carolina. It has a low stature, growing to usually less than 2 feet high. The leaves are compound with 7 to 13, serrately edged, hairy leaflets on a hairy rachis. Male or female flowers are found in dense terminal panicles typical of the genus. Flowers bloom in June, and seed heads are visible from August to September. Due to habitat fragmentation colonies of this dioecious plant, when they occur, often are only one large clone representing a single sex. Unfortunately, this quality is a serious

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limitation to the reproduction and repopulation of this species. Michaux's sumac grows in dry, open woodlands and forest edges in scattered locations from Virginia to Georgia. In the Piedmont region, it is usually associated with acidic to subacid clay loam or sandy clay loam soils over granites and occasionally found on clayey soils derived from mafic rock such as Carolina slates or gabbro.

Narrow-leaved smooth aster is a perennial plant in the Aster family that is listed as threatened by the State. The erect stems grow one to four feet tall from rhizomes. Leaves are lanceolate, obscurely crenate to entire along the margin, sessile, and glabrous and smooth on both surfaces. Flowers occur in a panicle with a few flower heads and appear from September to October. Flower heads consist of blue to violet ray flowers and yellow to red disk flowers. Narrow-leaved smooth aster inhabits woodlands and woodland borders.

5.11.2 Direct Impacts

Direct impacts to vegetative communities will be minimal as the communities are presently altered to accommodate existing rural development and roadside maintenance. Construction related impacts to vegetative communities will be temporary along the conveyance corridor and permanent within the WTP site. Temporarily disturbed communities will be returned to pre-construction grade and elevation and seeded with grass. In areas with infrequent maintenance, the local seed stock will support natural revegetation.

Direct impacts to terrestrial wildlife will be minimal. The proposed construction activities will occur in areas with minimal wildlife habitat. Construction activities are anticipated to temporarily displace organisms during construction. Displaced animals are expected to return to the project area upon completion of construction.

Habitat for northern long-eared bat, Michaux's sumac, and narrow-leaved smooth aster is present within and in the vicinity of the proposed project. If tree removal cannot be performed in accordance with the moratorium associated with the northern long-eared bat, then further investigation of the project site and/or coordination with USFWS may be appropriate. Pedestrian surveys conducted within the project site in May 2021 have not revealed the presence of Michaux's sumac or narrow-leaved smooth aster. No direct impacts to federally protected or state-listed species are anticipated to occur as a result of the proposed project.

5.11.3 Secondary and Cumulative Impacts

Two federally protected terrestrial species are listed for Davie County – northern long-eared bat and Michaux's sumac. Additionally, one vascular plant is listed by the State as having historically occurred in Davie County – narrow-leaved smooth aster. The documented population of Michaux's sumac should be monitored and protected from destruction due to future growth and development within the County. Secondary or cumulative impacts to the federally protected or state listed species may occur as a result of habitat modification.

Indirect and cumulative impacts to wildlife and natural vegetation may accrue from development in the project area. Continued growth and urban development in the project area will affect wildlife and natural vegetative communities. Urbanization and land use development have altered the natural landscape in

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currently developed areas and will dramatically alter the natural landscape in areas of future development. However, growth in the SA is expected to occur regardless of the project, and the project is not anticipated to increase the potential impacts or accelerate growth in the County.

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

5.12.1 Existing Conditions

Review of readily available federal, state, and local public information was performed to determine the presence of parkland, scenic, recreation, or state natural areas in and within a five-mile radius of the project areas. No sites were identified within the project areas; however, several state and local public lands, natural areas, and recreation areas are located within a five-mile radius of the project site. The sites identified are depicted on Figure 5-11 and discussed below.

Within a five-mile radius of the project areas, there are six local community parks with three of the parks located on land managed for conservation and open space. Several NHP-designated Natural Heritage Areas, several of which are also listed as land managed for conservation and open space, are located within and outside of a five-mile radius of the project areas. Two community parks located on land managed for conservation and open space are in proximity to the Cooleemee WTP and expansion sites, and the proposed 16-inch waterline on Main St. The South Yadkin River is used for recreational purposes, including fishing and boating, and is in proximity to the Cooleemee project components. No public lands or scenic, recreational, or state natural areas area located within or in proximity to the project area of the proposed 12-inch pipe on Gladstone Rd to US-601.

5.12.2 Direct Impacts

No designated public, scenic, or recreational areas are present within the project site; however, two areas designated as land managed for conservation and open space and that contain community parks, are in proximity to the Cooleemee project areas. No direct impacts to the public lands, natural areas, or parks in a five-mile radius of the project site will occur from construction of the proposed project. Additionally, no direct impacts to the recreational use or scenic value of the South Yadkin River will occur from implementation of the proposed project.

5.12.3 Secondary and Cumulative Impacts

Growth within the service area will not be induced by implementation of the proposed project. Adverse impacts to public, scenic, or recreational areas from land use changes induced by growth is not expected to occur. Existing public, scenic, and recreational areas in the SA are expected to be retained at their current level of service to the community and as development within the SA occurs, designation and construction of additional public and recreational facilities is anticipated to occur.

5.13 Areas of Archaeological or Historical Value

5.13.1 Existing Conditions

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the State Historic Preservation Office (SHPO) and the Office of State Archaeology files were reviewed to determine the potential presence of historic or archaeological resources located within a five-mile radius of the project site. Resources of interest are those in or eligible for inclusion in the National Register of Historic Places (NRHP).

Within a five-mile radius of the project areas, SHPO identifies numerous structures that have been surveyed but not determined eligible or listed on the National Register (Figures 5-12 and 5-13). The southern portion of the project area is located within the Cooleemee Mill Town Historic District (DE0763), which was listed in the NRHP in 2014. The NRHP Registration Form enumerates 440 contributing buildings, structures, or sites. One of the contributing sites has been determined eligible for listing on the NRHP, specifically the Cooleemee Cotton Mill (DE0093). The Cooleemee Cotton Mill is located immediately south of the Cooleemee WTP. The eligibility of the mill for listing was determined during a FERC undertaking for the dam.

Three NRHP-listed sites are located within a five-mile radius of the Cooleemee WTP and expansion site and the proposed 16-inch waterline corridor on Main St. South of Cooleemee is the St. Andrews Episcopal Church and Cemetery, which was listed in 1982. Southeast of Cooleemee is the Foard-Tatum House, which was listed in 1994. The Boxwood Lodge, listed in 1995, is located east of Cooleemee.

Within a five-mile radius of the proposed 12-inch waterline on Gladstone Rd to US-601 corridor, there are two NRHP Historic Districts and five NRHP historic structures. The Historic Districts are the Salisbury Street Historic District (DE0625) and the North Main Street Historic District (DE0582), which was expanded in 2006. The structures include the McGuire-Setzer House, Jesse Clement House, Davie County Jail, Davie County Courthouse, and Hinton Rowan Helper House. The nearest NRHP-listed property is approximately 1.6 miles northeast of the northern terminus of the proposed 12-inch pipe on Gladstone Rd to US-601.

Additionally, the Liberty United Methodist Church Cemetery is located along the 12-inch waterline on Gladstone Rd to US-601 corridor. The current design shows the pipeline as being constructed on the opposite side of the road from the cemetery. SHPO noted that cemeteries are protected under NC General Statutes Chapter 14-148 and 14-149 and are afforded consideration under Chapter 65. SHPO further recommended that the pipeline be constructed on the opposite side of the road to avoid impacts to the cemetery.

In the March 10, 2021, letter, provided in Appendix D, SHPO stated that the project area is considered as having relatively low probability for containing a significant, intact NRHP eligible site. The area anticipated to be disturbed for construction of the proposed project components has been previously disturbed for construction of existing residences and community infrastructure. The proposed project will have minimal disturbance to the topography and soils, and the disturbance will occur in a developed area and along roadways. No archaeological survey is recommended by SHPO for the proposed project.

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5.13.2 Direct Impacts

SHPO stated in the March 10, 2021, letter that the project will have no adverse effect on the Cooleemee Mill Historic District. SHPO requested that the proposed 12-inch waterline on Gladstone Rd to US-601 be installed along the north side of Road in order to avoid impacts to the Liberty United Methodist Church cemetery. The project has been designed in accordance with the request. Activities related to this project are not anticipated to adversely affect any archaeological or historic resources. However, if significant cultural materials are discovered during any part of this project, SHPO will be contacted immediately, and a contingency plan agreed upon by both the applicant and SHPO will be established. If unmarked skeletal remains are encountered during construction, activities shall cease immediately, and the county medical examiner shall be contacted. No construction activities are proposed for the Cooleemee WTP service area outside of the conveyance line corridors and the Cooleemee WTP site. Operation of the expanded WTP will be consistent with the current operations of the WTP, and the proposed waterlines will have no aboveground impacts within or in the vicinity of cultural resources. Therefore, no direct impacts to archaeological or historic resources are expected.

5.13.3 Secondary and Cumulative Impacts

No indirect or cumulative impacts to archaeological or historic sites are expected to occur from the proposed project or future development in the Cooleemee WTP service area.

5.14 Air Quality

5.14.1 Existing Conditions

The principal air quality pollutants emitted are particulates (TSP and PM-10), sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), carbon monoxide (CO), and lead (Pb). The major emission sources are fuel combustion for transportation and heating, power generation, industrial processes, waste incineration, forest fires, open burning of yard waste and construction debris, and non-industrial solvent use (EPA, 1990). Ground-level ozone (O₃) is created by the photochemical reaction of hydrocarbons (including VOCs) and NO_x with ultraviolet sunlight.

The N.C. Division of Air Quality (DAQ) and the U.S. Environmental Protection Agency (EPA) have established ambient air quality standards for each pollutant based on hourly, daily, quarterly, or annual averages. The standards are dependent on the pollutant's physical properties, chemical dynamics, human physiological responses, and monitoring technology (DENR, 1998). Primary air quality standards are established to protect against adverse effects on soil, water, crops, vegetation, animals, materials, climate, visibility, and personal comfort.

DAQ monitors compliance with National Ambient Air Quality Standards (NAAQS). A DAQ station in Lexington, Davidson County is the closest station to the project areas that monitors PM-2.5 criteria air pollutant concentrations in accordance with EPA regulatory requirements. A DAQ station in the Winston-Salem area of Forsyth County monitors for ozone, PM-2.5, PM-10, NO₂, SO₂, and air toxics. Ambient air quality at the Winston-Salem station from 2002 through present found that none of the monitored pollutants exceeded its corresponding DAQ ambient air quality standard.

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Several sources of emission are present in the project site and the project area. On-site emergency generators are located at the WTP site. Periodic testing of the emergency generators occurs to ensure that they are in good working order. Use of the emergency generators occurs during power outages such that the treatment process that process raw water from the South Yadkin River and distribution to the SA is not disrupted. Additional sources of air emissions from the site consist of vehicles used on-site for operation and maintenance of the facility. Sources of emissions in the project vicinity include vehicular traffic, emissions from open burning and residential fireplaces. No odor problems or complaints due to operation of the WTP are known to have been reported.

5.14.2 Direct Impacts

The increase in airborne particulates from exhaust emissions from construction vehicles during project rehabilitation, modification, and construction activities will be short-term and minor. Elevation of airborne pollutants is expected to be insignificant and would represent the level of similar small-site construction elsewhere. Compliance with air quality standards will be required at both the state and local level.

The on-site generators require an air permit for standby emergency usage. The permit allows each generator to operate without exceeding a specific number of hours per year to keep potential criteria pollutant emission to less than 100 tons/year. Operation of the emergency generators has minimal direct impact to air quality in the project vicinity. Except for the emergency generators, there are no operational sources of air emissions that require permitting.

5.14.3 Secondary and Cumulative Impacts

The proposed project will not increase the SA of the treatment facility or induce growth in the service area. The SA area is listed within the county's land use plan for continued development and redevelopment of existing urban and rural areas. The proposed project will assist with the long-term land use plan for the service area and will not create a significant adverse effect on the current air quality of the SA. Continued operation of the treatment facility will not have a significant adverse impact on the surrounding properties.

Urban growth in the service area may cause an increase in air pollutant emissions from vehicles, industrial activities, and construction, thereby contributing to the cumulative impacts of the proposed project. O₃, CO, and particulate matter are the primary pollutants of concern in the SA, and the levels of ozone in the project area will likely be affected by the projected increasing growth. Since NO_x is the limiting factor in O₃ formation and an estimated 60 percent of NO_x is emitted by automobiles, the additional vehicle miles traveled due to increased population will likely result in higher concentrations of ozone being formed during hot, summer months.

5.15 Noise Levels

5.15.1 Existing Conditions

Noise is subject to the federal Noise Control Act of 1972 (PL-92-574) and Quiet Communities Act of 1978 (PL-95-6009), which require standards of compliance and recommend approaches to abatement for stationary noise sources such as airports, highways, and industrial facilities. No ambient noise data is available for the project area. Davie County has a noise ordinance that restricts certain types of nuisance noise. No known noise complaints have been filed in association with past or current operational, construction, or maintenance activities at the Cooleemee WTP.

The Cooleemee WTP and expansion site, and the proposed 16-inch waterline on Main St are located in a portion of the Town of Cooleemee that was developed in the mid-1900's and consisted of a mill that is no longer in operation and residential development. The proposed 12-inch waterline on Gladstone Rd to US-601 is located along roadways in a rural area that mainly consists of rural residential, agricultural land, an undeveloped land.

The project area currently exhibits the day-to-day normal noise conditions representative of the existing conditions present within the project area including roadways within a township, moderate- and low-density residential neighborhoods, farmland, and forested areas. Occasional use and testing of the WTP's emergency generators will occur. Noise levels of the WTP site area have not been quantified.

5.15.2 Direct Impacts

Direct impacts from rehabilitation, modification, and construction activities associated with the proposed project will include noise from construction equipment. The proposed project activities will occur proximity to residences. Noise impacts from rehabilitation, modification, and construction of the proposed project will be temporary. A minimal and temporary increase in noise from construction vehicles is anticipated along public roadways in proximity to the site.

The potential source of post-construction noise at the site will be the use of emergency generators and operation of the treatment plant. Residents in the vicinity of the project areas may experience periodic nuisance noise due to the intermittent operation of the emergency generators. However, no increase in emergency generator or operational noise associated with operation of the WTP is anticipated to occur from implementation of the proposed project.

Growth in the project area is expected to occur regardless of the proposed project. Growth will result in increases in noise as a result of the daily activities of a larger population. Ambient noise in the areas immediately surrounding the project site consist of groundskeeping and vehicular traffic.

5.15.3 Secondary and Cumulative Impacts

The proposed project will not result in expansion of the SA; thereby, secondary and cumulative impacts from service area expansion due to implementation of the proposed project will not occur. Per the Davie County Comprehensive Plan 2019, development in the Cooleemee project areas is proposed to consist of mixed high-density urban growth and development in the proposed 12-inch waterline on Gladstone Rd to

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US-601 project area is proposed to consist of mixed use that will include residential and commercial development. Future development in the service area will not be induced by the proposed project; however, development in the project vicinity and the service area is anticipated and will result in an increase in noise levels.

5.16 Introduction of Toxic Substances

Water treatment processes, which requires the use of chemicals, have occurred on the site since 1930's. Chemical storage facilities, piping used to transport chemicals, and treatment processes that use chemicals are located throughout the facility. Operation and maintenance of equipment used in the treatment processes, as well as equipment used for maintenance and upkeep of the facility structures, roadways, and non-developed areas requires the use of chemicals and petroleum products. Maintenance of equipment and vehicles also requires the use of chemicals and petroleum products.

Direct impacts from implementation of the proposed project includes the potential for the introduction of toxic substances into the environment during rehabilitation, modification, and construction activities associated with the treatment plant site. Potential sources of toxic substances during rehabilitation, modification, and construction of the treatment plant and waterlines may include exhaust emissions, oil, fuel, lubricants, and other vehicle fluids. Concrete, which will be used during construction activities, is toxic to aquatic organisms in its uncured form; however, no construction activities will occur in proximity to aquatic areas. Additional sources of toxic substances include maintenance and refueling of construction equipment.

Hazardous and toxic materials will be handled, stored, used, and disposed of in accordance with applicable state and federal requirements during construction activities. Escape of toxic substances during demolition and construction activities will be minimized by proper vehicle maintenance and collection and disposal of fluid containers. Additionally, contractors will be instructed to take precautions to ensure that no uncured concrete is allowed to contact surface waters. Design measures specific to the handling, storage, use, and disposal of toxic substances have been incorporated into the design and operation of the facility to minimize the potential introduction of toxic substances into the environment. Direct impacts to the environment from the introduction of toxic substances during rehabilitation, modification, and construction activities is anticipated to be minimal.

5.17 Environmental Justice

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (1994) requires the applicant to determine the impacts that the project will have on minority and low-income populations. The EPA defines Environmental Justice as equitable treatment and involvement of all people regardless of race or income. Guidance provided by DENR states that the minority and low-income populations must be identified and disparities in the provision and location of sewer treatment and transport facilities between the general population and the minority and/or low-income populations documented.

The Environmental Justice assessment for the project was performed based on 2019 data reported by the U.S. Census Bureau for minority populations and for income data. The minority and low-income

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population assessments for the service area includes data from three block groups. The Minority and Income Demographic Study Area (MIDSA) consists of the 2010 Census block group in which the footprint of the project alternative is located. Figure 5-14 shows the MIDSA, the block groups thereof, and the census tracts associated therewith.

5.17.1.1 *Minority Populations*

The EPA defines minorities as individuals of American Indian, Alaskan Native, Asian or Pacific Islander, Black, or Hispanic descent. Demographic information for Davie County was obtained from the U.S. Census Bureau’s 2019 data and analyzed on a block group level. Table 5-1 provides the population demographics by minority classification for the Preferred Alternative. Figure 5-15 provides an illustration of the percentage of minority populations within the block groups of the MIDSA.

The 2019 Census Bureau data determined that Davie County has a minority population of 10.7 percent, and the state of North Carolina has a minority population of 31.3 percent. The minority population percentage in the block groups associated with the Preferred Alternative is compared against the threshold of 50 percent of the total population at or near the project location. If the Preferred Alternative is located in a block group with greater than 50 percent minority population, then the determination must be made as to whether the project may disproportionately impact a minority population. The data for the block group in the MIDSA is provided in Table 5-1.

Table 5-1: Minority Populations for the Preferred Alternative per the 2019 American Community Survey Data²

Geography	Total Population	White, Non-Hispanic		Minority Population ¹	
		Number of Persons	Percent of Population	Number of Persons	Percent of Population
Census Tract 805, Block Group 3	1,681	1,459	86.8%	222	13.2%
Census Tract 807, Block Group 1	1,390	1,154	83.0%	236	17.0%
Census Tract 807, Block Group 4	2,006	1,497	74.6%	509	25.4%
MIDSA	5,077	4,110	81.0%	967	19.0%
Davie County	42,257	37,753	89.3%	4,504	10.7%
North Carolina	10,264,876	7,049,919	68.7%	3,214,957	31.3%

¹Minority population includes all races that are Non-White and Hispanic populations that are also White.

²Source: US Census Bureau, American Community Survey 5-year Estimates (2015-2019), Table B03002, "Hispanic or Latino Origin by Race."

The proposed pipelines and WTP expansion components are located in three block groups – block group 3 of census tract 805 and block groups 1 and 4 of census tract 807. The minority constituency of the block groups are 13.2 percent, 17.0 percent, and 25.4 percent, respectively. Overall, the minority constituency of the MIDSA is 19.0 percent. The statistics are less than the environmental justice threshold of 50 percent of the total population.

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5.17.1.2 *Low-Income Populations*

Low-income is defined by the U.S. Health and Human Services poverty guidelines. The census poverty thresholds are similar to the U.S. Health and Human Services thresholds. Low-income population data was extracted from the American Community Survey data available from the U.S. Census Bureau for 2019 and is presented relative to the block groups from the 2010 Census. The analysis of the population below the poverty level was performed relative to the block groups in which the project is designed.

Low-income population in 2019 comprised approximately 13.7 percent of the total population in Davie County and 15.4 percent of the total population in North Carolina. The percentage of the population in the MDSA is compared against the threshold of 50 percent of the total population at or near the project location. If the proposed project is located in a block group with greater than 50 percent of the population below the poverty line, then the determination must be made as to whether the project may disproportionately impact a low-income population. The data for the block groups in the MDSA is provided in Table 5-2. Figure 5-15 illustrates the percentage of low-income people in the MDSA.

Table 5-2: Low-Income Populations for the Preferred Alternative per the 2019 American Community Survey Data¹

Geography	Population for whom Poverty Status is Determined	Below Poverty Level	
		Number of Persons	Percent of Population
Census Tract 805, Block Group 3	1,681	140	8.3%
Census Tract 807, Block Group 1	1,390	360	25.9%
Census Tract 807, Block Group 4	2,006	445	22.2%
MIDSA	5,077	945	18.6%
Davie County	41,952	5,835	13.9%
North Carolina	9,984,891	1,467,591	14.7%

¹Source: US Census Bureau, American Community Survey 5-year Estimates (2015-2019), Table C17002, "Ratio of Income to Poverty Level in the Past 12 Months."

The proposed pipeline and WTP expansion components are located in three block groups – block group 3 of census tract 805 and block groups 1 and 4 of census tract 807. The constituency of the block groups that is below the poverty line is 8.3 percent, 25.9 percent, and 22.2 percent, respectively. Overall, the constituency of the MIDSA that is below the poverty line is 18.6 percent. The statistics are less than the environmental justice threshold of 50 percent of the total population. Therefore, no evaluation of the potential for the direct impacts of the project to disproportionately affect low-income populations is required in this document.

5.18 Mitigative Measures

A summary of the anticipated direct, secondary, and cumulative impacts as a result of the proposed project are summarized in Table 5-3. Table 5-3 also includes a summary of mitigation measures to offset both direct and indirect impacts. Table 5-4 provides a summary of local programs and ordinances for each of the communities located in the service area, including the Towns of Cooleemee, Bermuda Run, Mocksville, and Davie County. These communities have developed rules and ordinances that guide current and future development and ensure compliance with state and federal standards. Local programs and ordinances will continue to minimize the potential environmental impacts related to the project alternatives. These ordinances include provisions that limit direct and indirect adverse impacts from stormwater runoff, floodplain development, and development related erosion and sedimentation.

The following sections provide a summary of each resource with respect to the anticipated impact.

5.18.1 Topography and Floodplains

Direct impacts to topography and floodplains in the proposed project area will be mitigated through the implementation of a project specific erosion and sedimentation control plan. Additionally, direct impacts will be mitigated by returning any disturbed areas back to original grade where feasible. Permanent topographic alterations due to the project will be minimal. The potential future growth may lead to modification of topography from construction. Temporary construction-related impacts to SFHAs are subject to the requirements of the FEMA Guidance Memorandum for Temporary Encroachments into the

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Floodway and the Davie County's Floodplain Development program. The potential for secondary and cumulative impacts from the proposed project will be mitigated by local erosion, sedimentation, and floodplain ordinances adopted by the county and municipal governments in the project area.

5.18.2 Soils

The proposed project has the potential to directly impact soils in the project area from erosion and sedimentation and from potential spillage during construction. These direct impacts will be mitigated with the implementation of a project specific erosion and sedimentation plan in addition to a construction waste material storage plan. Potential secondary and cumulative impacts to soils may include an increase in runoff leading to increase surface water turbidity. Local erosion control and stormwater ordinances, and the Davie County *Watershed Protection Ordinance* will mitigate potential impacts.

5.18.3 Prime and Unique Farmland

Davie County has numerous plans and programs in place to encourage retention of agricultural lands. The County has designated rural growth areas where high-intensity residential development is discouraged. The County commissioned a Farmland Preservation Plan in 2016 that will recommend practical policies and strategies to protect agriculture for future generations. A Voluntary Agricultural District program was developed in 2008 that allows landowners to protect their land from urban development. Davie County offers a present use value tax deferral program that applies a property tax rate based on the current use of a property (agriculture, horticulture, or forestry) rather than the market value of the parcel. Davie County's plans and programs support the County's goal to retain agricultural production in the county while accommodating targeted growth that is consistent with the surroundings. The County plans and programs will mitigate the potential impacts to prime and unique farmland throughout the SA.

5.18.4 Land Use

The Davie County Comprehensive Plan includes the goal of targeted growth and retention of the strong agricultural component of the County's character and land use patterns. The plan includes goals of increasing infill development, preserving the rural character of Davie County, promoting mixed-use developments, decreasing development impacts to environmentally sensitive areas, and ensuring quality development. The Comprehensive Plan will mitigate the potential impacts to land use and zoning districts in the SA.

5.18.5 Forest Resources

Clearing of forested areas for WTP expansion and waterline installation is anticipated to have only minor impacts to forest resources. Avoidance of mature forests and minimization of encroachments into forested areas will mitigate the potential impacts. Potential secondary and cumulative impacts to forest resources from the proposed project may include loss of forested land due to urban growth. Davie County's *2040 Comprehensive Land Use Plan* includes implementation strategies that support the protection of forest resources, including preservation of natural resources, sensitive environmental areas, and scenic features

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of the landscape that have recreational, environmental, or aesthetic value. The land use plans adopted by Davie County will mitigate the potential impacts to forest resources in the SA.

5.18.6 Wetlands and Streams

No direct impacts to wetlands, minor direct impacts to the South Yakin River from an increased withdrawal rate, and temporary minor impacts to the Peeler Creek during installation of the proposed 12-inch waterline on Gladstone Rd to US-601 will occur from the proposed project. Secondary and cumulative impacts to wetlands and streams at and downstream of the project areas from project activities and from additional withdrawal from the South Yadkin River is anticipated to be negligible.

Implementation of and strict adherence to Best Management Practices (BMPs) to protect surface waters will assist in the protection of surface waters. Increases in silt and sedimentation along with loss or disturbance of wetlands and streams from future development may result in secondary and cumulative impacts to wetlands and streams. Local erosion and sedimentation control and stormwater ordinances will mitigate the potential secondary and cumulative impacts to wetlands and streams.

5.18.7 Water Resources

Potential direct impacts to water quality from the proposed project include a degradation of water quality from construction runoff and sedimentation. The potential direct impacts will be mitigated by the implementation of the project specific erosion and sedimentation plan. Potential direct impacts to water quality from the increased withdrawal of water from the South Yadkin River includes a minor decrease in downstream flow. Local erosion and sedimentation ordinances will serve to mitigate the potential secondary and cumulative impacts from the proposed project.

5.18.8 Shellfish, Fish, and Their Habitats

Potential direct impacts to shellfish and fish from implementation of the proposed project may include water quality degradation from runoff and sediment associated with demolition and construction. Direct impacts to the South Yadkin River from the increased water withdrawal rate may also occur. These impacts will be mitigated through the implementation of a project specific erosion and sedimentation control plan. A potential secondary and cumulative impact may include the degradation of shellfish and fish habitat due to development. This potential will be mitigated through community erosion and sedimentation control ordinances.

5.18.9 Wildlife and Natural Vegetation

Construction activities associated with the proposed action may directly impact wildlife by temporarily displacing organisms during construction. These direct impacts will be mitigated through the implementation of a project specific erosion and sedimentation control plan along with minimizing encroachments into natural areas. The potential impact of future habitat degradation from further development will be mitigated by the *Davie County Comprehensive Plan*. Mitigation for cumulative impacts associated with unrelated development in primary and secondary growth areas will be tied to the provision of supporting infrastructure needs, specifically utility and roadway improvements, in areas of suitable habitat.

5.18.10 Public Lands and Scenic, Recreational and State Natural Areas

No impact or alternation of the visual context of public lands, scenic, recreation, or state natural areas will occur from implementation of the proposed project. There are no anticipated secondary or cumulative impacts from the proposed action in the SA to this environmental resource.

5.18.11 Areas of Archaeological or Historical Value

Mitigative measures are not necessary for the proposed project due to the lack of direct, secondary, or cumulative impacts to cultural resources as a result of the proposed project components.

5.18.12 Air Quality

The potential direct impacts to air quality from the proposed project include a potential increase in air emission during demolition and construction activities. The construction related impacts will be mitigated through proper equipment maintenance, wetting of exposed soil, and soil stabilization techniques. Temporary, minor operational impacts will occur from use of the onsite emergency generators during periodic testing and use. These minor direct impacts will be offset by the avoided major impacts on public health and safety if power service is disrupted.

5.18.13 Noise Levels

The potential direct impacts to noise levels associated with the proposed project include an increase in noise due to demolition and construction activities and an occasional increase in noise associated with emergency generators. Limiting construction hours to Monday through Friday, 6 am to 7 pm, to the maximum extent practical will mitigate the direct noise impacts associated with the proposed project. The potential secondary and cumulative impact of increased traffic noise from growth will be mitigated through local development ordinances.

5.18.14 Introduction of Toxic Substances

The proposed project has the potential to introduce toxic substances to the natural environment through exhaust emissions, use and storage of toxic substances during demolition activities, and from vehicular and equipment leaks. These impacts will be mitigated through proper vehicle and equipment maintenance and operation, proper collection and disposal for fluids and materials, and proper storage and handling of toxic substances. There are no anticipated secondary and cumulative impacts from toxic substances associated with the proposed project.

5.18.15 Environmental Justice

The proposed project is not anticipated to result in direct, secondary, or cumulative impacts that disproportionately impact a minority or low-income population.

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Table 5-3 Summary of Direct Impacts, Secondary and Cumulative Impacts, and Mitigation for the Cooleemee WTP Expansion Project

Resource Category	Potential Direct Impacts	Measures to Mitigate Direct Impacts	Potential Secondary and Cumulative Impact	Local Ordinances to Mitigate Secondary and Cumulative Impacts 1
Topography and Floodplains	Erosion and sedimentation during construction Addition of fill material Excavation and grading	Disturbed areas returned to original grade No new structures in floodway or floodway Erosion and Sedimentation Plan	Potential future growth may lead to modification of topography for construction	Local erosion and sedimentation ordinances Local floodplain ordinances
Soils	Erosion and sedimentation Impact to water resources from construction runoff and spillage	Erosion and Sedimentation Plan Waste material storage plan	Potential increase in surface water turbidity	Local erosion and sedimentation ordinances
Prime and Unique Farmland	No impact	N/A	Potential loss of prime and unique farmland due to urban growth	Davie County Comprehensive Plan and Davie County Zoning Code
Land Use	Conversion of maintained lawn to WTP facility	Davie County Comprehensive Plan	Potential loss of open space, forested lands, or agricultural areas to urban uses Potential for overuse of parks, greenways, and natural areas from growth	Davie County Comprehensive Plan and Town of Cooleemee Zoning Ordinance
Forest Resources	Forest clearing minimized for construction of the project components	Minimal clearing of mature forest or significant forest resources	Potential loss of forested land for urban growth	Future land use plans

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Resource Category	Potential Direct Impacts	Measures to Mitigate Direct Impacts	Potential Secondary and Cumulative Impact	Local Ordinances to Mitigate Secondary and Cumulative Impacts 1
Wetlands and Streams	No direct wetland impacts from construction Temporary, minor impacts to a stream during waterline installation	Erosion and Sedimentation Plan BMPs used for protection of surface waters	Potential for increase in silt and sediment from development activities Potential for loss or disturbance of wetlands from future development	State stream buffer ordinances Local erosion and sedimentation ordinances Local stormwater ordinances
Water Resources	Water quality degradation from runoff and sedimentation during construction	Erosion and Sedimentation Plan	Potential increase in surface water turbidity	Local erosion and sedimentation ordinances
Shellfish and Fish	Water quality degradation from runoff and sedimentation during construction	Erosion and Sedimentation Plan	Potential habitat degradation from development	Local erosion and sedimentation ordinances
Wildlife and Natural Vegetation	Habitat degradation during construction	Erosion and Sedimentation Plan Construction areas mostly limited to existing maintained grassed areas	Potential habitat degradation from development	Davie County Comprehensive Plan
Public Lands and Scenic, Recreational and State Natural Areas	No impacts	N/A	No impacts	N/A
Areas of Archaeological or Historic Value	No impacts	Coordinate with SHPO if significant cultural resources are identified during construction.	No impacts	Davie County Comprehensive Plan
Air Quality	Increase in emissions during construction	Proper vehicle maintenance Wetting of exposed soil and soil stabilization	Potential increase in air emissions due to growth	Local and state air quality standards
Noise Levels	Noise generated during construction Occasional and temporary noise from emergency generators	Construction hours limited to M-F, 6:00 am to 7:00 pm to maximum extent practicable.	Increase in traffic noise from growth	Unified Development Ordinance
Introduction of Toxic Substances	Exhaust emissions and oil, fuel, or other vehicle fluid leaks	Proper maintenance and collection and disposal of fluid containers	No impacts	N/A

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Resource Category	Potential Direct Impacts	Measures to Mitigate Direct Impacts	Potential Secondary and Cumulative Impact	Local Ordinances to Mitigate Secondary and Cumulative Impacts 1
Environmental Justice – Minority Population	No impacts expected as the block group has a minority population below threshold	N/A	Negligible impacts due to positive result of ensuring adequate, quality water service	N/A
Environmental Justice – Low Income Population	No impacts expected as the block group has a low-income population below threshold	N/A	Negligible impacts due to positive result of ensuring adequate, quality water service	N/A

¹ Refer to Table 5-4 for stormwater, floodplain, erosion control, buffer, and open space ordinances for the WTP service area.

