

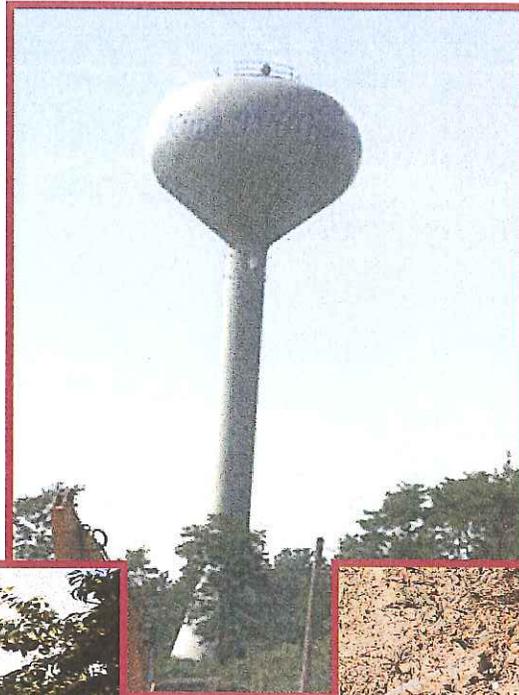


King William County

Master Utility Plan

January 20, 2008

Revised: May 14, 2010



P.N. 84008.40

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1.0 INTRODUCTION

In early 1999, the King William County Board of Supervisors created a Sewer Advisory Committee. It was the Board's desire for the development of a plan for providing potable water as well as providing wastewater collection and treatment within the County. The report and plan that was produced by that committee was implemented and created the ability for the growth that has occurred around the Central Garage area. Having been so successful in a relatively few years and with the strong demand for growth within the area, the County is once again evaluating and updating the initial report.

The original major "growth nodes" identified in the study included the following:

- Route 604, (Dabneys Mill Road)
- Manquin area,
- Central Garage area,
- Route 30 area,
- Midway area, and
- Aylett area.

In general these nodes cover the State Route 360 corridor and have not changed. However, this report will address the following that necessitate revisions to the original plan:

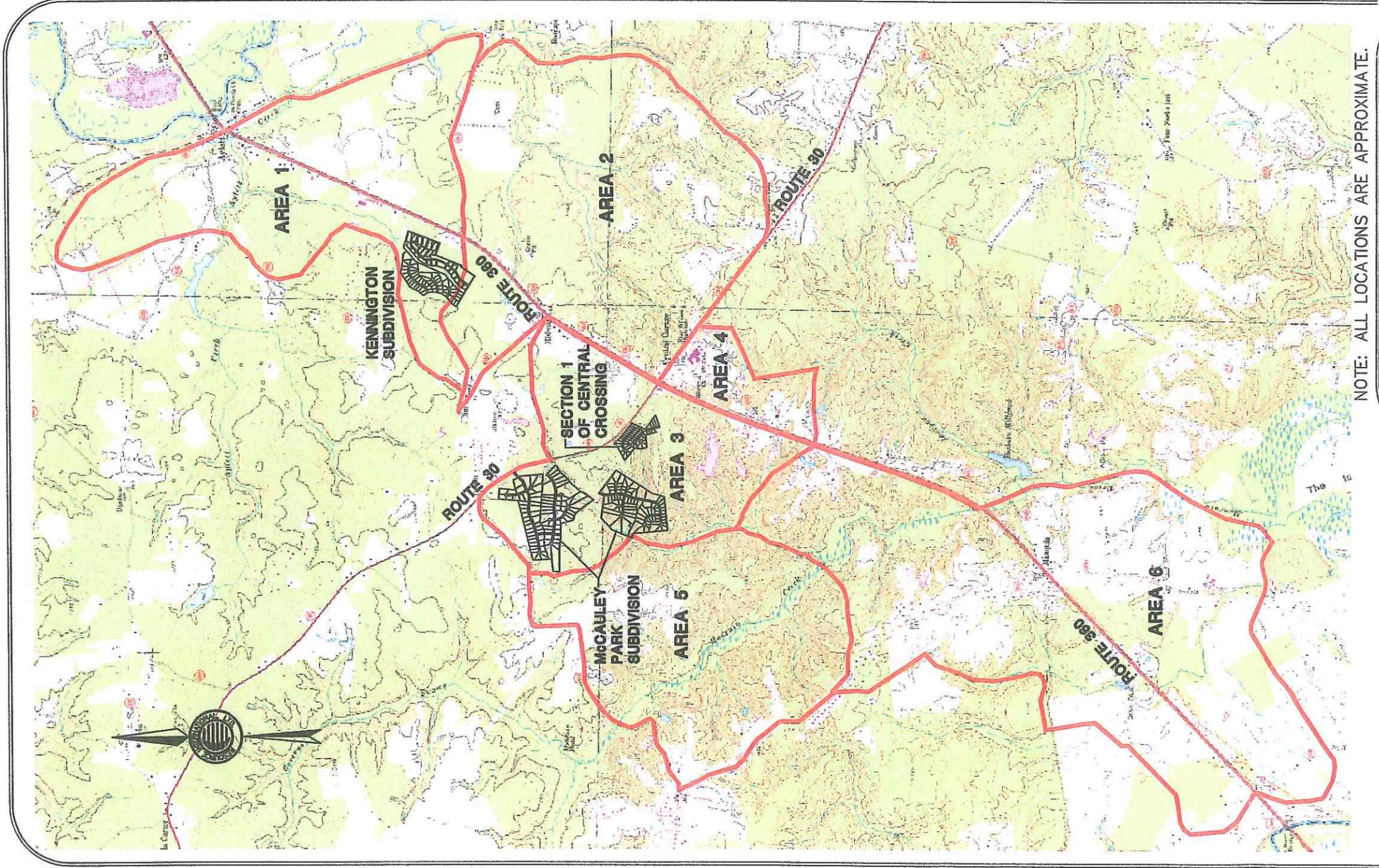
- Growth along the Route 360 corridor since the adoption of the Master Utility Plan
- Changes in the Comprehensive Plan
- Potential growth considerations
- Changes in zoning
- Other considerations desired by the County

The study area around Route 360 is identified by Figure 1 and was divided along drainage areas and major features such as roads or creeks. Therefore, there were six major subdivisions of the study area as identified in Figure 1.

1.1 Inventories of Existing Facilities

1.1.1 Wastewater

The original wastewater system that was designed and constructed in King William County served the High School and the Fontainebleau Industrial Park which included the kitty litter plant. This project included an 80 gallons per minute (gpm) pump station at the school and an 80 gpm influent pump station on Route 618 (Acquinton Church Road). The school pump station pumped into approximately 6,260 feet of 4" force main. The force main discharges into the 8" gravity system serving the Fontainebleau Industrial Park. The 8" gravity system is approximately 4,291 feet in length. The influent pump station pumps through a 4" forcemain to the waste water treatment plant. The Fontainebleau Industrial Park is served by approximately 5,247 feet of 8" gravity line that discharges into the influent pump station. The initial wastewater plant had a treatment capacity of 25,000 gallons per day (gpd). The Hampton Roads Sanitary District (HRSD) has updated the plant to 100,000 gpd.



NOTE: ALL LOCATIONS ARE APPROXIMATE.

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FIGURE 1
360 STUDY AREA
IN CENTRAL GARAGE AREA
KING WILLIAM COUNTY, VIRGINIA
NOT TO SCALE

The second project constructed was the Central Garage system that was designed to serve the Food Lion and immediate area around Central Garage. This project consisted of approximately 2,815 feet of 8" gravity sewer and a new 80 gpm pump station. The pump station is located in the Bailey development along Route 360. The new pump station utilized the existing 4" force main and retrofitted the High School pump station to pump directly into the new pump station.

Three developer driven projects, Central Crossing, McCauley Park and Kennington, are in the process of being completed. The major infrastructure has been constructed. The major off site components have been constructed through a tap fee reimbursement agreement where the County will reimburse the developer for the over sizing on the off-site lines through tap fee credits. The following is a list of the major components and off-site lines constructed by the developer.

McCauley Park

Force main

7,600 feet of 8" gravity sewer

248 gpm wastewater pump station

45 gpm wastewater pump station

7,700 feet of 8" gravity lines within the main roads of the subdivisions

Kennington

8,600 feet of 8" gravity sewer

12,800 feet of 8" force main

14,000 feet of 10" force main

386 gpm wastewater pump station

Central Crossing

Force main

12,278 feet of 8" gravity sewer

45-80 gpm wastewater pump station (based on conditions)

Mount Olive

The County is in the process of constructing water and wastewater facilities in the Mount Olive area through a Community Development Block Grant, County contribution and a self help program. The Mount Olive project was segmented into two (2) sections that were independent from the other. Area 1 only has a wastewater system served by a treatment plant and mass drainfield. Area 2 has a water system and a wastewater system. The water is supplied by a well and storage tank. The wastewater system has a microfiltration filter plant that discharges into Mallory Creek. The following is a list of the major components.

