



## Section 2 - Existing Wastewater System

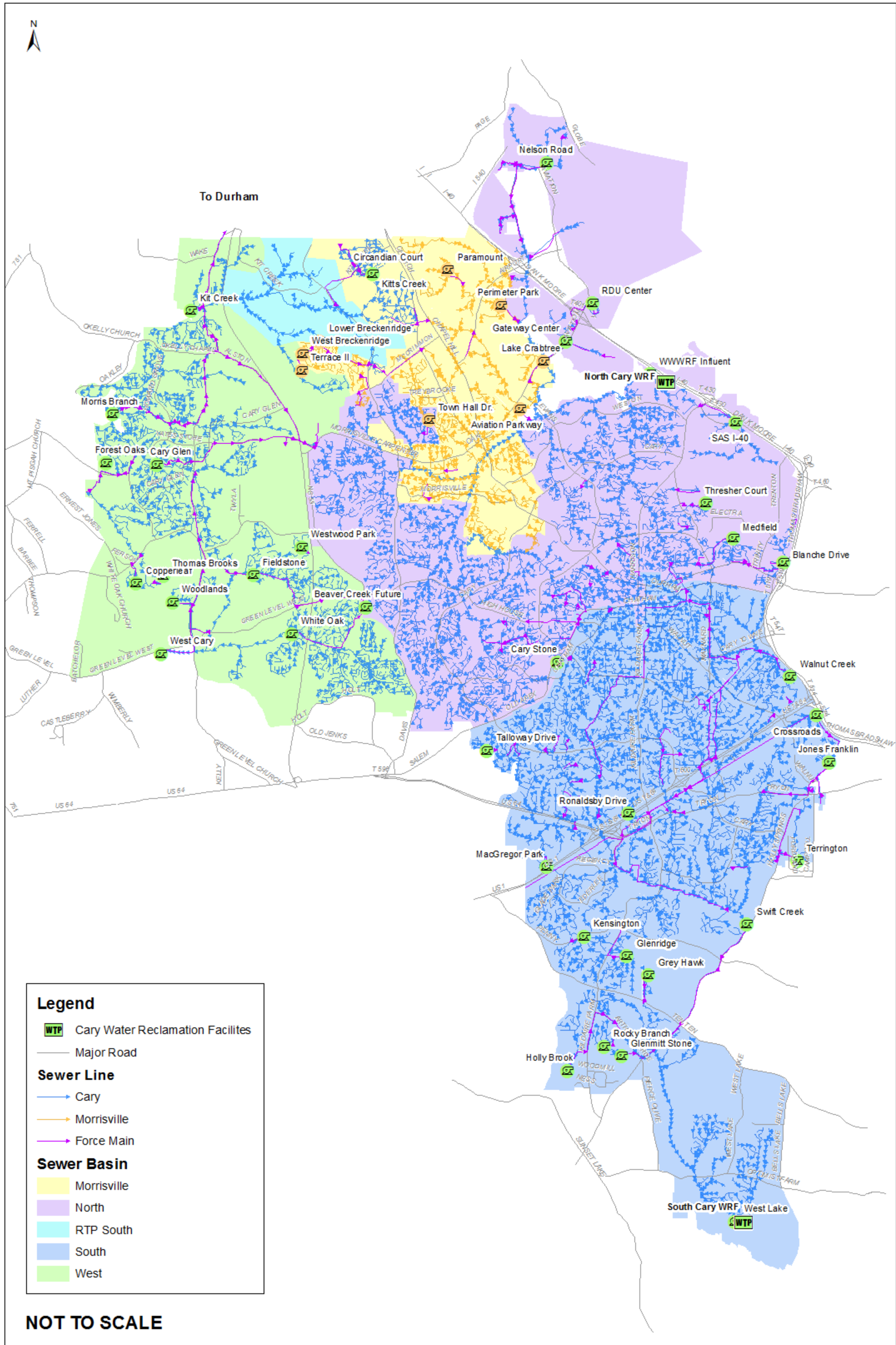
### 2.1 Introduction

In addition to serving its own residents, the Town of Cary provides wastewater collection, conveyance and treatment services for the Town of Morrisville, Raleigh-Durham (RDU) International Airport, and the Wake County portion of Research Triangle Park (RTP South). For billing purposes, all customers can be further classified as residential, commercial, institutional and industrial customers. The current residential population receiving the Town's wastewater services is estimated at slightly more than 140,000.

The Town of Cary currently operates and maintains nearly 873 miles of collection system pipes (789 miles of gravity sewers and 84 miles of force mains), more than forty wastewater pumping stations, and nearly 23,000 manholes, as illustrated in Figure 2-1, and safely treated approximately 13 million gallons of wastewater on an average daily basis in 2010, as shown in Figure 2-2. Detailed statistics for all gravity sewers and force mains in the collection system can be seen in Table 2-1 and Table 2-2.

The Town's primary responsibility for the sewer collection system is to maintain unimpeded wastewater flows in the collection system without surcharging and overflows under both dry and wet weather conditions. To accomplish this, the Town of Cary needs to provide adequate infrastructure, routinely maintain/clean its sewer lines and continuously perform preventive repairs.

The Towns of Cary and Morrisville completed a merger of their utility assets in 2005. The Town of Cary assumed the responsibility for maintaining and operating the sewer collection system within the Town of Morrisville. Figure 2-3 depicts the sewer service area in the Town of Morrisville immediately prior to the above-mentioned merger. Several projects were pursued by the Town of Cary to unify, streamline and optimize collection system operations in the previously Morrisville-owned service area by abandoning surplus lift stations and merging/redirecting sewer flows to Cary's system, thus enhancing system reliability and minimizing operational costs. Additional efforts were made in this study to help the Town of Cary further its consolidation efforts with respect to sewer assets previously owned by the Town of Morrisville. A few preliminary alternatives for these efforts are discussed in Section 6.



Town of Cary  
North Carolina

Figure 2-1: Overview of the Existing Sewer Collection System Owned and Serviced by the Town of Cary

**Table 2-1: Lengths of Gravity Pipes by Size**

Pipe Size (inch)	Length (Mile)
Less than 8	5
8	669
10	12
12	35
15	12
18	12
24	17
30	14
36	5
42	4
48	3
54	1
Total	789



**Table 2-2: Length of Force Main Pipes by Size**

Pipe Size (inch)	Length (Mile)
2	4
3	2
4	12
6	12
8	10
10	12
12	2
14	3
16	11
18	3
20	5
24	4
36	4
Total	84

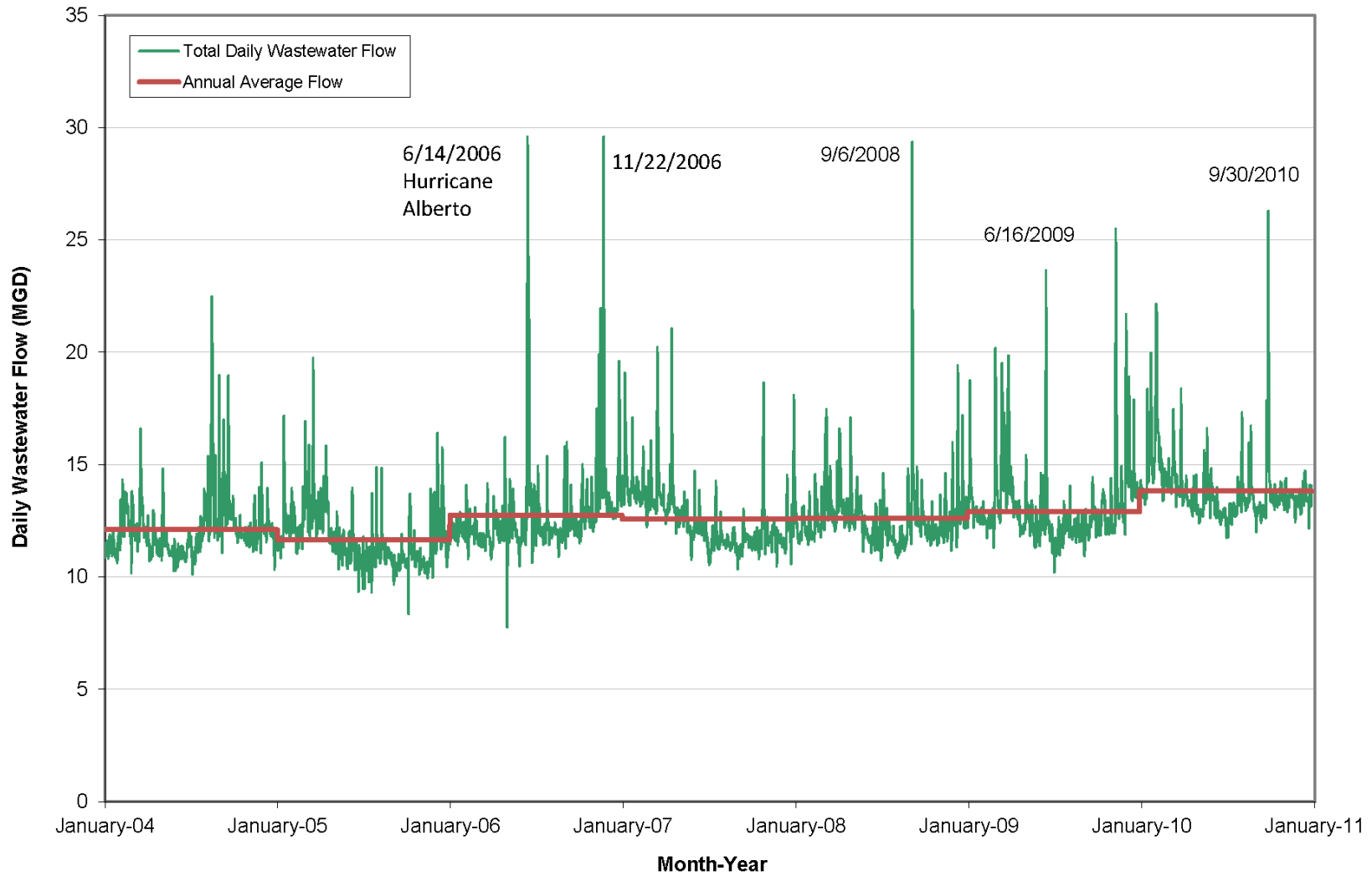
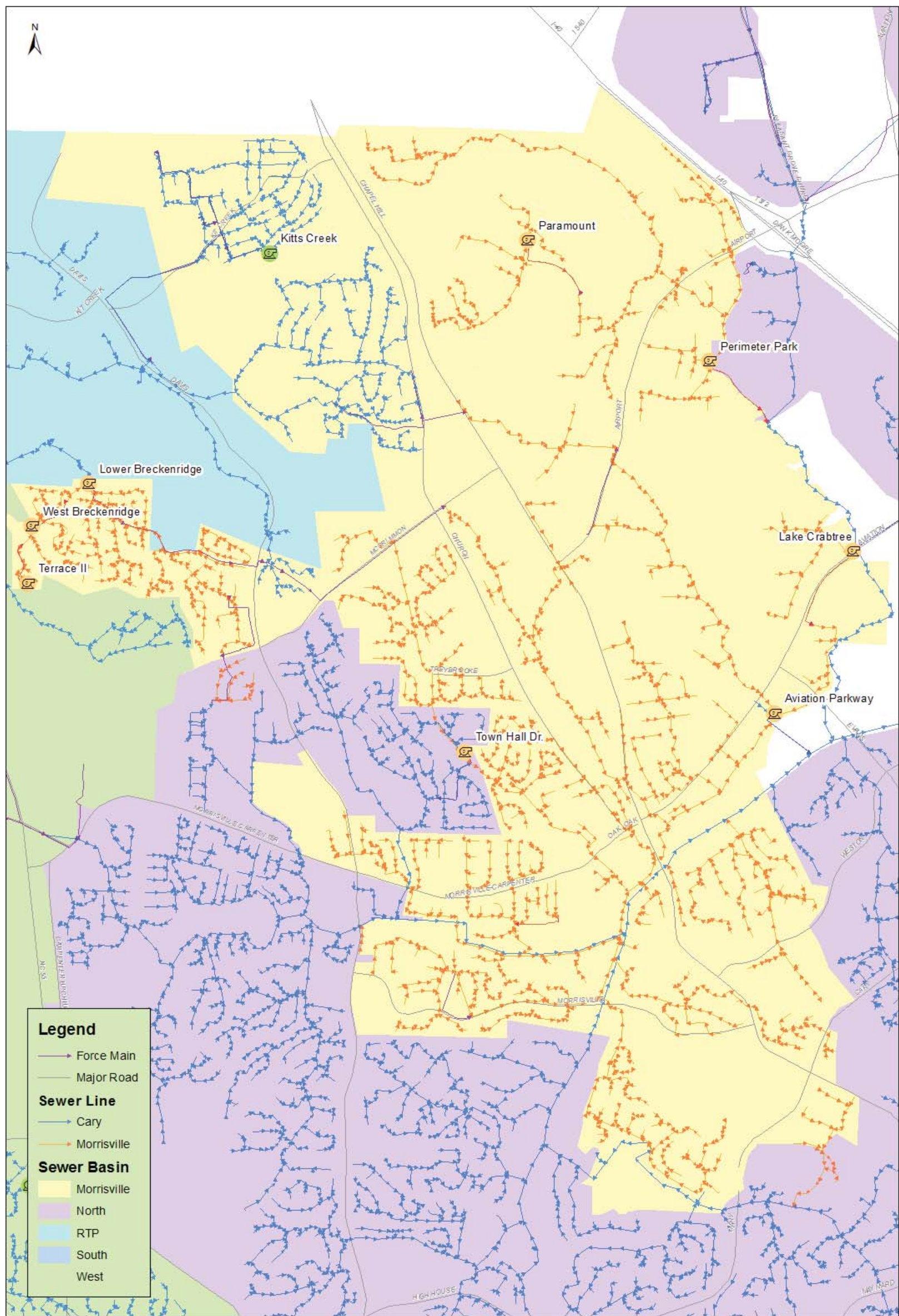