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Table 5-4 Summary of Floodplain, Stormwater, Erosion Control, Buffer, and Open Space Ordinances for the Town of Cooleemee and Davie County

Jurisdiction	Codification	Codification Reference	Description
Town of Cooleemee	Floodplain	Article II-4-1: FLOOD DAMAGE PREVENTION	<p>A Floodplain Development Permit shall be required in conformance with the provisions of this ordinance prior to the commencement of any development activities within Special Flood Hazard Areas determined in accordance with the provisions of II-4.2.3, Section B of this ordinance.</p> <p>An Elevation Certificate (FEMA Form 81-31) is required prior to the actual start of any new construction.</p> <p>If non-residential floodproofing is used to meet the Regulatory Flood Protection Elevation requirements, a Floodproofing Certificate (FEMA Form 81-65), with supporting data, an operational plan, and an inspection and maintenance plan are required prior to the actual start of any new construction.</p> <p>Must meet General Standards (Section II-4.2.5) and specific standards (Section B).</p>
	Erosion Control	Article II-2.12 EROSION AND SEDIMENTATION CONTROL	<p>All development shall be conducted in conformance with the standards and procedures for the control of sedimentation and soil erosion as set Town of Cooleemee Zoning Ordinance 104 forth in North Carolina General Statute, Chapter 113A, Article 4 (Sedimentation Pollution Control).</p> <p>No Zoning Compliance Permit shall be issued for development that involves land-disturbing activity if more than one (1) acre is to be uncovered, unless an erosion control plan has been approved by the Division of Land Resources of the North Carolina Department Division of Environmental Management.</p>
Davie County	Floodplain	Article 153.08 ESTABLISHMENT OF FLOODPLAIN DEVELOPMENT PERMIT	<p>A floodplain development permit shall be required in conformance with the provisions of this chapter prior to the commencement of any development activities within special flood hazard areas determined in accordance with the provisions of § 153.07.</p> <p>An elevation certificate (FEMA Form 81-31) is required prior to the actual start of any new construction. It shall be the duty of the permit holder to submit to the Floodplain Administrator a certification of the elevation of the reference level, in relation to mean sea level.</p> <p>If nonresidential floodproofmg is used to meet the regulatory flood protection elevation requirements, a floodproofing certificate (FEMA Form 81-65), with supporting data, an operational plan, and an inspection and maintenance plan are required prior to the actual start of any new construction.</p> <p>Must meet General Standards (Section 153.25) and specific standards (Section 153.26).</p>

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	Buffer	Article 151.25 STREAM BUFER AREAS REQUIRED	A minimum 30-foot vegetative buffer is required along all perennial waters indicated on the most recent versions of USGS 1:24,000 (7.5 minute) scale topographic maps or as determined by local government studies.
	Watershed Protection	Title XV: LAND USAGE, Chapter 151: WATERSHED PROTECTION	Davie County has a Watershed Protection Ordinance to protect watershed areas. The Ordinance provides for civil penalties associated with violation of effluent standards or water quality standards, as well as the effect on receiving waters, public health, and fish and wildlife. The water supply watersheds are divided into two categories: Watershed Critical Areas and Balance of Watershed.

6. Financial Analysis

This section provides a summary of the financial analysis for this project. The Division of Water Infrastructure financial analysis spreadsheet tables are provided in Appendix E.

6.1 System Financial Condition

6.1.1 Operating Ratio

The most recently available annual audit financial report was submitted by Davie County on June 30, 2019 for FY 2018-2019. Based on this report, the total water and sewer revenue was \$6,361,587, the operating expenses were \$4,887,786, and the total debt was \$0. The operating ratio calculated by dividing the water and sewer revenue by the operating expenses and debt is equal to 1.3. Since this is greater than 1.2, no further analysis is required regarding the financial feasibility of the project.

6.1.2 Analysis of User Rates as a Percentage of MHI

Table 8.1 in Appendix E presents the current rates and rate structure, effective since July 2019, for the Davie County service area. The water and sewer rate structures are based on a base charge plus a volumetric charge per 1,000 gallons for usage greater than 3,000 gallons. For the water rate structure, this corresponds to a base charge of \$27.80 and a volumetric charge of \$5.35 per 1,000 gallons. The sewer rate structures are categorized by Cooleemee, East Davie, and Mocksville sewer service areas. For this analysis a weighted average of sewer rates was calculated assuming the following percentages of connections in the service area: 25% Cooleemee, 25% East Davie, and 50% Mocksville. It is notable that the majority of Davie County is on a septic system, explaining why Mocksville has the most connections in the sewer service area. These assumptions correspond to a base charge of \$47.94 and a volumetric charge of \$8.05 per 1,000 gallons for sewer. Based on these assumptions, the average monthly bills in Davie County for 5,000 gallons of usage are \$64.03 for sewer and \$38.50 for water.

Table 8.1 also presents median household income for the service area. This was calculated based on a weighted average of the most recently available data for median household incomes and assumes Davie County is 70% of the service area and the Town of Mocksville is 30%. Based on these assumptions, the median household income for the service area is approximately \$55,165, which corresponds to a \$4,597 monthly median household income. The water bill as a percentage of median household income was calculated by dividing the monthly median household income of \$4,597 by the monthly water bill of \$31.85, which equals 0.97%. Therefore, the average monthly water bill does not exceed the EPA affordability threshold of greater than 2.0 percent of the median household income.

6.2 Funding and Loan Repayment

The Davie County Water Supply Alternatives project will be funded with the following:

- The State Reserve Project Grant will be twenty-five percent of eligible project costs up to a maximum of \$1,123,807;

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- The Drinking Water State Revolving Fund (DWSRF) loan will be \$20,000,000;
- Twenty-five percent of the loan (up to a maximum of \$2,000,000) will be forgiven, and the remainder will be repayable at a maximum interest rate of 0.10%; and,
- The remainder of the project cost, \$4.2 million, will be funded by revenue bonds at an interest rate of 3%.

Tables 8.2 and 8.3 in Appendix E summarize the distribution of funding and the amount due, including repayment and interest, at the end of the first year.

6.3 User Fee Analysis

The total capital cost of the proposed project is anticipated to be approximately \$25.3 million. The proposed project will be funded through a combination of low interest loan and principal forgiveness from the Drinking Water SRF, a grant from the State Reserve Project, and revenue bonds. Per Table 8.5 in Appendix E, the total user rate increase due to all loans is \$19.93 per 5,000 gallons.

7. Public Participation

To be updated based on completion of a public meeting.

8. References

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9. Figures

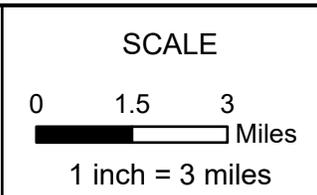
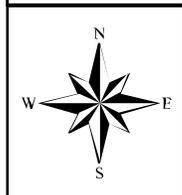
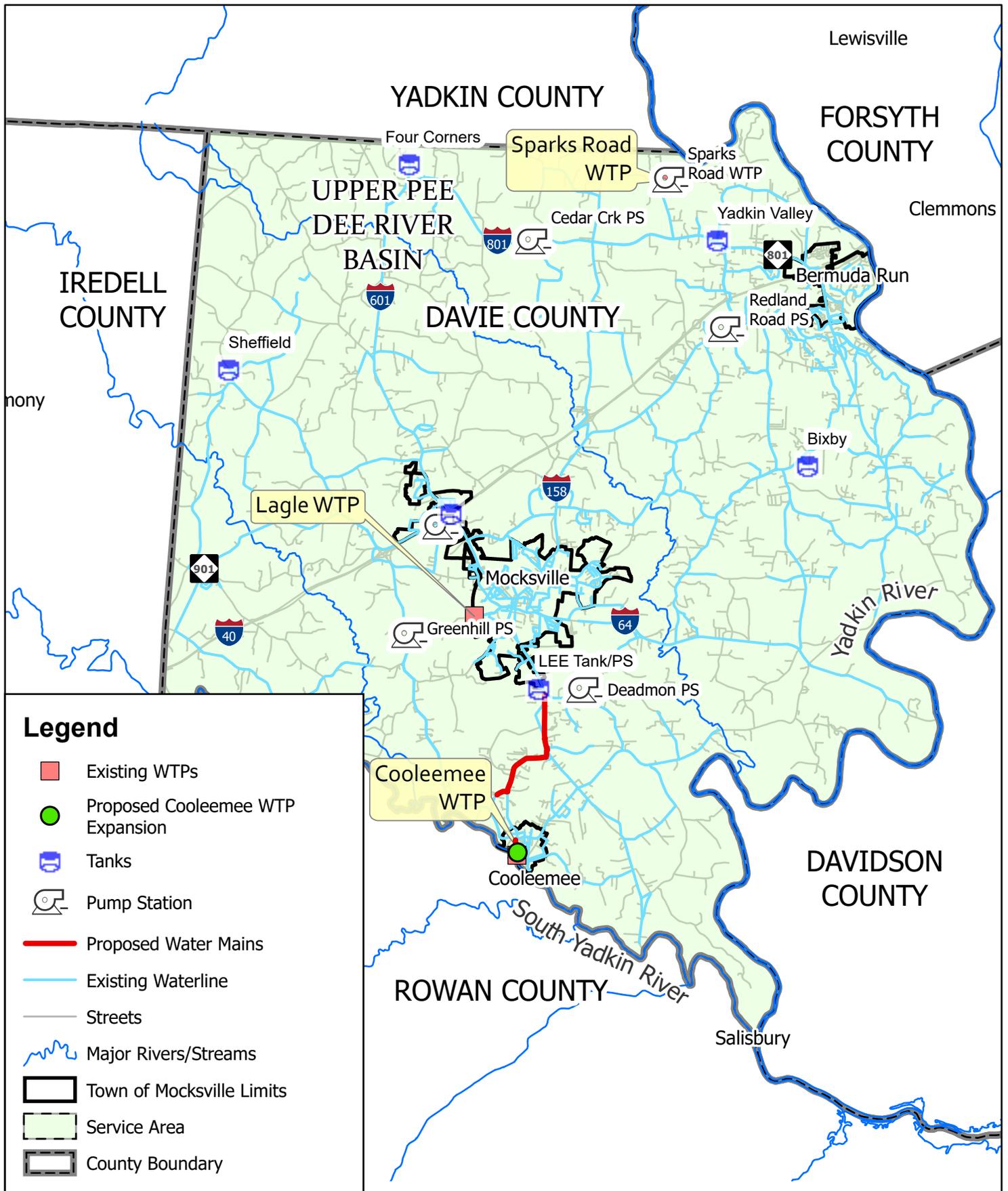


Figure 1-1: Project Vicinity Map

Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project

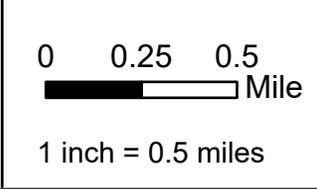
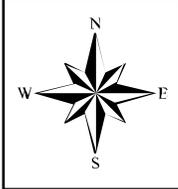
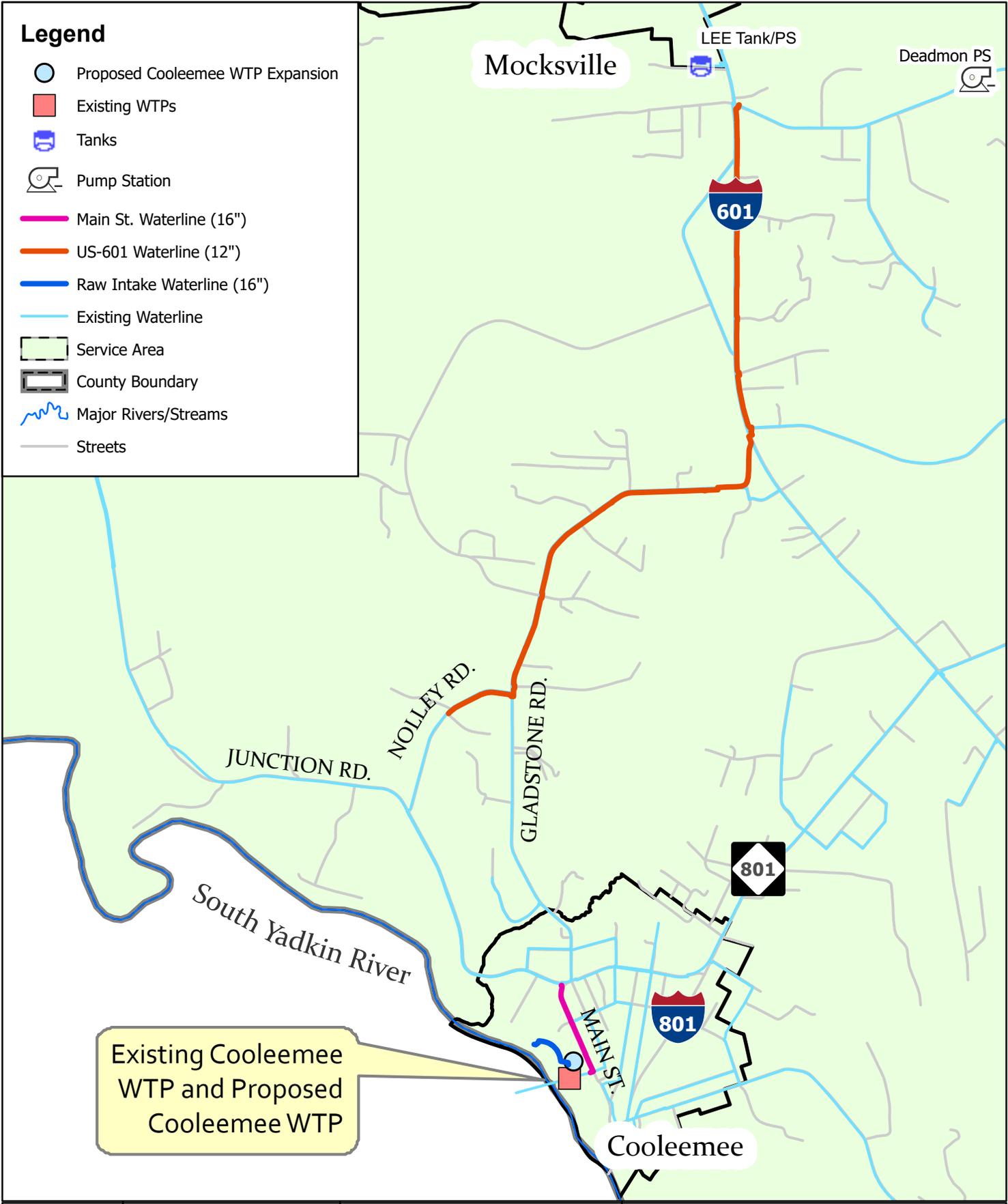
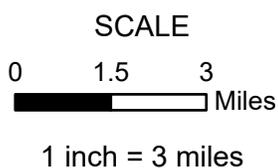
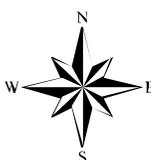
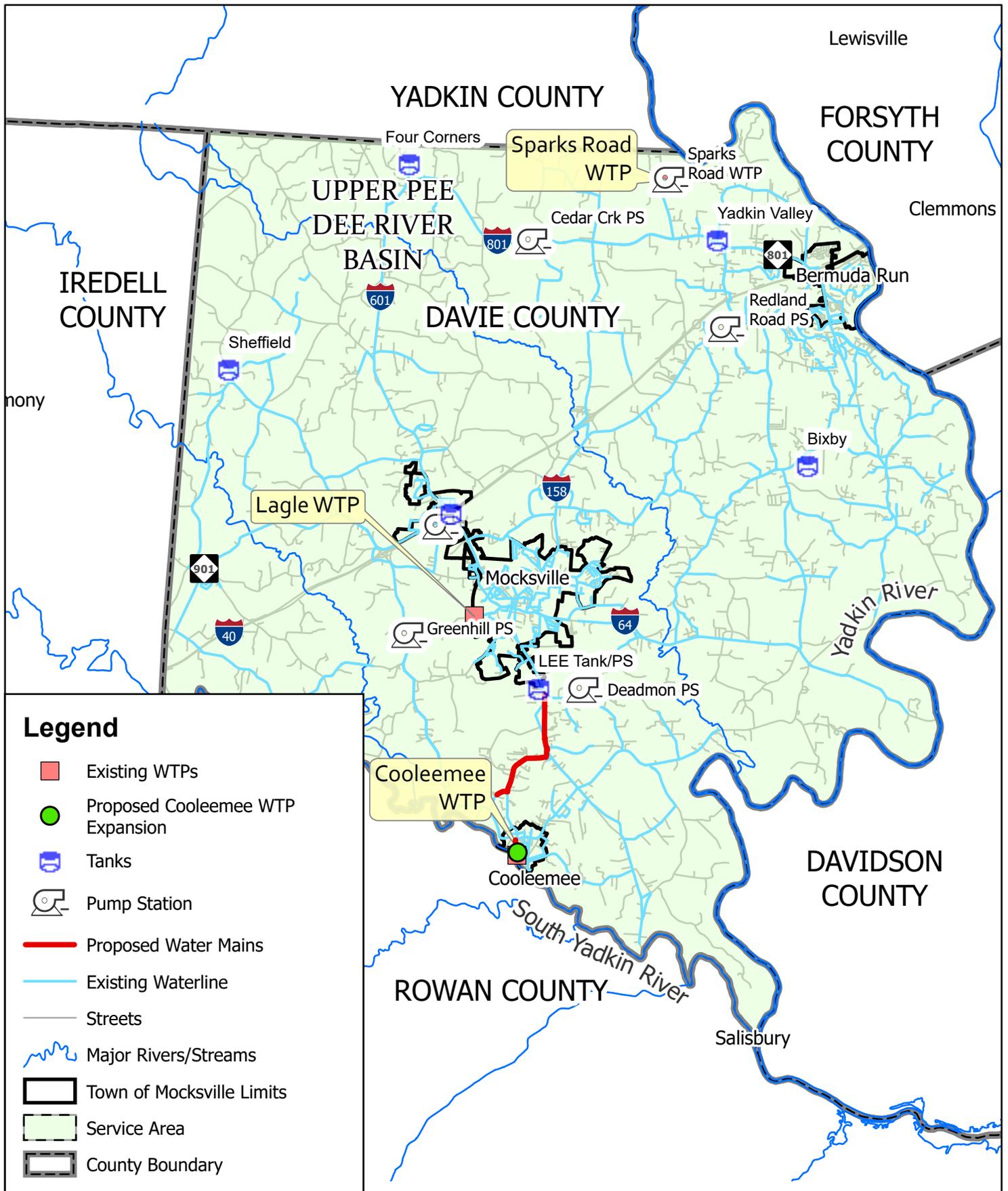


Figure 1-2: Project Location Map
 Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project



Hazen

Figure 2-1: Project Vicinity Map

Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project

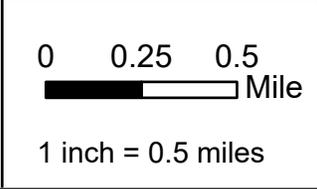
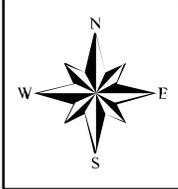
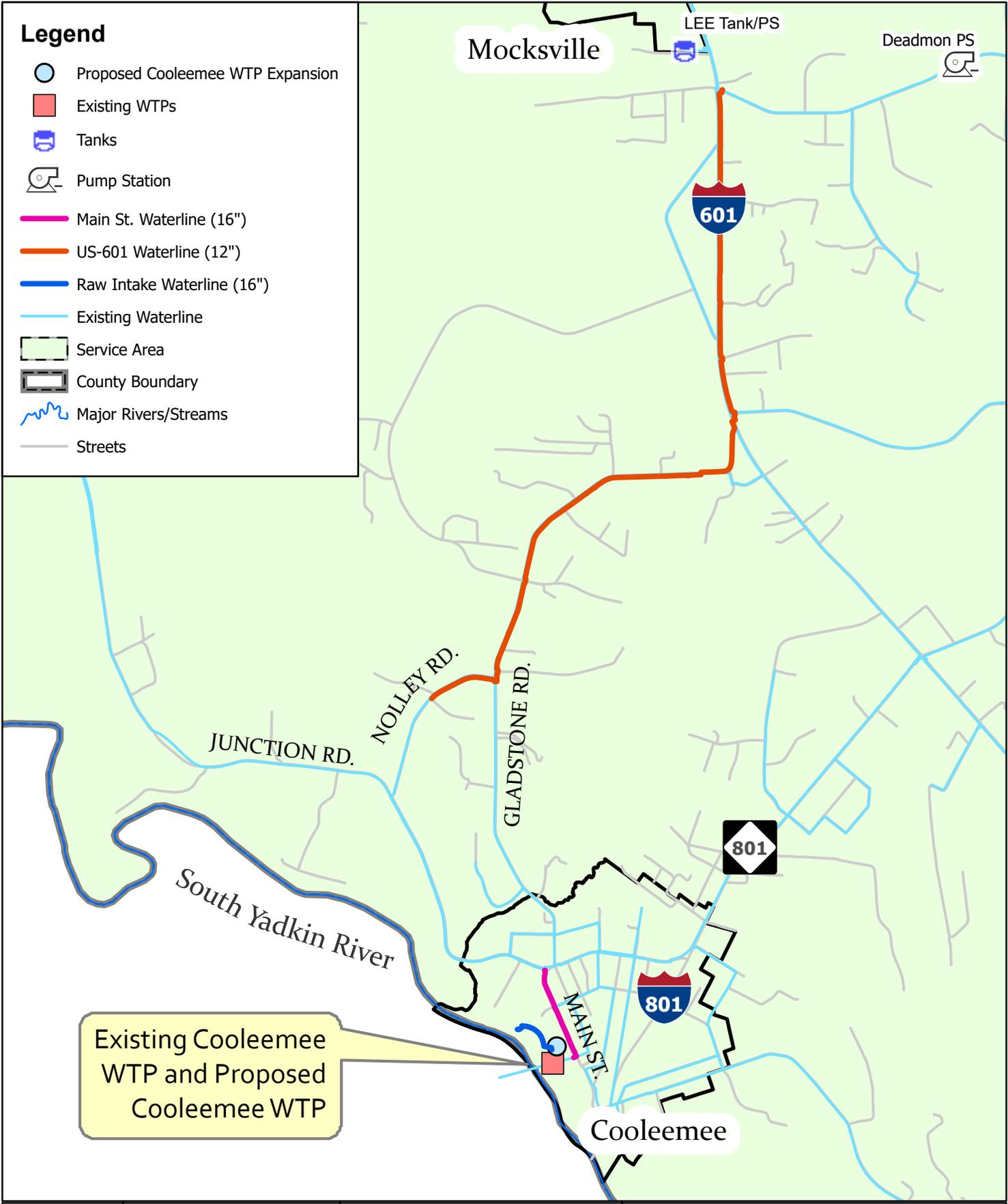
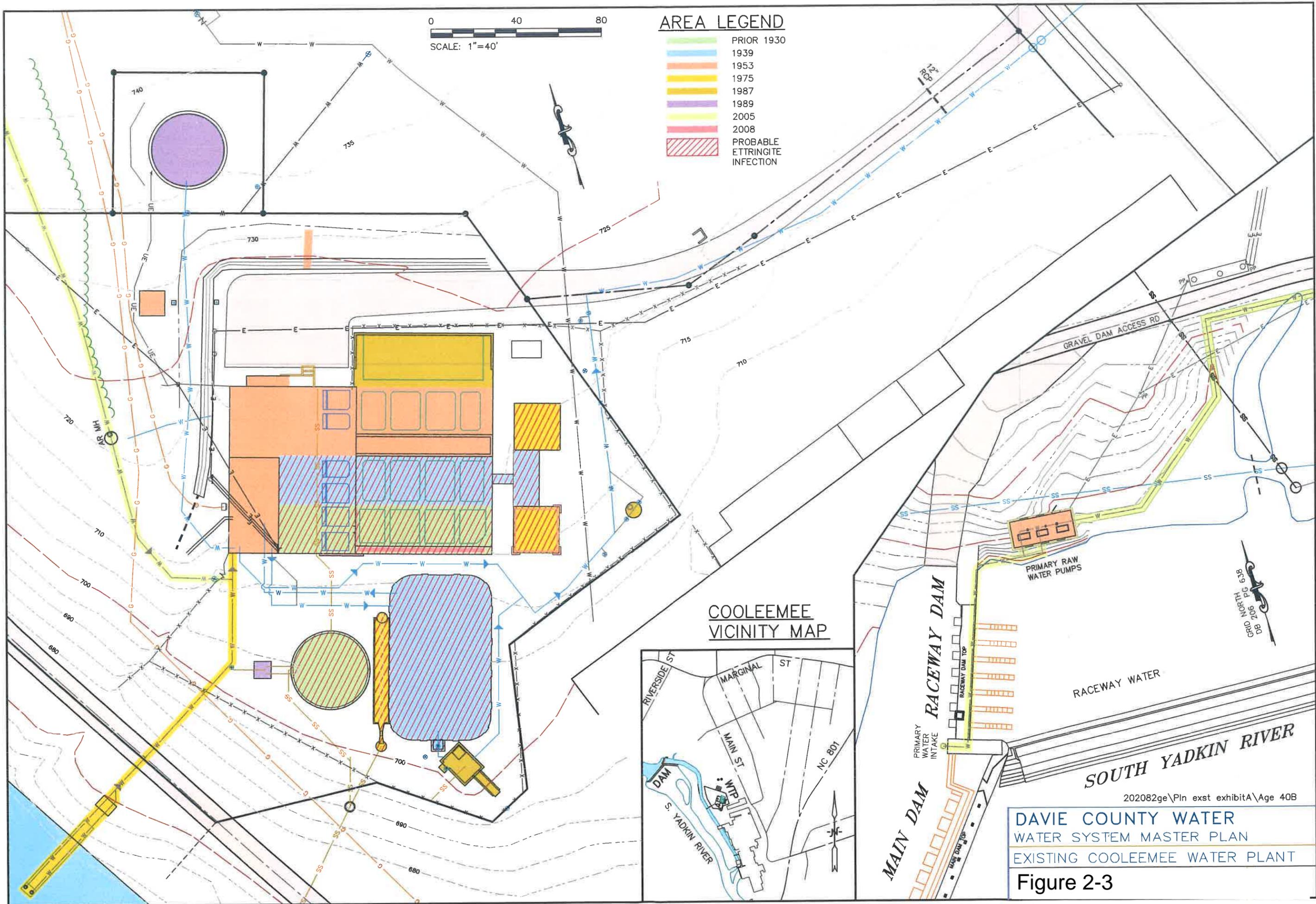


Figure 2-2: Project Location Map
 Davie County Public Utilities Department
 and Town of Mocksville Water Supply
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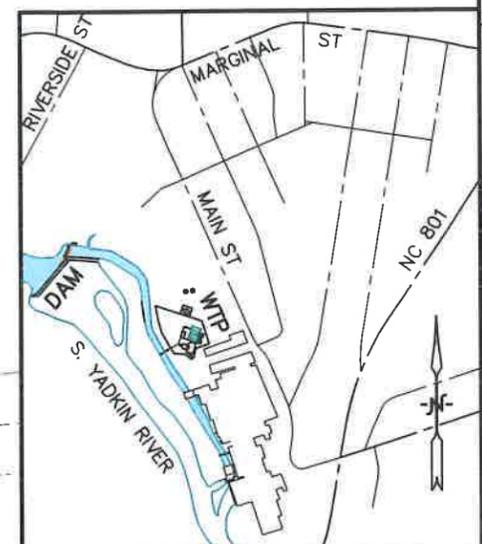


AREA LEGEND

- PRIOR 1930
- 1939
- 1953
- 1975
- 1987
- 1989
- 2005
- 2008
- PROBABLE ETTRINGITE INFECTION

0 40 80
SCALE: 1"=40'

COOLEEMEE VICINITY MAP



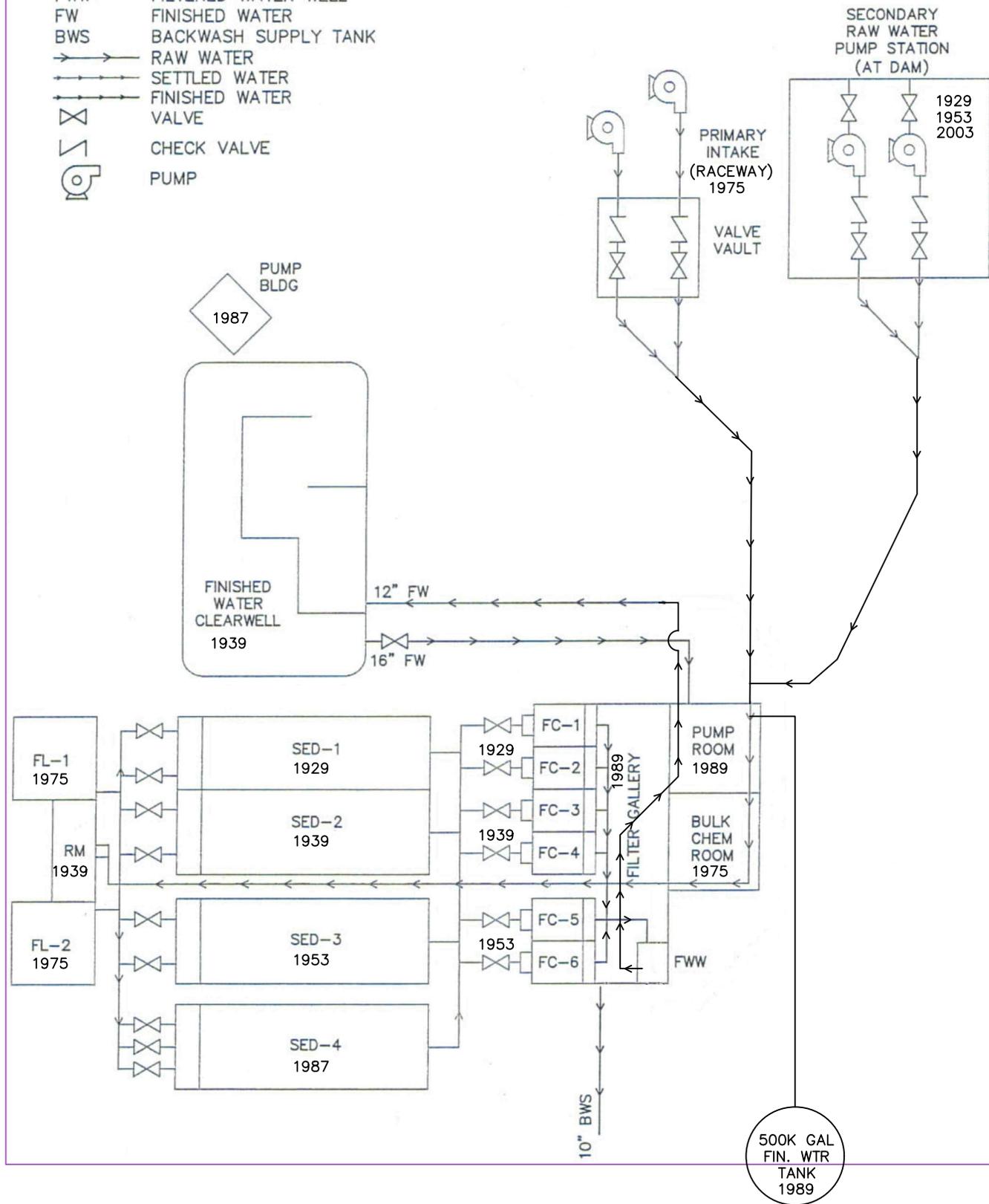
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DAVIE COUNTY WATER
WATER SYSTEM MASTER PLAN
EXISTING COOLEEMEE WATER PLANT

Figure 2-3

LEGEND

RM	RAPID MIX
FL	FLOCCULATOR
SED	SEDIMENTATION BASIN
FC	FILTER CELL
FWW	FILTERED WATER WELL
FW	FINISHED WATER
BWS	BACKWASH SUPPLY TANK
→	RAW WATER
→→	SETTLED WATER
→→→	FINISHED WATER
⊗	VALVE
⊏	CHECK VALVE
⊕	PUMP

NOTES:
 SCHEMATIC IS NOT TO SCALE
 ALL PIPING, VALVES, FITTING, ETC. ARE NOT SHOWN FOR CLARITY



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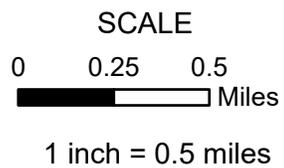
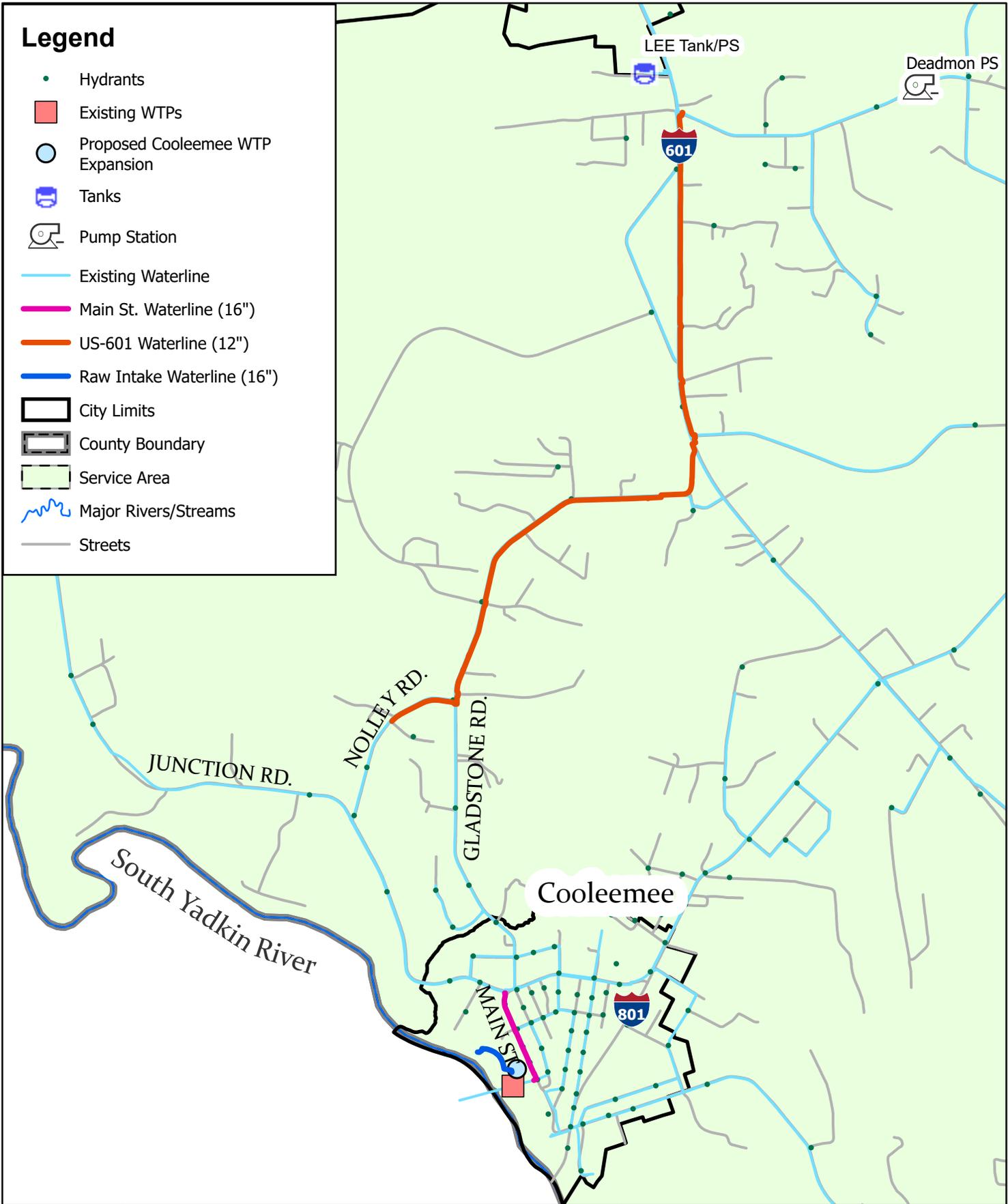
DAVIE COUNTY PUBLIC UTILITIES

