

Section 2

Existing Reclaimed Water Program

The Town's reclaimed water system includes piped distribution systems that supply reclaimed water to commercial facilities, single- and multi-family homes, schools, and Town-owned recreational complexes as well as bulk reclaimed water distribution stations at the Town's water reclamation facilities. The reclaimed water system was designed to meet the North Carolina Department of Environment and Natural Resources (NCDENR) mandatory treatment standards. The Town's reclaimed water system permits specify the water quality standards listed in **Table 2-1**, which corresponds to Type I reclaimed water.

Table 2-1. Minimum Reclaimed Water Quality Standards

Parameter	Daily Maximum	Maximum Monthly Average
Turbidity (ntu)	10	--
BOD ₅ (mg/L)	15	10
TSS (mg/L)	10	5
NH ₃ (mg/L)	6	4
Fecal Coliform (#/100 mL)	25	14
pH*	6.0 – 9.0	--

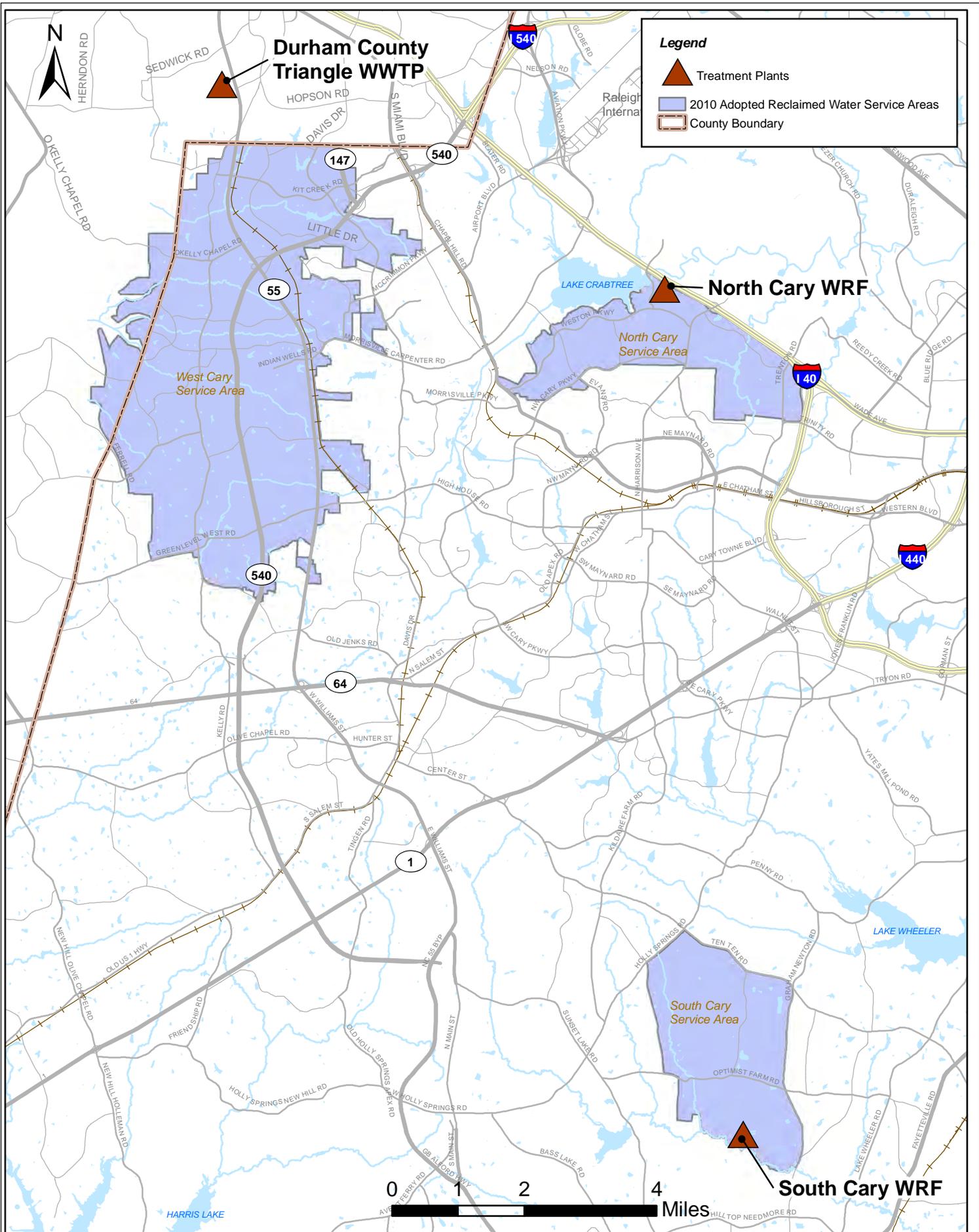
*Daily minimum pH is 6.0, daily maximum pH is 9.0