Figure 2-2: Total Wastewater Flows from the Town of Cary’s Service Area (2004-2010)



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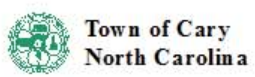


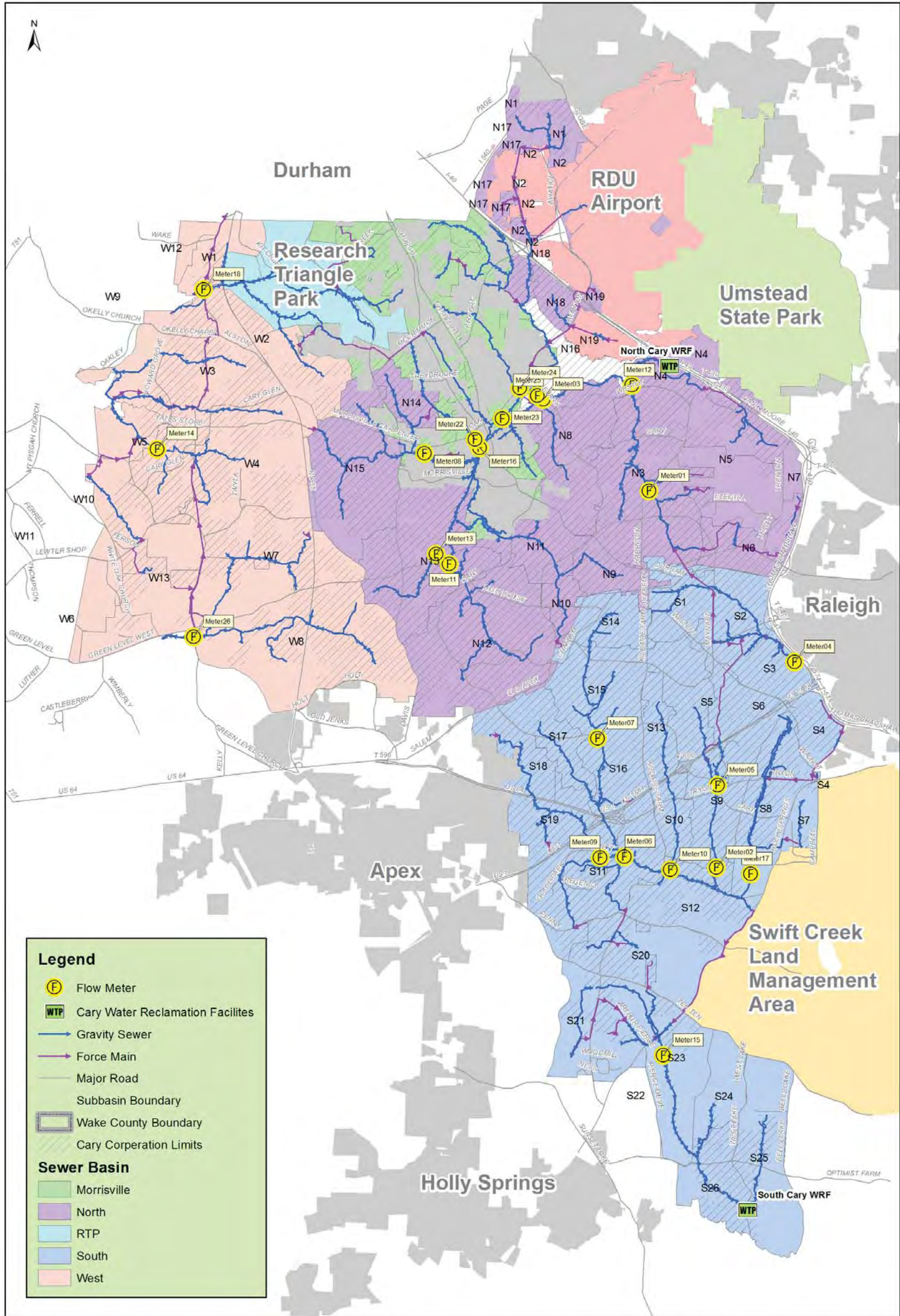
Figure 2-3: Illustration of Morrisville-Owned Sewer System Prior to the Merger



The long-range planning for the Western Wake Regional Water Reclamation Facility (WWRWRF) has been under way for a number of years and is proceeding smoothly. Currently, the majority of sewer flows generated from the western portion of Cary's sewer service area are pumped via the West Cary Regional Pump Station, the Morris Branch Pump Station and the Kit Creek Pump Station to Durham County Triangle Wastewater Treatment Plant (WWTP) for treatment and discharge. Subsequent to the completion of the WWRWRF, all wastewater flows from the referenced service area shall be delivered in opposite direction to the WWRWRF for treatment. Detailed planning for sewer collection system improvements accompanying the launch of the WWRWRF is addressed in Section 6 and Appendix A. During the transition period, the Kit Creek Pump Station does not possess the firm capacity that would allow it to pump all peak wet weather flows to the Triangle WWTP. Hence, wet weather peak flow management is accomplished by the Town of Cary through shifting flows between the Triangle WWTP and the North Cary WRF via the Fieldstone, White Oak, Cary Glen and Kit Creek Pump Stations. This is discussed further in detail in Section 6.

## 2.2 Service Boundary Dilation

The service area boundaries were originally developed as part of the Town of Cary's Wastewater System Master Plan in 2003. The existing service area boundary was further modified based upon a map of existing sewer lines as part of this study. Sub-basins within the Town's three main drainage basins, the North, South and West Basins, are also shown on Figure 2-4. Sewer line location information provided by the Town of Cary, as of 2010, was used to create the existing service area. Some additional areas were added to the service area in the south and the west within Wake County boundaries. Sub-basin boundaries throughout the Town's service area are largely based upon the 1992 sub-basin boundaries shown by Diehl & Phillips in the 1992 Wastewater System Report to provide continuity with past work. There are a total of 99 sub-basins in the current master plan. There are 43 sub-basins that are served by gravity or pumped to the North Cary WRF and are therefore in the North Cary service area. There are 28 sub-basins that are served by gravity or pumped to the South Cary WRF and are in the South Cary service area. The North and South Cary service areas are both in the Neuse River Basin. The remaining 28 sub-basins are in the West Cary service area, and are tributary to waters in the Cape Fear River Basin that flow into Jordan Lake. Flows from the areas of the West Cary service area that currently receive sewer service are pumped to Durham County's Triangle WWTP for treatment. The basin boundaries follow hydrologic boundaries in all situations where there are no existing sewer lines.



0 0.5 1 2 Miles

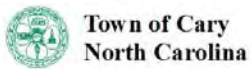


Figure 2-04  
Illustration of Sub-basin Delineation as Part of This Master Plan Update

Figure 2-4: Illustration of Sub-basin Delineation





## 2.3 Water Reclamation Facilities (WRFs)

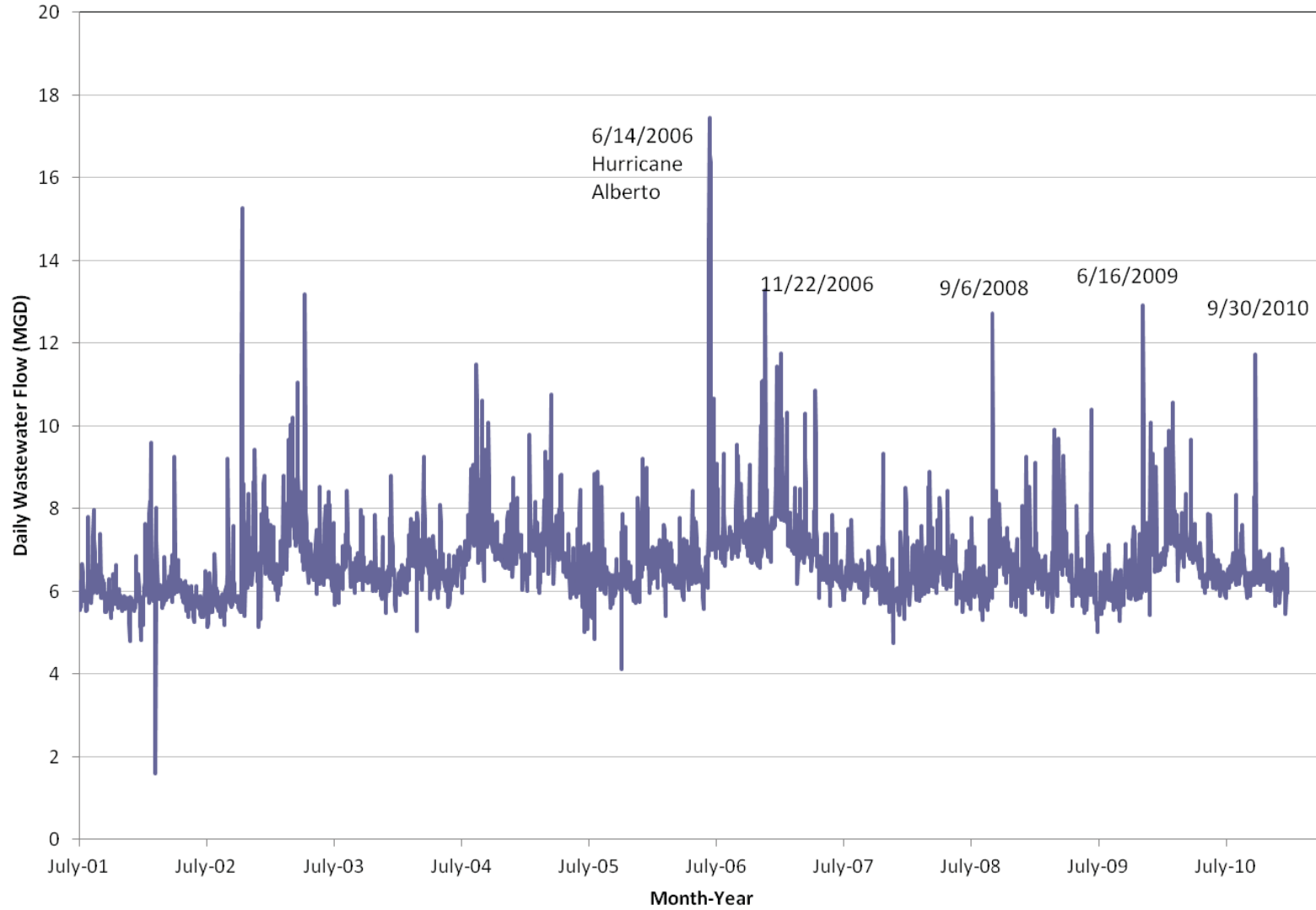
### 2.3.1 North Cary WRF

The North Cary WRF is located on Old Reedy Creek Road near I-40 and the William B. Umstead State Park. Its current treatment capacity is 12 MGD. The plant currently serves the northern portion of Cary, RTP South, RDU Airport and the Town of Morrisville. The average daily influent flow was approximately 6.35 MGD in 2010. The North Cary WRF discharges into Crabtree Creek, a tributary of the Neuse River. The Neuse River Basin is designated as nutrient sensitive waters; therefore, the NPDES permit has more stringent nutrient discharge limits.