**COOLEEMEE WATER TREATMENT PLANT
 FLOW DIAGRAM**

**FIGURE
 2-4**

Legend

- Hydrants
- Existing WTPs
- Proposed Cooleemee WTP Expansion
- Tanks
-  Pump Station
- Existing Waterline
- Main St. Waterline (16")
- US-601 Waterline (12")
- Raw Intake Waterline (16")
- City Limits
- County Boundary
- Service Area
-  Major Rivers/Streams
- Streets



Hazen

Figure 2-5: Existing and Proposed Distribution System
 Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project

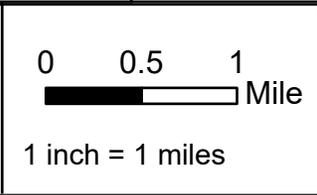
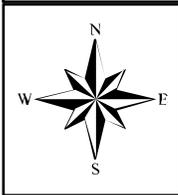
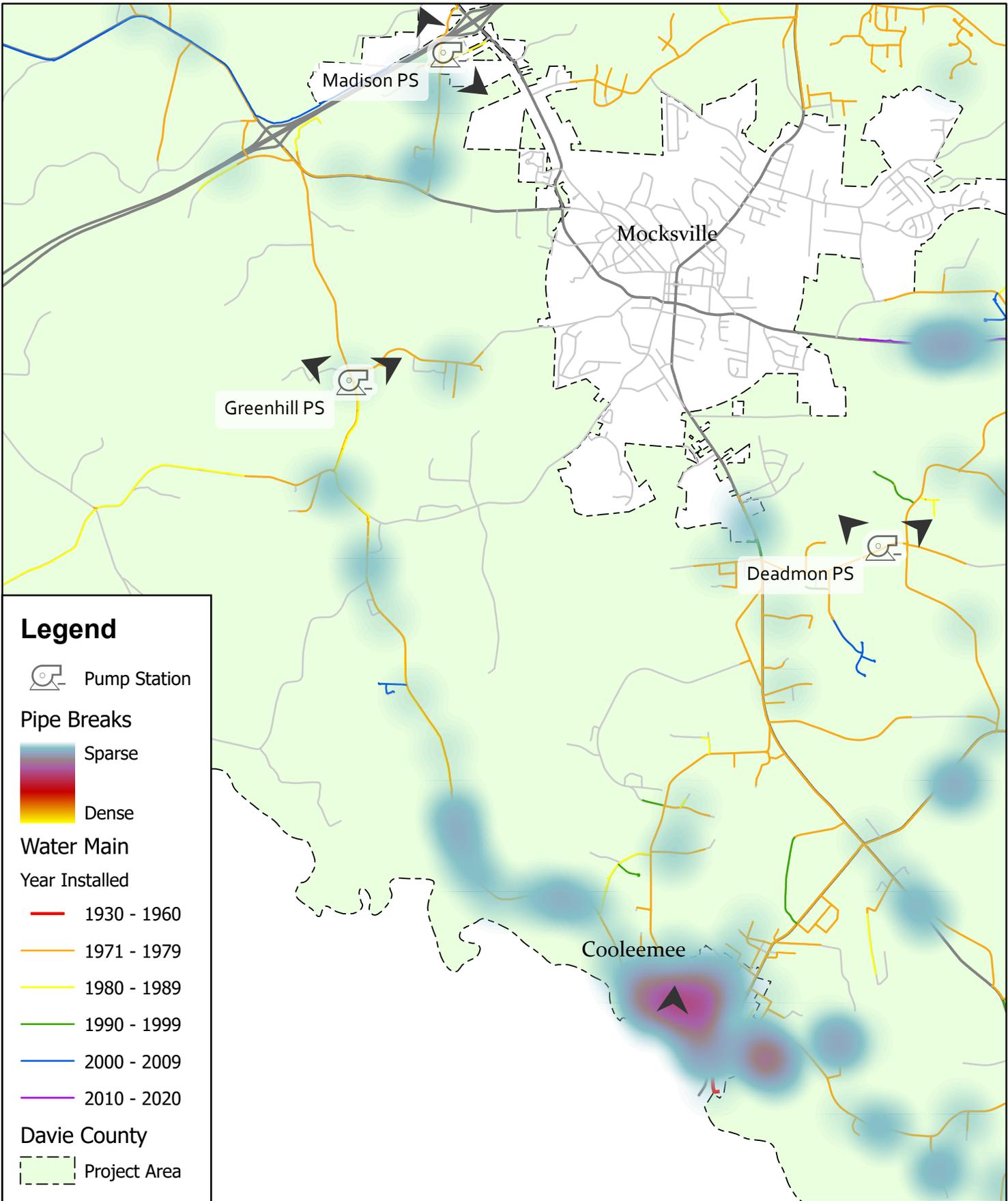
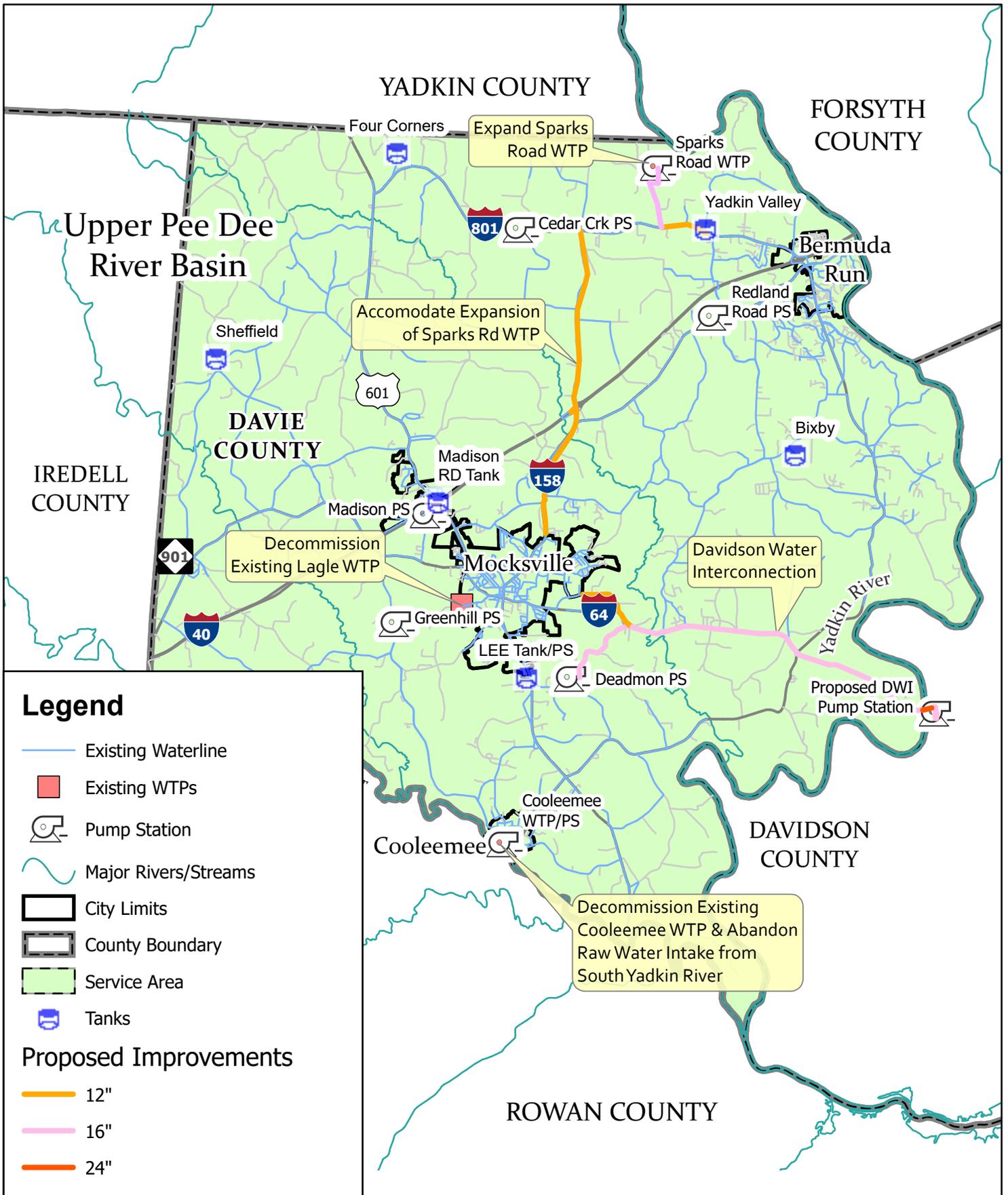


Figure 2-6: Pipe Condition History
 Davie County Public Utilities Department
 and Town of Mocksville Water Supply
 Improvements Project

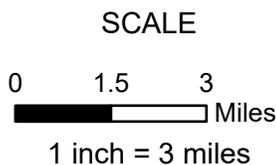
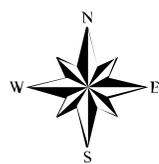


Legend

- Existing Waterline
- Existing WTPs
- Pump Station
- Major Rivers/Streams
- City Limits
- County Boundary
- Service Area
- Tanks

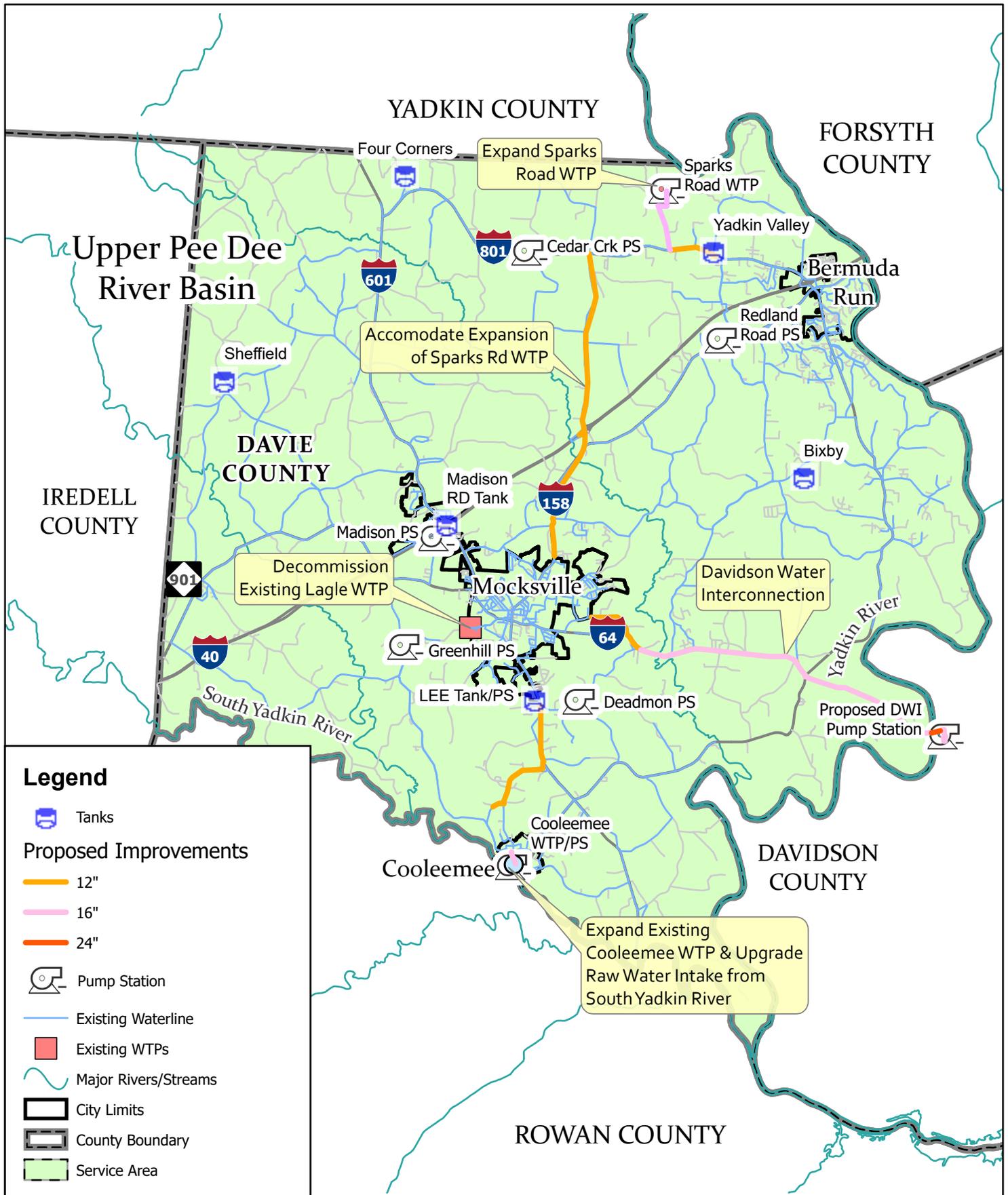
Proposed Improvements

- 12"
- 16"
- 24"



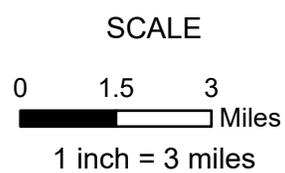
Hazen

Figure 4-1: Alternative 2
Distribution System Modifications
Davie County Public Utilities Department
and Town of Mocksville Water Supply
Improvements Project



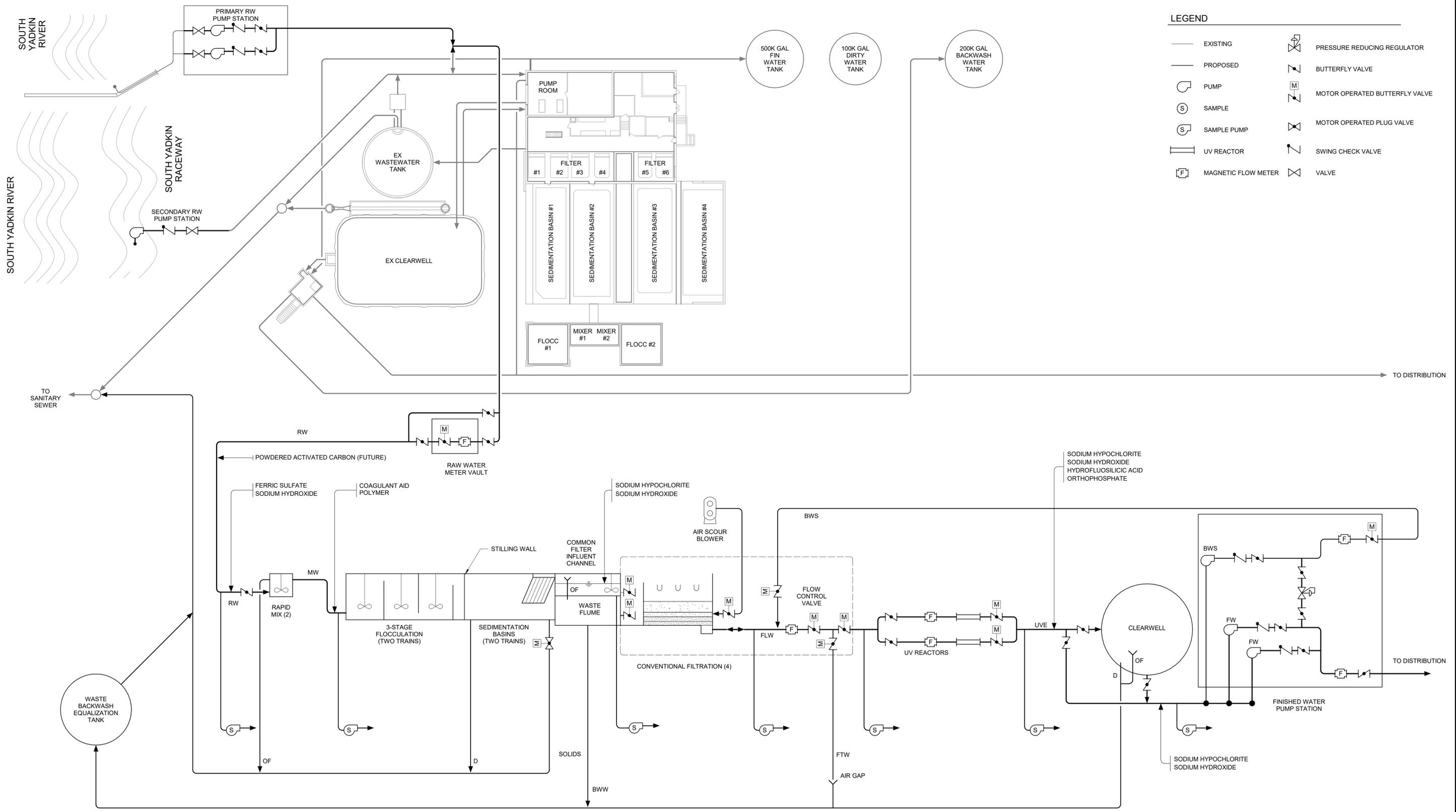
Legend

- Tanks
- Proposed Improvements**
- 12"
- 16"
- 24"
- Pump Station
- Existing Waterline
- Existing WTPs
- Major Rivers/Streams
- City Limits
- County Boundary
- Service Area



Hazen

Figure 4-2: Alternative 3 (Preferred) Distribution System Modifications Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project



LEGEND

— EXISTING	⊗ PRESSURE REDUCING REGULATOR
— PROPOSED	⌵ BUTTERFLY VALVE
⊙ PUMP	Ⓜ MOTOR OPERATED BUTTERFLY VALVE
Ⓢ SAMPLE	⊗ MOTOR OPERATED PLUG VALVE
Ⓢ SAMPLE PUMP	⌵ SWING CHECK VALVE
▭ UV REACTOR	⊗ VALVE
Ⓜ MAGNETIC FLOW METER	

E:\16201\031420\004_Water_Supply_Improvements\01420-004-GEN\4.rvt
4/16/2021 3:20:20 PM

REV	ISSUED FOR	DATE	BY

PROJECT ENGINEER:	D. BRILEY
DESIGNED BY:	J. HOSTETLER
DRAWN BY:	K. OVERBY
CHECKED BY:	Z. M. WANG
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE	

30% DESIGN REVIEW
DO NOT USE FOR
CONSTRUCTION



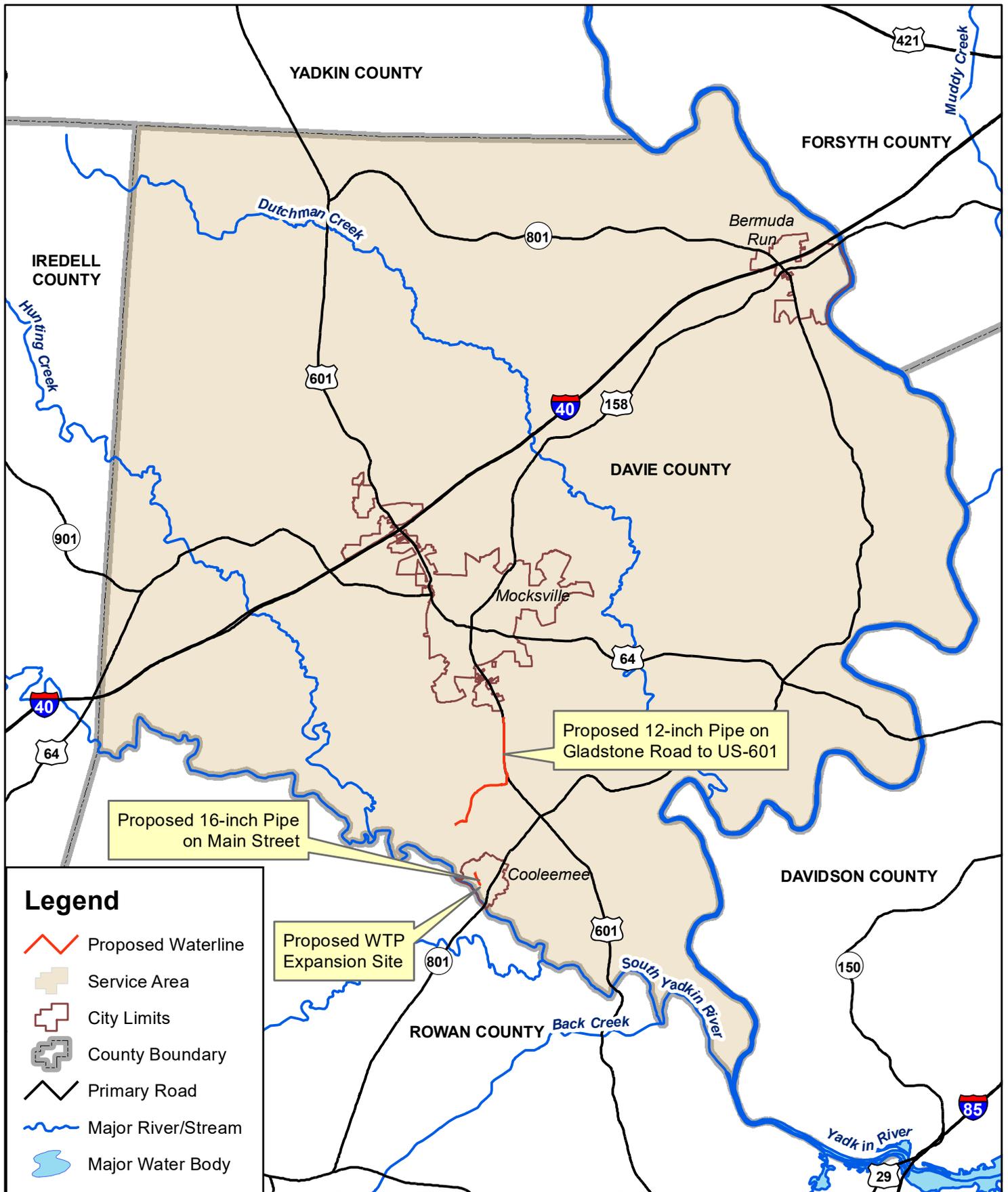
Hazen
HAZEN AND SAWYER
4011 WESTCHASE BOULEVARD, SUITE 500
RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

DAVIE COUNTY PUBLIC UTILITIES
MOCKSVILLE, NORTH CAROLINA

COOLEEMEE WATER TREATMENT
PLANT REPLACEMENT

FIGURE 4-3
GENERAL
PROCESS FLOW DIAGRAM

DATE:	APRIL 2021
HAZEN NO.:	31420-004
CONTRACT NO.:	1
DRAWING NUMBER:	G004



Legend

-  Proposed Waterline
-  Service Area
-  City Limits
-  County Boundary
-  Primary Road
-  Major River/Stream
-  Major Water Body

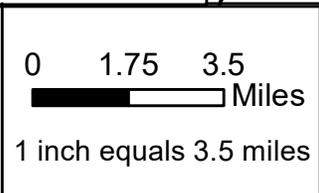
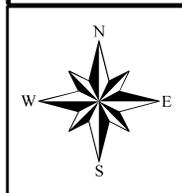
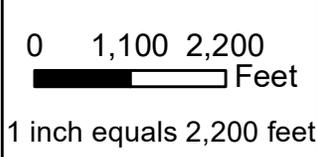
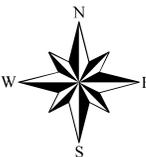


Figure 5-1: Project Service Area
 Davie County Public Utilities Department
 and Town of Mocksville
 Water Supply Improvements Project

Legend

-  Project Area
-  Primary Road
-  Major River/Stream



Hazen

Figure 5-2: Project Areas

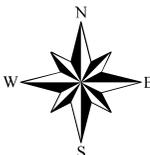
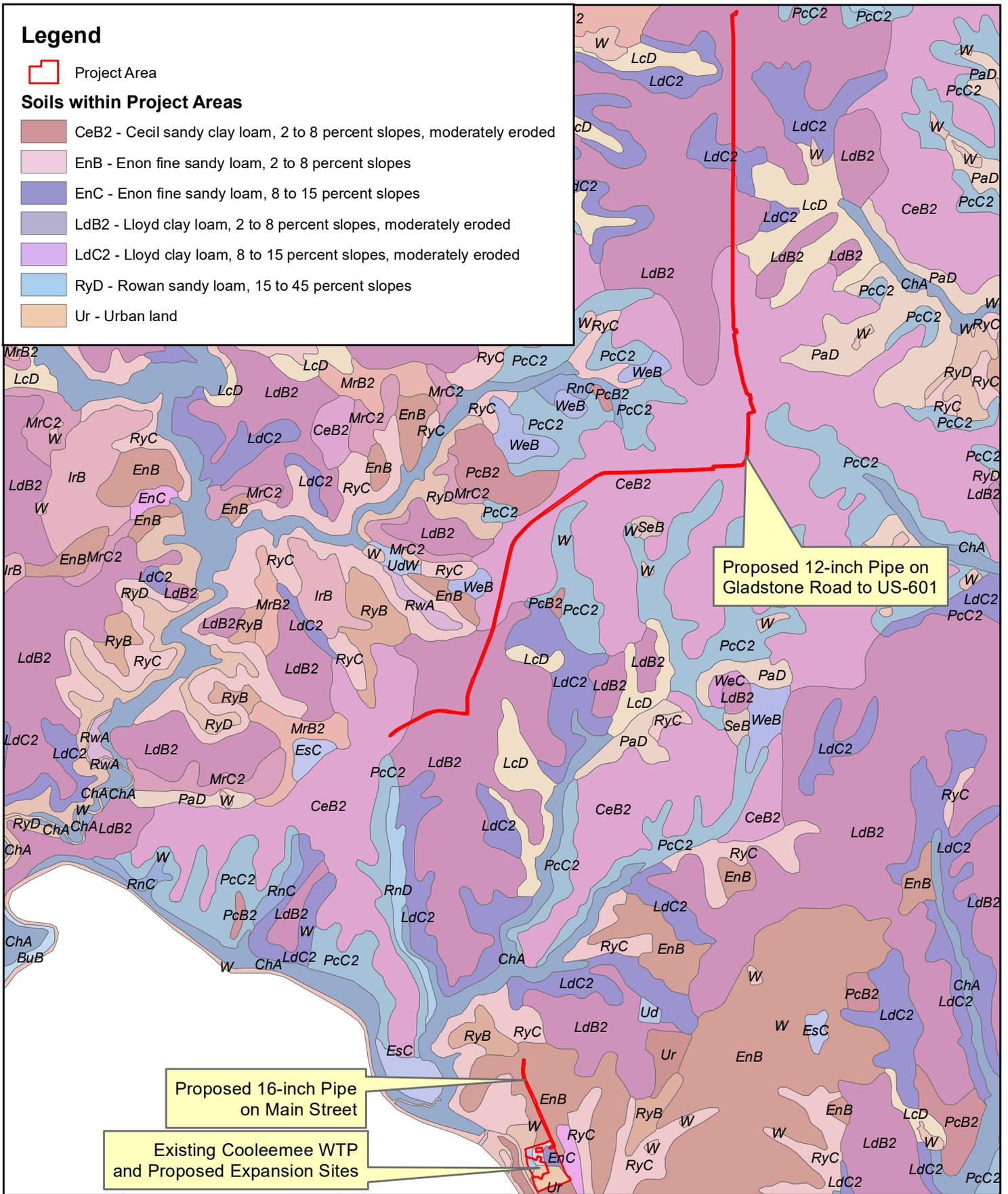
Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project

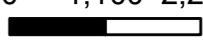
Legend

 Project Area

Soils within Project Areas

-  CeB2 - Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded
-  EnB - Enon fine sandy loam, 2 to 8 percent slopes
-  EnC - Enon fine sandy loam, 8 to 15 percent slopes
-  LdB2 - Lloyd clay loam, 2 to 8 percent slopes, moderately eroded
-  LdC2 - Lloyd clay loam, 8 to 15 percent slopes, moderately eroded
-  RyD - Rowan sandy loam, 15 to 45 percent slopes
-  Ur - Urban land



0 1,100 2,200

 Feet
 1 inch equals 2,200 feet



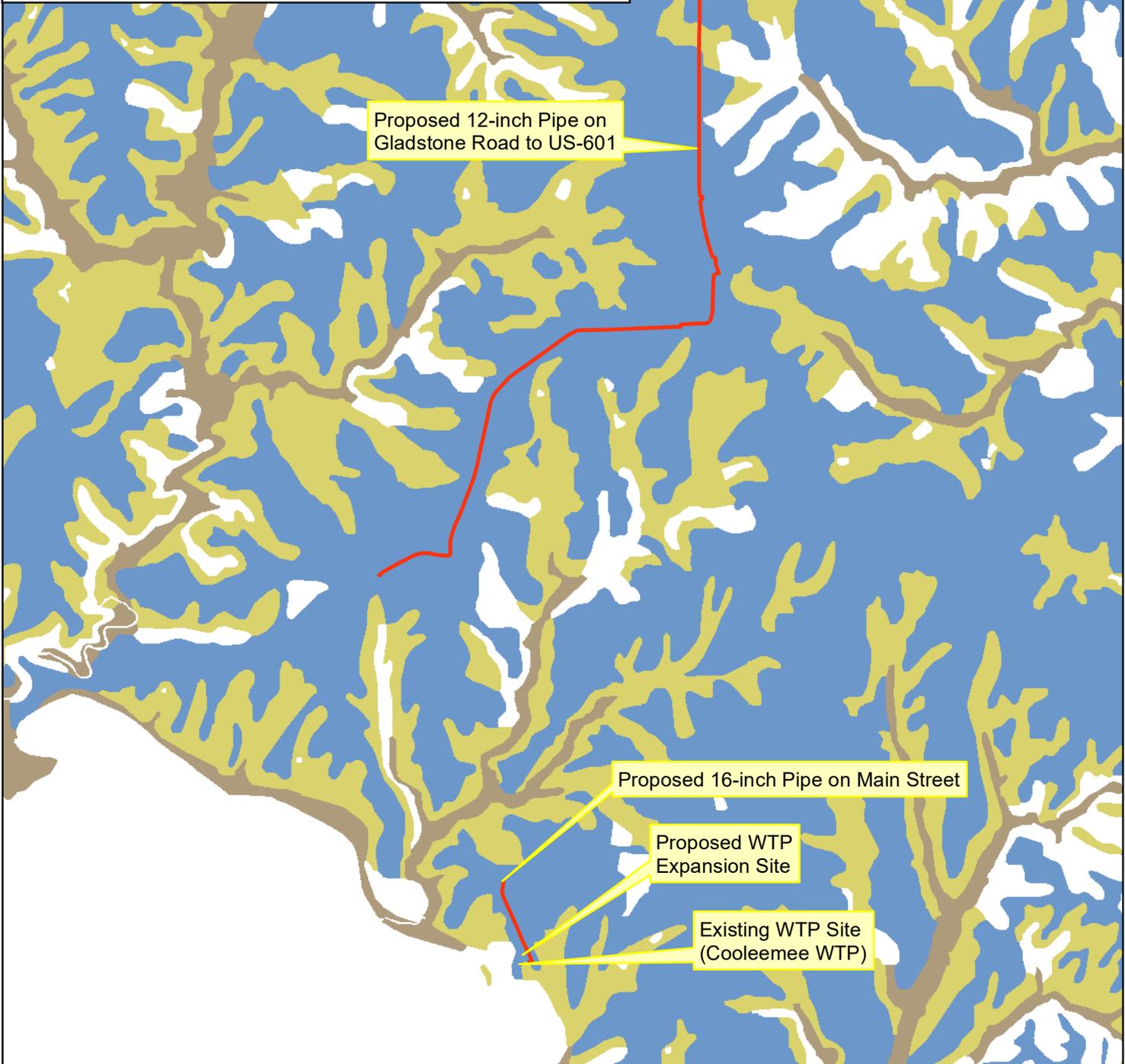
Hazen

Figure 5-4: NRCS Soils Map

Davie County Public Utilities Department
 and Town of Mocksville Water Supply
 Improvements Project

Legend

- Prime farmland
- Farmland of statewide importance
- Prime farmland if drained and either protected from flooding or not frequently flooded during growing season
- Prime farmland if protected from flooding or not frequently flooded during growing season



