Section 9 Updated July 2015

Recommended Capital Improvement Program

A Capital Improvement Program (CIP) was developed for implementing the recommended reclaimed water system improvements under Scenario 4. The CIP prioritizes improvements into the following phases for planning purposes:

- Phase 1A (2015)
- Phase 1B (2017)
- Phase 1C (2020)
- Phase 2 (2020-2030)
- Phase 3 (2030-2060)

In general, the timing of Phase 1 improvements are better defined than the Phase 2 and Phase 3 (long-term) improvements. Long-term improvements should be re-assessed in future master planning efforts to determine how actual demand growth impacts the recommended phasing of the reclaimed water system expansion and improvements. Some of the project phasing may also be revised to more closely match the planned construction of major transportation thoroughfares when the schedule for transportation improvements is refined. Construction of new reclaimed waterlines in conjunction with roadway construction, where possible, would be advantageous in terms of cost and ease of construction.

9.1 Cost Estimates

Skill and experience are important factors in cost estimating. Small details can have big cost impacts on a project. The American Association of Cost Engineers (AACE) recommends four levels of accuracy for construction cost estimating. The level of cost estimation is dependent on the stage and scope of the project. The four major categories are as shown in **Table 9-1**.

The accuracy of construction estimates should increase as the project moves through the process from conceptual to detailed design and eventually to project bidding and actual construction. It can be expected that conceptual and study level estimates would have a wide range of accuracy relative to the actual construction cost because not all the design features and details that would impact the final cost have been addressed. The construction cost estimates prepared for this memorandum are at the "Study Estimate" level (Category 2). Since the assumptions and methodology for identifying the costs are common to all service areas and routes, this level of accuracy is appropriate for this comparative evaluation.

Cost estimates for this study were prepared using previous estimates for similar projects, historical data from comparable work, and estimating guides and equipment costs. Factors such as competitive market conditions, actual site conditions, and implementation schedule cannot be quantified at the current level of detail but can significantly impact the project cost.

Projecting costs into the future is speculative, as inflation rates for energy prices, building materials, and construction labor fluctuate constantly. A "constant dollar" approach was used in developing

capital costs for the proposed system. All costs shown in the study are 2013 values. Care needs to be taken during future updates to index costs for each year based on the inflation rate experienced over the update year.

Table 9-1. Level of Cost Categories

Category Level	Accuracy
Category 1 – Conceptual Estimate	+50% to -30%
Category 2 – Study Estimate	+30% to -20%
Category 3 – Preliminary Estimate	+20% to -10%
Category 4 – Detailed Estimate	+15% to -5%

9.1.1 Unit Pipeline Construction Cost

For the purposes of this study, the costs of pipeline installation were divided into two broad categories:

- Unit costs to cover trench excavation and installation for reuse distribution lines parallel to roadways (**Table 9-2**); and,
- Unit costs to cover trenchless installation methods (horizontal directional drilling, microtunneling, jack and bore) that may be required for road crossings and stream crossings (**Table 9-3**).

Unit costs per linear foot (LF) presented in the tables considered the labor, equipment, and materials typically used to install pressurized pipelines. The unit costs for pipelines also include installation of fittings, gate valves, air release valves, and blow-offs. Costs for improvements to existing reclaimed water pipelines assume pipe replacement as a conservative estimate of cost. However, depending on the remaining service life of the existing pipelines, installing a smaller diameter parallel pipeline could be considered.

Table 9-2. Unit Construction Costs for Trench Installation of Reuse Pipeline

Diameter (in)	Construction Cost ($/LF)
6	$50
8	$60
10	$70
12	$90
16	$110
20	$210
24	$250
30	$320

1) Unit pipeline costs assume C900/905 PVC pipe for 6-inch through 16-inch diameter and ductile iron pipe for 20-inch diameter and greater. Costs assume restrained joint pipe per Town of Cary Standard Specifications.
2) Costs assume that minimum dewatering is required and 10 percent of the pipeline length will require rock excavation. Costs do not consider labor, materials, or equipment required for excavation of hazardous materials.
3) Costs for pressure pipelines assume 4 feet of cover and include valves and appurtenances (assumed valves located every 1,000 LF, air relief valves every 3,000 LF, blowoffs every 6,000 LF, and a ductile iron fitting every 1,000 feet).