Area 1

Five septic/pump tanks

Approximately 5,000 feet of force main

2,500 gpd wastewater treatment plant and mass drainfield

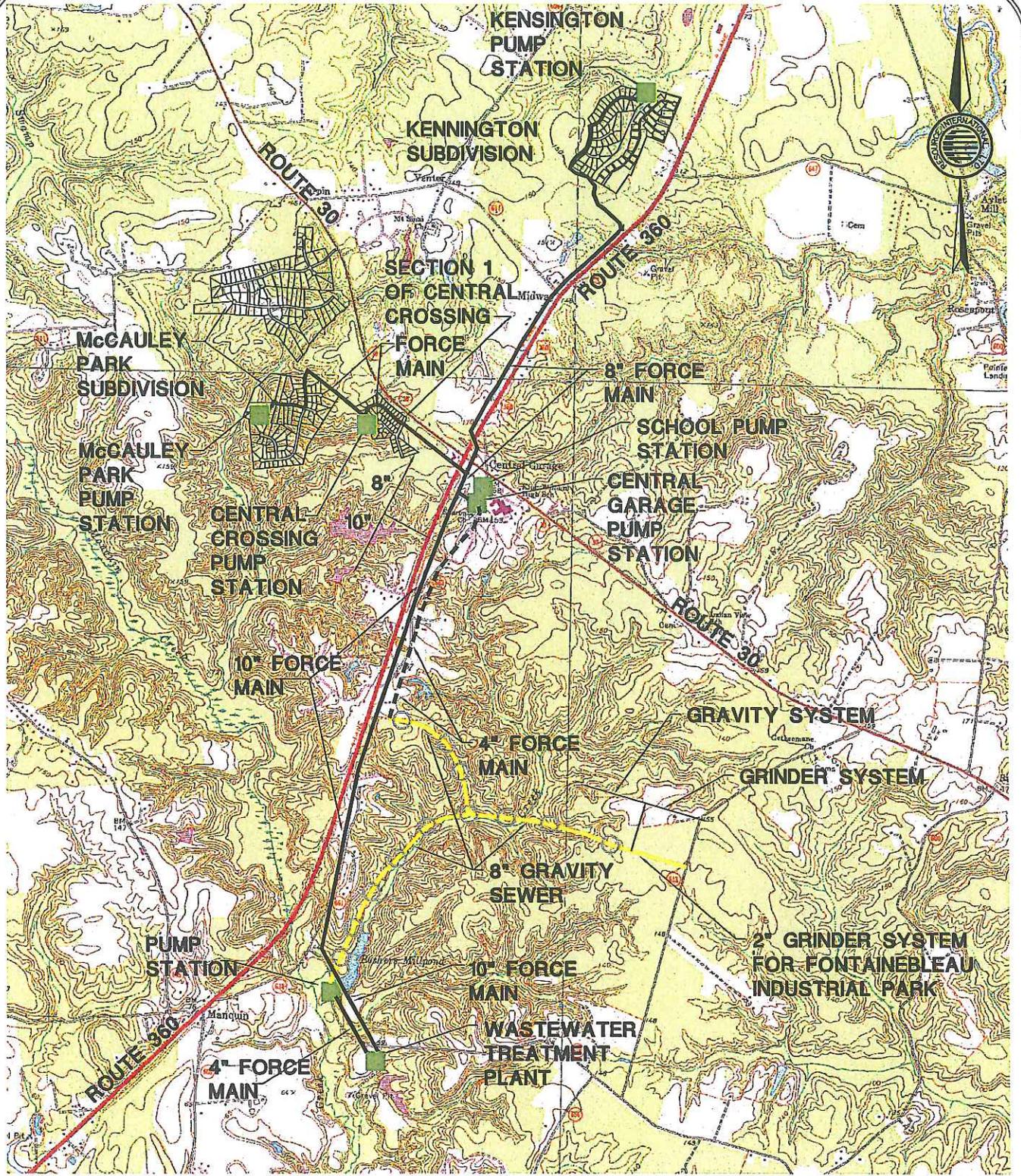
Area 2

8,000 gpd wastewater treatment plant

8,000 feet of force main line from 1-1/2" to 4" will be installed

Figure 2 shows the major wastewater components in the Route 360 corridor. Figure 3 shows the major wastewater components in the Mount Olive area.

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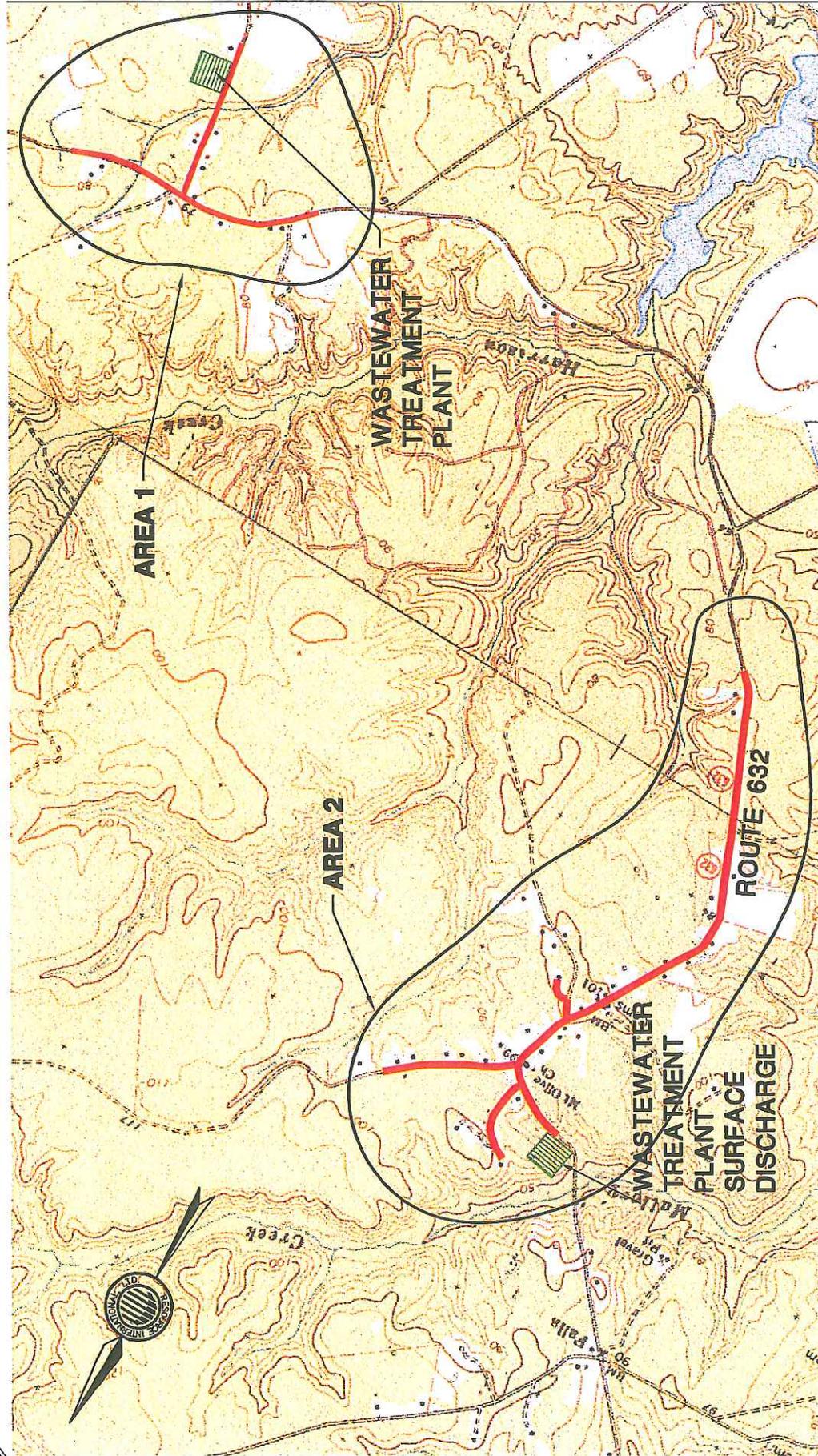
NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 2
 EXISTING WASTEWATER FACILITIES
 IN CENTRAL GARAGE AREA
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 NOTE: ALL LOCATIONS ARE APPROXIMATE
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NOTE: ALL LOCATIONS ARE APPROXIMATE.