The current treatment processes at the North Cary WRF consist of the following: bar screens; grit removal facilities; three separate biological treatment trains, each consisting of a four-stage anaerobic selector, two oxidation ditches, a three-stage secondary anoxic zone and a re-aeration zone; three secondary clarifiers; effluent sand filters; ultraviolet (UV) disinfection; and a cascade aerator for re-aeration prior to discharge. Solids treatment facilities include two gravity belt thickeners and three aerobic digesters/solids storage tanks. The solids then are hauled by truck for further treatment and disposal at the South Cary WRF, where dewatering and thermal drying facilities are provided.

The daily wastewater flows from 2001 to 2010 are presented in Figure 2-5. Yearly average daily wastewater flows are included in Table 2-3. A strong seasonal pattern can be observed with high flow in the early spring and early winter for each year. Rainfall dependent inflow and infiltration (RDI/I) can increase the daily wastewater flow up to 11-14 MGD. Hurricane Alberto in 2006 brought the daily wastewater flow on June 14, 2006 to the highest point at 18 MGD within our sample periods. With the average base flow of 6.35 MGD in 2010, this implies a peaking factor of approximately 2.9. A more in-depth discussion is included in Section 5 to analyze the system performance.

Table 2-4 lists all of the pump stations in the North Cary service area.



**Figure 2-5: Historical Daily Wastewater Flows to the North Cary WRF (2001-2010)**



**Table 2-3: Yearly Average Daily Wastewater Flows to Three WRFs Serving the Town of Cary's Collection System**

Year	North Cary WRF*	South Cary WRF*	Triangle WWTP*	Total Wastewater Flows*
	(MGD)	(MGD)	(MGD)	(MGD)
2001	5.93	5.22		11.15
2002	6.25	4.87		11.12
2003	6.84	5.48		12.31
2004	6.96	5.14		12.10
2005	6.74	4.91		11.65
2006	7.26	4.88	0.59	12.74
2007	6.74	4.92	0.91	12.56
2008	6.53	4.68	1.39	12.60
2009	6.51	5.02	1.47	13.01
2010	6.35	4.82	2.11	13.28

\* The flows listed in this table are the average daily flow less reclaimed water blowoff.

**Table 2-4: North Cary System – Pump Stations**

ID	Pump Station	Location	Wet Well Dimension (Diameter, ft or L×W, ft)	Pump Protection Mechanism
005	Nelson Road	4908 Nelson Road	8	Grinder
009	I-40	351 SAS Campus Drive	10×7.83	Basket Strainer
012	Medfield	1401 1/2 Baker Road	8	Basket Strainer
013	Blanche Drive	6106 Blanche Drive	6	Grinder
015	Gateway Center	1317 Aviation Parkway	10	Basket Strainer
016	RDU Center	3101 RDU Drive	6	Basket Strainer
020	Carystone	224 Kristin Court	6.1	Basket Strainer
021	Thresher Court	107 Thresher Court	6	Basket Strainer
023	Town Hall Dr.	635 Town Hall Drive	6	Grinder
032	Park at West Lake	4900 West Lake Road	8	Grinder
042	Aviation Parkway	414 Aviation Parkway	8.25	Basket Strainer
044	Paramount	5180 Paramount Parkway	6	Basket Strainers (2)
046	Perimeter Park	350 Perimeter Park Drive	8	None
047	Lake Crabtree	1040 Aviation Parkway	6	Basket Strainer
048	Kitts Creek	1601 Legendary Lane	10	Grinder



### 2.3.2 South Cary WRF

The South Cary WRF is located on West Lake Road, near Sunset Lake. Its current treatment capacity is 12.8 MGD. Its average daily influent flow was approximately 5 MGD in 2010. The South Cary WRF is permitted to discharge up to 16 MGD under the terms of its NPDES permit (No. NC0065102). The South Cary WRF also has stringent nutrient removal requirements because it discharges into Middle Creek, which is also located in the Neuse River Basin.

The current processes at the South Cary WRF consist of the following: bar screens, grit removal facilities, three secondary treatment units for biological nutrient removal, four secondary clarifiers, seven deep-bed tertiary filters, ultraviolet disinfection, and a cascade aerator for re-aeration prior to discharge. Solids handling facilities include two gravity belt thickeners and three aerobic digesters.

Figure 2-6 presents the historical daily wastewater flow to the South Cary WRF from 2004 to 2010. Similar to the North Cary WRF, the RDI/I plays an important role in driving elevated level of flows to the South Cary WRF. The average base flow at the South Cary WRF in 2010 was approximately 4.82 MGD. The peak wet weather flow reached as high as the 14-15 MGD range on a couple of occasions. The peaking factor for the South Cary service area is estimated at roughly 3.

Table 2-5 lists all of pump stations in the South Cary service area.

### 2.3.3 Triangle WWTP

The wastewater flow generated from the West Cary service area is currently pumped into the Triangle WWTP for treatment and discharge. There is only one flow meter on the border of Cary and Durham from which daily flow records are retrieved. As discussed in Section 5, there is some uncertainty about the reliability of the Durham County's flow meter data, particularly after the inception of the West Cary Regional Pump Station in October of 2007. The yearly average flow received at the Triangle WWTP is estimated at approximately 2.21 MGD based on the above meter. The difference between Durham's flow data and flow meter data can also be caused by the flow meter itself. Frazier Engineers is in the process of relocating its flow meter and trying other measures to fix the problems in coordination with flow monitoring program in Public Works Department.

Figure 2-7 presents Cary's historical daily wastewater flow to the Triangle WWTP from 2004 to 2010. The yearly average wastewater flow from the Town of Cary's service area has largely remained constant in the past six years. 2004-2006 were relatively wet years. 2007-2009 were very dry. However, the robust population growth has resulted in increases in the daily wastewater flow for the West Service Area. Yet this increase in population growth was partially offset by the relatively dry season in the past three years and the associated reduction in wet weather flow contribution. More diversion from the existing North Cary service area also contributed to its flow growth.

Table 2-6 lists all of pump stations in West Cary service area.



**Table 2-5: South Cary System – Pump Stations**

ID	Pump Station	Location	Wet Well Dimension (Diameter, ft or L×W, ft)	Pump Protection Mechanism
001	Swift Creek	7802 Holly Spring Rd	25×17	Bar Screens with Screenings Conveyors
002	Walnut Creek	1100 Buck Jones Road	12×20	Bar Screens with Screenings Conveyors
006	Crossroads	401 Crossroads Blvd.	8	Grinder
007	Glenmitt Stone	4139 Mitt Glen Lane	5×4.8	Basket Strainer
010	Glenridge	306 Copper Hill Drive	8	Basket Strainer
011	Jones Franklin	2104 Jones Franklin Road	10	Grinder
014	Talloway Drive	2005 1/2 Talloway Drive	5.6	None
017	MacGregor Park	403 Gregson Drive.	6	Basket Strainer
018	Ronaldsby Drive	223 Ronaldsby Drive	7.8	None
024	Holly Brook	4908 Holly Brook Drive	8	Basket Strainer
025	Rocky Branch	205 Drakewood Place	6	Basket Strainer
027	Kensington	10899 Penny Road	6	Basket Strainer
030	Grey Hawk	611 Hawks Ridge Court	6	Grinder
031	Terrington	5956 Terrington Ln	8	Grinder

**Table 2-6: West Cary System – Pump Stations**

ID	Pump Station	Location	Wet Well Dimension (Diameter, ft or L×W, ft)	Pump Protection Mechanism
003	Kit Creek	2605 Alston Avenue	10×18.4	Grinder
004	White Oak	2505 NC 55 Hwy	9.9×19.75	Grinder
019	Morris Branch	251 Beckingham Lp.	See drawing	Bypass Bar Screen
008	Fieldstone	8000 Branton Drive	11.5×10	Grinder
028	Cary Glen	319 Belles Landing Court	10	Grinder
033	Forest Oaks	2586 New Hope Church Road	8	Grinder
034	Copperleaf	7055 Copperleaf Place	8	Grinder
035	West Cary	3905 Green Level West Rd.	85.5*13 (see drawing)	Grinder
039	Terrace II	598 Walnut Woods Drive	5	Basket
040	West Breckenridge	820 Parkside Valley Drive	8	Basket
041	Woodlands	7748 Mills Rd.	6	Grinder
043	Circadian Court	1004 Circadian Court	6	Grinder
048	Kitts Creek	1601 Legendary Lane	10	Grinder
049	Copperleaf II (Palavar)	6841 Palavar Lane	8	Grinder
050	Somers (Aventon)	2000 Somers Drive	8	Grinder