Table 9-3. Unit Construction Cost for Trenchless Road and Stream Crossings

Diameter (in)	Additional Construction Cost [2] ($/LF)
6	$300
8	$400
10	$450
12	$500
16	$800
20	$900
24	$1,100
30	$1,500

1) Diameter is for carrier pipeline.
2) Unit pipeline costs assume C900/905 PVC for 6-inch through 16-inch diameter and ductile iron pipe for 20-inch diameter and greater. Unit costs include grout and casing pipe.
3) Rock excavation not included.

9.1.2 Land Acquisition

It is assumed that even though road rights-of-way will be used for most of the pipelines, some additional easement will have to be obtained. The estimated land acquisition costs assume one-half the length of the project will require additional easements 20 feet wide at a cost of $20,000 per acre.

9.1.3 Contingencies, Engineering, Legal, and Administrative Fees

Total construction cost is calculated by applying a 30 percent contingency to the cost of pipeline, pumping, and storage installation. The capital costs are calculated by applying 25 percent to the total construction cost for engineering, legal, and administrative fees.

9.2 Capital Improvement Program

The CIP is presented in **Table 9-4**. The CIP includes distribution/transmission mains, storage facilities, pumping facilities, and control valves. Costs are given in 2013 dollars without escalation with a January 2013 ENR construction cost index of 9437. A description of the recommended improvements is provided by phase in the following sections. The location of each project is shown color coded by phase on **Figure 9-1** and color coded by diameter on **Figure 9-2**. Projects are labeled by service area (NW = Northwest Cary Service Area; S = South Cary Service Area).

The costs presented in the CIP are for distribution/transmission mains along transportation thoroughfares and do not include the cost of smaller diameter neighborhood pipelines or retrofit within existing neighborhoods. For new development, it is assumed that the neighborhood pipes and service connections would be installed by the developer, per the Town's Policy Statement 132. However, the ultimate cost of providing reclaimed water service to customers within existing neighborhoods would include installation of smaller service lines and retrofit connections.

NOTE - Table 9-4, and Figures 9-1 and 9-2 have been removed, updated, and links provided on the webpage. The following descriptions should be compared to the updated information in those links

9.2.1 Phase 1A (2015)

Project NW-1: Baseball Elevated Tank

Construct new 0.5 MG elevated 'signature' baseball-shaped tank at Thomas Brooks Park/USA Baseball Training Complex to maintain adequate pressure at the USA Baseball irrigation system and provide reclaimed water system storage. Overflow elevation is 560 feet.

Engineer's Opinion of Probable Cost: $3,300,000

Project NW-2A: Northwest Connector Phase A

Construct approximately 17,400 LF of 24-inch diameter pipeline along Evans Road, Aviation Parkway, International Drive, McCrimmon Parkway extension, Perimeter Park Drive, and Highway 54. Project extends from existing reclaimed water line on Weston Parkway to Highway 54 and McCrimmon Parkway. The purpose of the NW Connector is to convey water from the NCWRF into the existing West Cary service area.

Engineer's Opinion of Probable Cost: $8,100,000

9.2.2 Phase 1B (2017)

Project NW-2B: Northwest Connector Phase B

Construct approximately 7,000 LF of 24-inch diameter pipeline along McCrimmon Parkway from Project NW-2A to Davis Drive. The purpose of the NW Connector is to convey water from the NCWRF into the existing West Cary service area.

Engineer's Opinion of Probable Cost: $3,400,000

Project NW-3: Davis Drive/ Little Drive Pipeline

Construct approximately 8,600 LF of 16-inch diameter pipeline along Davis Drive and Little Drive between McCrimmon Parkway (Project NW-2B) and the existing 12-inch diameter pipeline installed under Highway 540. Construct approximately 4,200 LF of 12-inch diameter pipeline along Little Drive from I-540 to the railroad and approximately 2,800 LF of 12-inch diameter pipeline along O'Kelly Chapel Road from Highway 55 to Green Level Church Road. Completion of the project will allow for transmission of reclaimed water from the NCWRF to the existing West Cary service area and will allow Town to discontinue regular supply of reclaimed water from Durham County.