SOURCE: U.S.G.S. 7.5 MINUTE SERIES QUADRANGLES
 KING WILLIAM AND TUNSTALL
 SCALE: 1" = 2,000'

LEGEND
 PRESSURE SEWER



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FIGURE 3
 MOUNT OLIVE SEWER
 COLLECTION SYSTEM
 KING WILLIAM COUNTY, VIRGINIA

1.1.2 Water

The County's first water system was constructed for the Fontainebleau Industrial Park which served only the kitty litter plant. This basically consisted of a 36 gpm well and well house.

The Central Garage water system was initially developed to serve the Food Lion, High School and area immediately around Central Garage. This initial project consisted of approximately 3,715 feet of 12" pipe; a 300,000 gallon elevated storage tank and a 120 gpm well. The well is located at the elevated storage tank.

To date, extensions of the water system have occurred through developer installed facilities that have been dedicated to the County. As with the wastewater, the major off-site components have been constructed through a tap fee reimbursement agreement where the County will reimburse the developer for the over sizing on the major distribution lines through tap fee credits. These extensions include the following:

McCauley Park Section 1

5,500 feet of 12" water line along Route 30
8,100 feet of 8" water line within the main roads of the subdivisions
2,750 feet of 6" water line along short side roads
350 feet of 4" water line at the end of cul-du-sacs

McCauley Park Section 2

5,100 feet of 8" water line within the main roads of the subdivisions
2,600 feet of 6" water line along short side roads

Kennington

8,600 feet of 8" water lines
8,400 feet of 12" water line along Route 360
480 gpm well facility

Central Crossing

10,500 feet of 8" water line within the main roads of the subdivisions
2,800 feet of 6" water line along short side roads
740 feet of 4" water line at the end of cul-du-sacs

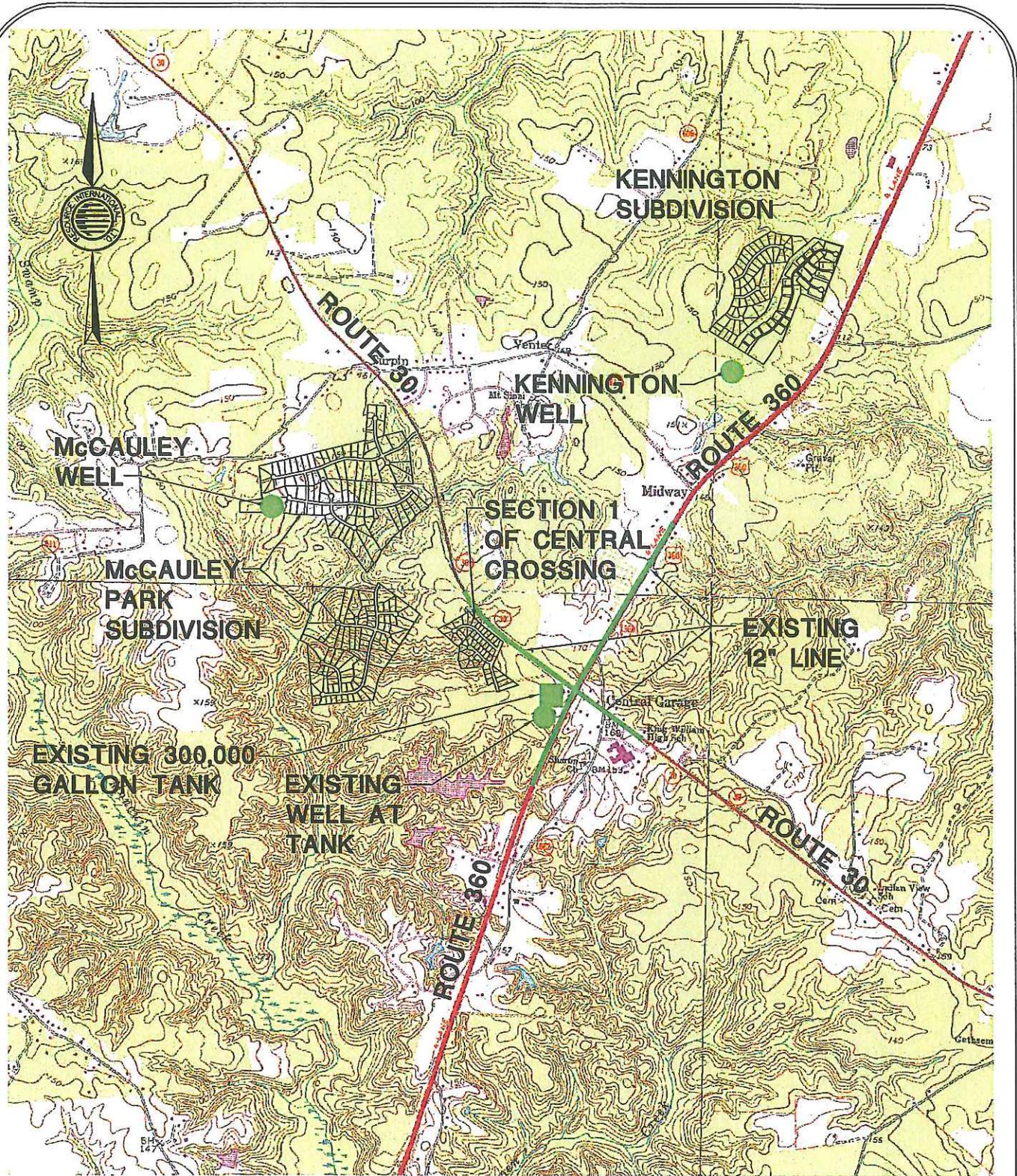
Mount Olive

The County is in the process of constructing a water system in the Mount Olive area through a Community Development Block Grant, County contribution and a self help program. Area 2 has a water system that is supplied by a well and storage tank. This system consists of the following:

Area 2

Approximately 7,000 feet of various size water lines
New well facilities

Figure 4 shows the major water components in the Route 360 corridor.
Figure 5 shows the major water components in the Mount Olive area.



NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 4
EXISTING WATER
IN CENTRAL GARAGE AREA
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1.2 Projected Water and Wastewater Demands

Information obtained in the initial portions of the study will be used to evaluate existing demands and project future usage demands. The projections will be tabulated by areas along the entire Route 360 corridor and Route 30 within two miles each way from the Central Garage area. A 20 year projection will be utilized. Therefore the planning period is through the year 2028.

Included will be alternative scenarios for projected water and wastewater demands and facilities reflecting low, medium and high growth scenarios. The projections will correlate the various utility development/extension scenarios with the County Comprehensive Plan.

In the evaluation of each area, consideration was given to wetlands and steep slopes. The buildable area was further adjusted by 40% to account for roads, stormwater basins and open space.

Understanding that each area has existing subdivisions and homes that are on individual wells or other community water systems, a conservative approach has been taken in calculating water and wastewater demands. Therefore, in general, the approach is to base potential usage on three (3) residences per acre. It is anticipated that commercial buildings may have usage equal to or less than residential uses. The Virginia Department of Health suggests 400 gallons per day (gpd) per Equivalent Dwelling Unit (EDU). However, this figure is considered extremely high and therefore, water and wastewater demands have been calculated based on 300 gpd per EDU. This figure is used for planning and does not necessarily reflect the current average usage. This approach will be used to provide estimates for planning purposes over a 20 year period and not the figure that will be used for short term evaluation of capacity.

1.2.1 Water Demand

Study Area	Buildable Acres	Adjusted Acres (60% of buildable acres)	EDUs (3/adjused acres)	Projected Demand (300 gpd per EDU)
1	1,450	870	2,610	783,000
2	1,973	1,184	3,552	1,065,600
3	1,003	601	1,600*	480,000*
4	238	143	428	128,400
5	1,189	713	2,140	642,000
6	<u>2,237</u>	<u>1,342</u>	<u>4,026</u>	<u>1,207,800</u>
Totals	8,090	4,853	14,356	4,306,800

* Further adjusted for park land and known development in area

Currently there are approximately 193 EDUs connected to the system as of December 2008. There are approximately 807 additional EDUs approved to be tied into the system.

In general, it does not seem realistic that there will be 14,356 EDU's constructed over a 20 year period. Even the construction of 500 EDU's per year may be unrealistic. However, for the 20 year projection if 450 EDU's were constructed per year, the water demand would be approximately 2,800,000 gpd including existing use. For the purposes of this report 2,800,000 gpd will be the anticipated usage at the end of the 20 study period.

1.2.2 Evaluation of Existing Demands

The total water pumped in 2009 from the two operating central Garage system wells amounted to 18,198,600 gallons. By the end of 2008 there were 193 EDUs. 174 EDU's were residential and were located predominately in the Rogers Chenault projects. The peak day demand was approximately 86,420 gpd and consisted of 51,396 gpd residential and 35,024 gpd commercial/school. An evaluation was made of the existing demands and the following was reported to the County. The County currently has a groundwater withdrawal permit for an average of 467,205 gpd. The permit is based on an allocation of 220,000 gpd to the Roger Chenault projects. An evaluation of the current withdrawal is based on the following assumptions;

Permit	467,205 gpd
Rogers Chenault projects	220,000 gpd and includes the existing 51,396 residential usage.
School and commercial reserve	60,000 gpd and includes the existing 35,024 gpd of the existing commercial and school usage.