0 0.25 0.5
Mile
1 inch equals 0.5 mile

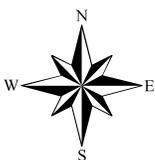
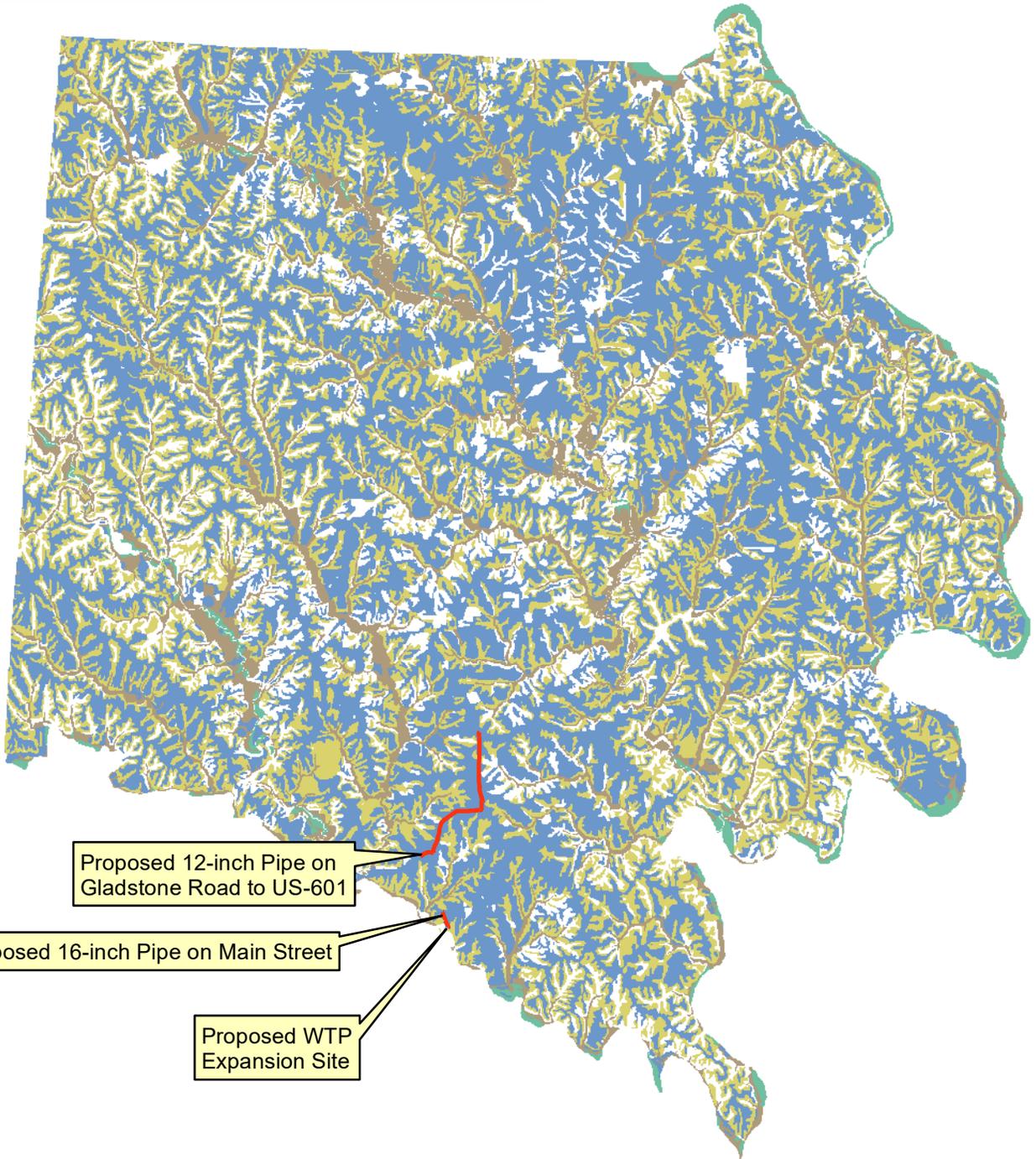


Hazen

Figure 5-5: Prime Farmland Soils In Project Area
Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project

Legend

- Prime farmland
- Farmland of statewide importance
- Prime farmland if drained and either protected from flooding or not frequently flooded during growing season
- Prime farmland if protected from flooding or not frequently flooded during growing season

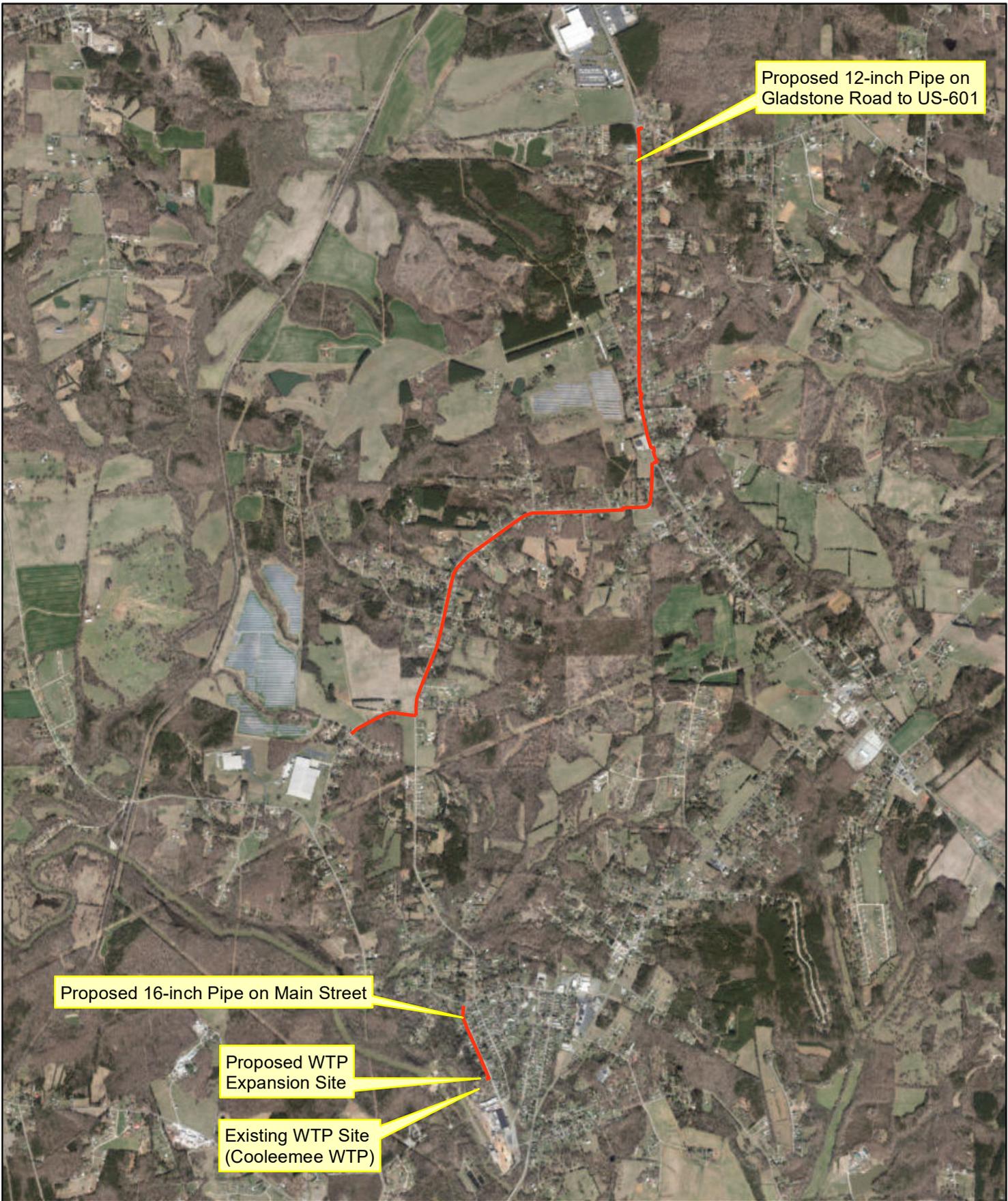


0 1.5 3 Miles
1 inch equals 3 miles



Hazen

Figure 5-6: Prime Farmland Soils In Service Area
Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project



Proposed 12-inch Pipe on Gladstone Road to US-601

Proposed 16-inch Pipe on Main Street

Proposed WTP Expansion Site

Existing WTP Site (Cooleemee WTP)



0 0.25 0.5
 Mile
 1 inch equals 0.5 mile

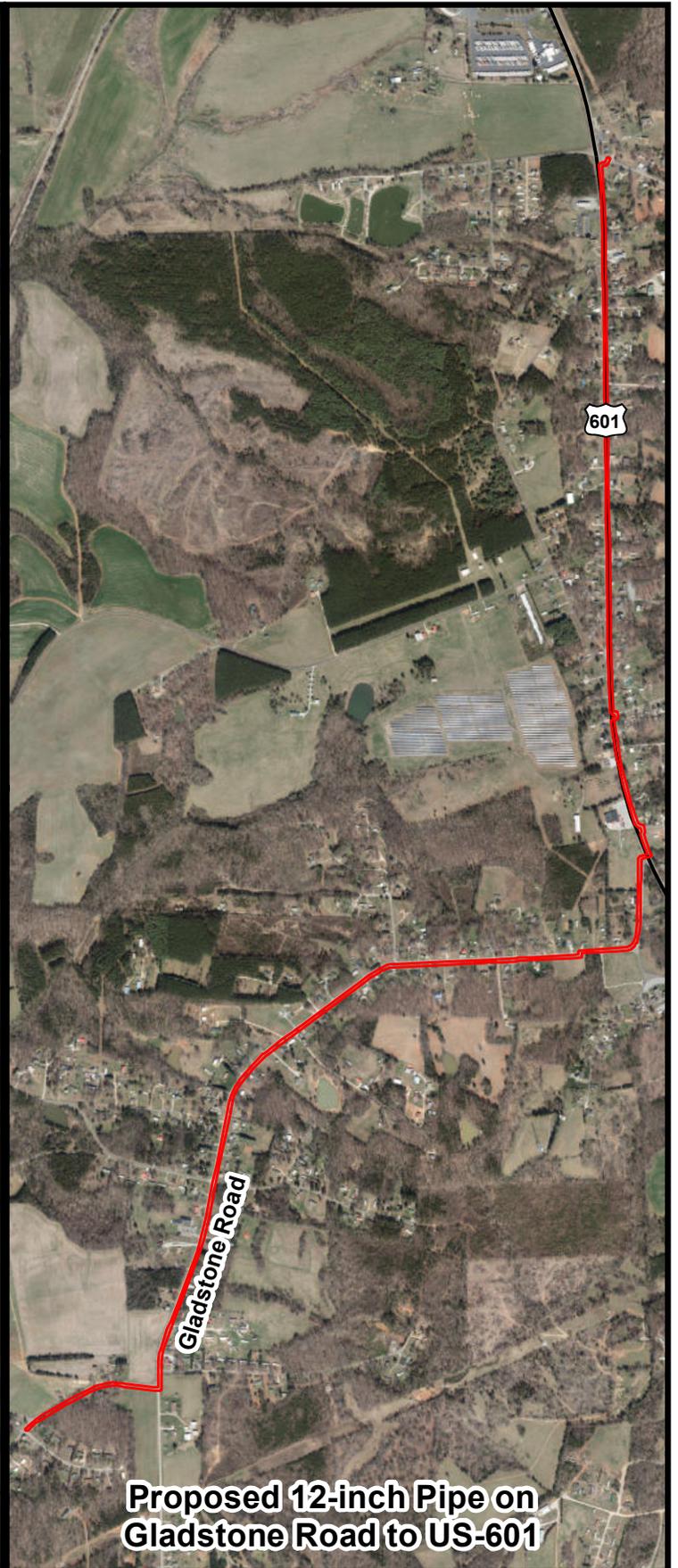


Hazen

Figure 5-7: Existing Land Use
 Davie County Public Utilities Department
 and Town of Mocksville Water Supply
 Improvements Project

Legend

 Project Area



Not to Scale



Hazen

Figure 5-8: Forest Resources

Davie County Public Utilities Department
and Town of Mocksville Water Supply
Improvements Project

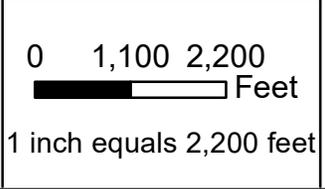
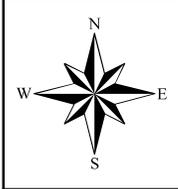
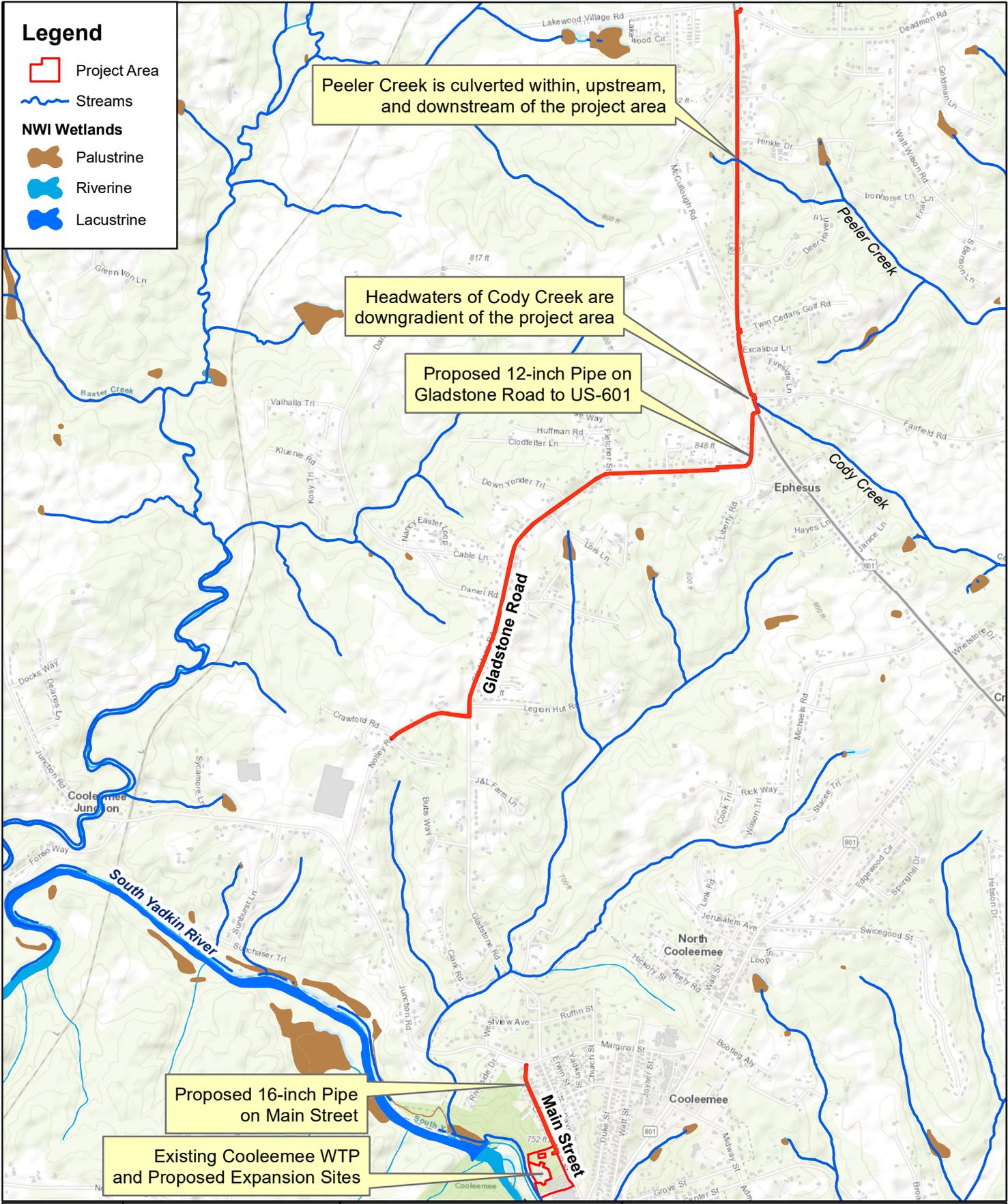


Figure 5-9: Jurisdictional Features
 Davie County Public Utilities Department
 and Town of Mocksville Water Supply
 Improvements Project

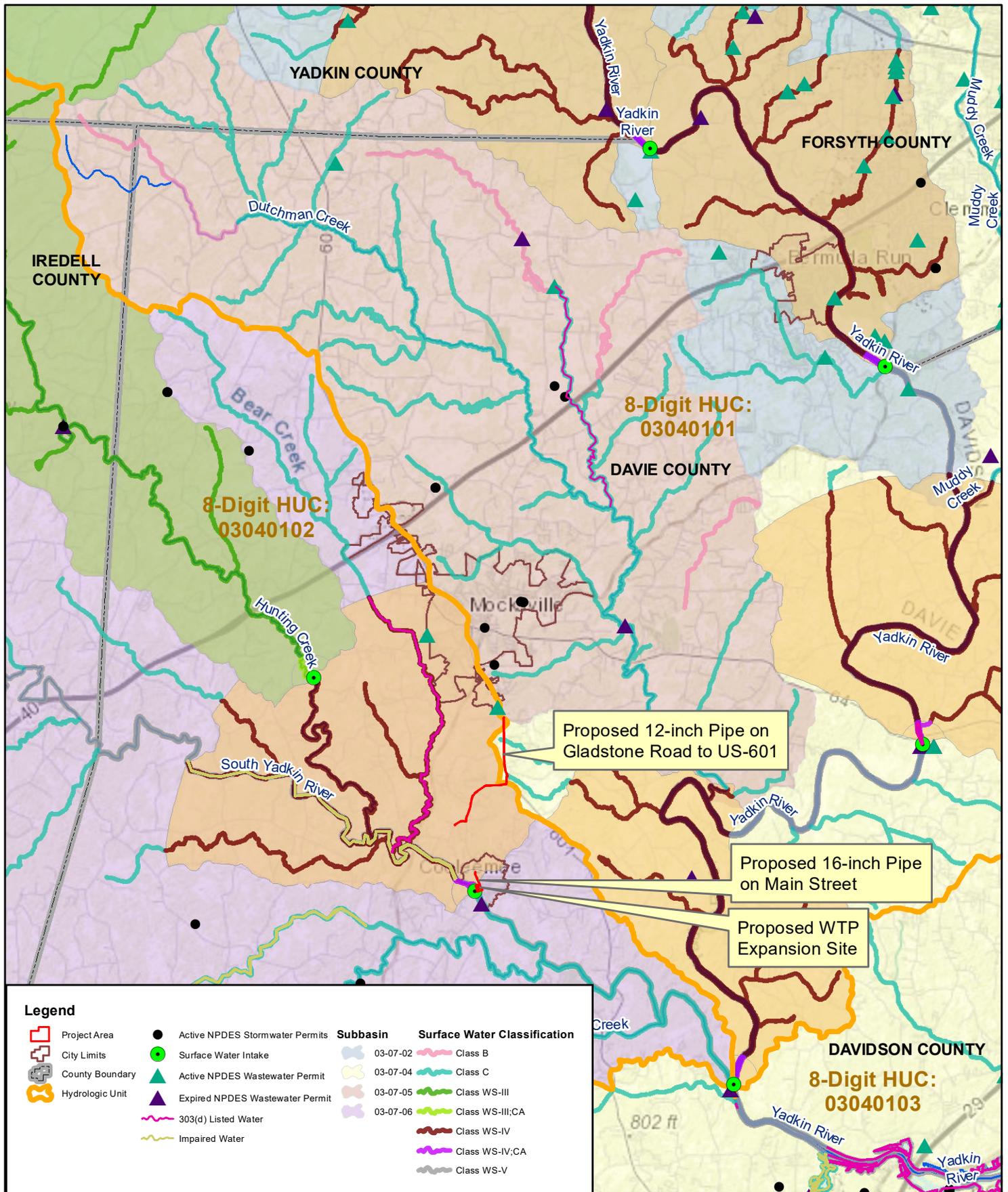
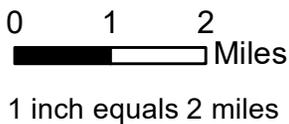
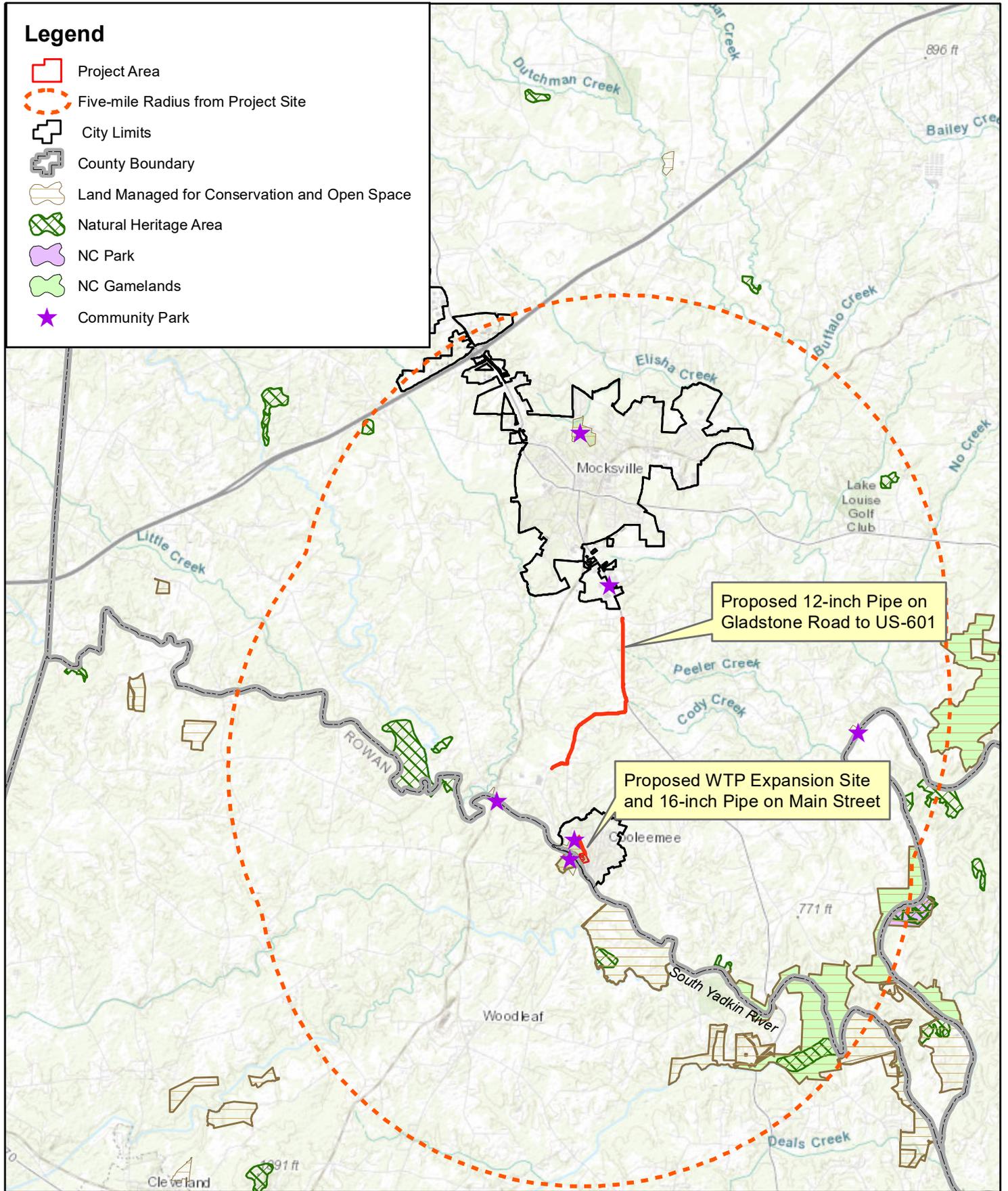


Figure 5-10: Water Resources

Davie County Public Utilities Department
and Town of Mocksville
Water Supply Improvements Project

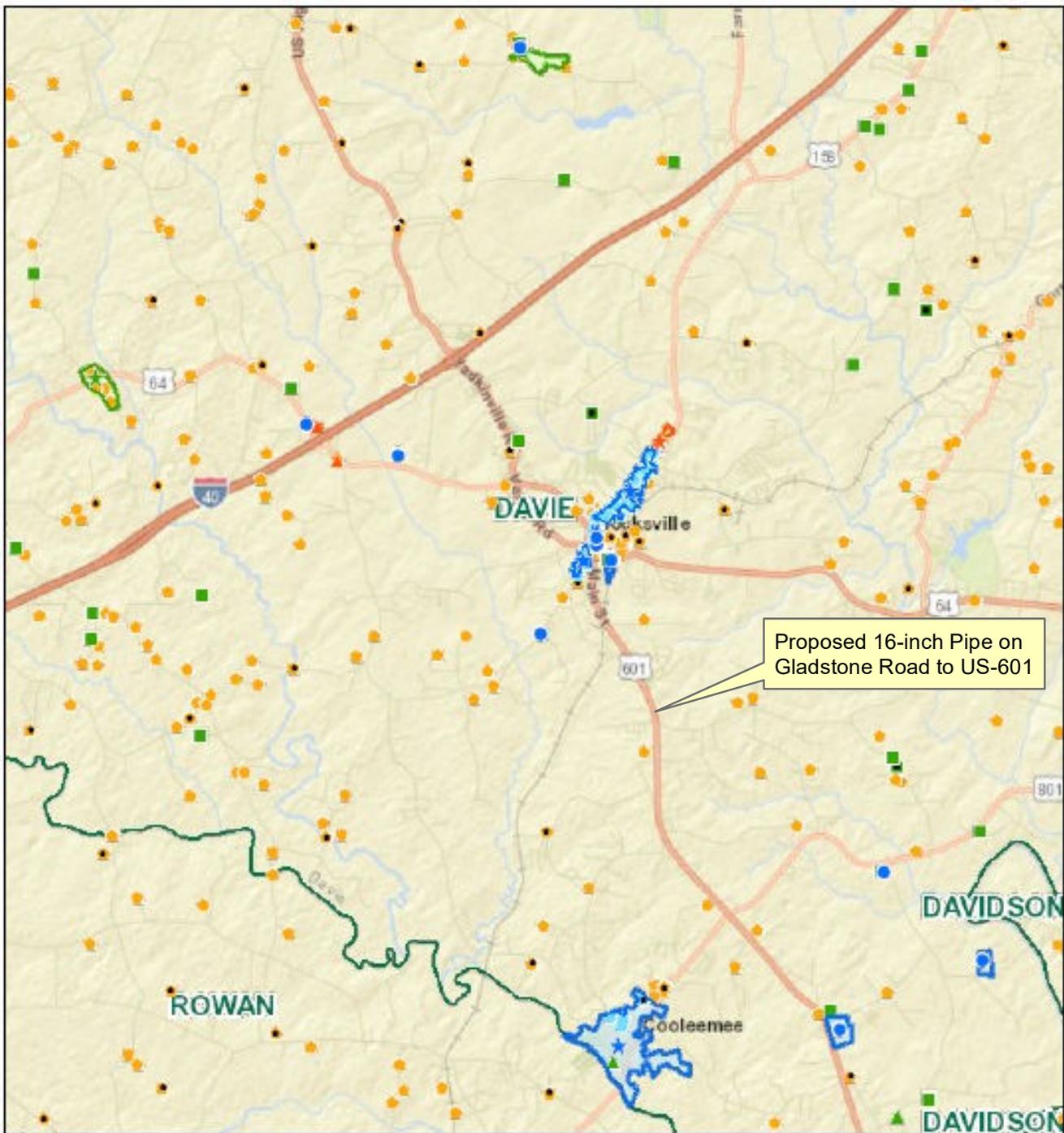
Legend

-  Project Area
-  Five-mile Radius from Project Site
-  City Limits
-  County Boundary
-  Land Managed for Conservation and Open Space
-  Natural Heritage Area
-  NC Park
-  NC Gamelands
-  Community Park



Hazen

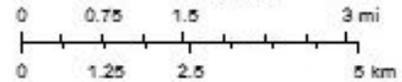
Figure 5-11: Public Lands, Recreational and Natural Areas
 Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project



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- | | |
|--|--------------------------------|
| Local districts & boundaries | Surveyed in NRHD |
| Local individual resources & centerpoints | Surveyed Only, Gone |
| Local Landmark | Surveyed in NRHD, Gone |
| Local Landmark, Gone | Blockface- Multiple properties |
| Local HD Center Point | Blockface in NRHD |
| Surveyed Only individual resources & centerpoints | Surveyed Area, No designation |
| Surveyed Only | Surveyed Area in NHRD |



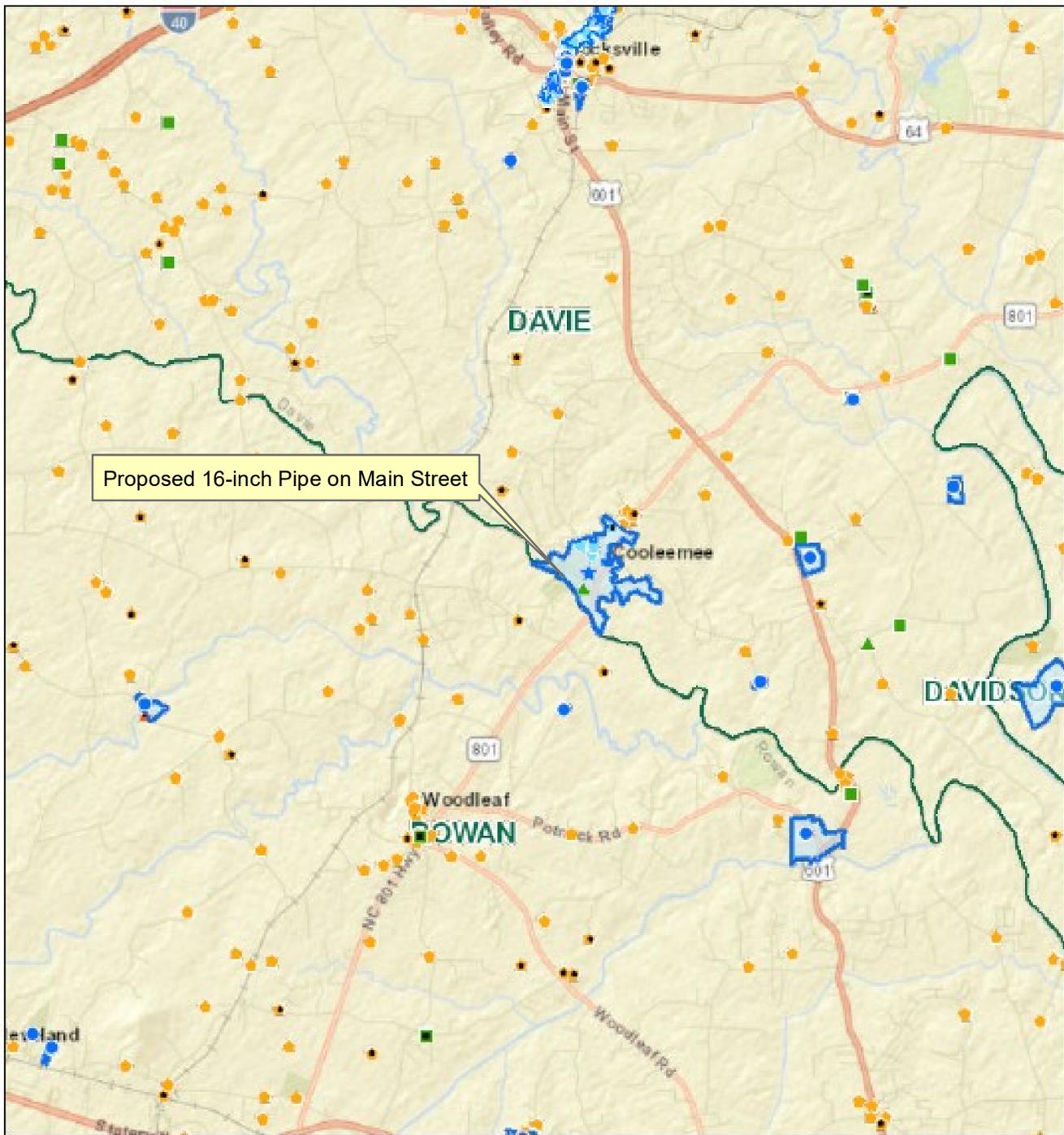
Davie County, State of North Carolina DOT, Esri, HERE, Garmin, IGA, USGS, NPS

North Carolina State Historic Preservation Office
 Davie County, State of North Carolina DOT, Esri, HERE, Garmin, INCREMENT P, IGA, USGS



Hazen

Figure 5-12: Historic Resources
 12-Inch Pipe on Gladstone Road to US-601
 Davie County Public Utilities Department
 and Town of Mocksville Water Supply
 Improvements Project

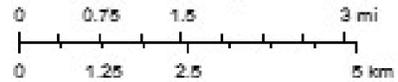


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1:124,988

- Local districts & boundaries
- Local individual resources & centerpoints
- Local Landmark
- Local Landmark, Gone
- Local HD Center Point
- Surveyed Only individual resources & centerpoints
- Surveyed Only

- Surveyed in NRHD
- Surveyed Only, Gone
- Surveyed in NRHD, Gone
- Blockface- Multiple properties
- Blockface in NRHD
- Surveyed Area, No designation
- Surveyed Area in NRHD



Davie County, Rowan County, State of North Carolina DOT, Esri, HERE, Garmin, NGA, USGS, NPS

North Carolina State Historic Preservation Office
 Davie County, Rowan County, State of North Carolina DOT, Esri, HERE, Garmin, INCREMENT P, NGA, USGS |