Reclaimed water usage is metered by the Town. Per gallon reclaimed water rates are currently set the same as the Tier 1 potable water rate (which applies to the first 5,000 gallons of monthly usage), regardless of volume of reclaimed water used. Potable irrigation rates range from 1.5 to 3.3 times the Tier 1 rates. Therefore, reclaimed water represents a significant savings over the potable irrigation rates. Reclaimed water customers are also exempt from the Town's alternate day watering restrictions.

Bulk reclaimed water is provided at no charge to approved customers who take at least 250 gallons at a time and complete a training course. The NCDENR restricts uses of bulk reclaimed water. Allowable uses are listed in the reclaimed water system permits and include irrigation, road construction, dust control, sewer flushing, and street cleaning.

2.1 Town Policy Statement

The Town adopted an official policy, set forth in Policy Statement 132, to ensure the continued orderly expansion and effective utilization of the reclaimed water system. This policy defines three reclaimed water service areas shown on **Figure 2-1**: North Cary, South Cary, and West Cary. For new development occurring within those service areas, the developers are required to extend the reclaimed water system to the development and to install reclaimed water facilities for irrigation, cooling towers, and other potential secondary plumbing use within the property. If reclaimed water is not available to the site at the time of development, the secondary water use facilities may be



temporarily supplied with potable water until reclaimed water is available, at which time they will be converted to the reclaimed system.

The Town updated the service areas defined in Policy Statement 132 in March 2013 to coincide with Scenario 4 developed as part of this Master Plan Update. A copy of Policy Statement 132 is included in Appendix A with the original service areas and with the newly adopted service areas. A description of the three original reclaimed water service areas and the existing facilities within those areas follows.

2.2 North Cary Service Area

The North Cary service area covers approximately 3,000 acres and is bounded by Interstate 40 to the east, SAS campus and Cary Parkway to the south, Chapel Hill Road to the west, and Lake Crabtree to the north. Reclaimed water is provided to customers within the North Cary service area from the North Cary Water Reclamation Facility (NCWRF). Primary existing reclaimed water uses include irrigation and cooling water for commercial customers, lawn irrigation for single- and multi-family homes, and non-potable uses at the NCWRF.

2.2.1 North Cary Water Reclamation Facility

The NCWRF has a treatment capacity of 12 million gallons per day (mgd). The main wastewater treatment process stream includes a biological nutrient removal, secondary clarifiers, tertiary filters, and ultraviolet (UV) disinfection. The facility discharges treated effluent to Crabtree Creek in the Neuse River basin under NPDES permit NC0048879. The facility is also permitted to supply up to 100,000 gallons per day (gpd) of bulk reclaimed water and up to 4,280,000 gpd peak day demand to residential, industrial, commercial, and institutional users through the North Cary reclaimed water distribution system under Permit No. WQ0017923 (included in Appendix B). A summary of NCWRF effluent water quality parameters is shown in **Table 2-2**. NCWRF effluent water quality parameters meet the reclaimed water permit limits provided in Table 2-1.