Engineer's Opinion of Probable Cost: $3,200,000

Project NW-4: O'Kelly Chapel Road Pressure Reducing & Flow Control Valve

Install pressure reducing valve with flow control valve at Highway 55 and O'Kelly Chapel Road. This valve is required to establish a West pressure zone (HGL = 560 ft) within the reclaimed water system along Highway 55 to correspond with the potable water system pressure zone boundary. Flow control is required to allow for turnover in the Baseball elevated tank. Flow control valve should be equipped with SCADA to allow remote control by operators.

Engineer's Opinion of Probable Cost: $50,000

Project NW-5: Green Level Church Road Pressure Reducing Valve

Install pressure reducing valve (set to West pressure zone HGL of 560 ft) at Green Level Church Road and Kit Creek Parkway. This valve is required to establish a West pressure zone (HGL = 560 ft) within the reclaimed water system along Highway 55 to correspond with the potable water system pressure zone boundary.

Engineer's Opinion of Probable Cost: $50,000

9.2.3 Phase 1C (2020)

Project NW-6: Stonewater Pipe Loop

Construct approximately 4,500 LF of 10-inch diameter pipeline along O'Kelly Chapel Road, Stonecroft Lane, Stonewater Glen Lane, and Yates Store Road between existing sections of pipeline to provide reclaimed water service to the Stonewater neighborhood and complete pipeline loop.

Engineer's Opinion of Probable Cost: $700,000

Project NW-7: Amberly Pipe Loop

Upsize approximately 3,100 LF of existing 6-inch diameter pipeline to 10-inch diameter along McCrimmon Parkway between Green Level Church Road and Yates Store Road to provide reclaimed water to serve the Amberly neighborhood.

Engineer's Opinion of Probable Cost: $500,000

9.2.4 Phase 2 (2020-2030)

Project NW-8: Old Reedy Creek Road Transmission Improvement

Upsize approximately 2,000 LF of existing 20-inch diameter transmission pipeline to 30-inch diameter along Old Reedy Creek Road between the NCWRF and Weston Parkway.

Engineer's Opinion of Probable Cost: $1,300,000

Project NW-9: Evans Drive & NW Cary Parkway Loop

Construct approximately 6,000 LF of 12-inch diameter pipeline along NW Cary Parkway and Evans Road to complete a loop between the existing pipeline sections on NW Cary Parkway and Evans Road. Construct approximately 3,600 LF of 6-inch diameter pipeline along Oak Island Drive and Nantucket Drive between Norwell Blvd and NW Cary Parkway to provide reclaimed water service to the Weston Pointe neighborhood.

Engineer's Opinion of Probable Cost: $1,400,000

Project NW-10: Highway 54 & Mason Farm Road Loop

Construct approximately 4,400 LF of 16-inch diameter pipeline along Highway 54 between the Northwest Connector and Mason Farm Road. Construct approximately 6,300 LF of 12-inch diameter pipeline along Mason Farm Road (and proposed Mason Farm Road extension) to Davis Drive to complete pipeline loop and provide reclaimed water service to nearby neighborhoods.

Engineer's Opinion of Probable Cost: $2,100,000

Project NW-11: Highway 54 Ground Storage Re-Pump Facility

Construct new 2.0 MG ground storage tank and 2.5 mgd booster pump station near Highway 54 and Watkins Road to provide reclaimed water system storage in the Central pressure zone.

Engineer's Opinion of Probable Cost: $4,300,000

Project NW-12: Northwest Connector Phase C

Construct approximately 8,900 LF of 24-inch diameter pipeline along McCrimmon Parkway from Project NW-2B to the proposed road between Highway 55 and 540. Construct approximately 5,000 LF of 20-inch diameter pipeline from proposed road to Green Level Church Road. Completion of the project will provide a second connection between the NCWRF and the West Cary service area.

Engineer's Opinion of Probable Cost: $6,500,000

Project NW-13: Highway 55 Pressure Reducing & Flow Control Valve

Install pressure reducing valve with flow control valve at Highway 55 and McCrimmon Parkway. This valve will be the primary feed from the NCWRF to the West pressure zone (HGL = 560 ft) once the Northwest Connector Phase C (Project NW-12) is completed. Flow control is required to allow for turnover in the Baseball elevated tank. Flow control valve should be equipped with SCADA to allow remote control by operators.