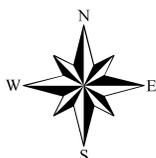
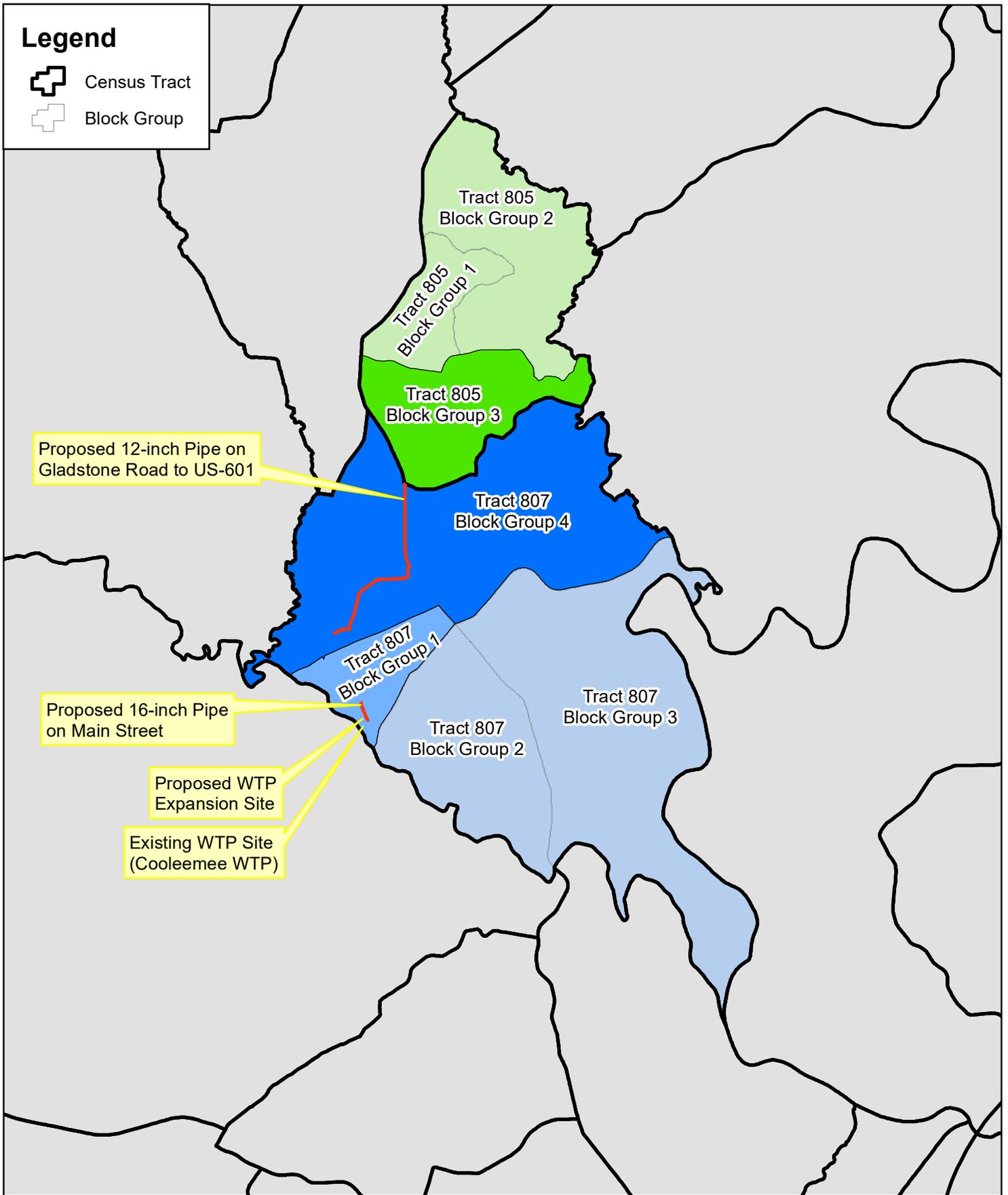


Hazen

Figure 5-13: Historic Resources
 16-Inch Pipe on Main Street
 Davie County Public Utilities Department
 and Town of Mocksville Water Supply
 Improvements Project

Legend

-  Census Tract
-  Block Group



0 1 2 Miles
1 inch equals 2 miles

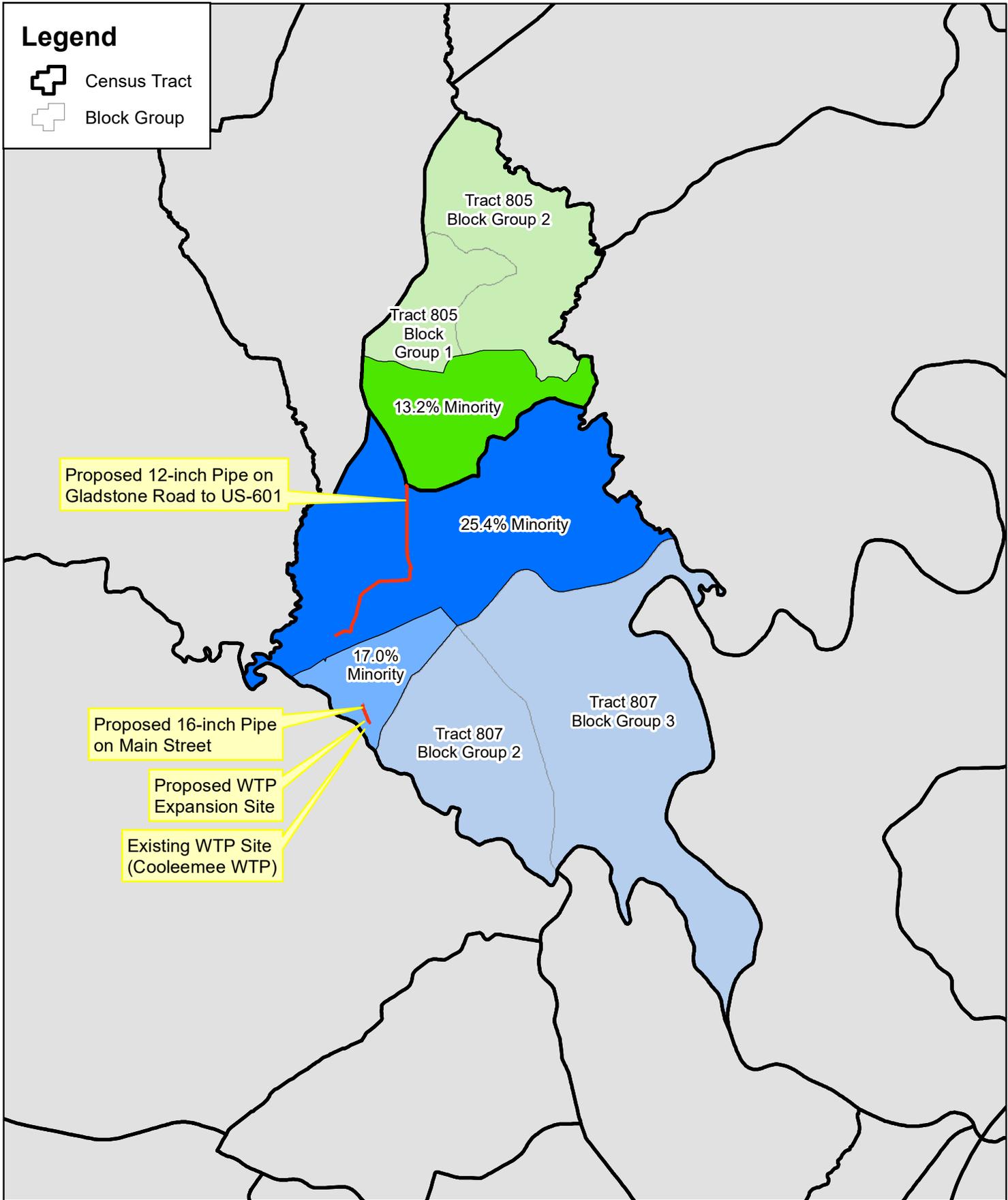


Hazen

Figure 5-14: Demographic Study Area
Davie County Public Utilities Department
and Town of Mocksville Water Supply
Improvements Project

Legend

-  Census Tract
-  Block Group



0 1 2 Miles
1 inch equals 2 miles

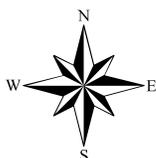
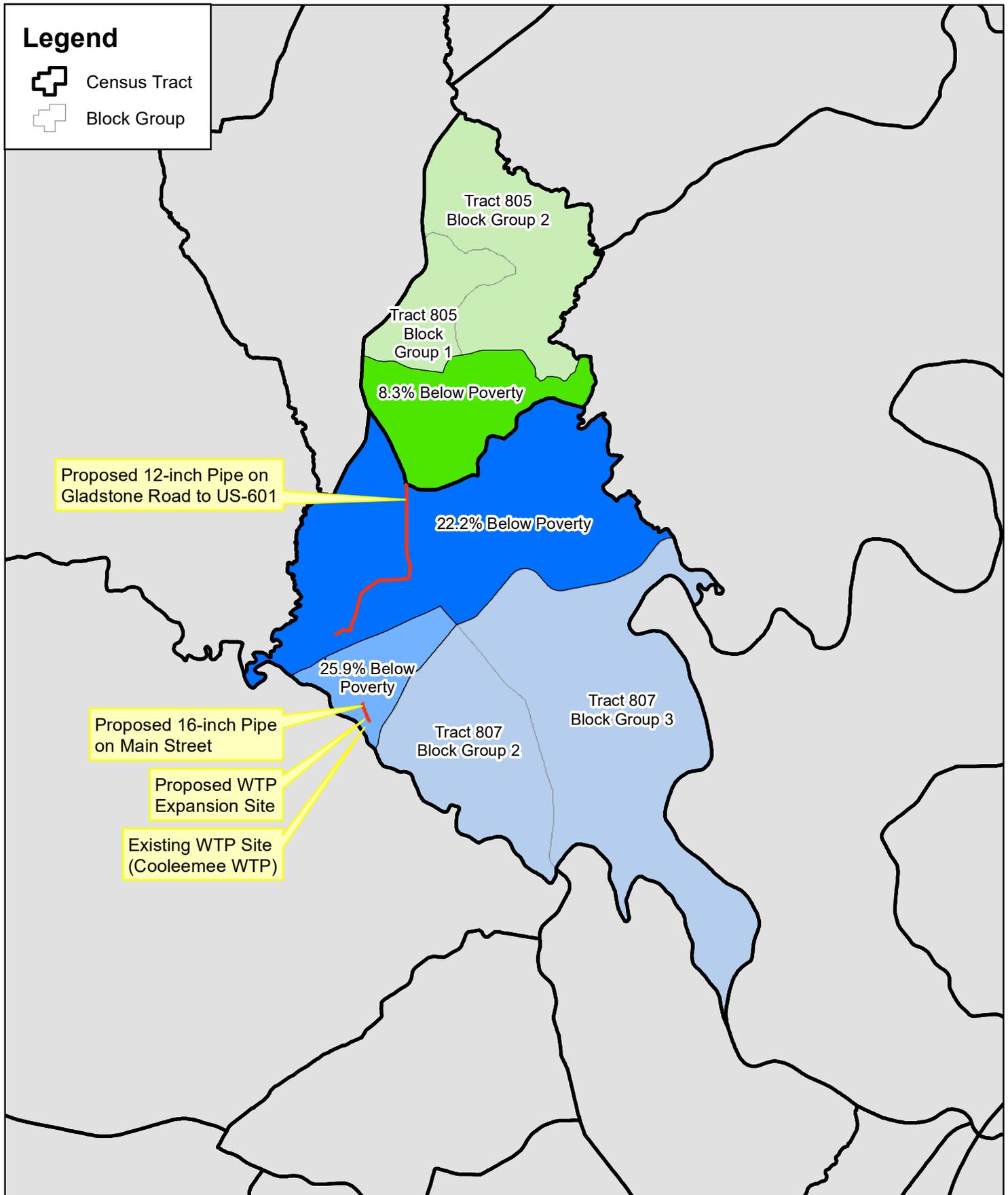


Hazen

Figure 5-15: Minority Populations
Davie County Public Utilities Department
and Town of Mocksville Water Supply
Improvements Project

Legend

-  Census Tract
-  Block Group



0 1 2 Miles
1 inch equals 2 miles



Hazen

Figure 5-16: Low-Income Populations
Davie County Public Utilities Department
and Town of Mocksville Water Supply
Improvements Project

Appendix A: Cooleemee WTP Monthly Operating Reports (MOR) Average Flow Data

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	1/1/2019	1.328	mgd
Raw Water Treated	1/2/2019	1.453	mgd
Raw Water Treated	1/3/2019	1.371	mgd
Raw Water Treated	1/4/2019	1.317	mgd
Raw Water Treated	1/5/2019	1.316	mgd
Raw Water Treated	1/6/2019	1.383	mgd
Raw Water Treated	1/7/2019	1.608	mgd
Raw Water Treated	1/8/2019	1.286	mgd
Raw Water Treated	1/9/2019	1.429	mgd
Raw Water Treated	1/10/2019	1.222	mgd
Raw Water Treated	1/11/2019	1.393	mgd
Raw Water Treated	1/12/2019	1.197	mgd
Raw Water Treated	1/13/2019	1.342	mgd
Raw Water Treated	1/14/2019	1.453	mgd
Raw Water Treated	1/15/2019	1.389	mgd
Raw Water Treated	1/16/2019	1.62	mgd
Raw Water Treated	1/17/2019	1.49	mgd
Raw Water Treated	1/18/2019	1.445	mgd
Raw Water Treated	1/19/2019	1.332	mgd
Raw Water Treated	1/20/2019	1.437	mgd
Raw Water Treated	1/21/2019	1.295	mgd
Raw Water Treated	1/22/2019	1.438	mgd
Raw Water Treated	1/23/2019	1.5	mgd
Raw Water Treated	1/24/2019	1.278	mgd
Raw Water Treated	1/25/2019	1.369	mgd
Raw Water Treated	1/26/2019	1.352	mgd
Raw Water Treated	1/27/2019	1.7	mgd
Raw Water Treated	1/28/2019	1.53	mgd
Raw Water Treated	1/29/2019	1.447	mgd
Raw Water Treated	1/30/2019	1.475	mgd
Raw Water Treated	1/31/2019	1.372	mgd
Raw Water Treated	2/1/2019	1.266	mgd
Raw Water Treated	2/2/2019	1.376	mgd
Raw Water Treated	2/3/2019	1.316	mgd
Raw Water Treated	2/4/2019	1.497	mgd
Raw Water Treated	2/5/2019	1.434	mgd
Raw Water Treated	2/6/2019	1.346	mgd
Raw Water Treated	2/7/2019	1.37	mgd
Raw Water Treated	2/8/2019	1.254	mgd
Raw Water Treated	2/9/2019	1.381	mgd
Raw Water Treated	2/10/2019	1.301	mgd
Raw Water Treated	2/11/2019	1.381	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	2/12/2019	1.379	mgd
Raw Water Treated	2/13/2019	1.396	mgd
Raw Water Treated	2/14/2019	1.328	mgd
Raw Water Treated	2/15/2019	1.434	mgd
Raw Water Treated	2/16/2019	1.249	mgd
Raw Water Treated	2/17/2019	1.405	mgd
Raw Water Treated	2/18/2019	1.273	mgd
Raw Water Treated	2/19/2019	1.413	mgd
Raw Water Treated	2/20/2019	1.341	mgd
Raw Water Treated	2/21/2019	1.152	mgd
Raw Water Treated	2/22/2019	1.202	mgd
Raw Water Treated	2/23/2019	1.369	mgd
Raw Water Treated	2/24/2019	1.5	mgd
Raw Water Treated	2/25/2019	1.486	mgd
Raw Water Treated	2/26/2019	1.601	mgd
Raw Water Treated	2/27/2019	1.163	mgd
Raw Water Treated	2/28/2019	1.363	mgd
Raw Water Treated	3/1/2019	1.343	mgd
Raw Water Treated	3/2/2019	1.29	mgd
Raw Water Treated	3/3/2019	1.462	mgd
Raw Water Treated	3/4/2019	1.386	mgd
Raw Water Treated	3/5/2019	1.262	mgd
Raw Water Treated	3/6/2019	1.343	mgd
Raw Water Treated	3/7/2019	1.367	mgd
Raw Water Treated	3/8/2019	1.308	mgd
Raw Water Treated	3/9/2019	1.299	mgd
Raw Water Treated	3/10/2019	1.398	mgd
Raw Water Treated	3/11/2019	1.475	mgd
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Raw Water Treated	3/13/2019	1.591	mgd
Raw Water Treated	3/14/2019	1.488	mgd
Raw Water Treated	3/15/2019	1.37	mgd
Raw Water Treated	3/16/2019	1.258	mgd
Raw Water Treated	3/17/2019	1.273	mgd
Raw Water Treated	3/18/2019	1.354	mgd
Raw Water Treated	3/19/2019	1.408	mgd
Raw Water Treated	3/20/2019	1.236	mgd
Raw Water Treated	3/21/2019	1.326	mgd
Raw Water Treated	3/22/2019	1.306	mgd
Raw Water Treated	3/23/2019	1.305	mgd
Raw Water Treated	3/24/2019	1.42	mgd
Raw Water Treated	3/25/2019	1.28	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	3/26/2019	1.21	mgd
Raw Water Treated	3/27/2019	1.359	mgd
Raw Water Treated	3/28/2019	1.444	mgd
Raw Water Treated	3/29/2019	1.323	mgd
Raw Water Treated	3/30/2019	1.34	mgd
Raw Water Treated	3/31/2019	1.265	mgd
Raw Water Treated	4/1/2019	1.451	mgd
Raw Water Treated	4/2/2019	1.272	mgd
Raw Water Treated	4/3/2019	1.414	mgd
Raw Water Treated	4/4/2019	1.389	mgd
Raw Water Treated	4/5/2019	1.404	mgd
Raw Water Treated	4/6/2019	1.369	mgd
Raw Water Treated	4/7/2019	1.543	mgd
Raw Water Treated	4/8/2019	1.168	mgd
Raw Water Treated	4/9/2019	1.321	mgd
Raw Water Treated	4/10/2019	1.268	mgd
Raw Water Treated	4/11/2019	1.209	mgd
Raw Water Treated	4/12/2019	1.321	mgd
Raw Water Treated	4/13/2019	1.189	mgd
Raw Water Treated	4/14/2019	1.32	mgd
Raw Water Treated	4/15/2019	1.43	mgd
Raw Water Treated	4/16/2019	1.346	mgd
Raw Water Treated	4/17/2019	1.438	mgd
Raw Water Treated	4/18/2019	1.333	mgd
Raw Water Treated	4/19/2019	1.297	mgd
Raw Water Treated	4/20/2019	1.3	mgd
Raw Water Treated	4/21/2019	1.35	mgd
Raw Water Treated	4/22/2019	1.525	mgd
Raw Water Treated	4/23/2019	1.286	mgd
Raw Water Treated	4/24/2019	1.356	mgd
Raw Water Treated	4/25/2019	1.475	mgd
Raw Water Treated	4/26/2019	1.309	mgd
Raw Water Treated	4/27/2019	1.368	mgd
Raw Water Treated	4/28/2019	1.53	mgd
Raw Water Treated	4/29/2019	1.482	mgd
Raw Water Treated	4/30/2019	1.451	mgd
Raw Water Treated	5/1/2019	1.553	mgd
Raw Water Treated	5/2/2019	1.578	mgd
Raw Water Treated	5/3/2019	1.501	mgd
Raw Water Treated	5/4/2019	1.491	mgd
Raw Water Treated	5/5/2019	1.48	mgd
Raw Water Treated	5/6/2019	1.548	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	5/7/2019	1.418	mgd
Raw Water Treated	5/8/2019	1.516	mgd
Raw Water Treated	5/9/2019	1.412	mgd
Raw Water Treated	5/10/2019	1.423	mgd
Raw Water Treated	5/11/2019	1.502	mgd
Raw Water Treated	5/12/2019	1.468	mgd
Raw Water Treated	5/13/2019	1.644	mgd
Raw Water Treated	5/14/2019	1.512	mgd
Raw Water Treated	5/15/2019	1.397	mgd
Raw Water Treated	5/16/2019	1.424	mgd
Raw Water Treated	5/17/2019	1.609	mgd
Raw Water Treated	5/18/2019	1.532	mgd
Raw Water Treated	5/19/2019	1.78	mgd
Raw Water Treated	5/20/2019	1.759	mgd
Raw Water Treated	5/21/2019	1.842	mgd
Raw Water Treated	5/22/2019	1.676	mgd
Raw Water Treated	5/23/2019	1.633	mgd
Raw Water Treated	5/24/2019	1.715	mgd
Raw Water Treated	5/25/2019	1.702	mgd
Raw Water Treated	5/26/2019	1.717	mgd
Raw Water Treated	5/27/2019	1.683	mgd
Raw Water Treated	5/28/2019	1.515	mgd
Raw Water Treated	5/29/2019	1.677	mgd
Raw Water Treated	5/30/2019	1.523	mgd
Raw Water Treated	5/31/2019	1.675	mgd
Raw Water Treated	6/1/2019	1.612	mgd
Raw Water Treated	6/2/2019	1.738	mgd
Raw Water Treated	6/3/2019	1.975	mgd
Raw Water Treated	6/4/2019	1.675	mgd
Raw Water Treated	6/5/2019	1.79	mgd
Raw Water Treated	6/6/2019	1.626	mgd
Raw Water Treated	6/7/2019	1.517	mgd
Raw Water Treated	6/8/2019	1.264	mgd
Raw Water Treated	6/9/2019	1.359	mgd
Raw Water Treated	6/10/2019	1.599	mgd
Raw Water Treated	6/11/2019	1.756	mgd
Raw Water Treated	6/12/2019	1.592	mgd
Raw Water Treated	6/13/2019	1.631	mgd
Raw Water Treated	6/14/2019	1.6	mgd
Raw Water Treated	6/15/2019	1.621	mgd
Raw Water Treated	6/16/2019	1.589	mgd
Raw Water Treated	6/17/2019	1.876	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	6/18/2019	1.593	mgd
Raw Water Treated	6/19/2019	1.55	mgd
Raw Water Treated	6/20/2019	1.428	mgd
Raw Water Treated	6/21/2019	1.537	mgd
Raw Water Treated	6/22/2019	1.501	mgd
Raw Water Treated	6/23/2019	1.561	mgd
Raw Water Treated	6/24/2019	1.896	mgd
Raw Water Treated	6/25/2019	1.501	mgd
Raw Water Treated	6/26/2019	1.865	mgd
Raw Water Treated	6/27/2019	1.761	mgd
Raw Water Treated	6/28/2019	1.634	mgd
Raw Water Treated	6/29/2019	1.711	mgd
Raw Water Treated	6/30/2019	1.748	mgd
Raw Water Treated	7/1/2019	1.62	mgd
Raw Water Treated	7/2/2019	1.663	mgd
Raw Water Treated	7/3/2019	1.815	mgd
Raw Water Treated	7/4/2019	1.638	mgd
Raw Water Treated	7/5/2019	1.682	mgd
Raw Water Treated	7/6/2019	1.658	mgd
Raw Water Treated	7/7/2019	1.73	mgd
Raw Water Treated	7/8/2019	1.865	mgd
Raw Water Treated	7/9/2019	1.558	mgd
Raw Water Treated	7/10/2019	1.664	mgd
Raw Water Treated	7/11/2019	1.883	mgd
Raw Water Treated	7/12/2019	1.604	mgd
Raw Water Treated	7/13/2019	1.897	mgd
Raw Water Treated	7/14/2019	1.995	mgd
Raw Water Treated	7/15/2019	2.069	mgd
Raw Water Treated	7/16/2019	1.755	mgd
Raw Water Treated	7/17/2019	1.934	mgd
Raw Water Treated	7/18/2019	1.738	mgd
Raw Water Treated	7/19/2019	1.706	mgd
Raw Water Treated	7/20/2019	1.82	mgd
Raw Water Treated	7/21/2019	1.69	mgd
Raw Water Treated	7/22/2019	1.947	mgd
Raw Water Treated	7/23/2019	1.633	mgd
Raw Water Treated	7/24/2019	1.789	mgd
Raw Water Treated	7/25/2019	1.838	mgd
Raw Water Treated	7/26/2019	1.76	mgd
Raw Water Treated	7/27/2019	2.084	mgd
Raw Water Treated	7/28/2019	1.598	mgd
Raw Water Treated	7/29/2019	1.938	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	7/30/2019	1.651	mgd
Raw Water Treated	7/31/2019	1.732	mgd
Raw Water Treated	8/1/2019	1.76	mgd
Raw Water Treated	8/2/2019	1.591	mgd
Raw Water Treated	8/3/2019	1.775	mgd
Raw Water Treated	8/4/2019	1.978	mgd
Raw Water Treated	8/5/2019	1.823	mgd
Raw Water Treated	8/6/2019	1.927	mgd
Raw Water Treated	8/7/2019	1.792	mgd
Raw Water Treated	8/8/2019	1.715	mgd
Raw Water Treated	8/9/2019	1.875	mgd
Raw Water Treated	8/10/2019	1.697	mgd
Raw Water Treated	8/11/2019	1.788	mgd
Raw Water Treated	8/12/2019	1.862	mgd
Raw Water Treated	8/13/2019	1.931	mgd
Raw Water Treated	8/14/2019	1.75	mgd
Raw Water Treated	8/15/2019	1.835	mgd
Raw Water Treated	8/16/2019	1.925	mgd
Raw Water Treated	8/17/2019	1.752	mgd
Raw Water Treated	8/18/2019	1.901	mgd
Raw Water Treated	8/19/2019	1.973	mgd
Raw Water Treated	8/20/2019	1.631	mgd
Raw Water Treated	8/21/2019	1.714	mgd
Raw Water Treated	8/22/2019	1.878	mgd
Raw Water Treated	8/23/2019	1.66	mgd
Raw Water Treated	8/24/2019	1.67	mgd
Raw Water Treated	8/25/2019	1.853	mgd
Raw Water Treated	8/26/2019	1.93	mgd
Raw Water Treated	8/27/2019	1.794	mgd
Raw Water Treated	8/28/2019	1.742	mgd
Raw Water Treated	8/29/2019	1.613	mgd
Raw Water Treated	8/30/2019	1.666	mgd
Raw Water Treated	8/31/2019	1.54	mgd
Raw Water Treated	9/1/2019	1.617	mgd
Raw Water Treated	9/2/2019	1.896	mgd
Raw Water Treated	9/3/2019	1.715	mgd
Raw Water Treated	9/4/2019	1.85	mgd
Raw Water Treated	9/5/2019	1.687	mgd
Raw Water Treated	9/6/2019	1.843	mgd
Raw Water Treated	9/7/2019	1.994	mgd
Raw Water Treated	9/8/2019	2	mgd
Raw Water Treated	9/9/2019	1.623	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	9/10/2019	1.787	mgd
Raw Water Treated	9/11/2019	1.891	mgd
Raw Water Treated	9/12/2019	1.8	mgd
Raw Water Treated	9/13/2019	1.848	mgd
Raw Water Treated	9/14/2019	1.823	mgd
Raw Water Treated	9/15/2019	1.9	mgd
Raw Water Treated	9/16/2019	1.821	mgd
Raw Water Treated	9/17/2019	1.896	mgd
Raw Water Treated	9/18/2019	1.679	mgd
Raw Water Treated	9/19/2019	1.694	mgd
Raw Water Treated	9/20/2019	1.768	mgd
Raw Water Treated	9/21/2019	1.591	mgd
Raw Water Treated	9/22/2019	1.779	mgd
Raw Water Treated	9/23/2019	1.793	mgd
Raw Water Treated	9/24/2019	1.802	mgd
Raw Water Treated	9/25/2019	1.805	mgd
Raw Water Treated	9/26/2019	1.786	mgd
Raw Water Treated	9/27/2019	1.879	mgd
Raw Water Treated	9/28/2019	1.971	mgd
Raw Water Treated	9/29/2019	1.885	mgd
Raw Water Treated	9/30/2019	1.668	mgd
Raw Water Treated	10/1/2019	1.93	mgd
Raw Water Treated	10/2/2019	2.005	mgd
Raw Water Treated	10/3/2019	1.926	mgd
Raw Water Treated	10/4/2019	1.946	mgd
Raw Water Treated	10/5/2019	1.838	mgd
Raw Water Treated	10/6/2019	1.882	mgd
Raw Water Treated	10/7/2019	1.824	mgd
Raw Water Treated	10/8/2019	1.806	mgd
Raw Water Treated	10/9/2019	1.718	mgd
Raw Water Treated	10/10/2019	1.722	mgd
Raw Water Treated	10/11/2019	1.729	mgd
Raw Water Treated	10/12/2019	1.588	mgd
Raw Water Treated	10/13/2019	1.563	mgd
Raw Water Treated	10/14/2019	1.856	mgd
Raw Water Treated	10/15/2019	1.67	mgd
Raw Water Treated	10/16/2019	1.659	mgd
Raw Water Treated	10/17/2019	1.733	mgd
Raw Water Treated	10/18/2019	1.63	mgd
Raw Water Treated	10/19/2019	1.813	mgd
Raw Water Treated	10/20/2019	1.538	mgd
Raw Water Treated	10/21/2019	1.591	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	10/22/2019	1.598	mgd
Raw Water Treated	10/23/2019	1.509	mgd
Raw Water Treated	10/24/2019	1.589	mgd
Raw Water Treated	10/25/2019	1.546	mgd
Raw Water Treated	10/26/2019	1.804	mgd
Raw Water Treated	10/27/2019	1.706	mgd
Raw Water Treated	10/28/2019	1.575	mgd
Raw Water Treated	10/29/2019	1.521	mgd
Raw Water Treated	10/30/2019	1.566	mgd
Raw Water Treated	10/31/2019	1.434	mgd
Raw Water Treated	11/1/2019	1.404	mgd
Raw Water Treated	11/2/2019	1.363	mgd
Raw Water Treated	11/3/2019	1.54	mgd
Raw Water Treated	11/4/2019	1.48	mgd
Raw Water Treated	11/5/2019	1.629	mgd
Raw Water Treated	11/6/2019	1.432	mgd
Raw Water Treated	11/7/2019	1.541	mgd
Raw Water Treated	11/8/2019	1.963	mgd
Raw Water Treated	11/9/2019	1.368	mgd
Raw Water Treated	11/10/2019	1.747	mgd
Raw Water Treated	11/11/2019	1.451	mgd
Raw Water Treated	11/12/2019	1.793	mgd
Raw Water Treated	11/13/2019	1.587	mgd
Raw Water Treated	11/14/2019	1.485	mgd
Raw Water Treated	11/15/2019	1.424	mgd
Raw Water Treated	11/16/2019	1.479	mgd
Raw Water Treated	11/17/2019	1.505	mgd
Raw Water Treated	11/18/2019	1.473	mgd
Raw Water Treated	11/19/2019	1.479	mgd
Raw Water Treated	11/20/2019	1.326	mgd
Raw Water Treated	11/21/2019	1.475	mgd
Raw Water Treated	11/22/2019	1.474	mgd
Raw Water Treated	11/23/2019	1.235	mgd
Raw Water Treated	11/24/2019	1.495	mgd
Raw Water Treated	11/25/2019	1.429	mgd
Raw Water Treated	11/26/2019	1.531	mgd
Raw Water Treated	11/27/2019	1.562	mgd
Raw Water Treated	11/28/2019	1.588	mgd
Raw Water Treated	11/29/2019	1.401	mgd
Raw Water Treated	11/30/2019	1.404	mgd
Raw Water Treated	12/1/2019	1.208	mgd
Raw Water Treated	12/2/2019	1.339	mgd