Table 2-2. North Cary WRF Effluent Water Quality Parameters, January 2009 through August 2011

Parameter	Average	Range	Permit Daily Maximum
Turbidity (ntu)	0.7	0.3 – 2.9	10
BOD ₅ (mg/L)	0.4	0 – 4.5	15
TSS (mg/L)	0.1	0 – 4.1	10
NH ₃ (mg/L)	0.0	0 – 1.3	6
Fecal Coliform (#/100 mL)	1.1	0 – 100*	25
pH	7.3	6.4 - 7.8	6.0 – 9.0

* WRF records indicate four daily fecal coliform readings that were greater than 25 between January 2009 and August 2011

Reclaimed water facilities at the NCWRF consist of the following components:

- **Reclaimed Water Diversion Structure.** A diversion structure allows automatic or manual diversion of WRF effluent flow to the reclaimed water storage and pumping facilities.

- **Reclaimed Water Disinfection.** Sodium hypochlorite is used to maintain a disinfection residual in the reclaimed water system. Disinfection facilities include a 6,000-gallon hypochlorite storage tank, three chemical metering pumps, and two injection points – one at the flow diversion structure to provide disinfectant residual in the storage tank and one at the tank effluent to provide a disinfectant residual to the distribution system. A chlorine residual greater than 2.0 parts per million (ppm) is targeted leaving the plant.
- **Reclaimed Water Storage.** A 1-million-gallon in-ground, covered reclaimed water storage tank is used to equalize diurnal differences that occur (typically in the summer) between peak morning irrigation demands and concurrent low flows into the NCWRF. The tank is located upstream of the high service pumps and is operated as a flow-through tank. The water level in the tank is maintained around 8 feet and the tank is set to fill from the diversion structure when the water level in the tank reaches a depth of 7.5 feet.
- **Reclaimed Water Pumping.** The reclaimed water high service pumping includes two 150-horsepower vertical turbine pumps with variable frequency drives (1,500 gallon per minute (gpm) design capacity), two 300-horsepower vertical turbine pumps with variable frequency drives (2,972 gpm design capacity), and a 2,000-gallon hydropneumatic tank. The firm capacity of the pump station (with one large pump out of service) is 8.5 mgd. The tank is used to maintain a constant target pressure between 115 psi and 120 psi to the system. Typically one 150-horsepower pump is used, supplemented with the second 150-horsepower pump during peak demands. Reclaimed water used on-site at the NCWRF is pumped through the high service pumps back to the plant, but metered separately from the remainder of the distributed reclaimed water. The historical maximum annual volume of reclaimed water pumped from the NCWRF (excluding the non-potable on-site usage) is 187 million gallons.
- **Reclaimed Water Monitoring.** Reclaimed water monitoring consists of continuous turbidity monitors, a magnetic flow meter, pressure gauge, and online residual chlorine analyzer.
- **Generator.** A generator with transfer switch outside of the hypochlorite building provides back-up power for the North Cary reclaimed water system.
- **Bulk Fill Station.** A bulk reclaimed water fill station is located at the NCWRF where approved users can fill non-potable water hauling trucks. Users are trained by Town staff and permitted on the use of the station. Reclaimed water is distributed at the station from an overhead hose connected to a four-inch fill pipe, or alternative two-inch side-fill port. An automated system allows users to input their permit information, withdraw water to fill trucks, and track reclaimed water volume and uses without assistance from WRF staff. All bulk use is metered. The historical maximum annual volume of bulk reclaimed water distributed from the NCWRF is 1,670,000 gallons.

Data sheets describing these facilities are included in Appendix C.