The following would be the allocation of existing withdrawal permit:

Permit	467,205 gpd
Rogers Chenault projects	(220,000) gpd
School and commercial reserve	(60,000) gpd
Current unallocated quantity	187,205 gpd

$187,205/300 \text{ gpd/EDU} = 624 \text{ to } 750 \text{ EDUs}$ as the maximum EDUs that can be allowed on the system outside of the Rogers Chenault projects and the amount reserved for commercial customers. However, this figure should be re-evaluated annually based on actual demands.

1.2.3 Wastewater Demand

All water provided to customers does not end up in the wastewater system. The wastewater demand is projected to be approximately two thirds (2/3) of the water demand. Therefore the wastewater treatment demand is as follows:

Based on 450 EDU's per year over 20 years the wastewater treatment demand would be $2,800,000 \times 2/3 = 1,866,700 \text{ gpd}$. As the Hampton Roads Sanitation Authority (HRSD) is responsible for supplying the treatment for King William, this figure is an estimate for HRSD's planning purposes. HRSD completed a preliminary study and the projected flows they arrived at are very close to the projected flow in this report.

1.3 Evaluations of Water Sources, Storage and Distribution

Based on the projected demands Resource will evaluate the anticipated facilities required to meet the demands. Included in the evaluation will be the use of the County's "share" of the King William Reservoir's water supply. Resource will also consider phasing of facilities.

1.3.1 Existing Water Supply

There are currently three (3) wells owned by King William County. A fourth well is to be completed within McCauley Park and dedicated to the County. One well is located next to the elevated storage tanks and has a capacity of 120 gpm. The second well is located at Kennington and has a capacity of 480 gpm. The third well is at the Fontainebleau Industrial Park and has a current pumping capacity of 36 gpm. A second well is to be located at McCauley Park and will have a capacity of 420 gpm. Wells should be limited to approximately 12 -16 hours per day of maximum operation based on the water usage projections of the study area. Assuming the well at the tank will be classified as a standby well the other two wells could potentially produce 860,000 gallons in a 16 hour period. Therefore, the current wells by themselves are not adequate to meet the 20 year projected demands.

King William County is within a Groundwater Resource Area which requires all groundwater withdrawals over 300,000 gallons per month to be permitted by Virginia's Department of Environmental Quality (DEQ). King William currently has a Withdrawal Permit issued by DEQ for the wells. The current permit under review by DEQ is for an average use of 482,733 gpd. Therefore, it is anticipated that the current permitted allocation will not be adequate to meet future demands.

1.3.2 Alternatives to Meet Future Water Demands

Ground Water

As groundwater is a limited resource, DEQ has become more insistent that the deep aquifers be reserved for domestic use only and that the upper aquifers are used for irrigation. Therefore, DEQ has been reluctant to consider new withdrawal requests or increases in existing permits. At a minimum the permitting has become a lengthy process. With three wells in the Central garage area it appears that the best areas for wells would be in the Aylett and Manquin areas. Assuming that it would be possible to place three (3) wells in each of these areas (total of 9 wells) that produce at a rate of 260 gpm the maximum production over a 16 hour period would be 2,246,400 gpd. This is short of the projected 20 year demand of 2,800,000 gpd.

The County currently owns and operates a well at the Fontainebleau Industrial Park. This well can be brought into the Route 360 corridor; however, this will only provide 34,560 gpd supply based on a 16 hour pumping time.

Of interest is the fact that King and Queen County is not within a Groundwater Resource Area at this time. It is therefore possible that wells could be established in King and Queen County without going through the permitting process. It would be possible to meet the Area 1 and Area 2 needs by wells within the Aylett area and wells in King and Queen County. This option would require consent from King and Queen County.

Surface Water

Ponds and Lakes

Ponds and lakes can be considered as a source of drinking water. Treatment for the water would be the same as for taking water directly out of a river. However, in most cases for the type of ponds and lakes along the Route 360 corridor, there is not enough volume in the lakes or ponds to provide a safe yield. A safe yield is the required storage or flow that during drought or low flow periods there is enough water to meet the needs of the water system.

Pamunkey River

The current County Comprehensive Plan states that the rivers offer an important advantage to the County because of their possible use for supplying drinking water. The Pamunkey River is also considered to be a potential source of drinking water. King William County, along with many other localities, is looking to the Pamunkey River as a primary drinking water resource in the future.

The Pamunkey River is a prime consideration as a water source for a portion of King William County. Figure 6 shows a potential area for a river intake. There are four (4) zones on the Pamunkey River rated as follows:

Freshwater - located above the fall line, which is considered to be at the confluence of Topopotomoy Creek.

Tidal/Fresh - has some saltwater influence, but freshwater standards apply. This zone is located between the fall line and Sweet Hall landing.

Transitional - increasing salinity traveling downstream: saltwater standards apply. This zone is located between Sweet Hall Landing and the beginning of the York River.

Estuarine - saltwater anywhere after the beginning of the York River.

The proposed intake would be in the Tidal/Fresh zone and therefore, freshwater standards would apply.

Safe Yield Calculations for the Pamunkey River

Since river flow is not gaged at the location of the proposed intake, the gage closest to the intake was considered for development of historical streamflow data to be used for the evaluation. Data is recorded at the U.S. Geological Survey's Hanover gage (01673000). This data can provide the opportunity to determine the safe yield of the Pamunkey River during historical drought events

of known severity. The drainage area at the proposed intake was calculated as 1,208 square miles as shown on Figure 6. The drainage area for the U.S. Geological Survey's Hanover gage is 1,078 square miles.

Streamflow data collected at the U.S. Geological Survey's Hanover gage was used. The following information was calculated using DFLOW 3.1 a windows based program using EPA methodology for stream flow modeling for 1IQ30 (1-day average flow that occurs on an average once every 30 years) as well as the 1Q29 (29 year low flow):

Jan 1972 through July 2007 (post Lake Anna)

1Q30 = 34.5 cubic feet per second (cfs)

1Q29 = 34.8 cfs

Oct 1943 through Jan 1972 (pre Lake Anna)

1Q30 = N/A cfs

1Q29 = 14.8 cfs

Oct 1943 through July 2007

1IQ30 = 20.8 cfs

1Q29 = 21.2 cfs

The Virginia Department of Environmental Quality requires Lake Anna to maintain a minimum discharge of 20 cfs (see Appendix A).

The streamflow data collected at the Hanover gage were transferred to the proposed intake using a ratio of the drainage area of the proposed intake (1,208 square miles) to the drainage area of the Hanover gage (1,078 square miles):

$$Q_{\text{intake}} = Q_{\text{Hanover}} * (\text{Intake Drainage Area} / \text{Gage Drainage Area})$$

$$Q_{\text{intake}} = 34.5 \text{ cfs} * (1.12)$$

$$Q_{\text{intake}} = 38.6 \text{ cfs}$$

Where: Q_{intake} = Streamflow at Proposed intake
 Q_{Hanover} = Streamflow at Hanover gage
Intake Drainage Area = 1,208 square miles
Gage Drainage Area = 1,078 square miles

The ratio of the drainage area for the Hanover gage and the proposed intake is approximately 1.12 (1,208 square miles/1,078 square miles).

The safe yield of the Pamunkey River at the proposed intake was determined by calculating the safe yield at the Hanover gage and transferring the streamflow value to the proposed intake. The Virginia Department of Health defines the safe yield of a simple river intake as the one-day 30-year (1Q30) low flow which is the minimum flow available for one day with a predicted recurrence interval of 30 years.

The streamflow data for the Hanover gage were evaluated to determine if an adjustment was needed to differentiate between natural watershed contributions and any water withdrawals or wastewater inputs located upstream of the proposed intake. Hanover County will start discharging treated wastewater from a new plant in the near future. This discharge will amount to up to 5 million gallons per day. However, for this report an adjustment of the historical streamflow records was not made.

Consequently, based on a drainage area ratio of 1.12, the safe yield or one-day 30-year low flow for the proposed intake would be equal to 38.6 cfs (24,948,528 gal/day).

The Virginia Department of Environmental Quality (DEQ) administers the Virginia Water Protection Permit (VWPP) Program. Their responsibility is to ensure adequate protection of all uses of State waters, including in stream uses and nontidal wetlands. Withdrawals from the Pamunkey River are regulated by a Virginia Department of Environmental Quality water withdrawal permit (Virginia Water Protection Permit/Section 401 Water Quality Certification).