Coolee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	12/3/2019	1.27	mgd
Raw Water Treated	12/4/2019	1.344	mgd
Raw Water Treated	12/5/2019	1.381	mgd
Raw Water Treated	12/6/2019	1.145	mgd
Raw Water Treated	12/7/2019	1.357	mgd
Raw Water Treated	12/8/2019	1.483	mgd
Raw Water Treated	12/9/2019	1.357	mgd
Raw Water Treated	12/10/2019	1.358	mgd
Raw Water Treated	12/11/2019	1.359	mgd
Raw Water Treated	12/12/2019	1.297	mgd
Raw Water Treated	12/13/2019	1.296	mgd
Raw Water Treated	12/14/2019	1.409	mgd
Raw Water Treated	12/15/2019	1.299	mgd
Raw Water Treated	12/16/2019	1.463	mgd
Raw Water Treated	12/17/2019	1.423	mgd
Raw Water Treated	12/18/2019	1.339	mgd
Raw Water Treated	12/19/2019	1.522	mgd
Raw Water Treated	12/20/2019	1.444	mgd
Raw Water Treated	12/21/2019	1.42	mgd
Raw Water Treated	12/22/2019	1.332	mgd
Raw Water Treated	12/23/2019	1.696	mgd
Raw Water Treated	12/24/2019	1.358	mgd
Raw Water Treated	12/25/2019	1.385	mgd
Raw Water Treated	12/26/2019	1.339	mgd
Raw Water Treated	12/27/2019	1.565	mgd
Raw Water Treated	12/28/2019	1.487	mgd
Raw Water Treated	12/29/2019	1.428	mgd
Raw Water Treated	12/30/2019	1.34	mgd
Raw Water Treated	12/31/2019	1.329	mgd
	2019 Average:	1.55	mgd
	2019 Max:	2.08	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	1/1/2020	1.229	mgd
Raw Water Treated	1/2/2020	1.395	mgd
Raw Water Treated	1/3/2020	1.323	mgd
Raw Water Treated	1/4/2020	1.287	mgd
Raw Water Treated	1/5/2020	1.314	mgd
Raw Water Treated	1/6/2020	1.428	mgd
Raw Water Treated	1/7/2020	1.404	mgd
Raw Water Treated	1/8/2020	1.402	mgd
Raw Water Treated	1/9/2020	1.394	mgd
Raw Water Treated	1/10/2020	1.449	mgd
Raw Water Treated	1/11/2020	1.371	mgd
Raw Water Treated	1/12/2020	1.406	mgd
Raw Water Treated	1/13/2020	1.384	mgd
Raw Water Treated	1/14/2020	1.21	mgd
Raw Water Treated	1/15/2020	1.173	mgd
Raw Water Treated	1/16/2020	1.32	mgd
Raw Water Treated	1/17/2020	1.317	mgd
Raw Water Treated	1/18/2020	1.189	mgd
Raw Water Treated	1/19/2020	1.392	mgd
Raw Water Treated	1/20/2020	1.373	mgd
Raw Water Treated	1/21/2020	1.319	mgd
Raw Water Treated	1/22/2020	1.456	mgd
Raw Water Treated	1/23/2020	1.299	mgd
Raw Water Treated	1/24/2020	1.304	mgd
Raw Water Treated	1/25/2020	1.299	mgd
Raw Water Treated	1/26/2020	1.208	mgd
Raw Water Treated	1/27/2020	1.324	mgd
Raw Water Treated	1/28/2020	1.354	mgd
Raw Water Treated	1/29/2020	1.275	mgd
Raw Water Treated	1/30/2020	1.53	mgd
Raw Water Treated	1/31/2020	1.281	mgd
Raw Water Treated	2/1/2020	1.363	mgd
Raw Water Treated	2/2/2020	1.304	mgd
Raw Water Treated	2/3/2020	1.339	mgd
Raw Water Treated	2/4/2020	1.293	mgd
Raw Water Treated	2/5/2020	1.266	mgd
Raw Water Treated	2/6/2020	1.222	mgd
Raw Water Treated	2/7/2020	1.223	mgd
Raw Water Treated	2/8/2020	1.104	mgd
Raw Water Treated	2/9/2020	1.292	mgd
Raw Water Treated	2/10/2020	1.318	mgd
Raw Water Treated	2/11/2020	1.408	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	2/12/2020	1.27	mgd
Raw Water Treated	2/13/2020	1.347	mgd
Raw Water Treated	2/14/2020	1.186	mgd
Raw Water Treated	2/15/2020	1.314	mgd
Raw Water Treated	2/16/2020	1.315	mgd
Raw Water Treated	2/17/2020	1.341	mgd
Raw Water Treated	2/18/2020	1.326	mgd
Raw Water Treated	2/19/2020	1.301	mgd
Raw Water Treated	2/20/2020	0.959	mgd
Raw Water Treated	2/21/2020	1.396	mgd
Raw Water Treated	2/22/2020	1.262	mgd
Raw Water Treated	2/23/2020	1.291	mgd
Raw Water Treated	2/24/2020	1.33	mgd
Raw Water Treated	2/25/2020	1.231	mgd
Raw Water Treated	2/26/2020	1.199	mgd
Raw Water Treated	2/27/2020	1.241	mgd
Raw Water Treated	2/28/2020	1.394	mgd
Raw Water Treated	2/29/2020	1.25	mgd
Raw Water Treated	3/1/2020	1.357	mgd
Raw Water Treated	3/2/2020	1.244	mgd
Raw Water Treated	3/3/2020	1.298	mgd
Raw Water Treated	3/4/2020	1.261	mgd
Raw Water Treated	3/5/2020	1.165	mgd
Raw Water Treated	3/6/2020	1.249	mgd
Raw Water Treated	3/7/2020	1.249	mgd
Raw Water Treated	3/8/2020	1.183	mgd
Raw Water Treated	3/9/2020	1.292	mgd
Raw Water Treated	3/10/2020	1.304	mgd
Raw Water Treated	3/11/2020	1.228	mgd
Raw Water Treated	3/12/2020	1.251	mgd
Raw Water Treated	3/13/2020	1.229	mgd
Raw Water Treated	3/14/2020	1.21	mgd
Raw Water Treated	3/15/2020	1.427	mgd
Raw Water Treated	3/16/2020	1.281	mgd
Raw Water Treated	3/17/2020	1.27	mgd
Raw Water Treated	3/18/2020	1.291	mgd
Raw Water Treated	3/19/2020	1.14	mgd
Raw Water Treated	3/20/2020	1.334	mgd
Raw Water Treated	3/21/2020	1.702	mgd
Raw Water Treated	3/22/2020	1.378	mgd
Raw Water Treated	3/23/2020	1.333	mgd
Raw Water Treated	3/24/2020	1.299	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	3/25/2020	1.307	mgd
Raw Water Treated	3/26/2020	1.251	mgd
Raw Water Treated	3/27/2020	1.297	mgd
Raw Water Treated	3/28/2020	1.314	mgd
Raw Water Treated	3/29/2020	1.389	mgd
Raw Water Treated	3/30/2020	1.302	mgd
Raw Water Treated	3/31/2020	1.313	mgd
Raw Water Treated	4/1/2020	1.317	mgd
Raw Water Treated	4/2/2020	1.396	mgd
Raw Water Treated	4/3/2020	1.351	mgd
Raw Water Treated	4/4/2020	1.497	mgd
Raw Water Treated	4/5/2020	1.402	mgd
Raw Water Treated	4/6/2020	1.511	mgd
Raw Water Treated	4/7/2020	1.358	mgd
Raw Water Treated	4/8/2020	1.327	mgd
Raw Water Treated	4/9/2020	1.44	mgd
Raw Water Treated	4/10/2020	1.287	mgd
Raw Water Treated	4/11/2020	1.236	mgd
Raw Water Treated	4/12/2020	1.545	mgd
Raw Water Treated	4/13/2020	1.292	mgd
Raw Water Treated	4/14/2020	1.385	mgd
Raw Water Treated	4/15/2020	1.254	mgd
Raw Water Treated	4/16/2020	1.253	mgd
Raw Water Treated	4/17/2020	1.434	mgd
Raw Water Treated	4/18/2020	1.332	mgd
Raw Water Treated	4/19/2020	1.309	mgd
Raw Water Treated	4/20/2020	1.386	mgd
Raw Water Treated	4/21/2020	1.464	mgd
Raw Water Treated	4/22/2020	1.447	mgd
Raw Water Treated	4/23/2020	1.424	mgd
Raw Water Treated	4/24/2020	1.461	mgd
Raw Water Treated	4/25/2020	1.471	mgd
Raw Water Treated	4/26/2020	1.4006	mgd
Raw Water Treated	4/27/2020	1.397	mgd
Raw Water Treated	4/28/2020	1.411	mgd
Raw Water Treated	4/29/2020	1.424	mgd
Raw Water Treated	4/30/2020	1.236	mgd
Raw Water Treated	5/1/2020	1.302	mgd
Raw Water Treated	5/2/2020	1.141	mgd
Raw Water Treated	5/3/2020	1.627	mgd
Raw Water Treated	5/4/2020	1.554	mgd
Raw Water Treated	5/5/2020	1.537	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	5/6/2020	1.333	mgd
Raw Water Treated	5/7/2020	1.41	mgd
Raw Water Treated	5/8/2020	1.393	mgd
Raw Water Treated	5/9/2020	1.359	mgd
Raw Water Treated	5/10/2020	1.358	mgd
Raw Water Treated	5/11/2020	1.598	mgd
Raw Water Treated	5/12/2020	1.495	mgd
Raw Water Treated	5/13/2020	1.59	mgd
Raw Water Treated	5/14/2020	1.575	mgd
Raw Water Treated	5/15/2020	1.813	mgd
Raw Water Treated	5/16/2020	1.685	mgd
Raw Water Treated	5/17/2020	1.837	mgd
Raw Water Treated	5/18/2020	1.642	mgd
Raw Water Treated	5/19/2020	1.37	mgd
Raw Water Treated	5/20/2020	1.426	mgd
Raw Water Treated	5/21/2020	1.393	mgd
Raw Water Treated	5/22/2020	1.344	mgd
Raw Water Treated	5/23/2020	1.446	mgd
Raw Water Treated	5/24/2020	1.508	mgd
Raw Water Treated	5/25/2020	1.623	mgd
Raw Water Treated	5/26/2020	1.627	mgd
Raw Water Treated	5/27/2020	1.406	mgd
Raw Water Treated	5/28/2020	1.594	mgd
Raw Water Treated	5/29/2020	1.426	mgd
Raw Water Treated	5/30/2020	1.31	mgd
Raw Water Treated	5/31/2020	1.494	mgd
Raw Water Treated	6/1/2020	1.576	mgd
Raw Water Treated	6/2/2020	2.663	mgd
Raw Water Treated	6/3/2020	2.527	mgd
Raw Water Treated	6/4/2020	1.242	mgd
Raw Water Treated	6/5/2020	1.675	mgd
Raw Water Treated	6/6/2020	1.501	mgd
Raw Water Treated	6/7/2020	1.71	mgd
Raw Water Treated	6/8/2020	1.672	mgd
Raw Water Treated	6/9/2020	1.605	mgd
Raw Water Treated	6/10/2020	1.64	mgd
Raw Water Treated	6/11/2020	1.515	mgd
Raw Water Treated	6/12/2020	1.632	mgd
Raw Water Treated	6/13/2020	1.659	mgd
Raw Water Treated	6/14/2020	1.595	mgd
Raw Water Treated	6/15/2020	1.764	mgd
Raw Water Treated	6/16/2020	1.235	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	6/17/2020	1.459	mgd
Raw Water Treated	6/18/2020	1.366	mgd
Raw Water Treated	6/19/2020	1.394	mgd
Raw Water Treated	6/20/2020	1.394	mgd
Raw Water Treated	6/21/2020	1.429	mgd
Raw Water Treated	6/22/2020	1.645	mgd
Raw Water Treated	6/23/2020	1.5	mgd
Raw Water Treated	6/24/2020	1.63	mgd
Raw Water Treated	6/25/2020	1.679	mgd
Raw Water Treated	6/26/2020	1.572	mgd
Raw Water Treated	6/27/2020	1.628	mgd
Raw Water Treated	6/28/2020	1.52	mgd
Raw Water Treated	6/29/2020	1.736	mgd
Raw Water Treated	6/30/2020	1.682	mgd
Raw Water Treated	7/1/2020	1.648	mgd
Raw Water Treated	7/2/2020	1.763	mgd
Raw Water Treated	7/3/2020	1.806	mgd
Raw Water Treated	7/4/2020	1.844	mgd
Raw Water Treated	7/5/2020	1.825	mgd
Raw Water Treated	7/6/2020	1.749	mgd
Raw Water Treated	7/7/2020	1.787	mgd
Raw Water Treated	7/8/2020	1.659	mgd
Raw Water Treated	7/9/2020	1.847	mgd
Raw Water Treated	7/10/2020	1.865	mgd
Raw Water Treated	7/11/2020	1.599	mgd
Raw Water Treated	7/12/2020	1.674	mgd
Raw Water Treated	7/13/2020	2.117	mgd
Raw Water Treated	7/14/2020	1.984	mgd
Raw Water Treated	7/15/2020	1.784	mgd
Raw Water Treated	7/16/2020	1.763	mgd
Raw Water Treated	7/17/2020	1.649	mgd
Raw Water Treated	7/18/2020	1.742	mgd
Raw Water Treated	7/19/2020	1.922	mgd
Raw Water Treated	7/20/2020	1.623	mgd
Raw Water Treated	7/21/2020	1.631	mgd
Raw Water Treated	7/22/2020	1.839	mgd
Raw Water Treated	7/23/2020	1.632	mgd
Raw Water Treated	7/24/2020	1.587	mgd
Raw Water Treated	7/25/2020	1.684	mgd
Raw Water Treated	7/26/2020	1.814	mgd
Raw Water Treated	7/27/2020	1.732	mgd
Raw Water Treated	7/28/2020	1.67	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	7/29/2020	1.814	mgd
Raw Water Treated	7/30/2020	1.737	mgd
Raw Water Treated	7/31/2020	1.651	mgd
Raw Water Treated	8/1/2020	1.674	mgd
Raw Water Treated	8/2/2020	1.668	mgd
Raw Water Treated	8/3/2020	1.824	mgd
Raw Water Treated	8/4/2020	1.711	mgd
Raw Water Treated	8/5/2020	1.705	mgd
Raw Water Treated	8/6/2020	1.591	mgd
Raw Water Treated	8/7/2020	1.719	mgd
Raw Water Treated	8/8/2020	1.697	mgd
Raw Water Treated	8/9/2020	1.725	mgd
Raw Water Treated	8/10/2020	1.85	mgd
Raw Water Treated	8/11/2020	1.673	mgd
Raw Water Treated	8/12/2020	1.651	mgd
Raw Water Treated	8/13/2020	1.572	mgd
Raw Water Treated	8/14/2020	1.597	mgd
Raw Water Treated	8/15/2020	1.765	mgd
Raw Water Treated	8/16/2020	1.71	mgd
Raw Water Treated	8/17/2020	1.628	mgd
Raw Water Treated	8/18/2020	1.716	mgd
Raw Water Treated	8/19/2020	1.595	mgd
Raw Water Treated	8/20/2020	1.703	mgd
Raw Water Treated	8/21/2020	1.624	mgd
Raw Water Treated	8/22/2020	1.706	mgd
Raw Water Treated	8/23/2020	1.633	mgd
Raw Water Treated	8/24/2020	1.717	mgd
Raw Water Treated	8/25/2020	1.816	mgd
Raw Water Treated	8/26/2020	1.706	mgd
Raw Water Treated	8/27/2020	1.976	mgd
Raw Water Treated	8/28/2020	1.789	mgd
Raw Water Treated	8/29/2020	1.661	mgd
Raw Water Treated	8/30/2020	1.978	mgd
Raw Water Treated	8/31/2020	1.697	mgd
Raw Water Treated	9/1/2020	1.585	mgd
Raw Water Treated	9/2/2020	1.693	mgd
Raw Water Treated	9/3/2020	1.684	mgd
Raw Water Treated	9/4/2020	1.739	mgd
Raw Water Treated	9/5/2020	1.81	mgd
Raw Water Treated	9/6/2020	1.735	mgd
Raw Water Treated	9/7/2020	1.759	mgd
Raw Water Treated	9/8/2020	1.711	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	9/9/2020	1.79	mgd
Raw Water Treated	9/10/2020	1.466	mgd
Raw Water Treated	9/11/2020	1.641	mgd
Raw Water Treated	9/12/2020	1.558	mgd
Raw Water Treated	9/13/2020	1.61	mgd
Raw Water Treated	9/14/2020	1.707	mgd
Raw Water Treated	9/15/2020	1.833	mgd
Raw Water Treated	9/16/2020	1.547	mgd
Raw Water Treated	9/17/2020	1.617	mgd
Raw Water Treated	9/18/2020	1.621	mgd
Raw Water Treated	9/19/2020	1.661	mgd
Raw Water Treated	9/20/2020	1.719	mgd
Raw Water Treated	9/21/2020	1.711	mgd
Raw Water Treated	9/22/2020	1.698	mgd
Raw Water Treated	9/23/2020	1.764	mgd
Raw Water Treated	9/24/2020	1.646	mgd
Raw Water Treated	9/25/2020	1.509	mgd
Raw Water Treated	9/26/2020	1.55	mgd
Raw Water Treated	9/27/2020	1.584	mgd
Raw Water Treated	9/28/2020	1.73	mgd
Raw Water Treated	9/29/2020	1.595	mgd
Raw Water Treated	9/30/2020	1.695	mgd
Raw Water Treated	10/1/2020	1.715	mgd
Raw Water Treated	10/2/2020	1.531	mgd
Raw Water Treated	10/3/2020	1.526	mgd
Raw Water Treated	10/4/2020	1.639	mgd
Raw Water Treated	10/5/2020	1.771	mgd
Raw Water Treated	10/6/2020	1.631	mgd
Raw Water Treated	10/7/2020	1.625	mgd
Raw Water Treated	10/8/2020	1.731	mgd
Raw Water Treated	10/9/2020	1.631	mgd
Raw Water Treated	10/10/2020	1.506	mgd
Raw Water Treated	10/11/2020	1.376	mgd
Raw Water Treated	10/12/2020	1.632	mgd
Raw Water Treated	10/13/2020	1.587	mgd
Raw Water Treated	10/14/2020	1.544	mgd
Raw Water Treated	10/15/2020	1.485	mgd
Raw Water Treated	10/16/2020	1.436	mgd
Raw Water Treated	10/17/2020	1.566	mgd
Raw Water Treated	10/18/2020	1.765	mgd
Raw Water Treated	10/19/2020	1.692	mgd
Raw Water Treated	10/20/2020	1.617	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	10/21/2020	1.592	mgd
Raw Water Treated	10/22/2020	1.576	mgd
Raw Water Treated	10/23/2020	1.455	mgd
Raw Water Treated	10/24/2020	1.566	mgd
Raw Water Treated	10/25/2020	1.652	mgd
Raw Water Treated	10/26/2020	1.903	mgd
Raw Water Treated	10/27/2020	1.821	mgd
Raw Water Treated	10/28/2020	1.972	mgd
Raw Water Treated	10/29/2020	1.656	mgd
Raw Water Treated	10/30/2020	1.945	mgd
Raw Water Treated	10/31/2020	1.949	mgd
Raw Water Treated	11/1/2020	2.027	mgd
Raw Water Treated	11/2/2020	2.036	mgd
Raw Water Treated	11/3/2020	1.968	mgd
Raw Water Treated	11/4/2020	1.543	mgd
Raw Water Treated	11/5/2020	1.597	mgd
Raw Water Treated	11/6/2020	1.614	mgd
Raw Water Treated	11/7/2020	1.53	mgd
Raw Water Treated	11/8/2020	1.611	mgd
Raw Water Treated	11/9/2020	1.621	mgd
Raw Water Treated	11/10/2020	1.639	mgd
Raw Water Treated	11/11/2020	1.424	mgd
Raw Water Treated	11/12/2020	1.493	mgd
Raw Water Treated	11/13/2020	1.339	mgd
Raw Water Treated	11/14/2020	1.482	mgd
Raw Water Treated	11/15/2020	1.402	mgd
Raw Water Treated	11/16/2020	1.521	mgd
Raw Water Treated	11/17/2020	1.526	mgd
Raw Water Treated	11/18/2020	1.597	mgd
Raw Water Treated	11/19/2020	1.612	mgd
Raw Water Treated	11/20/2020	1.426	mgd
Raw Water Treated	11/21/2020	1.338	mgd
Raw Water Treated	11/22/2020	1.558	mgd
Raw Water Treated	11/23/2020	1.479	mgd

Cooleemee Water Treatment Plant
Davie County Public Utilities
Monthly Operating Reports
Raw Water Treated (2019-2020)

Parameter	Date	Value	Units
Raw Water Treated	11/24/2020	1.351	mgd
Raw Water Treated	11/25/2020	1.406	mgd
Raw Water Treated	11/26/2020	1.519	mgd
Raw Water Treated	11/27/2020	1.481	mgd
Raw Water Treated	11/28/2020	1.327	mgd
Raw Water Treated	11/29/2020	1.44	mgd
Raw Water Treated	11/30/2020	1.559	mgd
Raw Water Treated	12/1/2020	1.361	mgd
Raw Water Treated	12/2/2020	1.366	mgd
Raw Water Treated	12/3/2020	1.43	mgd
Raw Water Treated	12/4/2020	1.4	mgd
Raw Water Treated	12/5/2020	1.336	mgd
Raw Water Treated	12/6/2020	1.442	mgd
Raw Water Treated	12/7/2020	1.609	mgd
Raw Water Treated	12/8/2020	1.432	mgd
Raw Water Treated	12/9/2020	1.238	mgd
Raw Water Treated	12/10/2020	1.484	mgd
Raw Water Treated	12/11/2020	1.407	mgd
Raw Water Treated	12/12/2020	1.401	mgd
Raw Water Treated	12/13/2020	1.448	mgd
Raw Water Treated	12/14/2020	1.382	mgd
Raw Water Treated	12/15/2020	1.449	mgd
Raw Water Treated	12/16/2020	1.367	mgd
Raw Water Treated	12/17/2020	1.339	mgd
Raw Water Treated	12/18/2020	1.382	mgd
Raw Water Treated	12/19/2020	1.212	mgd
Raw Water Treated	12/20/2020	1.469	mgd
Raw Water Treated	12/21/2020	1.399	mgd
Raw Water Treated	12/22/2020	1.498	mgd
Raw Water Treated	12/23/2020	1.42	mgd
Raw Water Treated	12/24/2020	1.335	mgd
Raw Water Treated	12/25/2020	1.34	mgd
Raw Water Treated	12/26/2020	1.416	mgd
Raw Water Treated	12/27/2020	1.569	mgd
Raw Water Treated	12/28/2020	1.75	mgd
Raw Water Treated	12/29/2020	1.518	mgd
Raw Water Treated	12/30/2020	1.376	mgd
Raw Water Treated	12/31/2020	1.407	mgd
	2020 Average	1.51	mgd
	2020 Max	2.66	mgd

Total Average 1.53 mgd

Total Max 2.66 mgd

Appendix B: United States (US) 2000 and 2010 Census Data

Profile of General Demographic Characteristics: 2000

Note: This is a modified view of the original table produced by the U.S. Census Bureau. This download or printed version may have missing information from the original table.

Label	Davie County, North Carolina		Mocksville town, North Carolina	
	Number	Percent	Number	Percent
▼ Total population	34,835	100.0	4,178	100.0
▼ SEX AND AGE				
Male	17,149	49.2	1,983	47.5
Female	17,686	50.8	2,195	52.5
Under 5 years	2,247	6.5	278	6.7
5 to 9 years	2,469	7.1	277	6.6
10 to 14 years	2,369	6.8	258	6.2
15 to 19 years	2,075	6.0	287	6.9
20 to 24 years	1,765	5.1	252	6.0
25 to 34 years	4,588	13.2	587	14.0
35 to 44 years	5,647	16.2	570	13.6
45 to 54 years	5,200	14.9	494	11.8
55 to 59 years	1,981	5.7	188	4.5
60 to 64 years	1,687	4.8	211	5.1
65 to 74 years	2,588	7.4	344	8.2
75 to 84 years	1,664	4.8	305	7.3
85 years and over	555	1.6	127	3.0

Table Notes

Profile of General Demographic Characteristics: 2000

Survey/Program:

Decennial Census

Year:

2000

Table ID:

DP1

Source: U.S. Census Bureau, Census 2000 Summary File 2, Matrices PCT3, PCT4, PCT8, PCT9, PCT10, PCT11, PCT14, PCT18, PCT19, PCT23, PCT26, HCT2, and HCT5.

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see <http://www.census.gov/prod/cen2000/doc/sf2.pdf>

When a race or ethnic group is selected, the data in this table refer to the race, Hispanic or Latino origin, or American Indian or Alaska Native tribe of the householder.

(X) Not applicable.

AGE AND SEX

Note: This is a modified view of the original table produced by the U.S. Census Bureau. This download or printed version may have missing information from the original table.

Label	Davie County, North Carolina		Mocksville town, North Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error
Total population	40,581	*****	4,952	±21
▼ AGE				
Under 5 years	5.8%	±0.1	5.2%	±2.3
5 to 9 years	6.7%	±0.6	5.0%	±2.1
10 to 14 years	7.3%	±0.6	6.4%	±2.1
15 to 19 years	6.6%	±0.4	9.9%	±2.6
20 to 24 years	4.2%	±0.3	6.3%	±2.0
25 to 29 years	4.6%	±0.3	5.3%	±2.2
30 to 34 years	5.3%	±0.3	6.1%	±2.3
35 to 39 years	7.0%	±0.7	5.7%	±2.2
40 to 44 years	7.6%	±0.8	8.5%	±2.4
45 to 49 years	8.2%	±0.3	8.0%	±2.4
50 to 54 years	7.7%	±0.2	6.6%	±2.4
55 to 59 years	6.7%	±0.7	4.6%	±2.1
60 to 64 years	6.6%	±0.7	3.4%	±1.5
65 to 69 years	5.2%	±0.5	5.3%	±2.1
70 to 74 years	3.5%	±0.5	3.6%	±1.8

Table Notes

AGE AND SEX

Survey/Program:

American Community Survey

Year:

2010

Estimates:

5-Year

Table ID:

S0101

Explanation of Symbols:

An "***" entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.

An "-" entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.

An "-" following a median estimate means the median falls in the lowest interval of an open-ended distribution.

An "+" following a median estimate means the median falls in the upper interval of an open-ended distribution.

An "****" entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.

An "*****" entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.

An "N" entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.

An "(X)" means that the estimate is not applicable or not available.

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Data and Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

Estimates of urban and rural population, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2000 data. Boundaries for urban areas have not been updated since Census 2000. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

While the 2006-2010 American Community Survey (ACS) data generally reflect the December 2009 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

The child dependency ratio is derived by dividing the population under 18 by the 18-to-64 population and multiplying by 100.

The old-Age dependency ratio is derived by dividing the population 65 and over by the 18-to-64 population and multiplying by 100.

The age dependency ratio is derived by dividing the combined under-18 and 65-And-over populations by the 18-to-64 population and multiplying by 100.

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, for 2010, the 2010 Census provides the official counts of the population and housing units for the nation, states, counties, cities and towns. For 2006 to 2009, the Population Estimates Program provides intercensal estimates of the population for the nation, states, and counties.

Source: U.S. Census Bureau, 2006-2010 American Community Survey

Appendix C: Present Worth Analysis Tables

Figure E.1 Example of Present Worth Analysis Input

Enter information into the gray areas. For the Preferred Alternative, place the word Preferred in parentheses after the alternative name.

Project Name:	Davie County Water Supply Alternative
LGU Name:	Davie County and Town of Mocksville
Alternative 1 Name:	Alternative 2
Alternative 2 Name:	Alternative 3, Phasing 1 Option
Alternative 3 Name:	Alternative 3, Phasing 2 Option
Alternative 4 Name:	Alternative 3, Phasing 3 Option
Alternative 5 Name:	
Alternative 6 Name:	

Table 5.2.7. Present Value of Operations and Maintenance Costs (Years 1-10)
Davie County Water Supply Alternative
Davie County and Town of Mocksville
Alternative 2

Complete the cells shown in gray below.													
Current Inflation Rate Based on Municipal Cost Index: 3.29%										EPA Discount Rate:		1.500%	
Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:									
				1	2	3	4	5	6	7	8	9	10
Davie County Treatment Costs	\$1,500.00	MG	1,205	\$1,838,576	\$1,870,963	\$1,903,921	\$1,937,459	\$1,971,588	\$2,006,318	\$2,041,660	\$2,077,624	\$2,114,222	\$2,151,465
Purchased Water Costs	\$2,550.00	MG	1,095	\$2,841,436	\$2,891,489	\$2,942,423	\$2,994,255	\$3,047,000	\$3,100,673	\$3,155,293	\$3,210,874	\$3,267,434	\$3,324,991
Total Present Value of Yearly O&M Expenses (Years 1-10):				\$4,680,013	\$4,762,452	\$4,846,344	\$4,931,714	\$5,018,588	\$5,106,991	\$5,196,952	\$5,288,498	\$5,381,657	\$5,476,456

Table 5.2.8. Present Value of Operations and Maintenance Costs (Years 11-20)
Davie County Water Supply Alternative
Davie County and Town of Mocksville
Alternative 2

Current Inflation Rate Based on Municipal Cost Index: 3.29%				EPA Discount Rate: 1.500%									
Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:									
				11	12	13	14	15	16	17	18	19	20
Davie County Treatment Costs	\$1,500.00	MG	1,205	\$2,189,363	\$2,227,930	\$2,267,175	\$2,307,112	\$2,347,753	\$2,389,109	\$2,431,194	\$2,474,020	\$2,517,601	\$2,561,949
Purchased Water Costs	\$2,550.00	MG	1,095	\$3,383,562	\$3,443,164	\$3,503,816	\$3,565,537	\$3,628,345	\$3,692,259	\$3,757,300	\$3,823,485	\$3,890,837	\$3,959,375
Total Present Value of Yearly O&M Expenses (Years 11-20):				\$5,572,925	\$5,671,094	\$5,770,992	\$5,872,649	\$5,976,098	\$6,081,368	\$6,188,493	\$6,297,505	\$6,408,438	\$6,521,324
Total Present Value of Annual O&M Costs (Life of Project):													#####

Table 5.2.10. Present Value of Intermittent Operations and Maintenance Costs (Years 11-20)
Davie County Water Supply Alternative
Davie County and Town of Mocksville
Alternative 2

Current Inflation Rate Based on Municipal Cost Index: 3.29%

EPA Discount Rate: 1.500%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:										
				11	12	13	14	15	16	17	18	19	20	
Total Present Value of Intermittent Operations & Maintenance Costs (Years 11-20):				\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
													Total Present Value of Intermittent Operations & Maintenance Costs (Life of Project):	\$0

Table 5.2.17. Present Value of Operations and Maintenance Costs (Years 1-10)
Davie County Water Supply Alternative
Davie County and Town of Mocksville
Alternative 3, Phasing 1 Option

Complete the cells shown in gray below.

Current Inflation Rate Based on Municipal Cost Index: 3.29%				EPA Discount Rate: 1.500%									
Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:									
				1	2	3	4	5	6	7	8	9	10
Davie County Treatment Costs	\$1,500.00	MG	1,278	\$1,950,005	\$1,984,355	\$2,019,310	\$2,054,881	\$2,091,078	\$2,127,913	\$2,165,397	\$2,203,541	\$2,242,357	\$2,281,857
Total Present Value of Yearly O&M Expenses (Years 1-10):				\$1,950,005	\$1,984,355	\$2,019,310	\$2,054,881	\$2,091,078	\$2,127,913	\$2,165,397	\$2,203,541	\$2,242,357	\$2,281,857

Table 5.2.20. Present Value of Intermittent Operations and Maintenance Costs (Years 11-20)

Davie County Water Supply Alternative

Davie County and Town of Mocksville

Alternative 3, Phasing 1 Option

Current Inflation Rate Based on Municipal Cost Index: 3.29%

EPA Discount Rate: 1.500%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:										
				11	12	13	14	15	16	17	18	19	20	
Total Present Value of Intermittent Operations & Maintenance Costs (Years 11-20):				\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
													Total Present Value of Intermittent Operations & Maintenance Costs (Life of Project):	\$0

Table 5.2.28. Present Value of Operations and Maintenance Costs (Years 11-20)

Davie County Water Supply Alternative
 Davie County and Town of Mocksville
 Alternative 3, Phasing 2 Option

Current Inflation Rate Based on Municipal Cost Index: 3.29%				EPA Discount Rate: 1.500%										
Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:										
				11	12	13	14	15	16	17	18	19	20	
Davie County Treatment Costs	\$1,500	MG	1,278	\$2,322,052	\$2,362,956	\$2,404,580	\$2,446,937	\$2,490,041	\$2,533,903	\$2,578,539	\$2,623,961	\$2,670,182	\$2,717,218	
Total Present Value of Yearly O&M Expenses (Years 11-20):				\$2,322,052	\$2,362,956	\$2,404,580	\$2,446,937	\$2,490,041	\$2,533,903	\$2,578,539	\$2,623,961	\$2,670,182	\$2,717,218	
										Total Present Value of Annual O&M Costs (Life of Project):				\$46,271,063

Table 5.2.30. Present Value of Intermittent Operations and Maintenance Costs (Years 11-20)

Davie County Water Supply Alternative

Davie County and Town of Mocksville

Alternative 3, Phasing 2 Option

Current Inflation Rate Based on Municipal Cost Index: 3.29%

EPA Discount Rate: 1.500%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:										
				11	12	13	14	15	16	17	18	19	20	
Total Present Value of Intermittent Operations & Maintenance Costs (Years 11-20):				\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
													Total Present Value of Intermittent Operations & Maintenance Costs (Life of Project):	\$0

Table 5.2.38. Present Value of Operations and Maintenance Costs (Years 11-20)

**Davie County Water Supply Alternative
Davie County and Town of Mocksville
Alternative 3, Phasing 3 Option**

Current Inflation Rate Based on Municipal Cost Index: 3.29%				EPA Discount Rate: 1.500%										
Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:										
				11	12	13	14	15	16	17	18	19	20	
Purchased Water Costs	\$2,550	MG	1,278	\$3,947,489	\$4,017,025	\$4,087,786	\$4,159,793	\$4,233,069	\$4,307,636	\$4,383,516	\$4,460,733	\$4,539,310	\$4,619,271	
Total Present Value of Yearly O&M Expenses (Years 11-20):				\$3,947,489	\$4,017,025	\$4,087,786	\$4,159,793	\$4,233,069	\$4,307,636	\$4,383,516	\$4,460,733	\$4,539,310	\$4,619,271	
										Total Present Value of Annual O&M Costs (Life of Project):				\$78,660,808

Table 5.2.40. Present Value of Intermittent Operations and Maintenance Costs (Years 11-20)

Davie County Water Supply Alternative

Davie County and Town of Mocksville

Alternative 3, Phasing 3 Option

Current Inflation Rate Based on Municipal Cost Index: 3.29%

EPA Discount Rate: 1.500%

Component	Unit Cost	Unit	Quantity	Present Value of O&M Costs for Year:										
				11	12	13	14	15	16	17	18	19	20	
Total Present Value of Intermittent Operations & Maintenance Costs (Years 11-20):				\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
				Total Present Value of Intermittent Operations & Maintenance Costs (Life of Project):										\$0

Table 5.2.62. Total Present Worth for Feasible Alternatives						
Davie County Water Supply Alternative						
Davie County and Town of Mocksville						
	Capital Costs	Replacement Costs Present Worth	O&M Costs Present Worth			Total Present Worth
			Annual	Intermittent	Total	
Alternative 2	\$30,678,550	\$0	\$111,050,552	\$0	\$111,050,552	\$141,729,102
Alternative 3, Phasing 1 Option	\$25,287,350	\$0	\$46,271,063	\$0	\$46,271,063	\$71,558,413
Alternative 3, Phasing 2 Option	\$25,287,350	\$0	\$46,271,063	\$0	\$46,271,063	\$71,558,413
Alternative 3, Phasing 3 Option	\$21,492,350	\$0	\$78,660,808	\$0	\$78,660,808	\$100,153,158
0	\$0	\$0	\$0	\$0	\$0	\$0
0	\$0	\$0	\$0	\$0	\$0	\$0

Appendix D: March 2021 SHPO Concurrence Letter



**North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office**

Ramona M. Bartos, Administrator

Governor Roy Cooper

Secretary D. Reid Wilson

March 10, 2021

Tim Devine
Hazen and Sawyer
4011 West Chase Boulevard, Suite 300
Raleigh, NC 27607

tdevine@hazensawsawyer.com

Re: Install 18,000 LF water transmission main between the Towns of Cooleemee & Mocksville, Davie County, ER 21-0311

Dear Mr. Devine:

Thank you for your email of January 21, 2021, regarding the above-referenced undertaking. We have reviewed your submission and offer the following comments. We apologize for the delay in our response and any inconvenience it may have caused.