Engineer's Opinion of Probable Cost: $100,000

Project NW-14: Baseball Tank Pipe Loop

Construct approximately 14,300 LF of 12-inch diameter pipeline along Green Hope School Road and proposed road between the Baseball Tank and McCrimmon Parkway to complete additional pipeline loop from the Northwest Connector (main transmission pipe into the West pressure zone) and Baseball storage tank.

Engineer's Opinion of Probable Cost: $2,800,000

Project NW-15: Carpenter Fire Station Road Pipe Loop

Construct approximately 5,100 LF of 8-inch diameter pipeline along Carpenter Fire Station Road between Green Level Church Road and project NW-14. Construct approximately 2,400 LF of 6-inch diameter pipeline along Cary Glen Blvd between Carpenter Fire Station Road and McCrimmon Parkway. Project will provide additional looping and provide reclaimed water service to the Cameron Pond and Cary Park neighborhoods.

Engineer's Opinion of Probable Cost: $1,200,000

Project S-1: SCWRF Pump Upgrade

Replace existing reclaimed water pump station at SCWRF with new 2.0 mgd pump station.

Engineer's Opinion of Probable Cost: $2,100,000

Project S-2: Pierce Olive Road Loop

Construct approximately 14,800 LF of 8-inch diameter pipeline along Optimist Farm Road, Pierce Olive Road, a proposed future road, and Middle Creek Park Avenue to create a loop extending reclaimed water service to the west.

Engineer's Opinion of Probable Cost: $1,700,000

Project S-3: Heritage and Woodlands Loop

Construct approximately 6,300 LF of 6-inch diameter pipeline along Serene Forest Drive and Glade Hill Drive between West Lake Road and Optimist Farm Road to provide reclaimed water service to the Heritage and Woodlands neighborhoods.

Engineer's Opinion of Probable Cost: $600,000

9.2.5 Phase 3 (2030-2060)

Project NW-16: NCWRF Ground Storage Tank

Construct new additional 1.0 MG ground storage tank at the NCWRF to provide additional reclaimed water storage for peak demands.

Engineer's Opinion of Probable Cost: $800,000

Project NW-17: NCWRF Pump Upgrade

Replace the two existing 150 hp pumps at the North Cary WRF reclaimed water pump station with new 300 hp pumps

Engineer's Opinion of Probable Cost: $1,500,000

Project NW-18: Weston Parkway Transmission Improvement

Upsize approximately 8,300 LF of existing 16-inch diameter transmission pipeline to 30-inch diameter along Weston Parkway between Old Reedy Creek Road and Evans Road.

Engineer's Opinion of Probable Cost: $4,600,000

Project NW-19: Harrison Avenue Pipe Loop

Construct approximately 6,000 LF of 12-inch diameter pipeline along NW Cary Parkway and Harrison Avenue between the existing sections of pipe on NW Cary Parkway and Harrison Avenue to complete pipe loop.

Engineer's Opinion of Probable Cost: $1,100,000

Project NW-20: SAS Campus Drive Pipeline

Construct approximately 2,500 LF of 8-inch diameter pipeline along SAS Campus Drive to extend existing 8-inch diameter pipe to provide reclaimed water service on SAS campus.

Engineer's Opinion of Probable Cost: $300,000

Project NW-21: Morrisville Distribution Line Extensions

Construct approximately 59,400 LF of 6-inch and 8-inch diameter pipelines along existing and planned thoroughfares in north Morrisville to provide reclaimed water service throughout this area. Individual projects should be broken out as dictated by future growth.

Engineer's Opinion of Probable Cost: $6,500,000

Project NW-22: RTP South & Breckenridge Distribution Line Extensions

Construct approximately 14,100 LF of 8-inch diameter pipelines along Old Maynard Rd and Parkside Valley Drive to provide reclaimed water service throughout this area. Upsize approximately 5,100 LF of existing small diameter pipe to 6-inch and 8-inch diameter along Development Drive, Kit Creek Parkway, and River Pine Drive.