### **2.3.4 Western Wake Regional Wastewater Reclamation Facility (WWRWRF)**

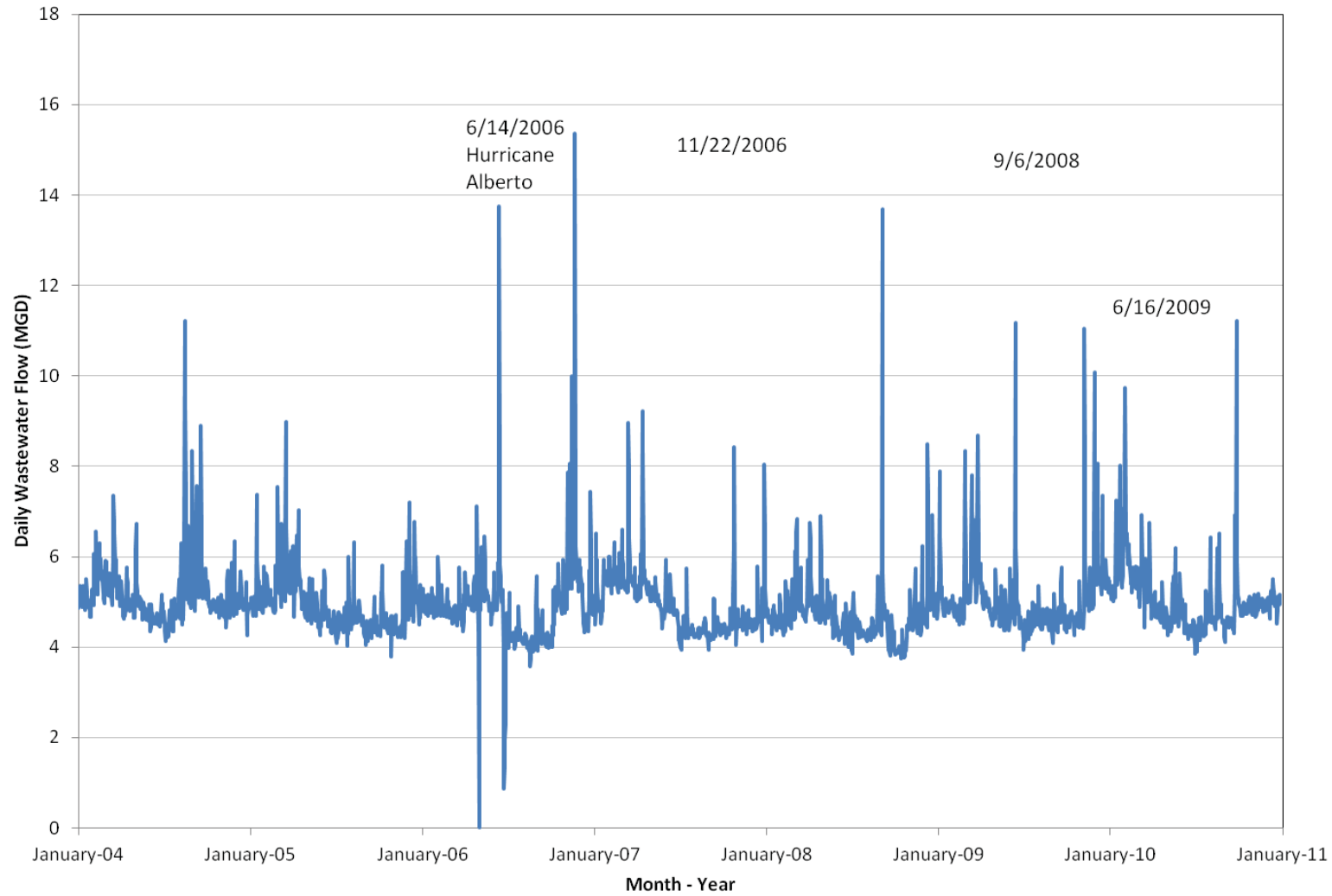
WWRWRF is the third water reclamation facility in the Town of Cary. It is currently under construction. The facility is expected to start operation by mid-2014. The pre-treatment facility consists of mechanical screening, influent flow measurement, and grit removal. The treatment odor control facility is constructed to provide odor control for the preliminary treatment facilities, the influent splitter box, and the future fine screening facility. The secondary treatment facility is to provide removal of biochemical oxygen demand (BOD), total suspended solids (TSS), total nitrogen, and total phosphorus. Secondary effluent flows by gravity from the clarifiers to tertiary filtration. Tertiary treatment consists of cloth disk filters, an ultraviolet (UV) disinfection system, effluent flow measurement, post-aeration, and plant non-potable water facilities. Disinfected effluent flows by gravity to one of two post aeration basins for the 18 MGD design flow.

The biosolids are thickened by gravity belt filtration and dewatered by centrifuges. The solids handling facility has facilities for scum digestion and an area to load the dewatered biosolids into trucks prior to land application.

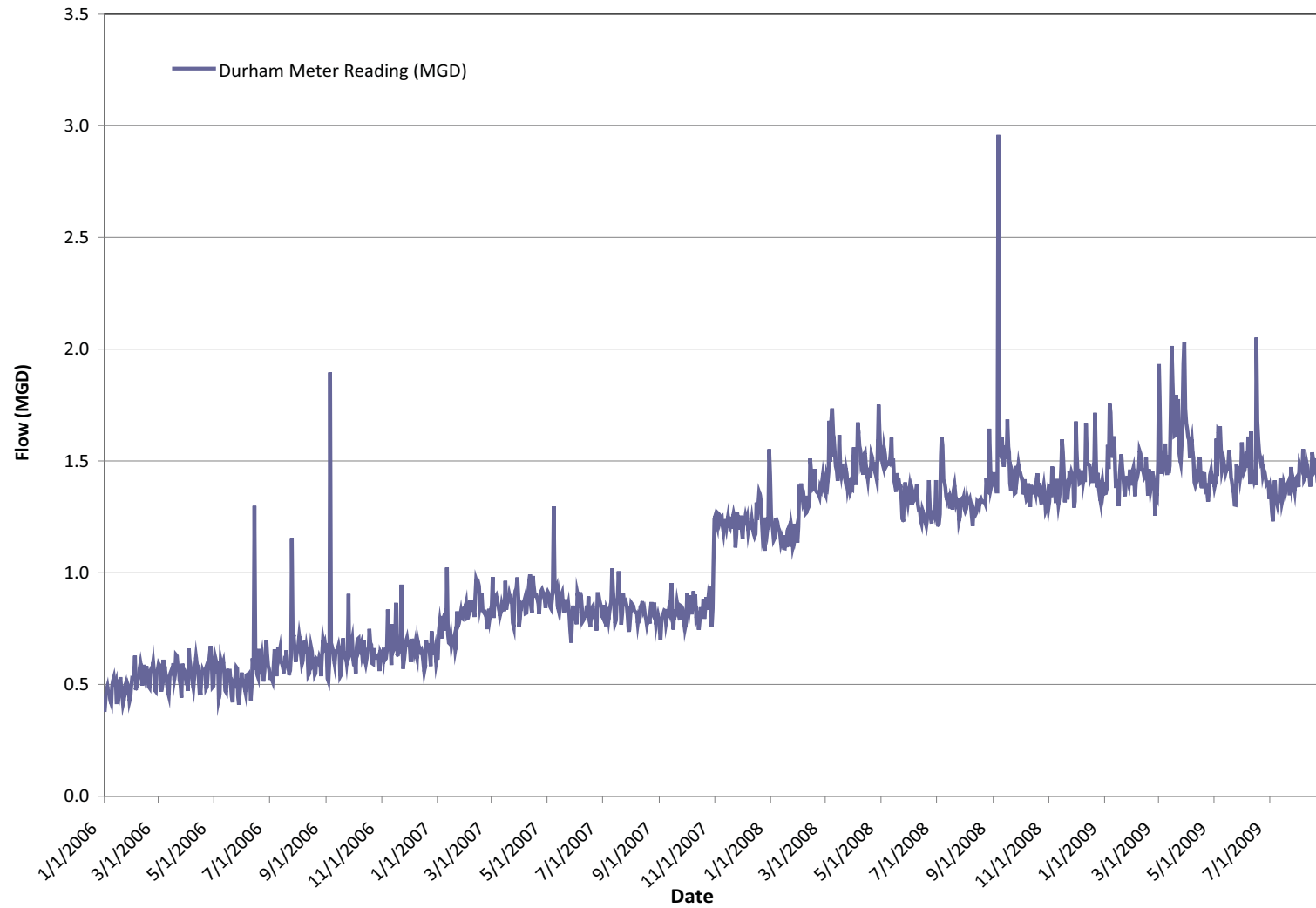
### **2.3.5 Per Capita Wastewater Flows**

The per capita wastewater flows are of great interest to this project. In order to arrive at a per capita wastewater flow, the served population and annual average wastewater flows were computed. In the Towns of Cary and Morrisville, nearly all households are provided with municipal sewer services. For this project, we are assuming a 100 percent connection rate for sewer services. As such, we can use the entire historical population as the served population. The annual average wastewater flows are calculated based on the flow records maintained at the North and South Cary WRFs and Durham County's Triangle WWTP. The connection to Durham County's service commenced in 2006. There are two data sources prior to 2006. The results are summarized in Table 2-7. The trend of population growth is shown in Figure 2-8. Robust growth has been witnessed in the service area. In the past decade, the served population increased by almost 50%. Nevertheless, the per capita wastewater flows went in the opposite direction (Figure 2-9). The per capita flow decreased from approximately 105 GPD to 85 GPD today. The observed trends of flow discharge are consistent with the reduced per capita water consumption in the service area as a result of the water conservation program by the Town of Cary. There are many factors that have been identified to contribute to the reduction of per capita wastewater production, such as water reuse, water conservation, household toiletry improvement, and higher pricing. So far, there are no clear signs of leveling off in the decrease in per capita wastewater flow. More attention should be paid to this trend so that the wastewater delivery and treatment capacity in the Town can be closely matched with the wastewater generation and so avoid costly over-investment.





**Figure 2-6: Historical Wastewater Flow Data for the South Cary WRF (2004-2010)**



**Figure 2-7: Total Wastewater Flow for the West Cary Service Area (2004-2010)**

**Table 2-7: Historical Per Capita Wastewater Flows**

Year	Population	Total Wastewater Flow (MGD)	Average Per Capita WW Flow (gpd)
2001	105,344	11.15	105.9
2002	109,346	11.12	101.7
2003	117,438	12.31	104.9
2004	120,278	12.10	100.6
2005	123,868	11.65	94.0
2006	129,355	12.74	98.5
2007	136,548	12.56	92.0
2008	145,024	12.60	86.9
2009	150,911	13.01	86.2
2010	154,610	13.28	86.7