Portions of the project are within the National Register-listed Cooleemee Mill Historic District (DE0763).

Due to the nature of the proposed work, the project will have no adverse effect on the historic district based on the following conditions being implemented.

- Efforts should be made to minimize disturbances caused by using machinery during staging and operations.
- Areas impacted by construction activities, should be returned to pre-construction condition upon project completion. Any plans to not return impacted areas within the historic districts or properties to pre-construction condition should be submitted to us for review and comment.
- Photographs of the work completed within the historic district should be submitted to us for review and comment.

We strongly recommend that project management consults our free GIS base web-mapping platform, HPOWEB 2.0, to help locate the historic properties listed above and to ensure that the above conditions are met. HPOWEB 2.0:

<https://nc.maps.arcgis.com/apps/webappviewer/index.html?id=79ea671ebdcc45639f0860257d5f5ed7>

The project area is considered as having relatively low probability for containing a significant, intact National Register of Historic Places-(NRHP-)eligible site. No archaeological survey is recommended.

We do note that the Liberty United Methodist Church Cemetery is located on the south side of Gladstone Road. It is unclear which side of the road the water line is proposed to go, we therefore recommend it be constructed on the north side of the road to avoid impacts to the cemetery.

Please note that cemeteries are protected under NC General Statutes Chapter 14-148 and 14-149, and are afforded consideration under Chapter 65. If unmarked human skeletal remains are encountered during construction, the provisions of North Carolina General Statute Chapter 70, Article 3 apply. Construction activities should immediately cease and the county medical examiner should be contacted.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,



for Ramona Bartos, Deputy
State Historic Preservation Officer

Appendix E: Financial Analysis Tables

Enter information into the gray areas.

Project Name:	Water Supply Improvements
Applicant/LGU Name:	Davie County and Town of Mocksville
Preferred Alternative Name:	Alternative 3, Phase Option 2

**Table 8.1. Applicant's/LGUs Financial Condition
Water Supply Improvements
Alternative 3, Phase Option 2**

Utility Bill as Percent of Median Household Income

Use the pulldown menu to select the type of rate structure used for water and sewer. If using a rate structure other than uniform, then there is no need to complete the base charge (charge and volume) or volumetric charge.

	Sewer Rate Structure	Water Rate Structure
Rate Structure:	Uniform	Uniform
Base Charge:	\$47.94	\$27.80
Thousands of Gallons in Base Charge:	3	3
Volumetric Charge per 1,000 gallons:	\$8.05	\$5.35
Monthly Bill for 5,000 gallons:	\$64.03	\$38.50
Combined Monthly Water and Sewer Bill for 5,000 gallons:	\$102.53	
Median Household Income:	\$55,165	
Monthly Median Household Income for LGU:	\$4,597	
Bill as % of Median Household Income:	1.39%	0.84%
Overall Bill as % of Median Household Income:	2.23%	

Additional Information if needed (see Subchapter 8.1 of Part B of the guidance).

Sewer Rate Structure is based on weighted average of Cooleemee (25%), East Davie (25%), and Mocksville (50%) Sewer rates.

Median Household income for LGU is the service area weighted average assuming 70% Davie County and 30% Town of Mocksville.

Table 8.2. Funding Distribution

Water Supply Improvements

Davie County and Town of Mocksville

Alternative 3, Phase Option 2

Enter data into the gray areas. Where applicable, use the pulldown menus as shown by the arrows.

	Funding Source^a	Amount	Funding Type	Specified Interest Rate from LOIF^b (if applicable)	Repayment Period (if applicable)
Main Division Funding:	DWSRF-PF	\$2,000,000	Principal Forgiveness	N/A	N/A
Funding 1:	NCRC Grant	\$1,123,807	Grant	N/A	N/A
Funding 2:	DWSRF	\$18,000,000	Loan	0.100%	20
Funding 3:	Bonds	\$4,163,543	Loan	3.000%	20
Funding 4:					
Funding 5:					
Closing/Administrative Fee(s):		\$416,857	If Other, list:		
Total Funded Amount (minus applicable closing/administrative fee[s]):		\$25,287,350			
Total Project Cost (with closing/administrative fee[s]):		\$25,704,207			
^a For SRP grants, grant administrative fee is 1.5% of Total grant award.					
For SRP and SRF loans, loan administrative fee is 2.0% of Total loan award.					
^b LOIF is Letter of Intent to Fund issued by the Division.					

Table 8.3. Year 1 Interest and Repayment

Water Supply Improvements

Davie County and Town of Mocksville

Alternative 3, Phase Option 2

	Funding Source	Total Funding Amount	Year 1 Principal Payment	Year 1 Interest Payment	Year 1 Total Payment (Principal + Interest)
Main DWI Funding :	DWSRF-PF	\$2,000,000			
Funding 1:	NCRC Grant	\$1,123,807			
Funding 2:	DWSRF	\$18,000,000	\$900,000	\$18,000	\$918,000
Funding 3:	Bonds	\$4,163,543	\$208,177	\$124,906	\$333,083
Funding 4:					
Funding 5:					
		Total Payment @ Specified Interest Rate(s)^a:			\$1,251,083
^a The interest rates are shown on Table 8.2.					

Table 8.4. User Fee Increase Due to Project
Water Supply Improvements
Davie County and Town of Mocksville
Alternative 3, Phase Option 2

Select Customer Type for Financing Project ^c		Average Water Usage Per Month (gallons)	Number of Connections	Total Monthly Water Usage by Customer Type (gallons)	Total Monthly Water Usage for Customer Base (gallons):		
<input checked="" type="checkbox"/>	Residential	4,869	13,747	66,930,019	# of 5,000 Gallon Units to Finance Project:	82,140,022 16,428	
<input checked="" type="checkbox"/>	Non-Residential	16,975	896	15,210,003	Year 1 O&M Expenses Due to Project:	\$1,950,005	
	Funding Source	Year 1 Annual Repayment	Year 1 Annual O&M Costs	Total Year 1 Annual Costs @ Specified Interest Rate	Year 1 Monthly Costs @ Specified Interest Rate	Monthly Cost/ 5,000 Gallons Due to Project @ Specified Interest Rate (All Users)	Monthly Cost/5,000 Gallons Due to Project @ Specified Interest Rate (Residential Users Only)
DWI Main Funding Source:	DWSRF-PF		\$1,950,005	\$1,950,005	\$162,500	\$9.89	\$12.14
Funding Source 1:	NCRC Grant		 				
Funding Source 2:	DWSRF	\$918,000	 	\$918,000	\$76,500	\$4.66	\$5.71
Funding Source 3:	Bonds	\$333,083	 	\$333,083	\$27,757	\$1.69	\$2.07
Funding Source 4:			 				
Funding Source 5:			 				
Total Year 1 Annual Cost @ Specified Interest Rate:				\$3,201,089			
Total Year 1 Monthly Cost @ Specified Interest Rate:					\$266,757		
Total Monthly Cost to Treat 5,000 Gallons @ Specified Interest Rate:						\$16.24	
Total Monthly Cost to Treat 5,000 Gallons @ Specified Interest Rate (Residential Users Only):							\$19.93

**Table 8.5. Impacts to User Rates
Water Supply Improvements
Davie County and Town of Mocksville
Alternative 3, Phase Option 2**

Current Sewer Bill (\$/5,000 gallons):	\$64.03		
Current Water Bill (\$/5,000 gallons):	\$38.50		
Current - Combined Water & Sewer Bill (\$/5,000 gallons):	\$102.53		
	Funding Source	User Rate Increase Due to Project @ Specified Interest Rate (All Users)	User Rate Increase Due to Project @ Specified Rate (Residential Users Only)
Main IFS Funding Source:	DWSRF-PF	\$9.89	\$12.14
Funding Source 1:	NCRC Grant		
Funding Source 2:	DWSRF	\$4.66	\$5.71
Funding Source 3:	Bonds	\$1.69	\$2.07
Funding Source 4:			
Funding Source 5:			
Total User Rate Increase Due to DWI Loan(s) (\$/5,000 gal.):		\$9.89	\$12.14
Total Increase Due to All Loans(s) (\$/5,000 gal.):		\$16.24	\$19.93
New Sewer Bill Due to DWI Loan(s) (\$/5,000 gal.):		\$73.92	\$76.17
New Sewer Bill Due to All Loan(s) (\$/5,000 gal.):		\$80.27	\$83.96
Percent Change in Sewer Bill Due to DWI Loan(s):		15.45%	18.96%
Percent Change in Sewer Bill Due to All Loan(s):		25.36%	31.12%
New Sewer & Water Bills Due to DWI Loan(s) (\$/5,000 gal.):		\$112.42	\$114.67
New Water & Sewer Bills Due to All Loan(s) (\$/5,000 gal.):		\$118.77	\$122.46
Percent Change in Sewer & Water Bills Due to DWI Loan(s):		9.65%	9.65%
Percent Change in Sewer & Water Bills Due to All Loan(s):		15.84%	19.44%

^aChange in User Fee to finance DWI Loan.

^bChange in User Fee to finance ALL funding sources.

**Table 8.6. Impact to Bills Due to Project
Water Supply Improvements
Davie County and Town of Mocksville
Alternative 3, Phase Option 2**

Sewer Bill as % Monthly MHI:		1.39%	Water Bill as % Monthly MHI:	0.84%	
Current Sewer Bill (\$/5,000 gal.):		64.03	Current Water Bill (\$/5,000 gal.):	\$38.50	
Current Sewer & Water Bill (\$/5,000 gal.):		102.53	Sewer & Water Bill as % Monthly MHI:	2.23%	
Monthly MHI for LGU:		\$4,597			
		Sewer Bill Due to DWI Loans	Sewer Bill Due to All Loans	Water & Sewer Bills Due to DWI Loans	Water & Sewer Bills Due to All Loans
Specified Interest Rate (All Users)	New	\$73.92	\$80.27	\$112.42	\$118.77
	New %MHI Due to Project	1.61%	1.75%	2.45%	2.58%
	Potentially Significant Impact?	No	No	No	No
Specified Interest Rate (Residential Users Only)	New	\$76.17	\$83.96	\$114.67	\$122.46
	New %MHI Due to Project	1.66%	1.83%	2.49%	2.66%
	Potentially Significant Impact?	No	No	No	No

If the user fee increases will be significantly increased, discuss why the LGU has determined to proceed with the project.

If a different financial model has been used to determine project financing, then discuss how the Applicant will accommodate the project in terms of financing it.

Appendix F: NCDEQ ER-EID Comments and Responses

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
SHADI ESKAF
Director



August 26, 2021

David Bone, County Manager
Davie County
123 S. Main Street
Mocksville, NC 27028

Subject: Request for Additional Information
Davie County
Town of Mocksville Water Supply
Improvements
Projects Nos. 2018 and SRP-D-0203

Dear Mr. Bone:

The Division of Water Infrastructure (Division) has completed its review of the "Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project" Engineering Report (ER) and Environmental Information Documentation (EID). This letter transmits the comments resulting from this review to your engineer for clarification and resolution. Our goal is to approve the ER/EID as soon as possible. Please provide a response within 30 days of this letter. **Projects not meeting required funding deadlines will lose assurance of funding.**

Upon receipt of satisfactory responses from your engineer to our comments, we will complete our review of the project documents. If you have any questions concerning the environmental review comments, please contact Susan C. Kubacki by email at susan.kubacki@ncdenr.gov or (919) 707-9181. If you have any questions concerning the technical review comments, please contact Robin Peele, by phone at (919) 707-9056 or by email at robin.peele@ncdenr.gov.

Sincerely,

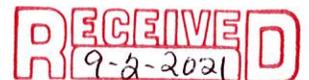
David Giachini, for

Vincent Jude Tomaino, PE, Supervisor
Drinking Water Projects Unit

Attachments: Request for Additional Information
Internal DEQ Comments



North Carolina Department of Environmental Quality | Division of Water Infrastructure
512 N. Salisbury Street | 1633 Mail Service Center | Raleigh, North Carolina 27699-1633
919.707.9160



David Bone, County Manager
Projects Nos. 2018 and SRP-D-0203
August 26, 2021
Page 2 of 2

cc: Nicole Johnson, PE, Senior Associate, Hazen and Sawyer, Raleigh
Vincent Jude Tomaino, PE, DWI (via email)
Susan C. Kubacki, DWI (via email)
Robin Peele, DWI (via email)
SRF File (EREID/ERIL)

Request for Additional Information

A. General Comments (no response needed)

1. If the Engineering Report is not approved by May 2, 2022, you must request a funding deadline extension, or the project will lose assurance of funding.
2. Provide a response to all comments on a "Comment for Comment" basis. You can include this as an Appendix in the Revised Engineering Report.
3. Please highlight all changes with different color text in the Engineering Report body.
4. Submit two hardcopies and one digital (on CD, DVD or Flash Drive) copy of the revised report incorporating all changes.

B. Technical Comments

5. Please include the PWSID number on the cover page of the Engineering Report/
Environmental Information Document.
6. Please provide the Drought Bill Information "Certification regarding the water system efficiency requirements of § NCGS 143 355.4(b)" with the initial submittal of an ER/EID for a Drinking Water project that extends waterlines or expands treatment capacity (DWSRF, DWSRP), see attachment or find at the link provided below:
https://files.nc.gov/ncdeq/WI/Planning/Drought_Bill_Cert_170216.docx
7. Please provide a detailed project budget. The budget must be signed and sealed by a PE.

C. Environmental Comments

1. General: Based on review of the ER/EID as submitted, it appears that the environmental review covers the construction of the Cooleemee WTP and the transmission main, not the future phases of the Sparks WTP expansion and improvements needed for interconnection with Davidson Water, Inc. Note that the Division expects that the Finding of No Significant Impact (FONSI) anticipated to result from this environmental review will cover only the Cooleemee WTP and the transmission main construction. Future phases may be subject to additional environmental review.
2. Section 5.7 Forest Resources: Under Subsection 5.7.2, please indicate approximately how much land is expected to be cleared of trees to accommodate construction.
3. Section 5.8 Wetlands and Streams: Under Subsection 5.8.2, please provide additional detail on the temporary impacts to Peeler Creek related to installation of the waterline. If this is a stream crossing, include what construction method will be used for the crossing and include a reference to a figure showing the location of the crossing.

4. **Section 5.9 Water Resources:** This section will need revisions to address comments from the Division of Water Resources (see Comment 5 below).
5. **Agency Comments:** Please review the attached comments from the Department's review of the project. All comments should be addressed, and necessary revisions made to the ER/EID. You may contact the commenters directly as needed with any questions regarding these comments. Additional comments are anticipated from the U.S. Fish & Wildlife Service and will be forwarded when received.



NORTH CAROLINA
Environmental Quality

ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

To: Susan Kubacki
Environmental Assessment Coordinator
Division of Water Infrastructure
Environmental and Special Projects Unit

From: Lyn Hardison
Division of Environmental Assistance and Customer Service
Washington Regional Office

RE: Environmental Review/Engineering Report
Davie County Public Utilities and Town of Mocksville -
Proposal to replace the existing 2.6-mgd Cooleemee WTP
with a new 3.5-mgd facility, DEQ#1824.
Davie County

Date: August 5, 2021

The NC Department of Public Safety Emergency Management requested to participate in NC Department Environmental Quality internal review process and it was granted essentially to help expedite the environmental document for the applicant.

Both departments have completed the review of the proposal referenced project. Once the applicant has addressed the concerns provided, please give us another opportunity to review the report. The comments are attached for review.

We appreciate the opportunity to respond during the Department's internal review.

Thank you for the opportunity to respond.

Attachments



North Carolina Department of Environmental Quality
217 West Jones Street | 1601 Mail Service Center | Raleigh, North Carolina 27699-1601
919.707.8600

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
S. DANIEL SMITH
Director



July 22, 2021

MEMORANDUM

To: Lyn Hardison
Department of Environmental Quality

From: David Wainwright *DW*
SEPA Coordinator, Division of Water Resources

Subject: SCH # 1824
Environmental Review/Engineering Report
Town of Mocksville and Davie County Public Utilities Proposed Replacement of the
Cooleemee Water Treatment Plant and Other Improvements
Davie County

The Division of Water Resources' (DWR) Central Office staff have reviewed the Environmental Review/Engineering Report for the Town of Mocksville and Davie County Public Utilities proposed replacement of the Cooleemee Water Treatment Plant. The preferred alternative would construct a new 3.5 MGD WTP to replace the existing 2.6 MGD Cooleemee WTP which, along with the existing 3.0 MGD Hugh A. Lagle WTP, will both be decommissioned after construction. To supplement the water needs the Town will purchase a limited amount of water from Davidson Water. The project will also upgrade 18,500 lf of waterline to address existing hydraulic deficiencies.

Staff provides the following comments:

Water Supply Planning Branch (Vardry Austin – Vardry.Austin@ncdenr.gov or 919-707-9002):

- Please address the following:
 - Pg. 2-2: The 2020 annual average daily demand in Table 2-1 is inconsistent with Appendix A.
 - Pg. 2-8: The LWSP shows a different plant capacity for Mocksville than what is shown in Table 2-8. Make corrections to this table as needed and all associated text.
 - Pg. 2-8: In the 1st paragraph after Table 2-8, max day demands should reflect data in the LWSPs. Make corrections as needed.
 - Pg. 2-10: The last line in Table 2-9 is inconsistent with the LWSP for Mocksville. Make changes to this table as needed.
 - Pg. 2-11: Data in Table 2-11 is inconsistent with the LWSPs. Make corrections to this table as needed.
 - Pg. 2-12: 4th paragraph, change 11,500 residential "customers" to "connections".



- Pg. 2-13: Table 2-12 note#2, change 350 "customers" to "connections".
- Pg. 2-14: Provide the analysis for how the projected demand was determined for commercial, industrial, institutional, and system process uses in Table 2-14.
- Include "Unaccounted-for" water demand when calculating total water demand.

Water Supply Planning Branch (Harold Brady – Harold.M.Brady@ncdenr.gov or 919-707-9005):

- According to the USGS, the stream flows are adequate to sustainably handle the additional withdrawals from the South Yadkin River. Please consider including the stream flow statistics, particularly the low-flow statistics (i.e., 7Q10) from USGS, in Section 5-8-2, as it is critical environmental information.

Classifications, Standards & Rules Review Branch (Elizabeth Kountis - Elizabeth.Kountis@ncdenr.gov or 919-707-3685):

- There are several clarifications that should be made regarding the surface water classification discussion in Section 5.9.1, Existing Conditions within the Water Resources section. Please consider the following:

DWR classifies surface waters of the state based on ~~their existing or proposed~~ uses of waters. All named ~~the classified~~ streams within the SA are classified as C, B, WS-III, WS-IV, or WS-V. The WS-V classification is assigned to waters protected as water supplies and which are generally upstream and draining to Class WS-IV waters. ~~Class WS-III and WS-IV waters are also~~ or waters used by industry to supply their employees with drinking water or as water ~~waters~~ formerly used as a water supply. Class WS-III and WS-IV waters are waters protected as sources of public water supply, and Class B waters are waters protected for primary recreation. ~~Water~~ Waters classified as B, WS-III, WS-IV, and WS-V are also protected for Class C uses. Class C waters are protected for fishing, ~~boating~~, secondary recreation, aquatic life, and other uses.

A section of the South Yadkin River (and its tributaries) from the Cooleemee WTP intake site to a point upstream for approximately six miles is classified as WS-IV. South Yadkin River Hunting Creek is a tributary and its tributaries to the South Yadkin River, and upstream of the WS-IV classification classified reach of this creek that meets the South Yadkin River, this creek and its tributaries are classified as WS-III. Several sections of the Yadkin River (and ~~it~~ their tributaries) bordering and within the SA are classified as WS-IV, ~~including South Yadkin River upstream of the Cooleemee WTP.~~

The Division of Water Resources, Central Office, thanks you for the opportunity to comment. Should you have questions regarding any of the above comments, please contact the listed staff. I can be reached at either David.Wainwright@ncdenr.gov or 919-707-9045.

cc: Vardry Austin, Water Supply Planning Branch
Harold Brady, Water Supply Planning Branch
Elizabeth Kountis, Classifications, Standards, and Rules Review Branch





North Carolina Wildlife Resources Commission

Cameron Ingram, Executive Director

MEMORANDUM

TO: Lyn Hardison, Environmental Assistance and SEPA Coordinator
NCDENR Division of Environmental Assistance and Customer Services

FROM: Olivia Munzer, Western Piedmont Coordinator 
Habitat Conservation

DATE: 26 July 2021

SUBJECT: Environmental Review of the Davie County Public Utilities and Town of Mocksville
Engineering Report/Environmental Information Document for the Water Supply
Improvement Project, Davie County. DEQ Project No. 1824.

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the subject information. Comments are provided in accordance with provisions of the National Environmental Policy Act and Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e).

The Davie County Public Utilities Department and the Town of Mocksville propose to conduct a water improvement project in Davie County, North Carolina. The project primarily consists of replacing the existing 2.6-mgd Cooleemee Water Treatment Plant (WTP) with a new 3.5-mgd facility, as well as upgrading the existing intakes and raw water pump stations to supply the new Cooleemee WTP; decommissioning the existing Lagle WTP; demolition of the existing Cooleemee WTP upon the operation of the new facility; and the construction of 18,500 linear feet (lf) of transmission mains parallel the existing water lines.

The project drains to unnamed tributaries to Peeler Creek, Cody Creek, and South Yadkin River. We have records for the state endangered yellow lampmussel (*Lampsilis cariosa*) in the South Yadkin River. We also have current records for the federal and state endangered Michaux's sumac (*Rhus michauxii*) near the proposed site. We have no known records of state-listed species within the project area. An on-site survey is the only definitive means to determine whether a rare, threatened, or endangered species would be impacted by the project.

NCWRC comments (dated 10 May 2021) on the water distribution system improvement project are attached. We offer the following general recommendations to minimize impacts to aquatic and terrestrial wildlife resources from the WTP project.

1. To minimize entrainment and impingement of eggs, larvae, and juvenile aquatic species, a screen system must be incorporated into the intake design. This includes a maximum intake velocity of 0.25 ft/sec through a mesh or slotted surface with openings not to exceed 1.0 millimeter.

26 July 2021
Water Supply Improvements Project
DEQ Project No. 1824

Methodology to clean the screen system must also be designed to minimize impacts to eggs, larvae, and juvenile aquatic species.

2. We recommend a minimum 100-foot forested buffer for perennial streams and a 50-foot forested buffer for intermittent streams. During construction, equipment should not be staged in stream channels or riparian buffers.
3. Re-seed disturbed areas with seed mixtures or native plants that are beneficial to wildlife. Avoid using invasive, non-native plants (i.e., tall fescue, lespedeza, and Bermudagrass) in seed mixtures. In open areas, consider planting native, wildflower seed mixes that will create pollinator habitat within the project boundary.
4. Due to the decline in tree-roosting bat populations, avoid tree clearing activities during the maternity roosting season for bats (May 15 – August 15).
5. Manage non-native, invasive species by pretreating the project site prior to construction, preventing spread during construction, and control non-native, invasive species throughout the monitoring period.
6. Avoid fill and development in the 100-year floodplain, especially since the frequency and intensity of floods has increased due to climate change and urbanization. Furthermore, development and fill in the floodplain increase the potential for flooding, interferes with the natural hydrologic process of the waterways, and will make sediment more readily available for transport into the stream during flood events.
7. Sediment and erosion control measures should use advanced methods and installed prior to any land-disturbing activity. The use of **biodegradable and wildlife-friendly sediment and erosion control devices** is strongly recommended. Silt fencing, fiber rolls and/or other products should have loose-weave netting that is made of natural fiber materials with movable joints between the vertical and horizontal twines. Silt fencing that has been reinforced with plastic or metal mesh should be avoided as it impedes the movement of terrestrial wildlife species. These measures should be routinely inspected and properly maintained. Excessive silt and sediment loads can have numerous detrimental effects on aquatic resources including destruction of spawning habitat, suffocation of eggs, and clogging of gills of aquatic species.

The NCWRC Green Growth Toolbox program provides technical guidance, habitat conservation recommendations, and datasets to assist communities in green planning (<http://www.ncwildlife.org/Conserving/Programs/GreenGrowthToolbox.aspx>). Also, the NCWRC encourages the applicant to consider additional measures to protect wildlife species in developing landscapes. More detailed information on each of these measures and supporting literature can be found in NCWRC's Guidance Memorandum to Address and Mitigate Secondary and Cumulative Impacts to Aquatic and Terrestrial Wildlife Resources and Water Quality (August 2002; http://www.ncwildlife.org/Portals/0/Conserving/documents/2002_GuidanceMemorandumforSecondaryandCumulativeImpacts.pdf).

Thank you for the opportunity to provide input in the early planning stages for this project. If I can provide further assistance, please call (919) 707-0364 or email olivia.munzer@ncwildlife.org.

cc: Bryan Tompkins, U.S. Fish and Wildlife Service
Thomas W. Russ, NCWRC



North Carolina Wildlife Resources Commission

Ingram Cameron, Executive Director

10 May 2021

Mr. Tim Devine, PE
Hazen and Sawyer
4011 West Chase Boulevard, Suite 300
Raleigh, NC 27607

Subject: Environmental Review
Cooleemee WTP Transmission Mains
Towns of Cooleemee and Mocksville, Davie County, North Carolina

Dear Mr. Devine,

Biologists with the North Carolina Wildlife Resource Commission (NCWRC) have reviewed the subject document. Comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e) and North Carolina General Statutes (G.S. 113-131 et seq.).

Davie County and the Town of Mocksville is proposing to improve the water distribution system between the towns of Cooleemee and Mocksville in southwest Davie County, NC. The project involves the construction of 18,000 linear feet (lf) of 12-inch water transmission main and 455 lf of pipe using bore and jack trenchless crossing, and the installation of 36 valves and 18 fire hydrants.

The project drains to unnamed tributaries to Peeler Creek, Cody Creek, and South Yadkin River. We have records for the state endangered yellow lampmussel (*Lampsilis cariosa*) in the South Yadkin River. We have no known records of state-listed species within the project area. An on-site survey is the only definitive means to determine whether a listed or proposed species is on the site and would be impacted by the project.

We offer the following recommendations to minimize impacts to aquatic and terrestrial wildlife resources.

1. We recommend minimizing impacts to the two unnamed tributaries by installing the water line via jack and boring methods. If jack and boring cannot be used on all streams and trenching is determined to be the only viable method, every effort should be made to ensure that impacts to in-stream features are minimized and stable upon completion of the project. Open-trench crossings have been found to increase the likelihood for future lateral movement of the stream (which could undercut or erode around the utility line), and the correction of such problems could result in costly future maintenance and devastating impacts to natural resources. Therefore, as much work

10 May 2021
Cooleemee WTP Transmission
Davie County

as possible should be accomplished in the dry, and the amount of disturbance should not exceed what can be successfully stabilized by the end of the workday. In-stream work should consider forecasted high-flow events. During construction, equipment should not be staged in stream channels or riparian buffers.

2. Stream crossings should be near perpendicular (75° to 105°) to stream flow.
3. All mechanized equipment operated near surface waters should be inspected and maintained regularly to prevent contamination from fuels, lubricants, hydraulic fluids or other toxic materials.
4. Consider using state-of-the-art natural channel design and restoration techniques. Disturbed stream banks and wetlands should be restored to original contours and re-vegetated with native plant species.
5. Monitoring is recommended to ensure successful channel and bank stabilization and vegetation growth. We recommend monitoring the site once per year during the growing season for three years or three bankfull events. Invasive species control should occur regularly, including prior to and after construction. Invasive species outcompete native plants and provide minimal benefit to wildlife.
6. Re-seed disturbed areas with native seed mixtures that are beneficial to wildlife. Consider planting native, wildflower seed mixes that will create pollinator habitat within the project boundary. Avoid using Bermudagrass, redtop, tall fescue, and lespedeza, which are invasive and/or non-native and provide little benefit to wildlife.
7. Sediment and erosion control measures should be installed prior to any land-disturbing activity. Banks should be stabilized and sediment barriers installed as soon as possible, but at least within 24 hours.
8. Stringent sediment and erosion control measures should be implemented by using advanced methods and installed prior to any land-disturbing activity. The use of biodegradable and wildlife-friendly sediment and erosion control devices is strongly recommended. Silt fencing, fiber rolls and/or other products should have loose-weave netting that is made of **natural fiber materials with movable joints** between the vertical and horizontal twines. Silt fencing that has been reinforced with plastic or metal mesh should be avoided as it impedes the movement of terrestrial wildlife species. Excessive silt and sediment loads can have detrimental effects on aquatic resources including destruction of spawning habitat, suffocation of eggs, and clogging of

At this time, the information provided is not sufficient for our staff to make definitive recommendations or conclusions concerning this project and its effects on aquatic resources. If I can be of additional assistance, please call (919) 707-0364 or email olivia.munzer@ncwildlife.org.

Sincerely,



Olivia Munzer
Western Piedmont Coordinator
Habitat Conservation Program

Department of Environmental Quality Project Review Form

Project Number DEQ # <u>1824</u>	County: <u>Davie</u>	Date Received <u>7-5-2021</u>	Date Response Due <u>7-26-2021</u>
<i>Environmental Review/Engineering Report - Davie County Public Utilities and Town of Mocksville - Proposal to replace the existing 2.6-mgd Cooleemee WTP with a new 3.5-mgd facility.</i>			

This project is being reviewed as indicated below:

Regional Office	Sections	In-House Review
<input type="checkbox"/> Asheville	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Marine Fisheries <input type="checkbox"/> Coastal Management
<input type="checkbox"/> Fayetteville	<input checked="" type="checkbox"/> DWR – All Water Programs	<input checked="" type="checkbox"/> Waste Mgmt (Haz, solid, Inactive, Superfund & UST)
<input type="checkbox"/> Mooresville	<input checked="" type="checkbox"/> Land Quality & Stormwater Programs	<input type="checkbox"/> Air Quality <input checked="" type="checkbox"/> CC & PS Div. of Emergency Mgmt
<input type="checkbox"/> Raleigh	<input checked="" type="checkbox"/> UST	<input checked="" type="checkbox"/> Water Resources Management (Public Water, Planning & Water Quality Program)
<input type="checkbox"/> Washington	<input checked="" type="checkbox"/> Public Water	<input type="checkbox"/> Shellfish Sanitation <input type="checkbox"/> USFWS
<input type="checkbox"/> Wilmington		<input type="checkbox"/> Parks & Recreation <input type="checkbox"/> USACE <input type="checkbox"/>
<input checked="" type="checkbox"/> Winston-Salem		<input type="checkbox"/> NC Natural Heritage
		<input type="checkbox"/> DWR – Transportation Unit _____
		<input checked="" type="checkbox"/> Wildlife <u>Olivia Munaer</u> <input type="checkbox"/> Cultural Resources
		<input type="checkbox"/> Wildlife (DOT) _____

Regional Coordinator Sign-off: _____	Date: _____	In-House Reviewer/Agency: _____ JWen / Emergency Mgmt
---	----------------	---

Response (check all applicable)

No objection to project as proposed No comment

Insufficient information to complete review Other (specify or attach comments)

Comments: _____

The proposed project is in close vicinity of Special Flood Hazard Area (SFHA). If the proposed project encroaches into SFHA, a Floodplain Development Permit issued by the Town of Summerfield will be required. Please coordinate with the Town's Floodplain Administrator for permitting.

RETURN TO:
Lyn Hardison – Lyn.Hardison@ncdenr.gov, 252-948-3842
943 Washington Square Mall
Washington N C 27889
Courier No. 16-04-01

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MICHAEL SCOTT
Director



DATE: July 22, 2021

TO: Michael Scott, Division Director through Sharon Brinkley

FROM: Deb Aja, Western District Supervisor - Solid Waste Section

RE: DEQ Project #1824, Davie County, N.C.
Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project

The Solid Waste Section has reviewed the Engineering Report / Environmental Information Document for the Davie County Public Utilities Department and Town of Mocksville Water Supply Improvements Project located in Davie County, North Carolina. The project preferred alternative proposes to demolish structures. Lead paint, asbestos, or other contaminants may be present and must be managed appropriately prior to and during project activities. Otherwise, the review has been completed and has found no adverse impact on the surrounding community and likewise knows of no situations in the community, which would affect this project from a solid waste perspective.

During the project, every feasible effort should be made to minimize the generation of waste, to recycle materials for which viable markets exist, and to use recycled products and materials in the development of this project where suitable. Any waste generated by this project that cannot be beneficially reused or recycled must be disposed of at a solid waste management facility approved to manage the respective waste type. The Section strongly recommends that any contractors are required to provide proof of proper disposal for all waste generated as part of the project. A list of permitted solid waste management facilities is available on the Solid Waste Section portal site at: <http://deq.nc.gov/about/divisions/waste-management/waste-management-rules-data/solid-waste-management-annual-reports/solid-waste-permitted-facility-list>

Please contact Kim Sue, Environmental Senior Specialist, for any other questions regarding solid waste management for this project. Ms. Sue may be reached at (704) 235-2163 or by email at kim.sue@ncdenr.gov.