Engineer's Opinion of Probable Cost: $2,100,000

Project NW-23: West Pressure Zone Distribution Line Extensions

Construct approximately 19,600 LF of 6-inch and 8-inch diameter pipelines along O'Kelly Chapel Road, Morrisville Parkway, Green Level West Road, Green Level Church Road, and Roberts Road to provide reclaimed water service through the West pressure zone.

Engineer's Opinion of Probable Cost: $2,200,000

Project NW-24: Pump Upgrade at Highway 54 Storage Facility

Replace the two 50-hp pumps at the Highway 54 Storage Facility with new 140-hp pumps.

Engineer's Opinion of Probable Cost: $1,500,000

Project NW-25: SAS Area

Construct approximately 20,200 LF of 6-inch, 8-inch, and 12-inch diameter pipelines along Trenton Road, the future Cary Parkway extension, and a proposed future thoroughfare. Individual projects should be broken out as dictated by future growth.

Engineer's Opinion of Probable Cost: $2,400,000

Project NW-26: Central Morrisville

Construct approximately 45,000 LF of 6-inch and 8-inch diameter pipelines south of McCrimmon Parkway along NW Cary Parkway, Weston Parkway, Highway 54, Church Street, Morrisville Carpenter Road, and Davis Drive in central Morrisville. Individual projects should be broken out as dictated by future growth.

Engineer's Opinion of Probable Cost: $4,700,000

Project NW-27: Highway 55 Area

Construct approximately 27,300 LF of 6-inch diameter pipelines on existing and proposed thoroughfares adjacent to Highway 55. Individual projects should be broken out as dictated by future growth.

Engineer's Opinion of Probable Cost: $2,500,000

Project S-4: West Lake Road Transmission Improvement

Upsize approximately 6,300 LF of existing 12-inch diameter transmission pipeline to 16-inch diameter along West Lake Road between the SCWRF and Optimist Farm Road. Upsize approximately 1,500 LF of existing 8-inch diameter pipeline to 12-inch diameter along Optimist Farm Road between West Lake Road and Middle Creek School.

Engineer's Opinion of Probable Cost: $1,500,000

Project S-5: Bells Lake Road Loop

Construct approximately 11,800 LF of 8-inch diameter pipeline along Optimist Farm Road, Bells Lake Road, Oxford Green Road, and Langston Circle and approximately 1,700 LF of 12-inch diameter pipeline along West Lake Road between Langston Circle and the existing 12-inch diameter pipe to create a loop extending reclaimed water service to the east.

Engineer's Opinion of Probable Cost: $1,600,000

Project S-6: Bells Lake Road Pipeline South

Construct approximately 5,700 LF of 6-inch diameter pipeline along Bells Lake Road south of project S-5 to extend reclaimed water service to nearby areas.

Engineer's Opinion of Probable Cost: $500,000

Project S-7: Bells Lake Road Pipeline North

Construct approximately 1,800 LF of 6-inch diameter pipeline along Bells Lake Road north of project S-5 to extend reclaimed water service to nearby areas.

Engineer's Opinion of Probable Cost: $200,000

Project S-8: West Lake Road Pipeline North

Construct approximately 4,400 LF of 12-inch diameter pipeline along West Lake Road north of the proposed Highway 540 corridor to Ten Ten Road to extend reclaimed water service to the north.

Engineer's Opinion of Probable Cost: $700,000

Project S-9: West Lake Elevated Storage Tank

Construct new 0.5 MG elevated tank near West Lake Road and Floresta Drive (north of the proposed Highway 540 corridor) to provide distribution system storage and maintain adequate pressure for areas to the north.

Engineer's Opinion of Probable Cost: $1,700,000

Project S-10: Ten Ten Road Pipeline

Construct approximately 6,200 LF of 8-inch diameter pipeline along Ten Ten Road between West Lake Road and Holly Springs Road. Construct approximately 2,800 LF of 6-inch diameter pipeline along Ten Ten Road from West Lake Road to the east.

Engineer's Opinion of Probable Cost: $1,000,000

Project S-11: Distribution Line Extensions in Northern Portion of Service Area

Construct approximately 21,000 LF of 6-inch diameter pipeline along Summer Oaks Drive, South Pointe Drive, Orchard Knoll Drive, Holly Springs Road, Pierce Olive Road, and Bamburgh Lane to provide reclaimed water service throughout this area. Individual projects should be broken out as dictated by future growth.