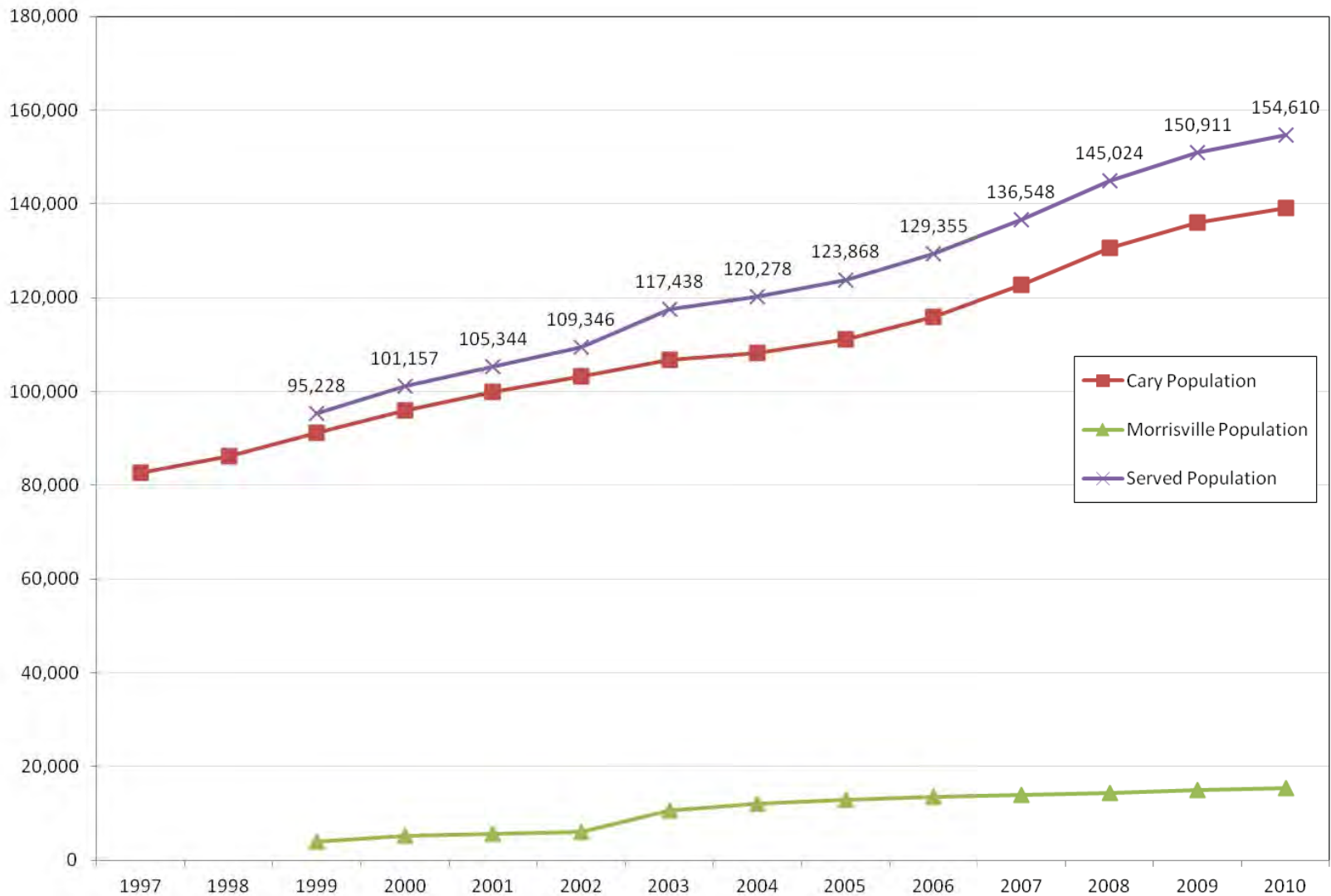


Figure 2-8: Historical Population Trends in the Towns of Cary and Morrisville

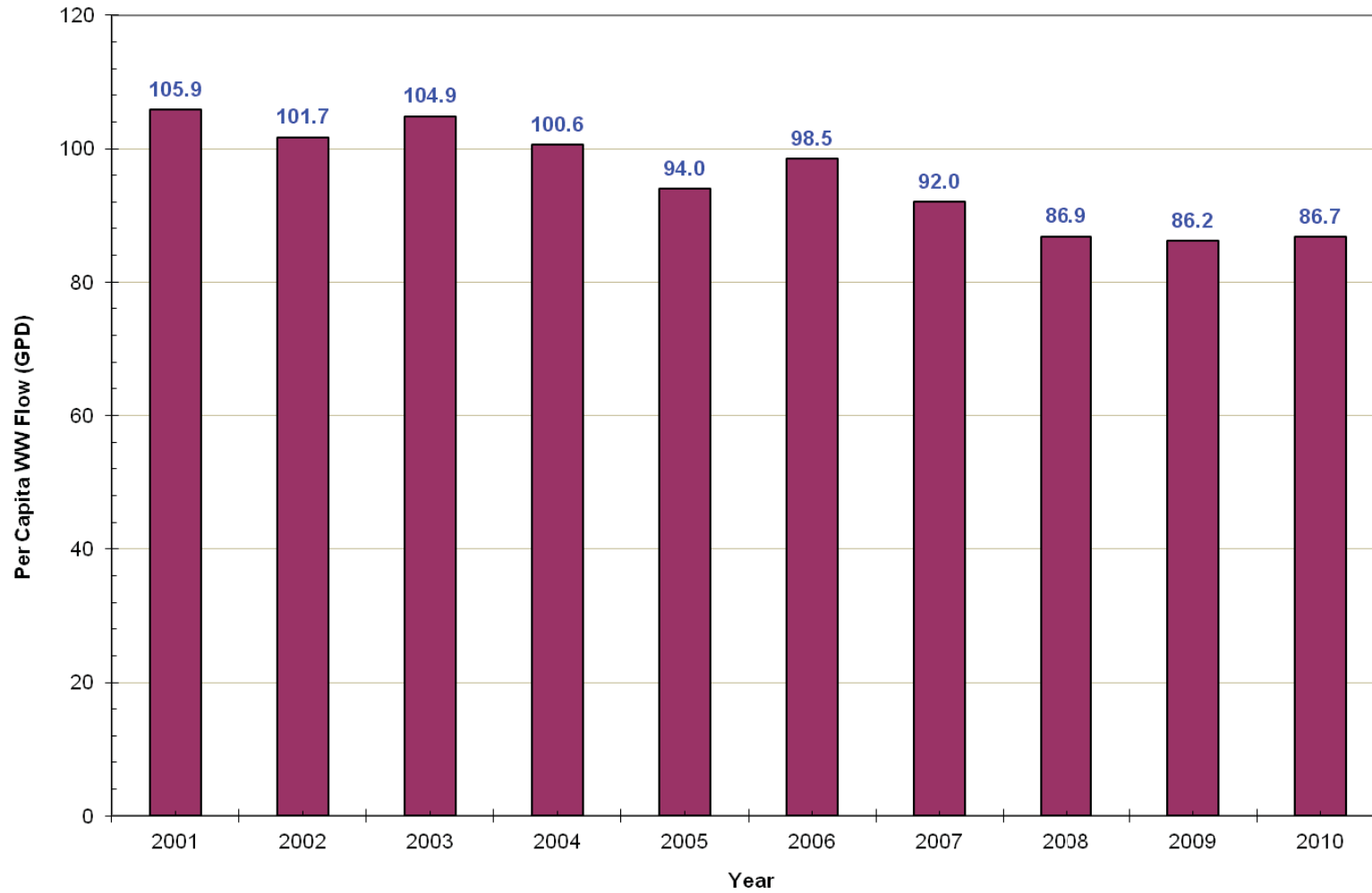


Figure 2-9: Historical Per Capita Wastewater Flows



## 2.4 Wastewater Collection System

The Town of Cary wastewater collection system is currently divided into three service areas, the North, South and West Cary service areas. The dividing line closely follows the natural east-west ridge that crosses the Town of Cary, as shown on Figure 2-1 above. The dividing line for the North and South service areas starts west of the intersection of the Cary Parkway and Old Apex Road, and generally follows Old Apex Road north to West Chatham Street. After following West Chatham Street east, the dividing line then generally parallels East Chatham Street to I-40. The dividing line for the North and West service areas largely follows Davis Drive and Carpenter/Upchurch Road north. It goes across Morrisville Carpenter Road in parallel with McCrimmon Drive. It finally follows Chapel Hill Road north.

### 2.4.1 North Cary System

The main gravity interceptor to the North Cary WRF is the Crabtree Creek Interceptor. There are approximately 307 miles of gravity lines and 25 miles of force mains within the North Basin. The North Basin also contains 14 pump stations. These include four pumps stations in the West Basin which serve the portion of the Town's service area in the Cape Fear River Basin. The flows from these pump stations are currently pumped to the North Cary WRF in the Neuse River Basin. Flows for these four pump stations will eventually be redirected to the WWRWRF, which will serve the Western Cary service area.

The locations and general information for the pump stations are summarized in Table 3-1 in Section 3. There are 11 permanent flow meters in the North Cary service area. A schematic of the North Cary service area is shown in Figure 2-10.



## North Cary Wastewater Collection System

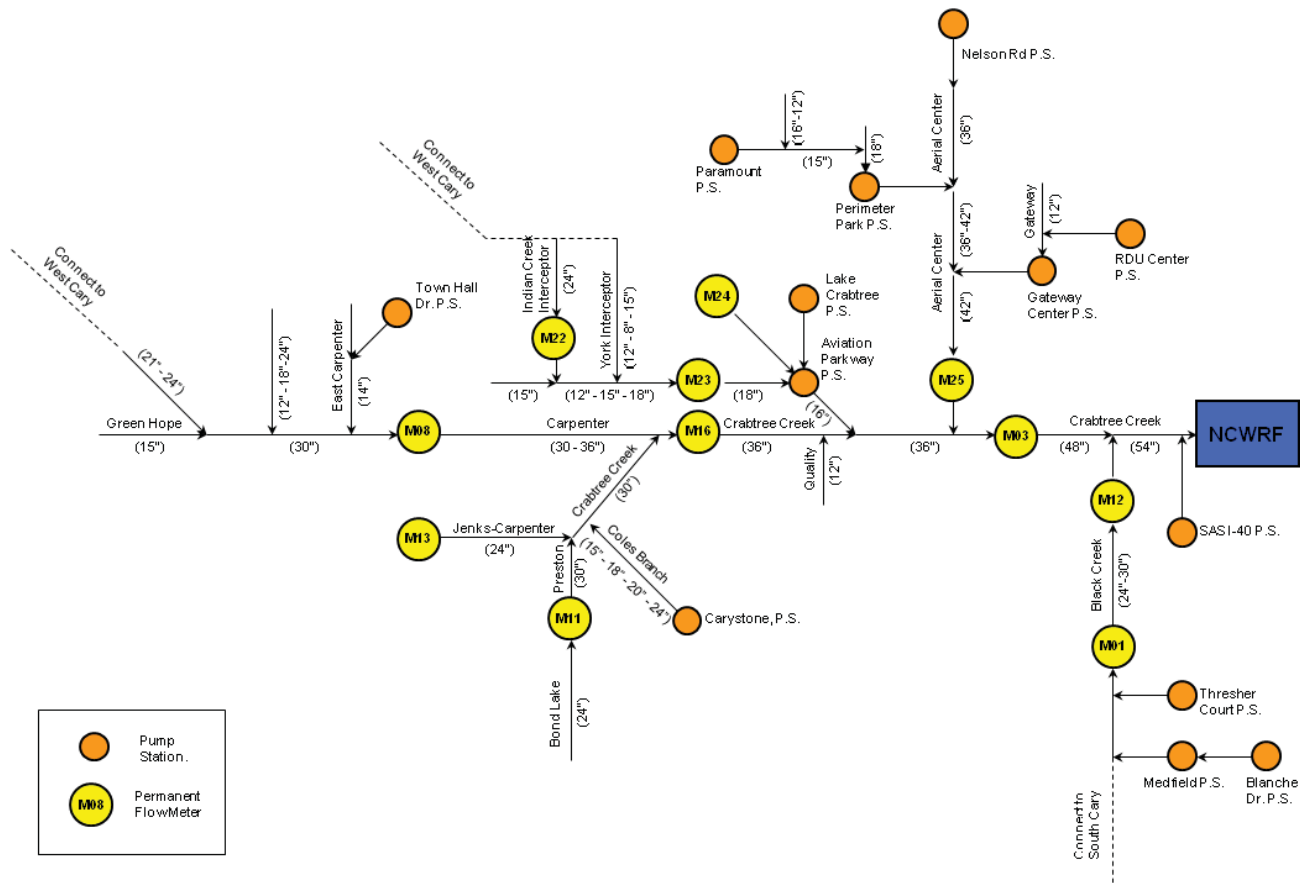


Figure 2-10: Schematic of the North Cary Service Area



### **2.4.2 South Cary System**

The main gravity interceptor to the South Cary WRF is the Camp Branch Interceptor. There are approximately 211 miles of gravity lines and 20 miles of force mains within the South Basin. The South Basin also contains 13 pump stations. A schematic of the South Cary service area can be found in Figure 2-11.

The locations and general information for the 13 pump stations are summarized in Table 2-5. All pump stations utilize a wet well only, with submersible pumps. The Swift Creek and Walnut Creek Pump Stations employ two duty pumps and one standby pump; the remaining pump stations utilize one duty and one standby pump.

### **2.4.3 West Cary System**

The West Cary System is primarily supported by the Kit Creek, Morris Branch and West Cary Regional Pump Stations and their associated force mains. A schematic of the West Cary service area is shown in Figure 2-12.

The locations and general information for the pump stations in the West Cary system are summarized in Table 2-6.

### **2.4.4 RDU International Airport**

The RDU International Airport served 10 million passengers in 2007. It operates three runways and provides direct service to 35 domestic and international destinations on 340 daily flights. The airport is located north of Cary between I-40 and US Highway 70.

Wastewater flow from upstream gravity sewer from RDU is pumped into the North Cary collection system through the RDU Center Pump Station located on RDU Drive. RDU's 1985 (amended 1989) wastewater service agreement with the Town of Cary states that the discharged flow shall not exceed a 12-month average flow of 0.300 MGD. RDU's average wastewater flow in 2010 was 0.22 MGD, as shown in Figure 2-13.

### **2.4.5 RTP South**

The Town of Cary provides wastewater service for the Wake County portion of Research Triangle Park, referred to as RTP South. Current businesses within RTP South are Sony Ericsson, Delta Products Corporation, Biogen, A.M. Pappas/ Alexandria Innovation Center, and Cisco Systems. The Kit Creek Pump Station and its associated force main convey wastewater flow from RTP South to the West Cary collection system. The flows from RTP South are captured at permanent flow Meter 18 near the Kit Creek Pump Station.