The US Army Corps of Engineers has broad jurisdiction over activities in the waters of the U.S. through authorities granted by the Clean Water Act and the Rivers and Harbors Act. Numerous additional state and federal agencies may be involved in an advisory capacity.

A withdrawal permit granted under the VWPP program would likely restrict the proposed withdrawals from the river under low flow conditions, and the withdrawal would likely be required to enact drought conservation measures to minimize river withdrawals during periods of low flow. State and Federal permit applications needed for modification of natural stream flows through such activities as construction of an impoundment or modification of a river intake require consideration of existing in stream and off stream uses of the stream. These issues are generally addressed by evaluating streamflow thresholds required to protect stream biota and other beneficial uses. These required flow quantities are termed minimum in stream flows (MIF). The federal and state agencies providing review and oversight are particularly concerned with MIF requirements because reduced quantities of natural river flow could adversely impact downstream water quality, habitat, and other uses of the river.

In lieu of imposing restrictions on the amount of water that could be withdrawn from rivers, regulatory agencies can require water suppliers to establish voluntary and mandatory drought water conservation plans to be enacted when stream flow drops below a specified level. One key factor concerning drought conditions is the availability of ground water as a source to augment the water needs in King William County.

Safe Yield vs. Usage

The 2,800,000 gpd usage is a 20 year projection to the Year 2028. The Pamunkey Safe Yield is 24.9 million gallons; therefore there is ample water supply that can be used to serve King William County. However, in accordance with the surface water withdrawal supply planning regulations (9 VAC 25-780) and Local and Regional Water Supply Planning (adding 9 VAC 25-

780-10 through 9 VAC 25-780-190), and guidance documents King William must submit a plan by November 2, 2009 should its population be greater than 15,000 or until November 2, 2010 if its population is less than 15,000. Therefore, King William with a population of 15,315 should submit the plan by November 2009.

It must be noted that surface water will require treatment. Therefore, a water filtration plant will be needed. Of concern is the permitting required for surface water withdrawal and any impacts on wetlands that a water intake may create during construction.

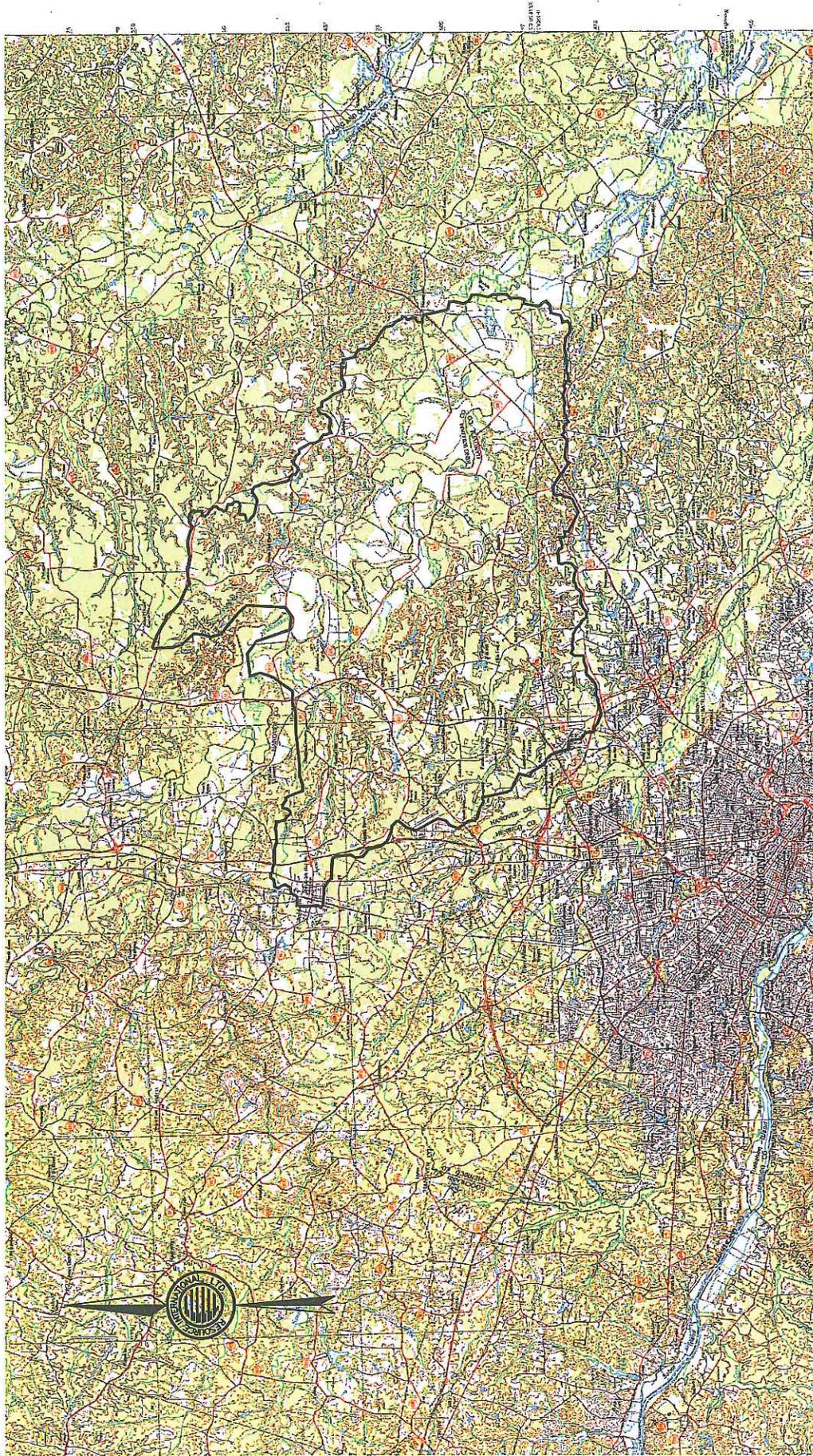
The following are steps needed to obtain a Surface Water Permit:

This presents a brief outline of the steps needed to obtain a surface water withdrawal permit. Items 2 and 3 are not sequential, as some steps can occur concurrently and/or independently.

1. The withdrawal should be consistent with Local and Regional Water Supply Plans. King William County is included in a Regional Water Supply Plan prepared by/or the Middle Peninsula Planning District in 2002 and has a draft update that is currently being reviewed. That plan addresses groundwater primarily, but consistency with the plan should be addressed.
2. Two permit applications are required:
 - a. Virginia Water Protection (VWP) Permit
 - b. USACOE/DEQ/VMRC Joint Permit Application

If the surface water withdrawal will utilize the distribution/storage system in place for an existing groundwater permit (e.g., Central Garage), then some form of "combined" permit would be in order. Resource understands that the pending revision of the GW Withdrawal regulation includes language addressing combination of permits. The draft regulation will not be available for public review until early June 2010, and will not become regulation until mid 2011 at the earliest.

3. Select the site for withdrawal
 - a. Wetland delineation (required for permit application)
 - b. Design (required for permit application)
 - c. Funding
 - d. Bidding/Construction
 - e. Public participation



NOTE: ALL LOCATIONS ARE APPROXIMATE.