Engineer's Opinion of Probable Cost: $2,100,000

9.2.6 Summary

The total cost of CIP projects presented in Table 9-1 is $82.9 million. However, many of these projects are recommended in Phase 3 as the system nears build-out. A summary of the CIP costs by project type and year is presented in **Table 9-5**.

It should be noted that there may be alternatives, including continuation of reclaimed water supply from Durham County, to delay the cost of construction of the NW Connector pipeline in the initial phases.

Table 9-5. Summary of CIP Project Costs by Type and Year (in millions of dollars)[1]

Project Type	2015	2017	2020	2030	2060	Total
Storage	$3.3	-	-	$4.3	$2.5	$10.1
Pipelines[2]	$8.1	$6.6	$1.2	$17.6	$34.0	$67.5
Pumping	-	-	-	$2.1	$3.0	$5.1
Control Valves	-	$0.1	-	$0.1	-	$0.2
Total	**$11.4**	**$6.7**	**$1.2**	**$24.1**	**$39.5**	**$82.9**

1) Capital costs include 30% for construction contingencies and 25% for engineering, legal, and administration fees. All cost estimates are based on 2013 dollars without escalation.
2) Costs are for distribution/transmission mains along transportation thoroughfares and do not include the cost of smaller diameter pipelines, meters, appurtenances, etc. for retrofit within existing neighborhoods. The Town would likely fund retrofits. Developers may help fund some of the service area pipeline extensions included in the costs presented in this table.

9.3 Operational Considerations

As discussed in Section 8, storage sizing recommendations are based on maximum day demand conditions. However, due to the nature of the peaking factors associated with the reclaimed water system, the recommended storage volume is large in comparison with the average annual demand or summer seasonal demands. To maintain water quality and decrease water age in the storage facilities, particularly during summer seasonal and average annual demand conditions, the following operational measures are recommended:

- Operate the flow control valves on the primary connections to the West pressure zone to limit flow into the West pressure zone during peak hours to allow the Thomas Brooks Park Baseball tank to drain. The valves can be opened to allow the tank to fill during off-peak hours. This tank should be removed from service in the winter when demands are minimal.
- Operate the Highway 54 Ground Storage Facility with a lesser volume (i.e. do not fill the entire tank volume), as dictated by system demand conditions, to minimize water age in the tank. The tank may be removed from service in the winter when demands are minimal.
- Operate the SCWRF reclaimed water pumps based on the level in the West Lake Elevated Tank. Flow from the plant should be stopped/ reduced so demand is met from storage, allowing the storage tank to empty. The pumping is then restarted/ increased to refill the tank.

Additionally, the recommended pipelines are sized to meet minimum design criteria for build-out peak hour demands. In the intermediate phases and during periods of lower demand, blowoffs may

be required in some areas to maintain water quality. This is especially true for the first phases of construction of the NW Connector (projects NW-2A and NW-2B) since the large pipeline will serve very few customers until completion of the connection between McCrimmon Parkway and Green Level Church Road (project NW-3).

The Town may also consider adding booster disinfection in the system to maintain disinfectant residuals. Once the NW Connector is constructed and water from the NCWRF transmitted to the western portion of the service area, the Town should evaluate disinfection residuals in the western portion of the service area and determine the need for booster disinfection.

9.4 Reclaimed Water Program Policy Considerations

The following recommendations and considerations pertain to the Town's reclaimed water program policies.

9.4.1 Policy Statement 132

Scenario 4 was selected as the preferred scenario for planning. Since the preferred scenario did not include the entire 2010 adopted service area defined in Policy Statement 132, the Town revised the Policy Statement in March 2013 to reflect the Scenario 4 service area boundary. **Figure 9-3** compares the 2010 adopted service area with the Scenario 4 service area. Based on current reclaimed water usage patterns and peaking factors, not all of the projected demands in the full Scenario 4 (Scenarios 4.1 and 4.2) can be served with the supply available from the NCWRF. Reclaimed water service may be extended on a first come, first served basis. As development occurs, the Town should re-evaluate the extent of the Scenario 4 area that can be served as part of the Northwest Cary reclaimed water system.