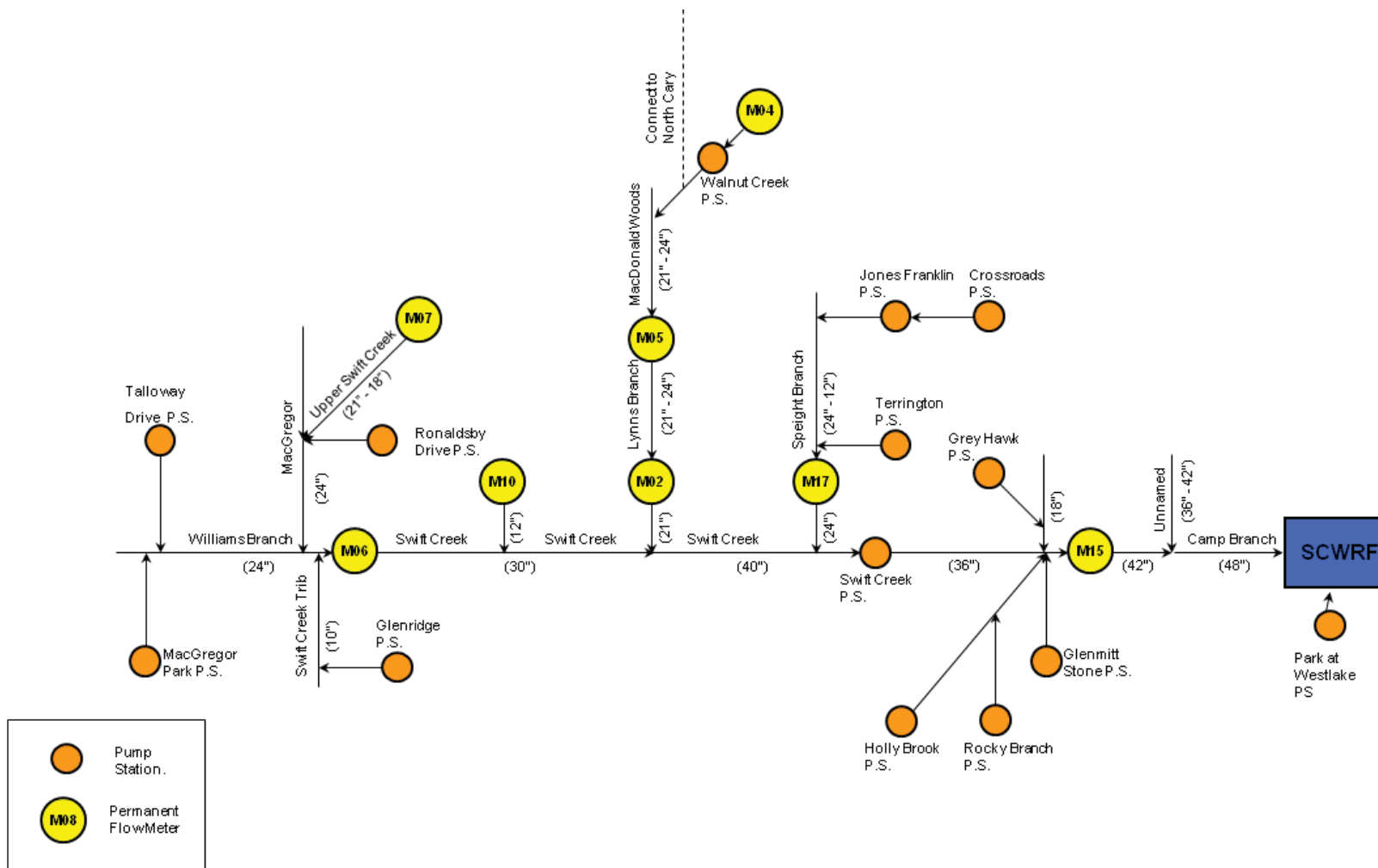


Figure 2-11: Schematic of the South Cary Service Area

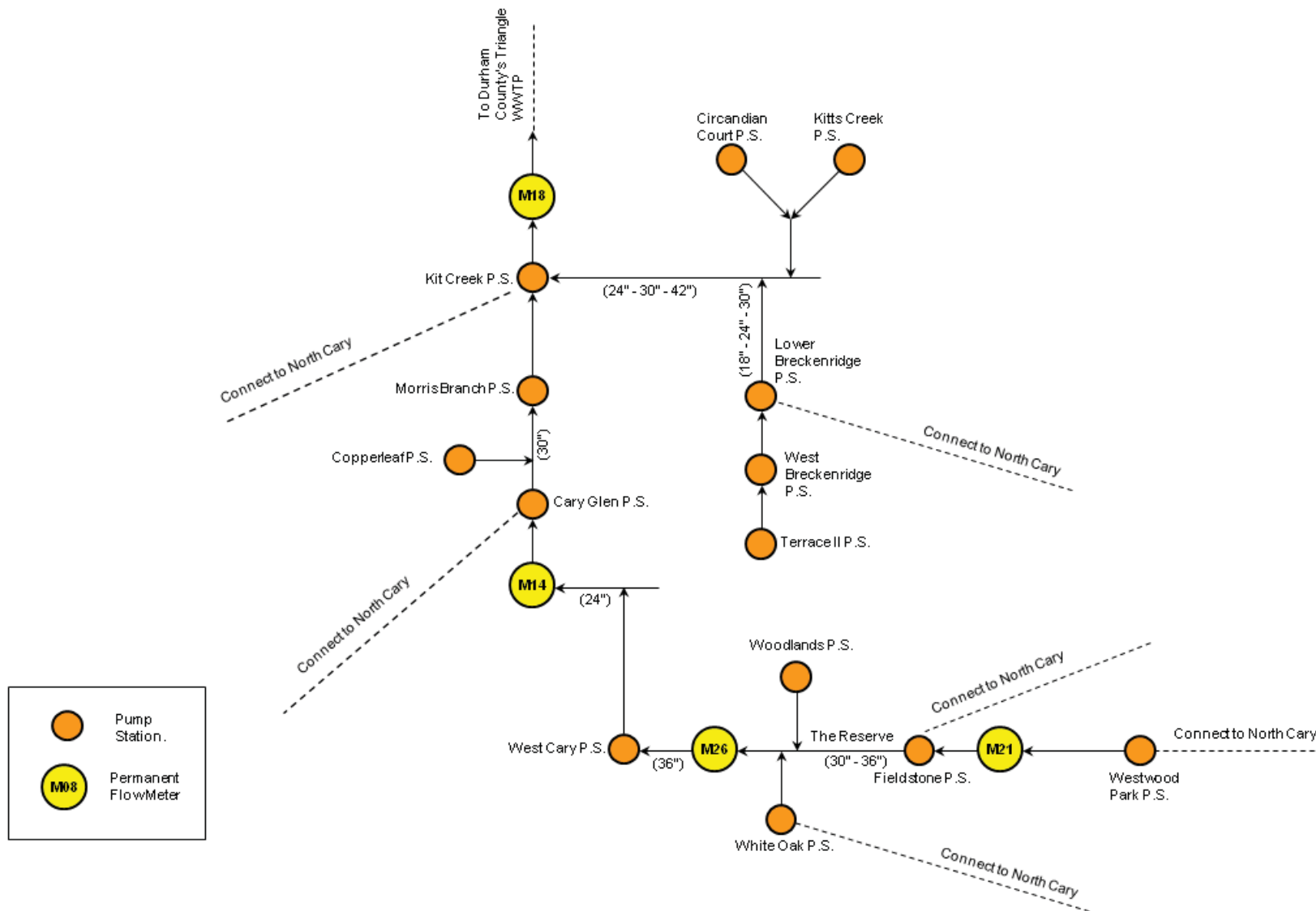


Figure 2-12: Schematic of the West Cary Service Area

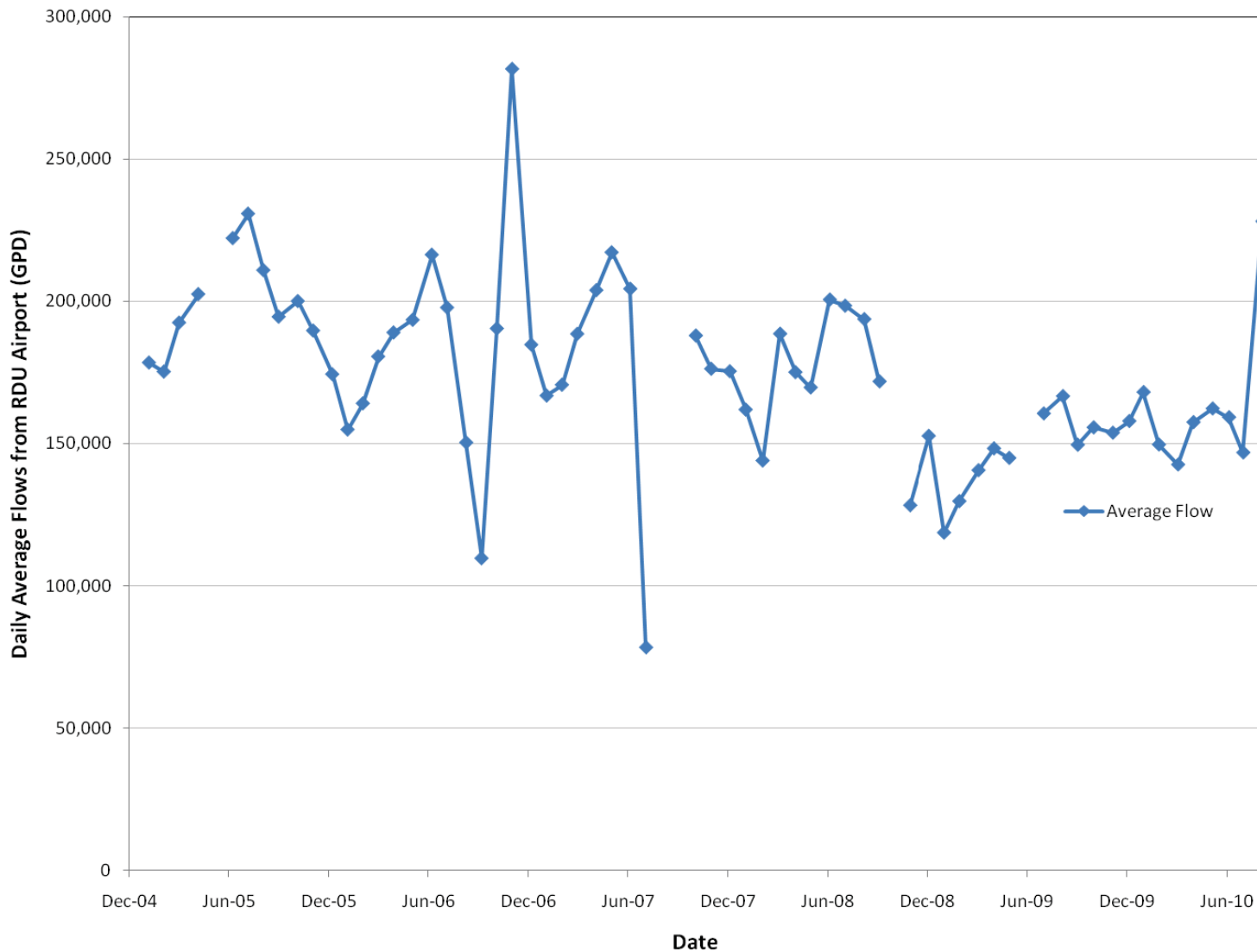


Figure 2-13: Historical Daily Average Flows from RDU Airport



## 2.5 Current O&M Practices

Two departments oversee the operation and maintenance (O&M) practices for the Town's wastewater collection system. The Utilities Department, Utility System Maintenance Division, oversees the inspection and maintenance of the pump stations. The Public Works Department, Wastewater Collection Division, inspects and maintains the gravity lines, easements and manholes.

### 2.5.1 Pump Stations

Pump stations are routinely inspected on Mondays, Wednesdays, and Fridays. Routine inspection includes recording pump runtimes, flow meter readings, and amp readings. The baskets at pump stations with basket strainers are cleaned every two weeks. All pumps are removed and inspected for wear and tear twice a year. Grease is removed on an as needed basis.