2.2.2 Reclaimed Water Distribution System

Figure 2-2 shows the existing North Cary reclaimed water distribution system. The distribution system serves the portion of the North Cary service area primarily along Weston Parkway and in the Wessex, Beechtree, Bexley, and Weston Oaks subdivisions. The system consists of 12.5 miles of pipeline ranging in diameter from 4 to 20 inches which provide reclaimed water to approximately 495 residences and 51 commercial customers. Commercial customers account for approximately 60 percent of the billed reclaimed water usage in the North Cary service area. Verizon

Telecommunications, SAS Building D, and Weston One currently use reclaimed water for cooling towers. In addition, reclaimed water meters have recently been installed for cooling tower water at the Embassy Suites and Umstead Hotel and SAS Building R.

2.3 South Cary Service Area

Reclaimed water in the South Cary service area is supplied from the South Cary Water Reclamation Facility (SCWRF). The service area covers approximately 3,600 acres of primarily residential land use and extends from the SCWRF north to Ten Ten Road and Holly Springs Road, east to Bells Lake Road, and west to Pierce Olive Road. Reclaimed water service is currently only provided to a portion of the service area. Major uses of reclaimed water in the service area include residential and recreational irrigation as well as non-potable use at the SCWRF.

2.3.1 South Cary Water Reclamation Facility

The SCWRF has a treatment capacity of 12.8 mgd. The main wastewater treatment process stream includes biological nutrient removal, secondary clarifiers, tertiary filters, and UV disinfection. The facility discharges treated effluent to Middle Creek in the Neuse River basin under NPDES permit NC0065102. The facility is also permitted to supply up to 300,000 gpd of bulk reclaimed water and up to 864,000 gpd peak day demand to residential, commercial, and institutional users through the South Cary reclaimed water distribution system under Permit No. WQ0018489 (included in Appendix B). A summary of SCWRF effluent water quality parameters is shown in **Table 2-3**. SCWRF effluent water quality parameters meet the reclaimed water permit limits provided in Table 2-1.

Table 2-3. South Cary WRF Effluent Water Quality Parameters, January 2009 through August 2011

Parameter	Average	Range	Permit Daily Maximum
Turbidity (ntu)	0.4	0.1 - 7.0	10
BOD ₅ (mg/L)	0.01	0 - 2.9	15
TSS (mg/L)	0.1	0 - 2.4	10
NH ₃ (mg/L)	0.1	0 - 5.8	6
Fecal Coliform (#/100 mL)	1.0	1.0 - 3.0	25
pH	7.0	6.4 - 7.5	6.0 – 9.0

Reclaimed water facilities at the SCWRF consist of the following components:

- Reclaimed Water Storage.** Until recently, the South Cary reclaimed water system has been operating without storage. However, in 2012, the Town completed construction of a new 500,000-gallon reclaimed water storage tank on the SCWRF site. The tank stores reclaimed water prior to being pumped into the distribution system. The storage tank project included two transfer pumps to divert water into the tank and relocation of the two existing high service pumps from the wet well adjacent to the UV channel to new pump cans adjacent to the ground storage tank.
- Reclaimed Water Pumping.** The reclaimed water high service pumping includes two 475-gpm constant speed vertical turbine pumps and an 8,000-gallon hydropneumatic tank. The

firm capacity of the pump station (with one pump out of service) is 0.7 mgd. The tank is used to maintain a target pressure between 100 psi and 120 psi to the system. The historical maximum annual volume of reclaimed water pumped from the SCWRF is 125 million gallons.

- **Reclaimed Water Disinfection.** Sodium hypochlorite is used to maintain a disinfection residual in the reclaimed water distribution system. Disinfection facilities include a 1,000-gallon hypochlorite storage tank, two chemical metering pumps, two hypochlorite booster pumps, and an inline static mixer. A chlorine residual greater than 2.0 ppm is targeted leaving the plant.
- **Reclaimed Water Monitoring.** Reclaimed water monitoring consists of continuous turbidity monitors, a magnetic flow meter, pressure gauge, and residual chlorine analyzer.
- **Bulk Fill Station.** Approved users can fill non-potable water hauling trucks at the bulk reclaimed water fill station located at the SCWRF. Reclaimed water is manually distributed at the station from a two-inch diameter hose connected to the four-inch diameter reclaimed water line that serves the SCWRF. All bulk use is metered. The historical maximum annual volume of bulk reclaimed water distributed from the NCWRF is 170,000 gallons.