Ec: Jason Watkins, Field Operations Branch Head
Kim Sue, Environmental Senior Specialist



North Carolina Department of Environmental Quality | Division of Waste Management
Asheville Regional Office | 2090 U.S. Highway 70 | Swannanoa, North Carolina 28778
828.296.4500

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MICHAEL SCOTT
Director



Date: July 26, 2021

To: Michael Scott, Director
Division of Waste Management

Through: Janet Macdonald
Inactive Hazardous Sites Branch – Special Projects Unit

From: Bonnie S. Ware
Inactive Hazardous Sites Branch

Subject: DEQ Project # 1824, DWI/Davie County Public Utilities Town of Mocksville, Davie County, North Carolina

The Superfund Section has reviewed the proximity of sites under its jurisdiction to the DWI/Davie County Public Utilities Town of Mocksville project. Proposed project will develop a new campus for the approximately 2,500 North Carolina Department of Health and Human Services (DHHS) employees.

Two (2) Superfund Section sites were identified within one mile of the project as shown on the attached report. The Superfund Section recommends that site files be reviewed to ensure that appropriate precautions are incorporated into any construction activities that encounter potentially contaminated soil or groundwater. Superfund Section files can be viewed at: <http://deq.nc.gov/waste-management-laserfiche>.

Please contact Janet Macdonald at 919.707.8349 if you have any questions concerning the Superfund Section review portion of this SEPA/NEPA inquiry.



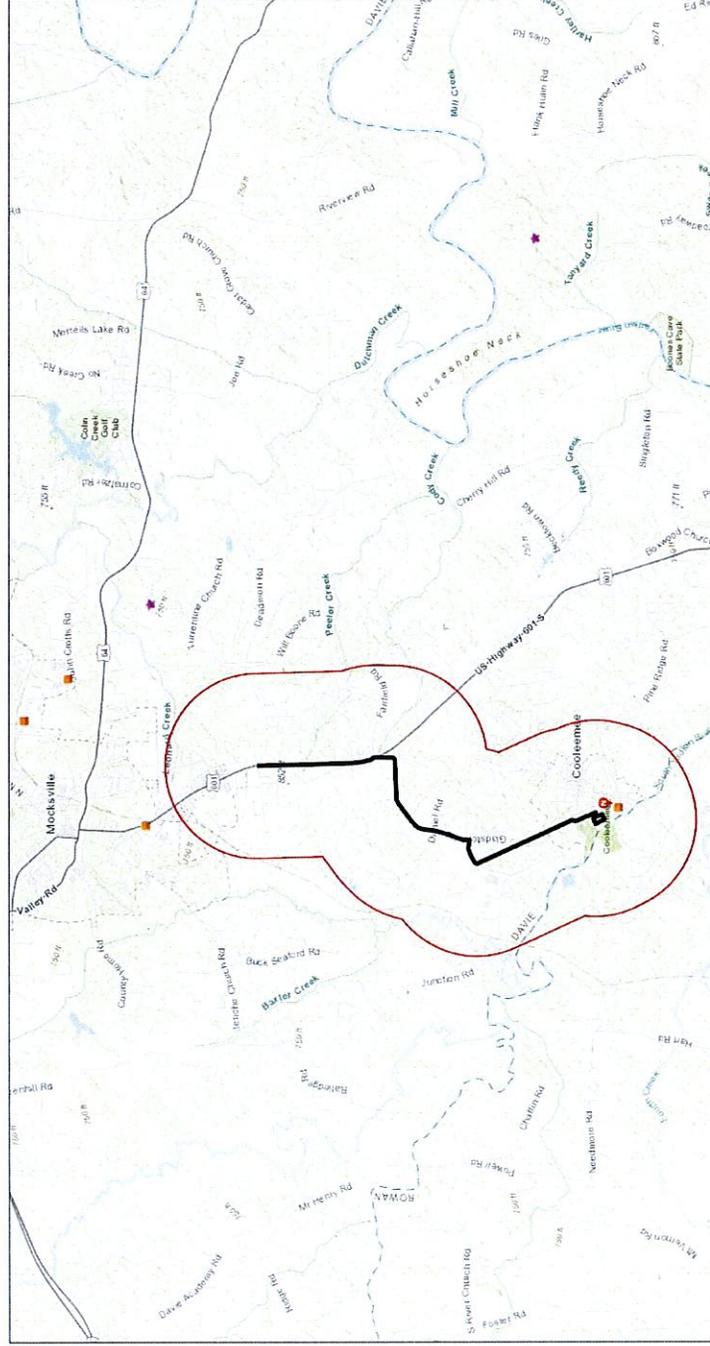
North Carolina Department of Environmental Quality | Division of Waste Management
217 West Jones Street | 1646 Mail Service Center | Raleigh, North Carolina 27699-1646
919.707.8200

SUPERFUND SECTION SITES ONLY : SEP/NEPA

Area of Interest (AOI) Information

Area : 7,737.88 acres

Jul 26 2021 14:36:16 Eastern Daylight Time



IC Brownfields Location_View

0 0.75 1.5 3 0 0 1 2 3 4 5 6 7 8 9 10

1:72,224

0 0.75 1.5 3 0 0 1 2 3 4 5 6 7 8 9 10

Rowan County, Rowan County, State of North Carolina DOT, Esri,
Mapbox, DeLorme, INCREMENT P, USGS, METNACA, NGA, EPA,
USA

Superfund Section Sites Only : 1824 Davie County

Summary

Name	Count	Area(acres)	Length(mi)
Certified DSCA Sites	0	N/A	N/A
Federal Remediation Branch Sites	0	N/A	N/A
Inactive Hazardous Sites	1	N/A	N/A
Pre-Regulatory Landfill Sites	0	N/A	N/A
Brownfields Program Sites	1	N/A	N/A

Inactive Hazardous Sites

#	EPAID	SITENAME	Count
1	NONCD0002123	ERWIN MILLS #3	1

Brownfields Program Sites

#	BF_ID	BF_Name	Count
1	1701813030	Cooleemee Cotton Mill	1

State of North Carolina Department of Environmental Quality
 INTERGOVERNMENTAL REVIEW PROJECT COMMENTS

Reviewing Regional Office: WSRO
 Project Number: DEQ-1824 Due Date: 7/26/2021
 County: Davie

After review of this project it has been determined that the DEQ permit(s) and/or approvals indicated may need to be obtained in order for this project to comply with North Carolina Law. Questions regarding these permits should be addressed to the Regional Office indicated on the reverse of the form. All applications, information and guidelines relative to these plans and permits are available from the same Regional Office.

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
<input type="checkbox"/>	Permit to construct & operate wastewater treatment facilities, non-standard sewer system extensions & sewer systems that do not discharge into state surface waters.	Application 90 days before begins construction or award of construction contracts. On-site inspection may be required. Post-application technical conference usual.	30 days (90 days)
<input type="checkbox"/>	Permit to construct & operate, sewer extensions involving gravity sewers, pump stations and force mains discharging into a sewer collection system	Fast-Track Permitting program consists of the submittal of an application and an engineer's certification that the project meets all applicable State rules and Division Minimum Design Criteria.	30 days (N/A)
<input type="checkbox"/>	NPDES - permit to discharge into surface water and/or permit to operate and construct wastewater facilities discharging into state surface waters.	Application 180 days before begins activity. On-site inspection. Pre-application conference usual. Additionally, obtain permit to construct wastewater treatment facility-granted after NPDES. Reply time, 30 days after receipt of plans or issue of NPDES permit-whichever is later.	90-120 days (N/A)
<input type="checkbox"/>	Water Use Permit	Pre-application technical conference usually necessary.	30 days (N/A)
<input type="checkbox"/>	Well Construction Permit	Complete application must be received and permit issued prior to the installation of a groundwater monitoring well located on property not owned by the applicant, and for a large capacity (>100,000 gallons per day) water supply well.	7 days (15 days)
<input type="checkbox"/>	Dredge and Fill Permit	Application copy must be served on each adjacent riparian property owner. On-site inspection. Pre-application conference usual. Filling may require Easement to Fill from N.C. Department of Administration and Federal Dredge and Fill Permit.	55 days (90 days)
<input type="checkbox"/>	Permit to construct & operate Air Pollution Abatement facilities and/or Emission Sources as per 15 A NCAC (2Q.0100 thru 2Q.0300)	Application must be submitted and permit received prior to construction and operation of the source. If a permit is required in an area without local zoning, then there are additional requirements and timelines (2Q.0113).	90 days
<input checked="" type="checkbox"/>	Any open burning associated with subject proposal must be in compliance with 15 A NCAC 2D.1900	N/A	60 days (90 days)
<input type="checkbox"/>	Demolition or renovations of structures containing asbestos material must be in compliance with 15 A NCAC 20.1110 (a) (1) which requires notification and removal prior to demolition. Contact Asbestos Control Group 919-707-5950	Please Note - The Health Hazards Control Unit (HHCU) of the N.C. Department of Health and Human Services, must be notified of plans to demolish a building, including residences for commercial or industrial expansion, even if no asbestos is present in the building.	60 days (90 days)
<input checked="" type="checkbox"/>	The Sedimentation Pollution Control Act of 1973 must be properly addressed for any land disturbing activity. An erosion & sedimentation control plan will be required if one or more acres are to be disturbed. Plan must be filed with and approved by applicable Regional Office (Land Quality Section) at least 30 days before beginning activity. A NPDES Construction Stormwater permit (NCG010000) is also usually issued should design features meet minimum requirements. A fee of \$65 for the first acre or any part of an acre. An express review option is available with additional fees.		20 days (30 days)
<input type="checkbox"/>	Sedimentation and erosion control must be addressed in accordance with NCDOT's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable Stormwater conveyances and outlets.		(30 days)
<input type="checkbox"/>	Sedimentation and erosion control must be addressed in accordance with _____ Local Government's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable Stormwater conveyances and outlets.		Based on Local Program
<input checked="" type="checkbox"/>	Compliance with 15A NCAC 2H .0126 - NPDES Stormwater Program which regulates three types of activities: Industrial, Municipal Separate Storm Sewer System & Construction activities that disturb ≥1 acre.		30-60 days (90 days)
<input checked="" type="checkbox"/>	Compliance with 15A NCAC 2H 1000 -State Stormwater Permitting Programs regulate site development and post-construction stormwater runoff control. Areas subject to these permit programs include all 20 coastal counties, and various other counties and watersheds throughout the state.		45 days (90 days)

State of North Carolina Department of Environmental Quality
 INTERGOVERNMENTAL REVIEW PROJECT COMMENTS

Reviewing Regional Office: WSRO
 Project Number: DEQ-1824 Due Date: 7/26/2021
 County: Davie

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
<input type="checkbox"/>	Mining Permit	On-site inspection usual. Surety bond filed with DEQ Bond amount varies with type mine and number of acres of affected land. Affected area greater than one acre must be permitted. The appropriate bond must be received before the permit can be issued.	30 days (60 days)
<input type="checkbox"/>	Dam Safety Permit	If permit required, application 60 days before begin construction. Applicant must hire N.C. qualified engineer to: prepare plans, inspect construction, and certify construction is according to DEQ approved plans. May also require a permit under mosquito control program. And a 404 permit from Corps of Engineers. An inspection of site is necessary to verify Hazard Classification. A minimum fee of \$200.00 must accompany the application. An additional processing fee based on a percentage or the total project cost will be required upon completion.	30 days (60 days)
<input type="checkbox"/>	Oil Refining Facilities	N/A	90-120 days (N/A)
<input type="checkbox"/>	Permit to drill exploratory oil or gas well	File surety bond of \$5,000 with DEQ running to State of NC conditional that any well opened by drill operator shall, upon abandonment, be plugged according to DEQ rules and regulations.	10 days N/A
<input type="checkbox"/>	Geophysical Exploration Permit	Application filed with DEQ at least 10 days prior to issue of permit. Application by letter. No standard application form.	10 days N/A
<input type="checkbox"/>	State Lakes Construction Permit	Application fee based on structure size is charged. Must include descriptions & drawings of structure & proof of ownership of riparian property	15-20 days N/A
<input type="checkbox"/>	401 Water Quality Certification	Compliance with the T15A 02H .0500 Certifications are required whenever construction or operation of facilities will result in a discharge into navigable water as described in 33 CFR part 323.	60 days (130 days)
<input type="checkbox"/>	Compliance with Catawba, Goose Creek, Jordan Lake, Randleman, Tar Pamlico or Neuse Riparian Buffer Rules is required. Buffer requirements: http://deq.nc.gov/about/divisions/water-resources/water-resources-permits/wastewater-branch/401-wetlands-buffer-permits/401-riparian-buffer-protection-program		
<input type="checkbox"/>	Nutrient Offset: Loading requirements for nitrogen and phosphorus in the Neuse and Tar-Pamlico River basins, and in the Jordan and Falls Lake watersheds, as part of the nutrient-management strategies in these areas. DWR nutrient offset information: http://deq.nc.gov/about/divisions/water-resources/planning/nonpoint-source-management/nutrient-offset-information		
<input type="checkbox"/>	CAMA Permit for MAJOR development	\$250.00 - \$475.00 fee must accompany application	75 days (150 days)
<input type="checkbox"/>	CAMA Permit for MINOR development	\$100.00 fee must accompany application	22 days (25 days)
<input type="checkbox"/>	Abandonment of any wells, if required must be in accordance with Title 15A. Subchapter 2C.0100.		
<input checked="" type="checkbox"/>	Notification of the proper regional office is requested if "orphan" underground storage tanks (USTS) are discovered during any excavation operation.		
<input checked="" type="checkbox"/>	Plans and specifications for the construction, expansion, or alteration of a public water system must be approved by the Division of Water Resources/Public Water Supply Section prior to the award of a contract or the initiation of construction as per 15A NCAC 18C .0300 et. seq., Plans and specifications should be submitted to 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. All public water supply systems must comply with state and federal drinking water monitoring requirements. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days
<input checked="" type="checkbox"/>	If existing water lines will be relocated during the construction, plans for the water line relocation must be submitted to the Division of Water Resources/Public Water Supply Section at 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days
<input type="checkbox"/>	Plans and specifications for the construction, expansion, or alteration of the ____ water system must be approved through the ____ delegated plan approval authority. Please contact them at ____ for further information.		

State of North Carolina Department of Environmental Quality
 INTERGOVERNMENTAL REVIEW PROJECT COMMENTS

Reviewing Regional Office: WSRO
 Project Number: DEQ-1824 Due Date: 7/26/2021
 County: Davie

Other Comments (attach additional pages as necessary, being certain to comment authority)

Division	Initials	No comment	Comments	Date Review
DAQ	TRS	<input type="checkbox"/>	If the proposed facility stores chlorine or ammonia onsite, it may need to write, submit, and implement a Risk Management Plan (RMP) under Section 112r of the 1990 Clean Air Act Amendments.	7/7/2021
DWR-WQROS	JG	<input checked="" type="checkbox"/>		7/11/2021
DWR-PWS	EH	<input type="checkbox"/>	See above	7/15/2021
DEMLR (LQ & SW)	LH	<input type="checkbox"/>	The Cooleemee, Lagle and Sparks Plants may be subject to Post Construction Stormwater Requirements under the WS-IV Local Program.	7/19/2021
DWM – UST	LE	<input type="checkbox"/>	See above. Incident #14746, Burlington Ind.-Cooleemee, still open.	7/7/2021
Other Comments		<input type="checkbox"/>		/ /

REGIONAL OFFICES

Questions regarding these permits should be addressed to the Regional Office marked below.

- | | | |
|---|--|--|
| <input type="checkbox"/> Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211
Phone: 828-296-4500
Fax: 828-299-7043 | <input type="checkbox"/> Fayetteville Regional Office
225 Green Street, Suite 714,
Fayetteville, NC 28301-5043
Phone: 910-433-3300
Fax: 910-486-0707 | <input type="checkbox"/> Mooresville Regional Office
610 East Center Avenue, Suite 301,
Mooresville, NC 28115
Phone: 704-663-1699
Fax: 704-663-6040 |
| <input type="checkbox"/> Raleigh Regional Office
3800 Barrett Drive,
Raleigh, NC 27609
Phone: 919-791-4200
Fax: 919-571-4718 | <input type="checkbox"/> Washington Regional Office
943 Washington Square Mall,
Washington, NC 27889
Phone: 252-946-6481
Fax: 252-975-3716 | <input type="checkbox"/> Wilmington Regional Office
127 Cardinal Drive Ext.,
Wilmington, NC 28405
Phone: 910-796-7215
Fax: 910-350-2004 |
| | <input checked="" type="checkbox"/> Winston-Salem Regional Office
450 Hanes Mill Road, Suite 300,
Winston-Salem, NC 27105
Phone: 336-776-9800
Fax: 336-776-9797 | |

Department of Environmental Quality Project Review Form

Project Number DEQ # <u>1824</u>	County: <u>Davie</u>	Date Received <u>7-5-2021</u>	Date Response Due <u>7-26-2021</u>
<i>Environmental Review/Engineering Report - Davie County Public Utilities and Town of Mocksville - Proposal to replace the existing 2.6-mgd Cooleemee WTP with a new 3.5-mgd facility.</i>			

This project is being reviewed as indicated below:

Regional Office	Sections	In-House Review
<input type="checkbox"/> Asheville	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Marine Fisheries <input type="checkbox"/> Coastal Management
<input type="checkbox"/> Fayetteville	<input checked="" type="checkbox"/> DWR – All Water Programs	<input checked="" type="checkbox"/> Waste Mgmt (Haz, solid, Inactive, Superfund & UST)
<input type="checkbox"/> Mooresville	<input checked="" type="checkbox"/> Land Quality & Stormwater Programs	<input type="checkbox"/> Air Quality <input checked="" type="checkbox"/> CC & PS Div. of Emergency Mgmt
<input type="checkbox"/> Raleigh	<input checked="" type="checkbox"/> UST	<input checked="" type="checkbox"/> Water Resources Management (Public Water, Planning & Water Quality Program)
<input type="checkbox"/> Washington	<input checked="" type="checkbox"/> Public Water	<input type="checkbox"/> Shellfish Sanitation <input type="checkbox"/> USFWS
<input type="checkbox"/> Wilmington		<input type="checkbox"/> Parks & Recreation <input type="checkbox"/> USACE
<input checked="" type="checkbox"/> Winston-Salem		<input type="checkbox"/> NC Natural Heritage
		<input type="checkbox"/> DWR – Transportation Unit _____
		<input checked="" type="checkbox"/> Wildlife <u>Olivia Munaer</u> <input type="checkbox"/> Cultural Resources
		<input type="checkbox"/> Wildlife (DOT) _____

Regional Coordinator Sign-off: _____	Date: <u>7/27/21</u>	In-House Reviewer/Agency: <u>Melodi Deaver, Hazardous Waste Section</u>
---	-------------------------	--

Response (check all applicable)

<input type="checkbox"/> No objection to project as proposed	<input checked="" type="checkbox"/> No comment
<input type="checkbox"/> Insufficient information to complete review	<input type="checkbox"/> Other (specify or attach comments)

Comments: _____

RETURN TO:
Lyn Hardison – Lyn.Hardison@ncdenr.gov, 252-948-3842
943 Washington Square Mall
Washington N C 27889
Courier No. 16-04-01

Request for Additional Information

A. General Comments: (no response needed)

1. If the Engineering Report is not approved by May 2, 2022, you must request a funding deadline extension, or the project will lose assurance of funding.
2. Provide a response to all comments on a “Comment for Comment” basis. You can include this as an Appendix in the Revised Engineering Report.
3. Please highlight all changes with different color text in the Engineering Report body.
4. Submit two hardcopies and one digital (on CD, DVD or Flash Drive) copy of the revised report incorporating all changes.

B. Technical Comments

5. Please include the PWSID number on the cover page of the Engineering Report/
Environmental Information Document.
 - a. [Addressed, PWSID number is added to the cover page of the Engineering Report/Environmental Information Document.](#)
6. Please provide the Drought Bill Information “Certification regarding the water system efficiency requirements of NCGS 143 355.4(b)” with the initial submittal of an ER/EID for a Drinking Water project that extends waterlines or expands treatment capacity (DWSRF, SWSRP), see attachment or find at the link provided below:
 - a. [See completed certification provided in this appendix.](#)
https://files.nc.gov/ncdeq/WI/Planning/Drought_Bill_Cert_170216.docx
7. Please provide a detailed project budget. The budget must be signed and sealed by a PE.
 - a. [See updated budget provided in this appendix.](#)

C. Environmental Comments

1. General: Based on review of the ER/EID as submitted, it appears that the environmental review covers the construction of the Cooleemee WTP and the transmission main, not the future phases of the Sparks WTP expansion and improvements needed for interconnection with Davidson Water, Inc. Note that the Division expects that the Finding of No Significant Impact (FONSI) anticipated to result from this environmental review will cover only the Cooleemee WTP and the transmission main construction. Future phases may be subject to additional environmental review.
 - a. [Comment noted.](#)
2. Section 5.7 Forest Resources: Under Subsection 5.7.2, please indicate approximately how much land is expected to be cleared of trees to accommodate construction.
 - a. [Addressed, approximately 0.57 acres of trees are expected to be cleared on the water treatment plant property to accommodate construction.](#)

3. Section 5.8 Wetlands and Streams: Under Subsection 5.8.2, please provide additional detail on the temporary impacts to Peeler Creek related to installation of the waterline. If this is a stream crossing, include what construction method will be used for the crossing and include a reference to a figure showing the location of the crossing.
 - a. The subsection has been updated to clarify the project areas relative to the two streams and reference the associated figure.
4. Section 5.9 Water Resources: This section will need revisions to address comments from the Division of Water Resource (see Comment 5 below).
 - a. Comment noted. Responses are provided in this appendix to address comments from the Division of Water Resources.
5. Agency Comments: Please review the attached comments from the Department's review of the project. All comments should be addressed, and necessary revisions.
 - a. Comment noted. Responses are provided in this appendix to address comments from the Department's review of the project.

NCDEQ Water Supply Planning Branch Comments:

1. Pg. 2-2: The 2020 annual average daily demand in Table 2-1 is inconsistent with Appendix A.
 - a. The 2020 annual average daily demand values in Table 2-1 on page 2-2 and Appendix A have been updated to be consistent with each other.
2. Pg. 2-8: The LWSP shows a different plant capacity for Mocksville than what is shown in Table 2-8. Make corrections to this table as needed and all associated text.
 - a. Table 2-8 on page 2-8 and all associated text has been updated with the plant capacity for Mocksville from the LWSP.
3. Pg. 2-8: In the 1st paragraph after Table 2-8, max day demands should reflect data in the LWSPs. Make corrections as needed.
 - a. In the 1st paragraph after Table 2-8, max day demands have been updated in the Engineering Report to reflect data in the LWSPs.
4. Pg. 2-10: The last line in Table 2-9 is inconsistent with the LWSP for Mocksville. Make changes to this table as needed.
 - a. The last line in Table 2-9 on page 2-10 has been updated to be consistent with the LWSP for Mocksville.
5. Pg. 2-11: Data in Table 2-11 is inconsistent with the LWSPs. Make corrections to this table as needed.
 - a. Addressed, the data in Table 2-11 has been updated to be consistent with the LWSPs.
6. Pg. 2-12: 4th paragraph, change 11,500 residential "customers" to "connections".
 - a. Addressed, this language has been revised.
7. Pg. 2-13: Table 2-12 note#2, change 350 "customers" to connections".
 - a. Addressed, this language has been revised.
8. Pg. 2-14: Provide the analysis for how the projected demand was determined for commercial, industrial, institutional, and system process uses in Table 2-14.
 - a. The analysis for how the projected demand was determined for commercial, industrial, institutional, and system process uses in Table 2-14 is provided in Sections 2.4.3.1 and 2.4.3.2.
9. Include "Unaccounted-for" water demand when calculating total water demand.

- a. Table 2-14 has been revised to include “Unaccounted-for” water demand.
10. According to the USGS, the stream flows are adequate to sustainably handle the additional withdrawals from the South Yadkin River. Please consider including the stream flow statistics, particularly the low-flow statistics (i.e., 7Q10) from USGS, in Section 5-8-2, as it is critical environmental information.
 - a. Addressed. The USGS provided an estimated range for the 7Q10 for the South Yadkin River at Cooleemee of 79 cfs to 113 cfs with an average and median value, both are approximately 102 cfs.

NCDEQ Classifications, Standards & Rules Review Branch Comments:

1. The following clarifications regarding the surface water classification discussion in Section 5.9.1, Existing Conditions within the Water Resources section have been made in the Engineering Report body:
 - a. DWR classifies surface waters of the state based on ~~their existing or proposed~~ uses of waters. All named ~~the classified~~ streams within the SA are classified as C, WS-III, WS-IV, or WS-V. The WS-V classification is assigned to waters protected as water supplies ~~and which~~ are generally upstream and draining to Class WS-IV waters. ~~Class WS-III and WS-IV waters are also~~ or waters used by industry to supply their employees with drinking water or ~~as water~~ waters formerly used as water supply. ~~Class WS-III and WS-IV waters are waters protected as sources of public water supply, and Class B waters are waters protected for primary recreation.~~ Water Waters classified as B, WS-III, WS-IV, and WS-V are also protected for Class C uses. Class C waters are protected for fishing, ~~boating~~, secondary recreation, aquatic life, and other uses.

~~A section of the South Yadkin River (and its tributaries) from the Cooleemee WTP intake site to a point upstream for approximately six miles is classified as WS-IV. South Yadkin River Hunting Creek is a tributary and its tributaries to the South Yadkin River, and upstream of the WS-IV classification classified reach of this creek that meets the South Yadkin River, this creek and its tributaries are classified as WS-III. Several sections of the Yadkin River (and # their tributaries) bordering and within the SA are classified as WS-IV, including South Yadkin River upstream of the Cooleemee WTP.~~

NCWRC Comments (July 26th Letter):

1. To minimize entrainment and impingement of eggs, larvae, and juvenile aquatic species, a screen system must be incorporated into the intake design. This includes a maximum intake velocity of 0.25 ft/sec through a mesh or slotted surface with openings not to exceed 1.0 millimeter. Methodology to clean the screen system must also be designed to minimize impacts to eggs, larvae, and juvenile aquatic species.
 - a. We are not modifying the intake structure; therefore, this comment is non-applicable.
2. We recommend a minimum 100-foot forested buffer for perennial streams and a 50-foot forested buffer for intermittent streams. During construction, equipment should not be staged in stream channels or riparian buffers.
 - a. Comment noted.
3. Re-seed disturbed areas with seed mixtures or native plants that are beneficial to wildlife. Avoid using invasive, non-native plants (i.e., tall fescue, lespedeza, and Bermudagrass) in

seed mixtures. In open areas, consider planting native, wildflower seed mixes that will create pollinator habitat within the project boundary.

- a. [Comment noted. An Erosion and Sediment Control Plan has been submitted for this project.](#)
4. Due to the decline in tree-roosting bat populations, avoid tree clearing activities during the maternity roosting season for bats (May 15 – August 15).
 - a. [Comment noted.](#)
5. Manage non-native, invasive species by pretreating the project site prior to construction, preventing spread during construction, and control non-native, invasive species throughout the monitoring period.
 - a. [Comment noted.](#)
6. Avoid fill and development in the 100-year floodplain, especially since the frequency and intensity of floods has increased due to climate change and urbanization. Furthermore, development and fill in the floodplain increase the potential for flooding, interferes with the natural hydrologic process of the waterways, and will make sediment more readily available for transport into the stream during flood events.
 - a. [Comment noted.](#)
7. Sediment and erosion control measures should use advanced methods and installed prior to any land-disturbing activity. The use of **biodegradable and wildlife-friendly sediment and erosion control devices** is strongly recommended. Silt fencing, fiber rolls and/or other products should have loose-weave netting that is made of natural fiber materials with movable joints between the vertical and horizontal twines. Silt fencing that has been reinforced with plastic or metal mesh should be avoided as it impedes the movement of terrestrial wildlife species. These measures should be routinely inspected and properly maintained. Excessive silt and sediment loads can have numerous detrimental effects on aquatic resources including destruction of spawning habitat, suffocation of eggs, and clogging of gills of aquatic species.
 - a. [Comment noted. An Erosion and Sediment Control Plan has been submitted for this project.](#)

NCWRC Comments (May 10th Letter):

1. We recommend minimizing impacts to the two unnamed tributaries by installing the water line via jack and boring methods. If jack and boring cannot be used on all streams and trenching is determined to be the only viable method, every effort should be made to ensure that impacts to in-stream features are minimized and stable upon completion of the project. Open-trench crossings have been found to increase the likelihood for future lateral movement of the stream (which could undercut or erode around the utility line), and the correction of such problems could result in costly future maintenance and devastating impacts to natural resources. Therefore, as much work as possible should be accomplished in the dry, and the amount of disturbance should not exceed what can be successfully stabilized by the end of the workday. In-stream work should consider forecasted high-flow events. During construction, equipment should not be staged in stream channels or riparian buffers.
 - a. [Comment noted. The project will not directly or indirectly impact the streams.](#)
2. Stream crossings should be near perpendicular (75° to 105°) to stream flow.
 - a. [Comment noted.](#)
3. All mechanized equipment operated near surface waters should be inspected and maintained regularly to prevent contamination from fuels, lubricants, hydraulic fluids or other toxic materials.
 - a. [Comment noted.](#)

4. Consider using state-of-the-art natural channel design and restoration techniques. Disturbed stream banks and wetlands should be restored to original contours and re-vegetated with native plant species.
 - a. [Comment noted. An Erosion and Sediment Control Plan has been submitted for this project.](#)
5. Monitoring is recommended to ensure successful channel and bank stabilization and vegetation growth. We recommend monitoring the site once per year during the growing season for three years or three bankfull events. Invasive species control should occur regularly, including prior to and after construction. Invasive species outcompete native plants and provide minimal benefit to wildlife.
 - a. [Comment noted. An Erosion and Sediment Control Plan has been submitted for this project.](#)
6. Re-seed disturbed areas with native seed mixtures that are beneficial to wildlife. Consider planting native, wildflower seed mixes that will create pollinator habitat within the project boundary. Avoid using Bermudagrass, redtop, tall fescue, and lespedeza, which are invasive and/or non-native and provide little benefit to wildlife.
 - a. [Comment noted. An Erosion and Sediment Control Plan has been submitted for this project.](#)
7. Sediment and erosion control measures should be installed prior to any land-disturbing activity. Banks should be stabilized and sediment barriers installed as soon as possible, but at least within 24 hours.
 - a. [Comment noted. An Erosion and Sediment Control Plan has been submitted for this project.](#)
8. Stringent sediment and erosion control measures should be implemented by using advanced methods and installed prior to any land-disturbing activity. The use of biodegradable and wildlife-friendly sediment and erosion control devices is strongly recommended. Silt fencing, fiber rolls and/or other products should have loose-weave netting that is made of natural fiber materials with movable joints between the vertical and horizontal twines. Silt fencing that has been reinforced with plastic or metal mesh should be avoided as it impedes the movement of terrestrial wildlife species. Excessive silt and sediment loads can have detrimental effects on aquatic resources including destruction of spawning habitat, suffocation of eggs, and clogging.
 - a. [Comment noted. An Erosion and Sediment Control Plan has been submitted for this project.](#)

NCDEQ Solids Comments:

1. The project preferred alternative proposes to demolish structures. Lead paint, asbestos, or other contaminants may be present and must be managed appropriately prior to and during project activities.
 - a. [Comment noted.](#)
2. During the project, every feasible effort should be made to minimize the generation of waste, to recycle materials for which viable markets exist, and to use recycled products and materials in the development of this project where suitable. Any waste generated by this project that cannot be beneficially reused or recycled must be disposed of at a solid waste management facility approved to manage the respective waste type. The Section strongly recommends that any contractors are required to provide proof of proper disposal for all waste generated as part of the project. A list of permitted solid waste management facilities is available on the Solid Waste Section portal site at:

<http://deq.nc.gov/about/divisions/waste-mangement/waste-management-rules-data/solid-waste-management-annual-reports/solid-waste-permitted-facility-list>

- a. Comment noted.

NCDEQ Superfund Section Recommendations:

1. Two (2) Superfund Section sites were identified within one mile of the project as shown on the attached report. The Superfund Section recommends that site files be reviewed to ensure that appropriate precautions are incorporated into any construction activities that encounter potentially contaminated soil or groundwater. Superfund Section files can be viewed at <http://deq.nc.gov/waste-management-laserfice>.
 - a. Comment noted.

North Carolina Department of Environment and Natural Resources

Division of Water Infrastructure

Certification regarding the water system efficiency requirements
of § NCGS 143-355.4(b)
(Last updated: 16 February 2017)



Water Infrastructure
ENVIRONMENTAL QUALITY

Regarding Davie County and Town of Mocksville Water Supply Improvements :
(Project name)

Project Number: WIF2018 & SRP-D-0203

NCGS § 143-355.4(b) requires that a local government or large community water system applying for funding from the Drinking Water State Revolving Fund or the Drinking Water Reserve demonstrate that it has taken the following water system efficiency steps:

- Has an Adequate Rate Structure;
- Has a Leak Detection and Repair Program;
- Has an approved water supply plan pursuant to G.S. 143-355;
- Has comprehensive metering;
- Has evaluated the use of reclaimed water; and
- Has implemented a consumer education program meeting certain requirements.

The statute appears on the reverse side of this certification.

Applicant's Certification:

I certify that the water system complies with the water system efficiency requirements of NCGS § 143-355.4(b).

A handwritten signature in blue ink, appearing to read 'David Bone', written over a horizontal line.

**SIGNATURE OF CHIEF ELECTED OFFICIAL
or AUTHORIZED REPRESENTATIVE**

A handwritten date '9/15/21' in blue ink, written over a horizontal line.

DATE

David Bone

TYPED NAME

County Manager

TYPED TITLE

Grant Administration (if applicable)			
Loan Administration (if applicable)			
ER Preparation	\$50,000		\$50,000
Environmental Documentation Preparation	\$50,000		\$50,000
Legal Costs			
Administration Subtotal:	\$190,500		\$190,500
TOTAL PROJECT COST:	\$37,175,427		\$37,175,427
<p>A PE Seal for the estimate <u>must be provided</u> in the space to the right for the application to be considered complete.</p>			