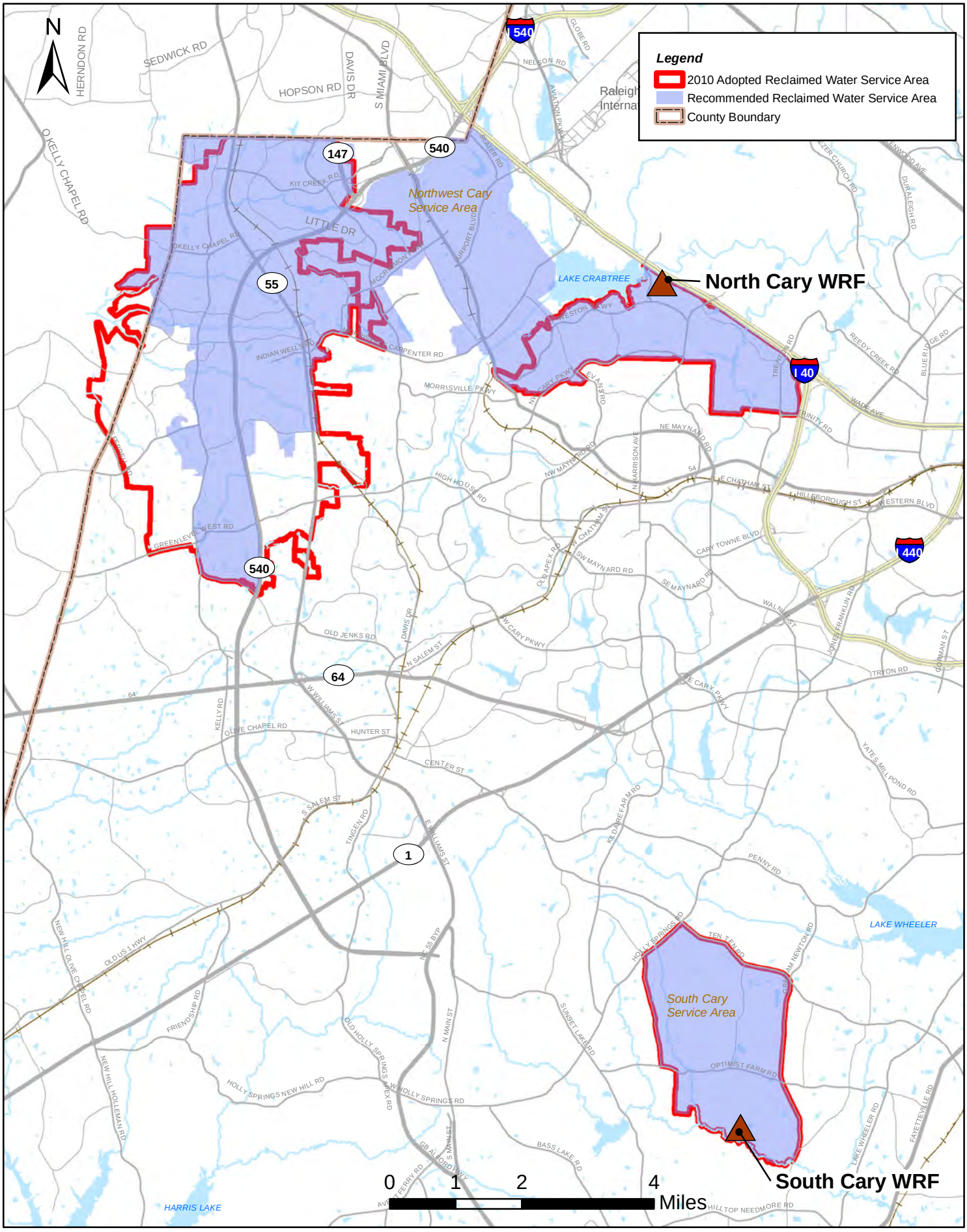
9.4.2 Conversion Benefit to Encourage Connections

The Town may want to consider the following ideas as part of its strategy to expand the reclaimed water system. These considerations are based on the experiences of other reclaimed water systems in the US and may be useful for the Town to address common expansion challenges as it moves into the future.