Data sheets describing these facilities are included in Appendix C.

2.3.2 Reclaimed Water Distribution System

Figure 2-3 shows the existing reclaimed water distribution system within the South Cary service area. The system consists of 4.6 miles of pipeline ranging in diameter from 4 to 12 inches which provide reclaimed water for irrigation to approximately 85 residential customers in the West Lake area as well as irrigation of the homeowner’s association common areas. The largest users in the service area are the Middle Creek Park and Middle Creek School, which both use reclaimed water for irrigation of recreational fields. These two users account for approximately 40 percent of the billed usage in the South Cary service area. In addition, toilet flushing is utilizing reclaimed water at the Middle Creek Park Phase II complex.

2.4 West Cary Service Area

The West Cary service area covers approximately 13,300 acres in the Cape Fear River Basin from the Durham County line, south to Roberts Road at the future Highway 540 intersection. The Town of Cary, Wake County, and Durham County are jointly implementing the Jordan Lake Water Reclamation and Reuse Project. This project provides reclaimed water from Durham County’s Triangle Wastewater Treatment Plant (TWWTP) to customers within the West Cary service area, including the Wake County portion of Research Triangle Park and the Town’s Thomas Brooks Park, the site of the USA Baseball national training center. The Jordan Lake Water Reclamation and Reuse (JLWR) pipeline also provides reclaimed water to some newer residential developments and undeveloped portions of the West Cary service area. In the future, the Town plans to provide reclaimed water to this service area from the NCWRF.

2.4.1 Triangle Wastewater Treatment Plant

The TWWTP is operated by Durham County and located at the intersection of NC 55 and Alexander Drive. The TWWTP provides tertiary treatment with UV disinfection. High service pumps, a bulk reclaimed water ground storage tank, and a sodium hypochlorite disinfection feed system were installed as part of recent plant upgrades to implement the reclaimed water system. The facility is