Based on a limited site inspection of the existing pump stations performed as a part of this master plan, all pump stations appeared to be in excellent operating condition.

### 2.5.2 Collection System

The Town of Cary is required by its collection system permit to inspect and clean ten percent of the system each year. The collection system is inspected and cleaned systematically using a grid system. There are four jet trucks that work together and clean a specified basin area until it is completed. Three jet trucks are capable of vacuuming as well as jetting. Everything that is done within the grid is recorded and entered into a database. Lines larger than 12-inches in diameter are subcontracted out for cleaning, as needed. Cleaning includes treating for grease and mechanically removing roots. Vitrified clay pipe (VCP) lines are cleaned on a more frequent basis, generally every 2 years. Ductile iron pipe (DIP) and polyvinyl chloride (PVC) lines are cleaned every ten years. A camera inspects each line after the jet crew has cleaned it to insure that there are no blockages in the line.

Additionally, the Town of Cary annually performs smoke tests for approximately 1/8 of its collection system to identify potential inflow sources. Large areas are smoke tested in September or October and the tests take several weeks to complete. Property owners are notified by letter, website, and media outlet prior to smoke testing.

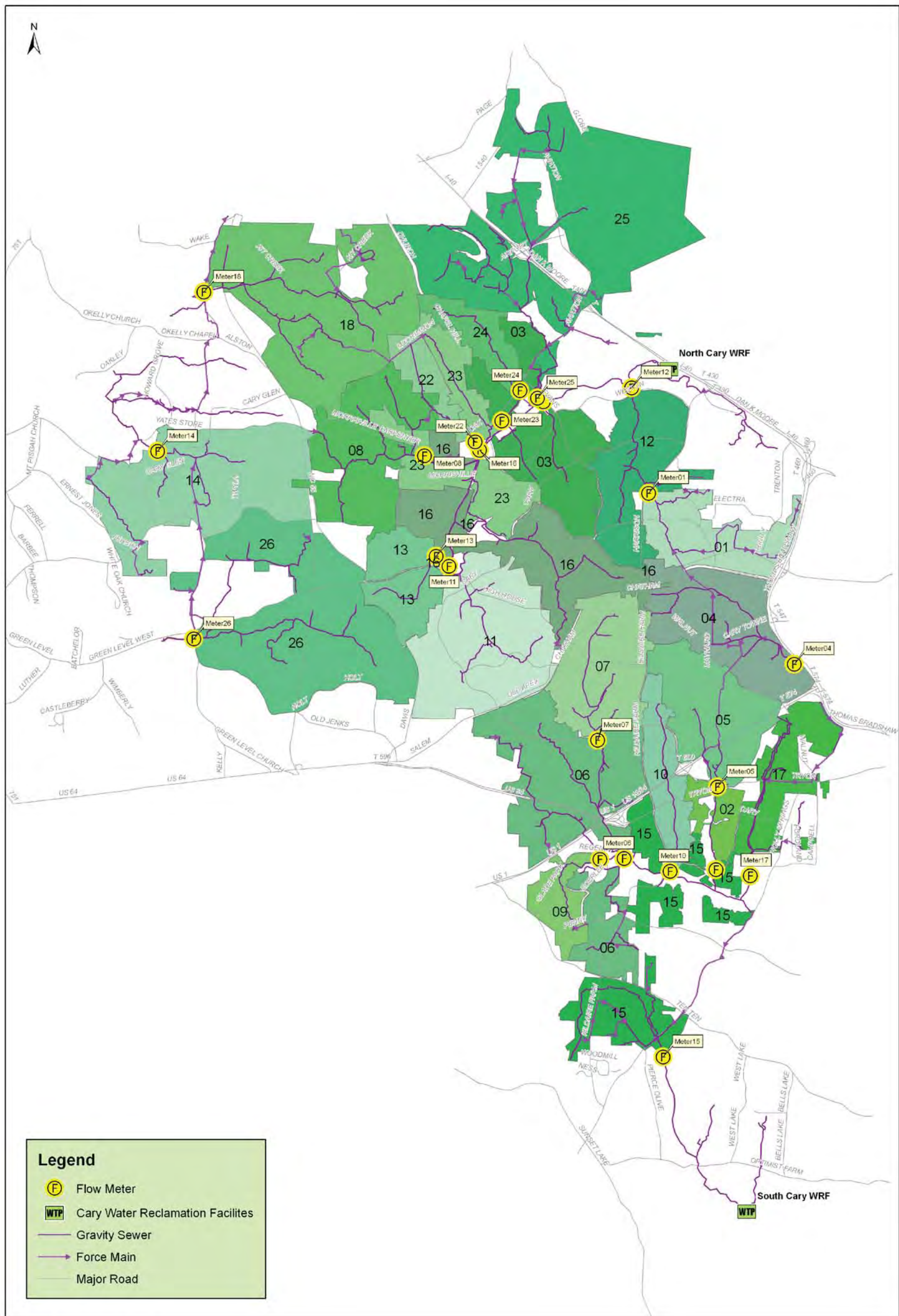
The Town of Cary has two easement crews that periodically clear easements of trees and shrubs to assure access and prevent root penetration into sewer lines. All property owners are notified with a letter that explains the purpose of the clearing and indicates the approximate time of the clearing operation to allow property owners the opportunity to remove any personal items from the easement. An easement inspector also checks all manholes. This is done every year. Higher priority areas, such as creek crossings or aerial lines, are checked more often as required by permit. The Town of Cary also has two rapid response trucks that respond to emergencies in the collection system. Emergencies consist of manhole overflows and sewer stoppages at customer's homes.



### 2.5.3 Permanent Flow Meters

Since the inception of its permanent flow metering program in 2006, the Town of Cary has slowly expanded the total number of flow meters under its umbrella to 23 locations, deploying them throughout the system as shown in Table 2-8. The metering services are provided by Frazier Engineering of Charlotte, NC. All of the flow meters use area/velocity meters for measurement. The Town also has permanent flow meters for measuring wastewater flows from the RTP South collection system and the RDU International Airport. The force main conveying flows from the West Basin to the Durham County Triangle WWTP has a Parshall flume at its connection to the gravity line to the Triangle Plant.

In general, all of the permanent flow meters are fully functioning and provide quality data for use in understanding the operation of the sewer system in both dry and peak wet weather conditions. A map on Figure 2-14 illustrates the location of the flow meters. The details of their individual locations can be found in Appendix B. The flow meters are also important components of the sewer system flow diagrams included in Figures 2-10, 2-11 and 2-12.



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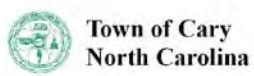


Figure 2-14: Permanent Flow Meter Locations in the Town of Cary’s Sewer Service Area



**Table 2-8: Details of Permanent Flow Meters in the Town of Cary**

Basin	Meter No.	Installed Branch	Size	Upstream Meters	Upstream Pump Stations	Associated Rain Gauge
North Cary WRF	1	Black Creek	24"	None	Blanche Dr, Medfield, Thresher Court	Town Hall
	12	Black Creek	30"	1	Blanche Dr, Medfield, Thresher Court	NCWRF
	8	Carpenter	30"	None	Town Hall Drive PS, (Cary Park and Kit Creek diverted to Durham County)	NCWRF
	11	Upper Preston	30"	None	None	Fire Station - Old Apex Road
	21	The Reserve	12"	None	Westwood Park PS	Kit Creek PS
	13	Jenks Carpenter	24"	21	Fieldstone PS & Thomas Brooks Park PS	Fire Station - Old Apex Road
	16	Crabtree Creek	36"	8, 11, 13	Fieldstone PS & Thomas Brooks Park PS, Westwood Pk PS (White Oak has been diverted to West Cary PS and Panther Creek Interceptor)	NCWRF
	22	Indian Creek	20"	None	None	NCWRF
	23	York Interceptor	18"	22	Breckinridge PS	NCWRF
	24	Aviation Parkway	16"	None	None	NCWRF
	25	Brier Creek	42"	None	Perimeter Park PS, RDU Center PS, Paramount PS, Nelson Rd PS, Gateway Center PS	NCWRF
	3	Crabtree Creek	48"	16, 23, 24, 25	Fieldstone PS & Thomas Brooks Park PS, (White Oak has been diverted to West Cary PS and Panther Creek Interceptor), Breckinridge PS, Perimeter Park PS, Nelson Road PS, Gateway Center PS, RDU Center PS, Paramount PS, Aviation Pkwy PS at Morrisville PW Yard & Westwood Pk PS	NCWRF
South Cary WRF	4	Walnut Creek	24"	None	All flow conveys to Walnut Creek PS	Town Hall
	5	MacDonald Woods	21"	4	Walnut Creek PS	Kensington PS
	2	Lynn's Branch	24"	5	Walnut Creek PS	Kensington PS
	7	Upper Swift Creek @ Carmel Court	21"	None	None	Fire Station - Old Apex Road
	9	Lower Wyndfall	18"	None	Kensington PS	Kensington PS
	6	Upper Swift Creek @ Regency	30"	7, 9	Kensington PS, Glenridge PS & Ronaldsby Drive PS	Kensington PS
	10	Long Branch	12"	None	None	Kensington PS
	17	Speight Branch	24"	None	Jones Franklin PS, Crossroads PS, Yates Elementary PS and Terrington PS	Kensington PS
	15	Camp Branch	42"	2, 6, 10, 17	Swift Creek PS, Walnut Creek PS, Glenmitt Stone PS, Grey Hawk PS, Kensington PS, Glenridge PS, Jones Franklin, Crossroads PS, Yates Elem PS, Terrington PS & Ronaldsby Drive PS	SCWRF
Durham Co. Triangle WWTP	14	Panther Creek	30"	26	Forest Oaks PS, Copperleaf PS, West Cary PS	Kit Creek PS
	18	Kit Creek	42"	None	Kitts Creek PS	Kit Creek PS
	26	White Oak Creek	36"	None	Woodlands PS	Kit Creek PS