San Antonio Water System

San Antonio Water System's reclaimed water system was initiated in the late 1990s and is one of the largest reclaimed water system in the United States. It provides approximately 31 million gallons of reclaimed water per day to customers through 130 miles of pipeline. Customers include golf courses, parks, commercial users, industrial users, and the City's River Walk.

The San Antonio Water System recognized that reclaimed water customers were burdened with the cost of making onsite improvements to use reclaimed water. To address this burden, the water system implemented a conversion benefit to provide $900 per acre-foot of reclaimed water signed for in the user agreement for the property. The larger the amount contracted to be served, the longer the period for reimbursement. For example, for a golf course using 200 acre-feet/year, this amounts to $180,000 to be reimbursed over 10 years, at $18,000 per year. Improvements can be any conversion but not a new irrigation system. This can include signage, replacement sprinkler heads (to change spray angle or pattern), purple valve box covers, quick connects, and other improvements.



CDM Smith

Figure 9-3
Recommended Reclaimed Water Service Area

City of Pompano Beach, FL

The City of Pompano Beach has operated a reclaimed water system since 1989 and currently produces approximately 7.5 million gallons of reclaimed water per day. It has experienced challenges getting residential customers to connect to the reclaimed water system. The City implemented a program to allow the City's contractors to install the plumbing for a customer's connection to the reclaimed water system. This eliminated the annual customer certification requirement, which was cited as a reason customers had been reluctant to connect to the system. The City recovers the costs for the program through a slightly higher rate for its reclaimed water.

9.4.3 Design Standards

As the Town moves into the future with an expanded reclaimed water system, staff should review the Town's reclaimed water design standards to make sure they are appropriate for the system. For example, the Town may want to consider allowing reclaimed water lines to be installed by the directional drilling method to reduce the expense of retrofitting already-developed areas. The Town's current reclaimed water design standards require C-900 and C-905 pipe (except where ductile is required for utility separations).

As an example, the Pecan Grove and New Territory developments in Fort Bend County south of Houston have been developed for many years and are heavily landscaped. The Pecan Grove development is bisected by a county road, which could not be open-cut. The New Territory development has concrete roadways, and road cuts were not allowed. The reclaimed water lines in these two developments were designed for directionally drilling butt-fused HDPE pipe to avoid road cuts and other conflicts with utilities. **Figure 9-4** shows HDPE pipe with purple striping to designate it as reclaimed water piping, and **Figure 9-5** shows the butt-fused connection of two HDPE reclaimed water pipes. Fusible PVC may also be considered.

Figure 9-4
HDPE Pipe for Reclaimed Water

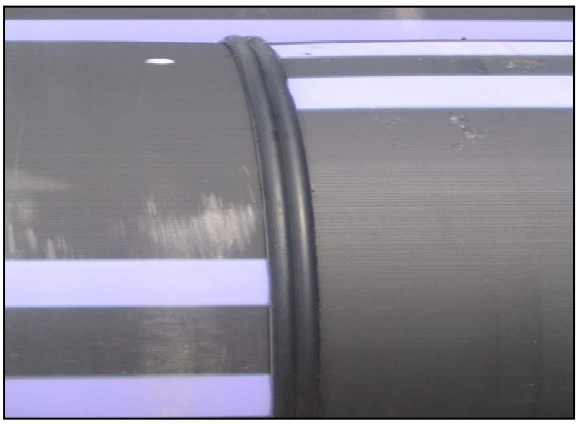


Figure 9-5
Butt-fused reclaimed water HDPE pipe

9.5 Summary

The CIP developed as part of the Reclaimed Water Master Plan Update provides phased improvements to extend reclaimed water service to customers throughout the recommended service area and maximize reclaimed water usage from the NCWRF. Because unforeseen events affecting projected growth and expansion may occur, it is recommended that the reclaimed water system improvements implementation plan summarized in this master plan be reviewed and updated periodically, at least every 5 years, to ensure that the system improvements and associated funding are being cost-effectively spent on pace with growth and development patterns. Factors such as right-of-way acquisitions and new roadway construction or existing roadway repaving/repairs may also affect the implementation schedule and should be considered in updating the implementation plan. Patterns of reclaimed water use should also be re-evaluated to determine if peaking factors used for planning purposes may be reduced.