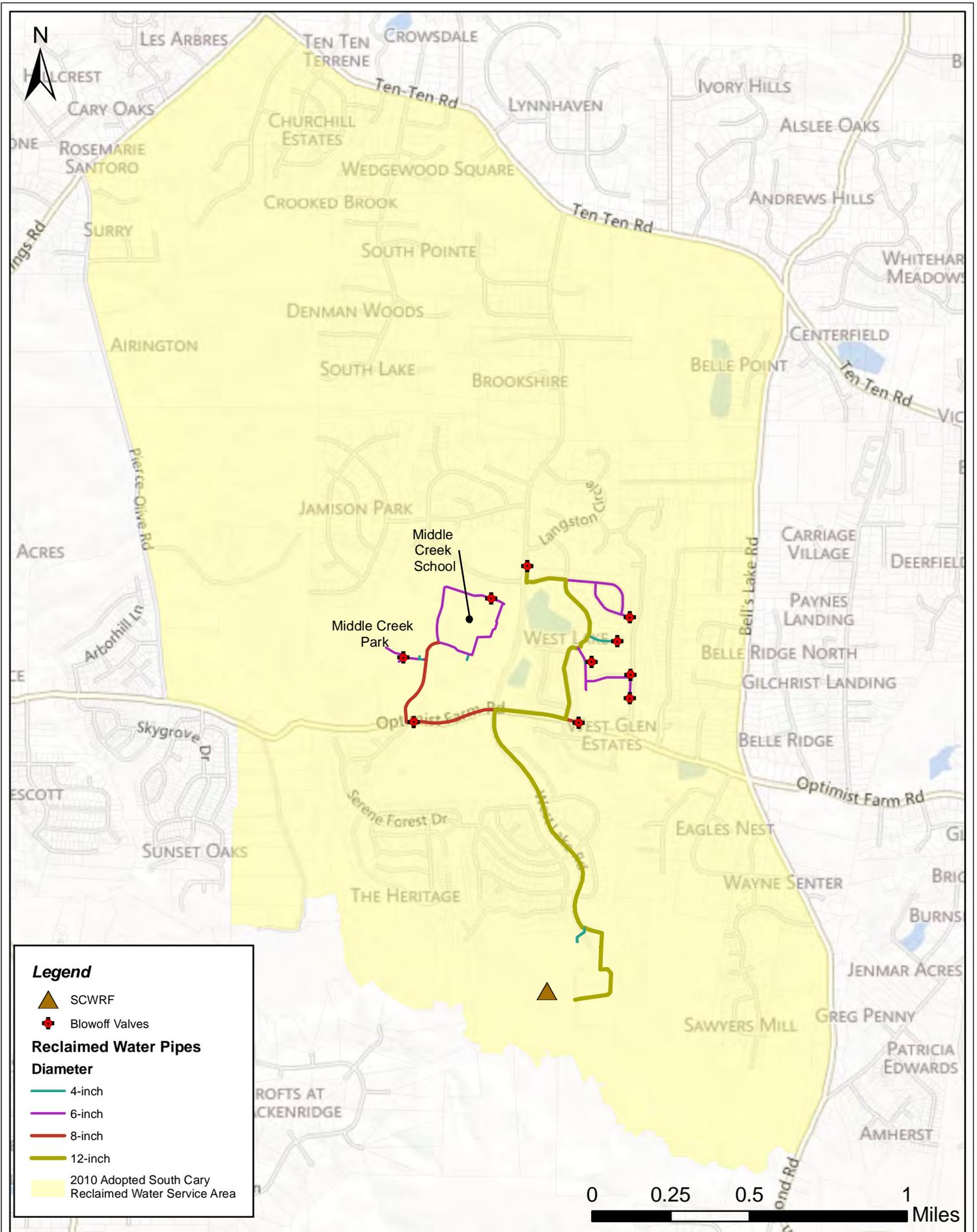


Figure 2-3
Existing South Cary Reclaimed Water Distribution System

permitted to supply reclaimed water to users in Durham County and the West Cary service area under Permit No. WQ0032821. The Town has entered into an interlocal agreement with Durham County to purchase reclaimed water from the TWWTP. The County will supply the Town with a peak reclaimed water flow of at least 150,000 gallons per hour (gph) at a hydraulic grade line elevation of at least 540 feet and a minimum chlorine residual of 2.0 ppm at the point of delivery on Alston Avenue. The TWWTP reclaimed water high service pumps are sized to provide this peak flow plus an additional 15,000 gph for Durham County demands. The interlocal agreement assumes an annual average capacity limit of 0.7 mgd (29,200 gph) available to the Town of Cary through 2021.

2.4.2 Reclaimed Water Distribution System

Figure 2-4 shows the existing reclaimed water distribution system within the West Cary service area, including the JLWR pipeline project, which conveys reclaimed water from the TWWTP to the Wake County portion of RTP South and to Thomas Brooks Park. The JLWR pipeline is being constructed in two phases. Phase 1 delivers reclaimed water to McCrimmon Parkway, including RTP South. Construction of this phase is complete and, since the spring of 2012, reclaimed water from the TWWTP has been delivered through this portion of the pipeline. Phase 2 will deliver reclaimed water south from McCrimmon Parkway to Thomas Brooks Park, with construction expected to be complete in 2014.