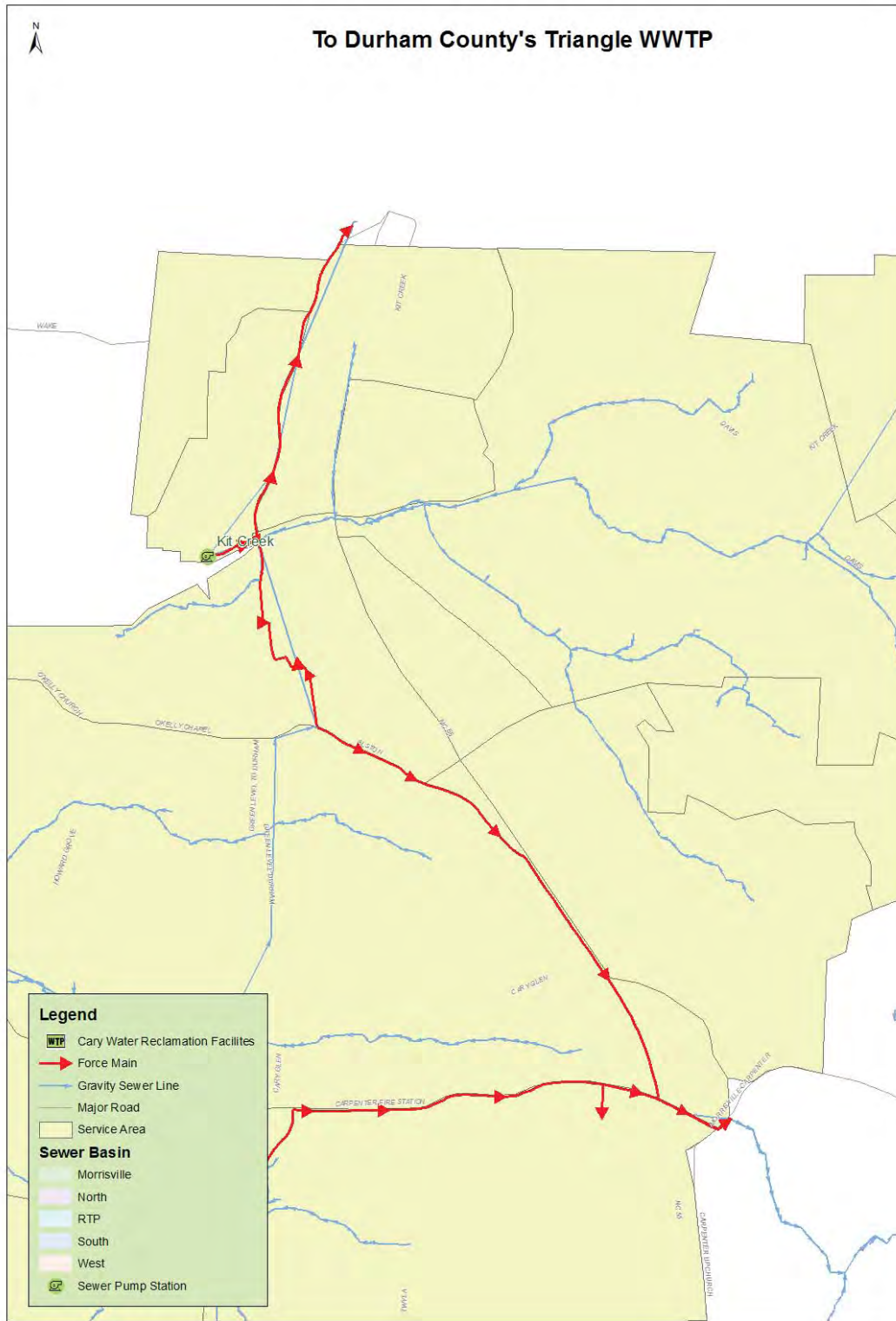
#### 2.5.4 Peak Wet Weather Management

The Town of Cary employs a fairly complicated pump-around strategy between different sewer sub-basins to properly manage sanitary sewer flow and mitigate the risks of surcharge/overflows in its collection system. This strategy is primarily embodied in four venues, through which the peak wet weather flow as a result of intensive precipitation events is diverted from service areas with a lack of capacity to service areas with excess capacity. Therefore, the utilization of available capacity in the existing system is maximized.

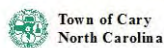
Figure 2-15 shows the flow shifting through Kit Creek Pump Station, which would be active through the transition periods of WWRWRF startup. Figure 2-16 shows the flow switching between the West Cary service area and the North Cary service area via four existing inactive pump stations, the White Oak Pump Station, the Fieldstone Pump Station, the Cary Glen Pump Station and the Lower Brenckenridge Pump Station. During peak wet weather flow conditions, the peak flow experienced in the West Cary service area can be pumped through those pump stations to the North Cary service area, ultimately discharging into the North Cary WRF through the Crabtree Creek Interceptor. As discussed in more detail in Section 6, the sewer collection system in the West Cary service area is constrained by the capacity of temporary pumps in the Kit Creek Pump Station. The limitation essentially results in the current pump-around strategy from the West Cary service area to the North Cary service area, thus alleviating the stress in the West Cary service area. This situation will be materially altered when the WWRWRF and North West Cary force main projects are completed. More consideration will be given to pumping excess flows from the North Cary service area to the West Cary service area in a totally opposite direction.

Figure 2-17 illustrates the switching pump capability of the Walnut Creek Pump Station, which is able to deliver the sewer flow from the Walnut Creek Basin to either the Black Creek Interceptor to the North or the Lynn's Branch Interceptor to the South. Due to the peak wet weather flow management practice between the West Cary service area and the North Cary service area, the South Cary service area possesses comparatively more capacity than the North Cary service area. The current mode of operation for the Town is to pump from the Walnut Creek Pump Station to the Lynn's Branch Interceptor, and ultimately to the South Cary WRF for treatment. As detailed in Section 6, the flows from the Walnut Creek Basin far outweigh the flow generated locally from Lynn's Branch Interceptor and are an important component of flow delivered through the Swift Creek Interceptor and the Camp Branch Interceptor to the South Cary WRF.

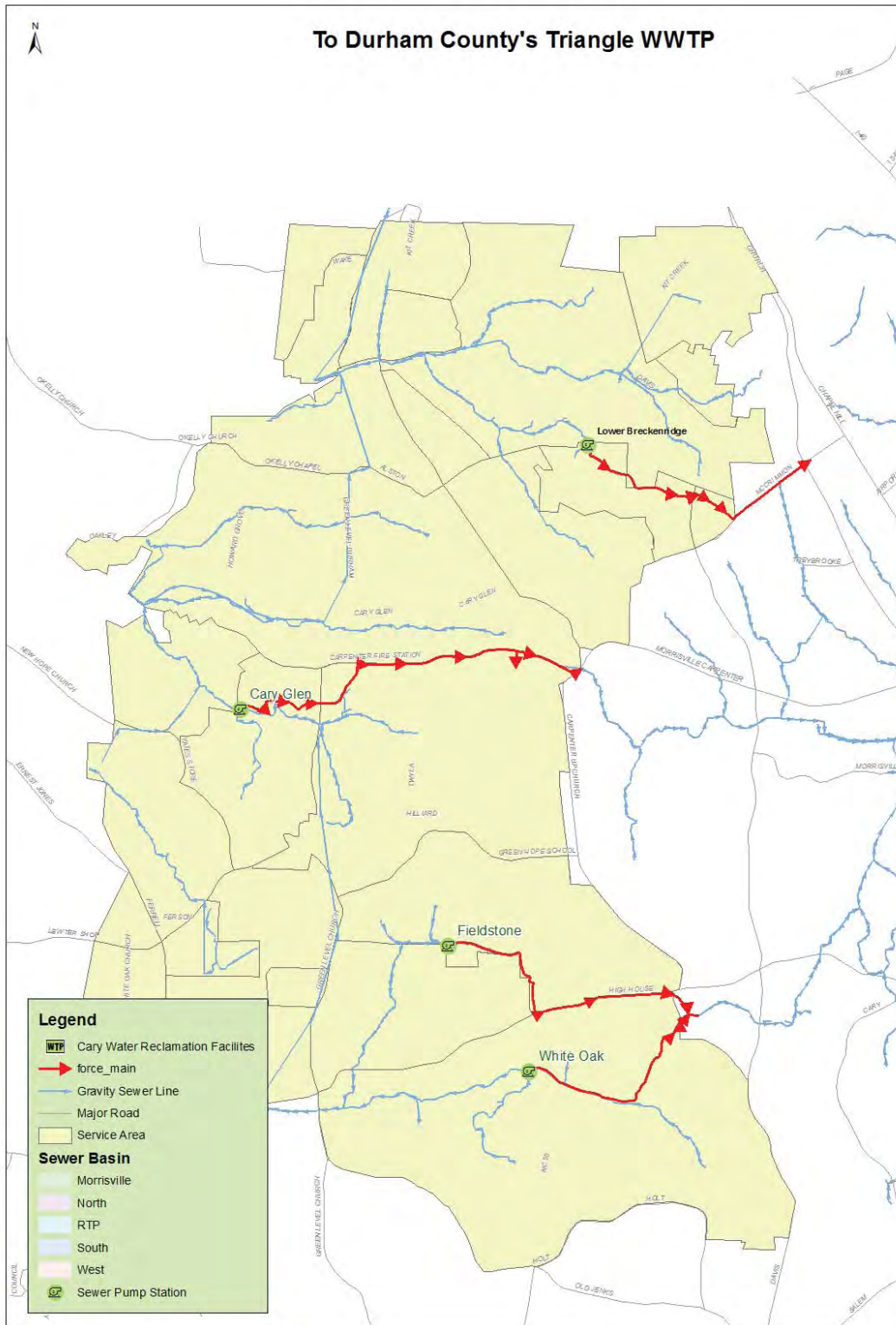




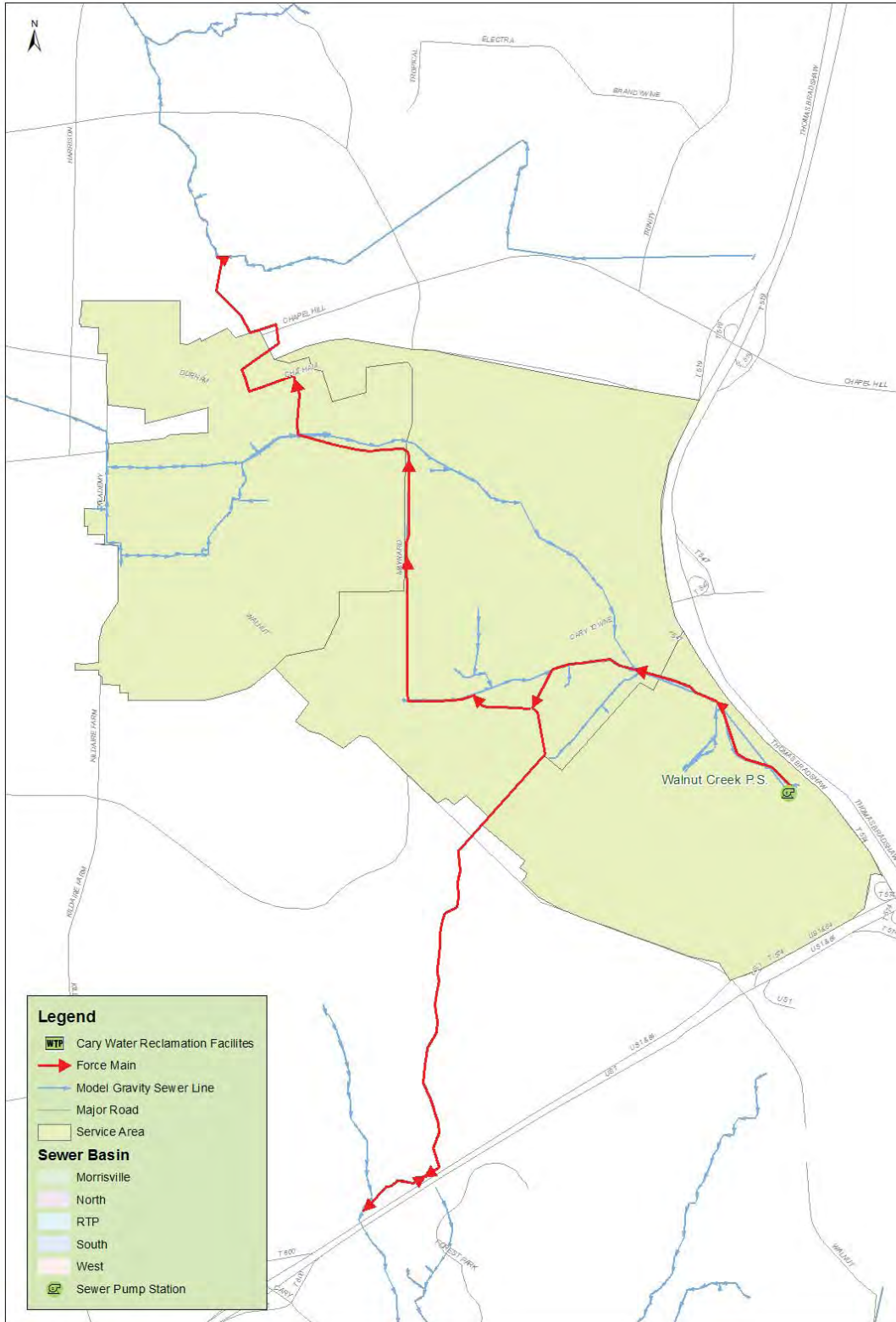
NOT TO SCALE



**Figure 2-15: Illustration of Flow Switching Between the North Cary and West Cary Service Areas Via Kit Creek Pump Station**



**Figure 2-16: Illustration of Flow Switching Between the North and West Cary Service Areas via Four Inactive Pump Stations**



NOT TO SCALE



Figure 2-17: Illustration of Flow Switching Between the North and South Cary Service Areas