The planned distribution system consists of 21.8 miles of pipeline ranging in diameter from 4 to 20 inches which will provide reclaimed water for irrigation and cooling water to commercial and residential customers. The largest users of reclaimed water in the West Cary service area are expected to be Biogen Idec and Thomas Brooks Park, with the majority of the demand within the service area coming from commercial/industrial/institutional users.

2.5 Reclaimed Water System Operations

Operation of the Town's reclaimed water system must conform with the following requirements:

- North Carolina Reclaimed Water Regulations 15A NCAC 02U (updates enacted 6/2011)
- Non-discharge permits issued by the North Carolina Division of Water Quality
- Town Policy Statements, including specifically Policy Statement 132 - Effective Utilization Of Reclaimed Water System, Policy Statement 23 - Utility System Extension and Connection, and Policy Statement 129 - Minimum Water Supply Pressure
- Standard Operating Procedures (SOPs) established by the Town for Blow-off Operations and Total Chlorine Residual Maintenance.

Operational items for the Town's reclaimed water system are discussed in the following sections.

2.5.1 Blow-offs

Long residence times in the reclaimed water distribution systems can lead to degradation of chlorine residual and overall water quality as well as internal pipeline corrosion and buildup issues. As part of the standard operating procedures, the Town has set a target chlorine residual of at least 0.5 mg/L at sampling points in the distribution system. In order to maintain chlorine residual in low demand areas of the distribution system, the Town flushes reclaimed water through blow-off valves at the

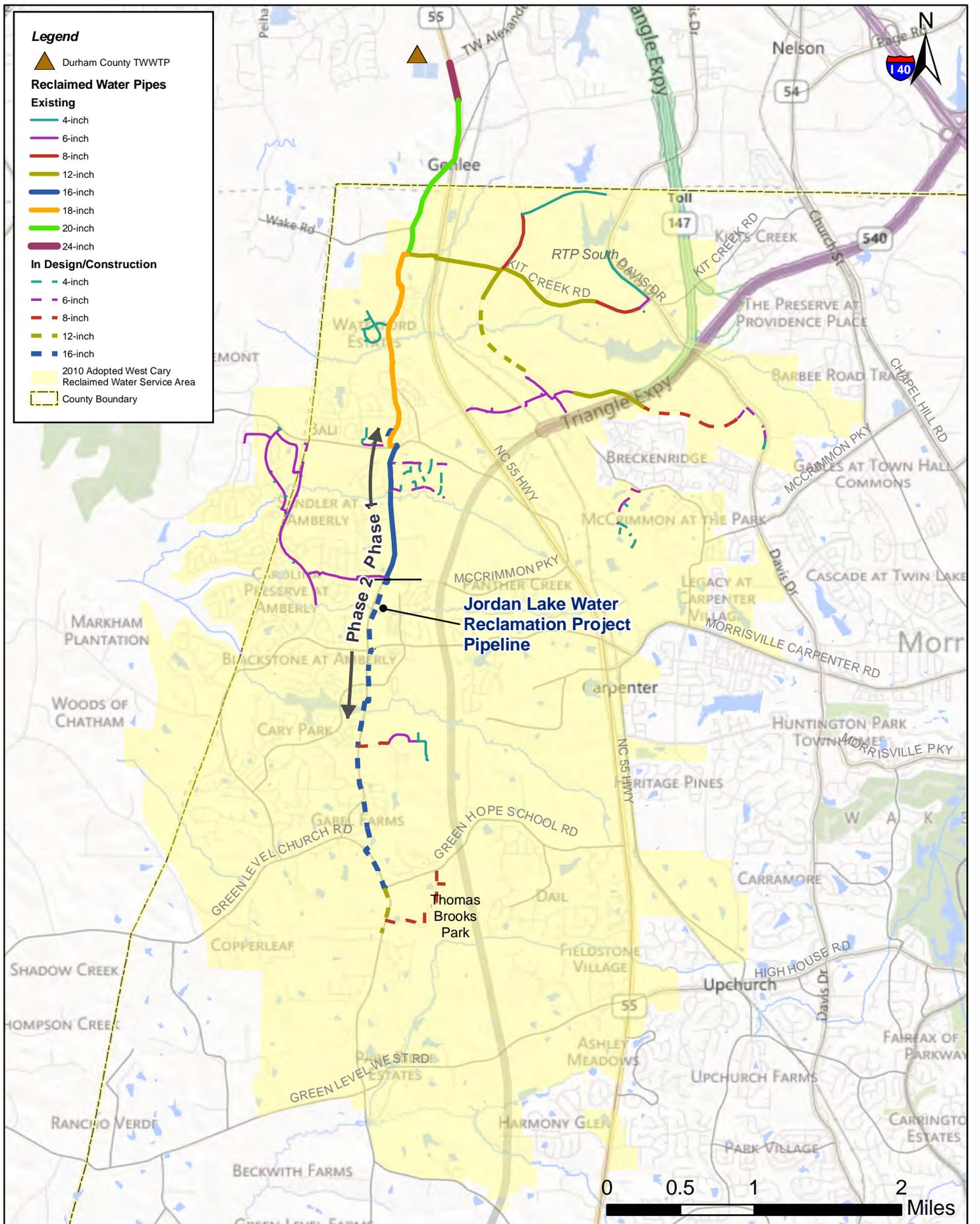


Figure 2-4
Existing West Cary Reclaimed Water Distribution System

extremities of the distribution system. According to Town staff, long-term constant blow-offs are maintained at 5 locations in the North Cary system and 2 locations in the South Cary system. The blow-off flow from the North and South Cary distribution systems is directly discharged to the wastewater collection system through an underground connection to a wastewater manhole. Due to this piping configuration, the blow-off flow cannot be directly metered. However, based on reclaimed water flow records and discussion with Town staff, it is estimated that blow-offs currently account for approximately 40 percent of the total annual reclaimed water use. As part of the recent permit renewal, the Town has received approval for blowoffs that discharge to the ground surface (after dechlorination to total residual chlorine concentration of 0.05 mg/L or less) in the West Cary service area. These approved blow offs to ground surface were approved solely where the extension of gravity sewer was cost prohibitive. In addition to dechlorination, scouring of ground surface must be prevented. The Town has metered eight of the blowoffs in the West Cary service area.

It is expected that as the reclaimed system demands increase, particularly at the extremities of the systems, blowoffs could be reduced, especially during the peak demand periods.

2.5.2 Minimum System Pressure

The Town adopted a minimum pressure policy (Policy Statement 129), which establishes a minimum water supply pressure to be provided through the potable and reclaimed water distribution systems of 40 psi during average and maximum day conditions, and 30 psi during peak hour conditions. Operation of the high service pumps and hydropneumatic tanks at the NCWRF and SCWRF are set to provide this pressure to the highest points in the distribution system.

2.5.3 Reclaimed Water Holiday

Each year in February, the Town conducts a reclaimed water “holiday” when all of the reclaimed water systems are temporarily shut down. The holiday allows staff to perform maintenance on the components of the system including inspection, cleaning, and repair, as necessary. The annual holiday is usually performed over 10 days assuming no significant repair issues arise during the system inspection. The holiday is conducted during the historically lowest reclaimed water demand period of the year to minimize disruption to customers.

2.5.4 Cross-Connections

Cross-connection control between the reclaimed water system and potable water system is important to protecting public health. The Town has adopted cross-connection control ordinances and requires backflow preventers on the potable water system where reclaimed water and potable water are supplied to the same structure or facility. Backflow preventers are provided on the reclaimed water system where potable water is to be temporarily supplied until reclaimed water is available to the site. To prevent cross-connections, reclaimed water meters and meter boxes are distinguished from potable water meters with reverse threads and purple colored lettering stating “Reclaimed Water – Do Not Drink”.