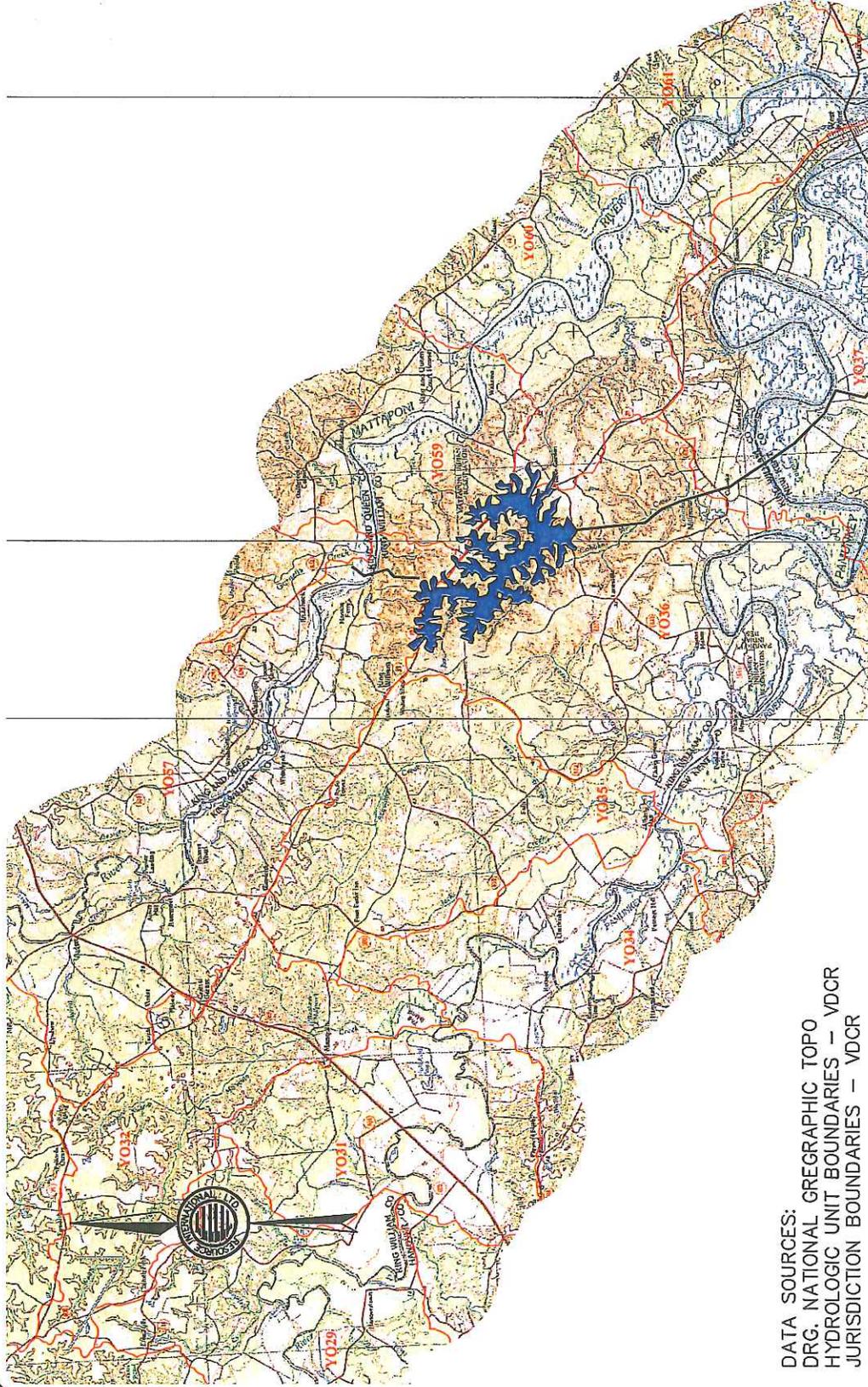
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FIGURE 6
PAMUNKEY DRAINAGE
AREA TO ROUTE 360
KING WILLIAM COUNTY, VIRGINIA
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1.3.3 Newport News Reservoir

After the Draft of this report was issued the permits for the construction of the reservoir were denied. Therefore, this alternative is no longer a consideration. The evaluation of this alternative is contained in Appendix B.



DATA SOURCES:
DRG: NATIONAL GEORGAPHIC TOPO
HYDROLOGIC UNIT BOUNDARIES - VDCR
JURISDICTION BOUNDARIES - VDCR

NOTE: ALL LOCATIONS ARE APPROXIMATE.



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FIGURE 7
KING WILLIAM RESERVOIR
KING WILLIAM COUNTY, VIRGINIA
NOT TO SCALE

1.3.4 Water Storage

The water use demands in the study area will require adequate water storage. The water system must be able to meet fire demands as well as maximum daily requirements. The criteria used to determine the proper size of storage facilities can best be understood in terms of the functions performed. These functions may be summarized as follows:

- Provide an equalizing reserve.
- Provide a fire reserve (based on the maximum fire flow requirement).
- Provide an emergency reserve

The equalizing reserve is the quantity of water needed to even out or "equalize" the system demands during a day's operation. The storage facilities allow the supply source to operate at a uniform rate because they provide this reserve. When the system demand is higher than the supply rate, water is drawn from the storage facilities. Conversely, when the system demand is below the supply rate, water is pumped into storage to ensure that an adequate quantity is available for the next period of high demand.

Fire flow storage is calculated at 2,500 gpm with 90 minute duration in order to provided protection for residential areas.

The emergency reserve is included as a precaution against disruptions in the supply source, breakage of water mains, or other unforeseen circumstances that would exert an additional demand on the storage facilities.

Potential Capacity for the Study Area

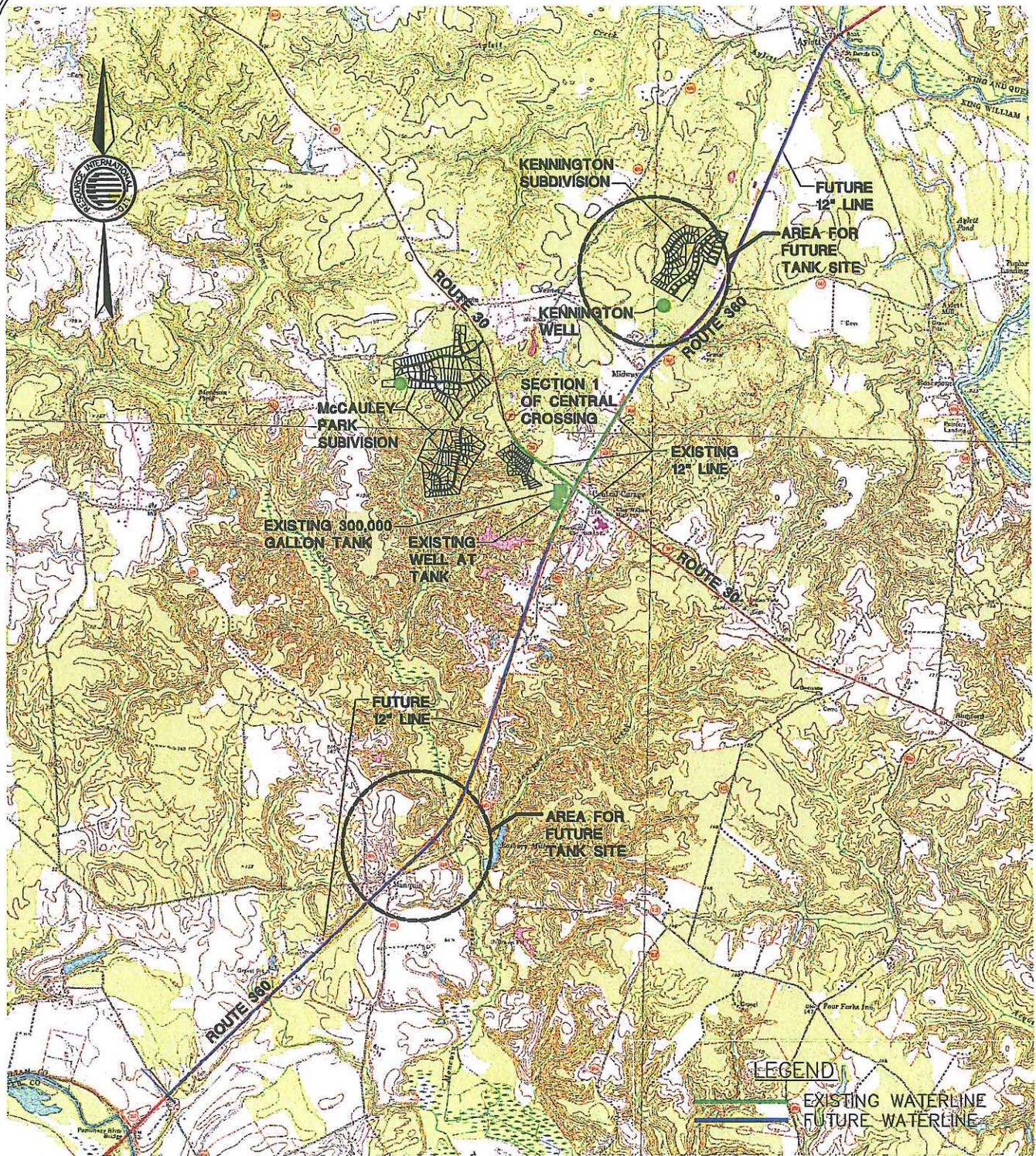
Storage Tank Calculations

Domestic Usage	2,800,000 gpd	2,800,000 gallons
Equalizing Reserve	2,800,000 gpd x 0.2	560,000 gallons
Fire reserve	2,500 gpm x 90 min	<u>225,000 gallons</u>
Subtotal		3,585,000 gallons
Emergency Reserve	25%	<u>896,250 gallons</u>
Total Storage Required		4,481,250 gallons

This storage can be provided by multiple tanks in various areas throughout the study area. Currently the County has 300,000 gallons of storage. Tank storage should be added as development occurs. New tanks should be spread out in the service area. There tanks, one near Manquin, one near Aylett and a new one near Central Garage would be the most likely scenario.

1.3.5 Water Distribution

Currently the main distribution lines are 12" in size. Hydraulic Analysis indicates that a 12" line along Route 360 along with elevated storage tanks in the Manquin area and the Aylett area will provide adequate domestic and fire flows throughout the study area. See Figure 8.



NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 8
PROPOSED FUTURE WATER
IN CENTRAL GARAGE AREA
KING WILLIAM COUNTY, VIRGINIA
NOT TO SCALE



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1.4 Evaluations of Wastewater Collection, Transportation and Wastewater Treatment

1.4.1 Wastewater Collection

With the exception of the original wastewater project serving the Kitty Litter plant where an 8" gravity system was constructed, to date wastewater collection systems have generally been installed by the developer within their respective commercial or residential developments. The developers have generally constructed pump stations to meet the needs of their development. This can create situations where the County is operating and maintaining more pump stations than is necessary within some drainage areas.

Therefore, future potential developers should be required to construct pump stations that serve the full drainage area and minimize the total number of pump stations. This can be accomplished by requiring that major interceptors could be constructed in each drainage area. Figure 9 illustrates where potential interceptors be located to collect and transport wastewater to a main pump station. Developers should be required to develop a conceptual plan with line sizing and pump station sizing to serve in general conformance with Figure 9. They should then design their respective collection system in conformance to the specific plan for the drainage basin and install the appropriate interceptors. If the full interceptor cannot be constructed due to cost or easements problems and a pump station is approved by the County, then it should be considered as temporary and designed so that when the main interceptor is constructed the pump station can be abandoned. The developer should not receive any tap fee credits for this station (if any such credits apply), due to its temporary nature.

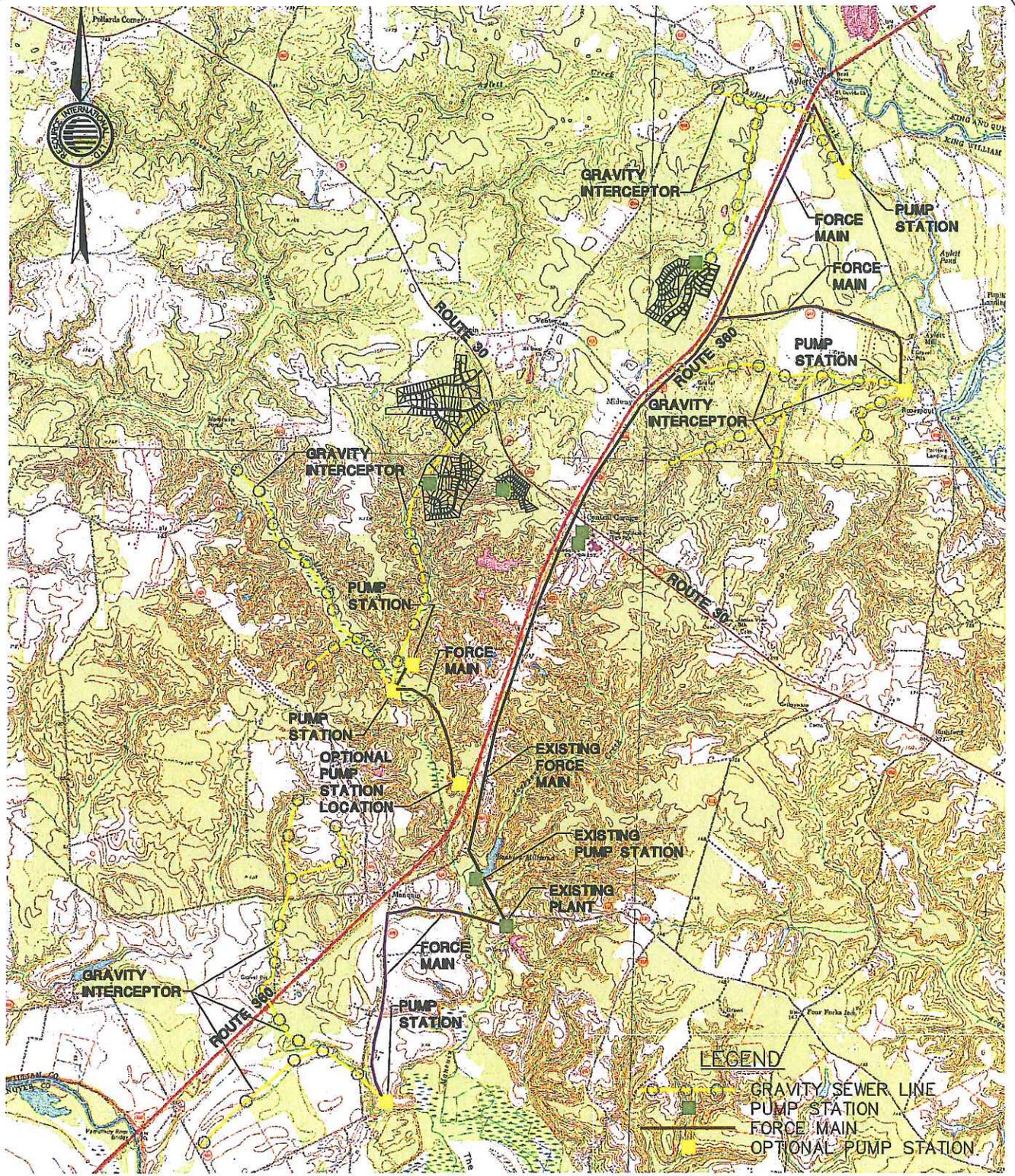
1.4.2 Wastewater Transportation

Based on the projected demands Resource has evaluated the anticipated facilities required to meet the projected demands. There is currently a 10 inch force main along Route 360 from the entrance to Central Crossing just below Route 30 to the wastewater treatment plant. This line was constructed to serve McCauley Park, Kennington and Central Crossing. The excess capacity of this 10" line has been calculated to be 1,560,000 gpd. This portion of the line therefore, should be adequate for growth along Route 360 south of Central Garage to Manfield Road (Route 605).

There is an existing pump station at Central Garage that currently serves the shopping center and school. This pump station pumps into a 4 inch force main. This pump station and force main should have the capacity to serve commercial growth along Sharon Road as well as further development in the commercial area around Central Garage.

Area 6 from the Hanover County line to Route 605 will be required to construct a force main along Route 360 to serve any development that might occur in the area. Figure 9 shows potential future pump stations and associated force mains.

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NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 9
 PROJECTED FIGURE
 WASTEWATER FACILITIES
 IN CENTRAL GARAGE AREA
 KING WILLIAM COUNTY, VIRGINIA
 NOT TO SCALE



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1.4.3 Wastewater Treatment

Resource conferred with HRSD on evaluation of the maximum potential for expansions at the existing plant site. HRSD has completed a study of the King William plant. The current study indicates that the existing wastewater plant could be expanded to 2 million gallons per day (mgd) if the effluent is transported directly to the Pamunkey River. The main difference in potential demands from this study and the HRSD study is that this study projects the study area has the potential to reach 1.87 mgd in 20 years, where the HRSD projects that a 2 mgd demand will be seen 30 years out. Therefore, there appears to be capacity for the planning period of 2 mgd.

Reuse Of Wastewater.

Due to the strict restrictions being placed on the discharge of wastewater into streams, reuse of wastewater is an area many localities are investigating. King William does not have a large industry that requires large quantities of water for process purposes. Other potential uses are for golf course irrigation and farm land. King William does have a substantial amount of prime farmland. Figures 10 and 11 indicate that areas 1 and 6 have significant areas that can be used for spray irrigation. Some of the considerations for spray irrigation are as follows:

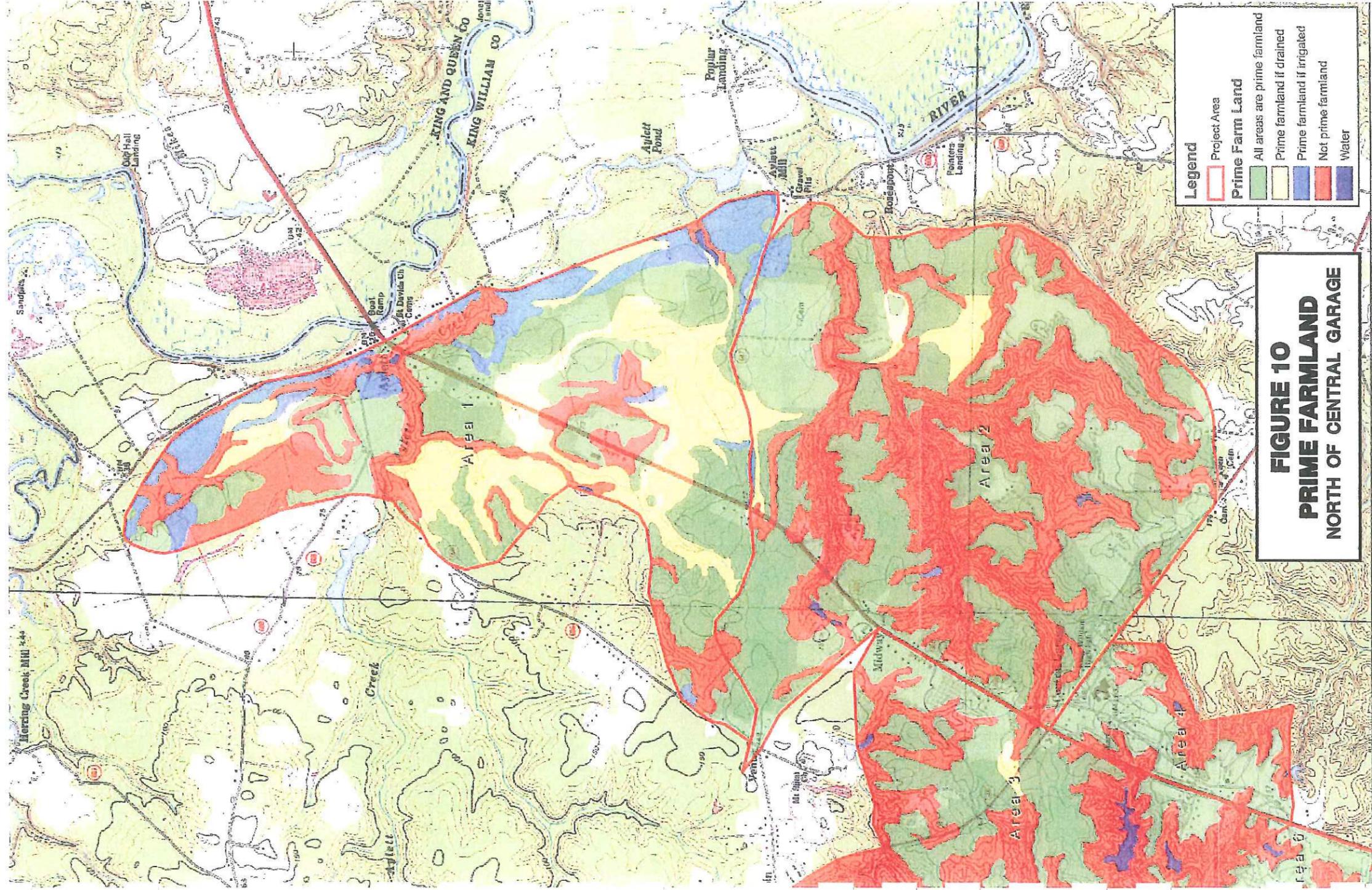
Pros

- Can be sprayed on crops not used for human consumption
- Provides adequate water to sustain crops even in drought conditions
- Requires less stringent treatment
- Maintains the rural character of the area
- Keeps farmland from being developed

Cons

- More manpower is required to operate when fields are being sprayed
- Cannot discharge in the winter and therefore requires storage in the winter or ability to discharge into a stream
- Generally requires a substantial amount of land

In general, a 200 foot buffer must be maintained around the spray irrigation fields. The amount of water that can be sprayed depends on the soils in which the crops are growing. In general, 150 acres should be able to support an average discharge of 150,000 gpd over a year's period. There is the potential that farmers in the area will give a long term lease or place their farm land in a conservation easement and allow the County to spray while they continue to farm the property. The larger the property the less the buffer takes away usable spray area.



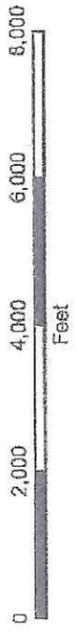
Legend

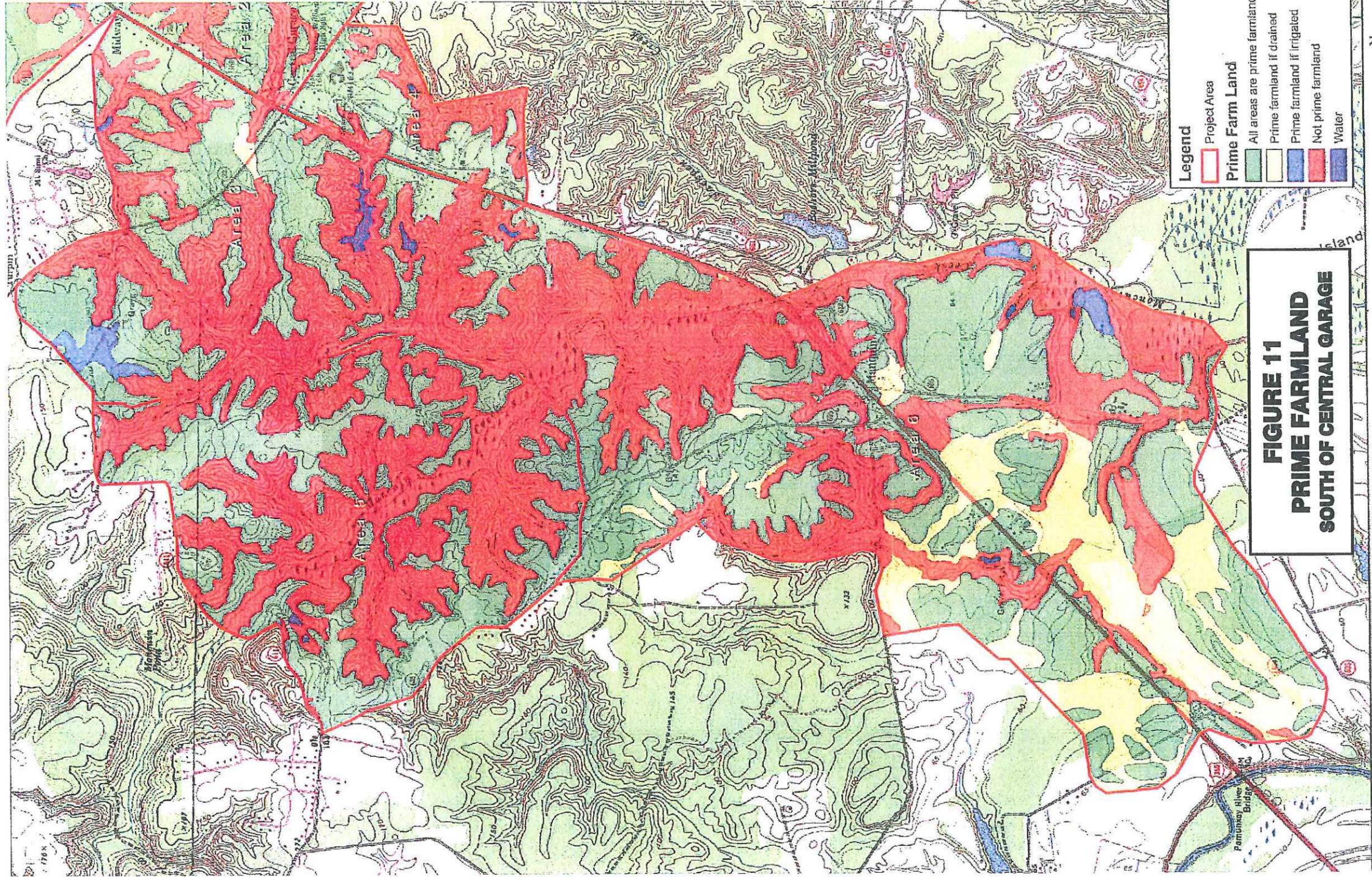
- Project Area
- Prime Farm Land**
 - All areas are prime farmland
 - Prime farmland if drained
 - Prime farmland if irrigated
 - Not prime farmland
 - Water

FIGURE 10
PRIME FARMLAND
NORTH OF CENTRAL GARAGE

USDA-NRCS-NCCG Digital Raster Graphic: MrSID Mosaic, King William County, Virginia

Note: All locations are approximate





Legend

- Project Area
- Prime Farm Land**
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if irrigated
- Not prime farmland
- Water

**FIGURE 11
PRIME FARMLAND
SOUTH OF CENTRAL GARAGE**

USDA-NRCS-ACGC Digital Raster Graphic, M:SID Mosaic, King William County, Virginia

Note: All locations are approximate



1.4.4 Other Considerations

There will occasionally be situations where consideration must be given to evaluating potential water and wastewater treatment alternatives for major developments that are not likely to be connected to the public utility systems due to cost and/or location. These will have to be evaluated on a case by case basis. The County currently has requirements for lot sizes in its zoning ordinance that provide for lot sizes where public water and sewer is not available. To date these standards have been effective in allowing development to occur outside of the water and wastewater service area.

It is more likely that a subdivision may ask for consideration to construct a private wastewater system utilizing either spray irrigation or mass drain fields. Generally, the controlling aspect for these treatment alternatives is the receiving soils. The County would need the developer to have a significant soils study performed to prove that the soils are adequate for the proposed use as well as reserve drain fields. In each case either DEQ or the State Health Department will be required to issue a permit for the construction of any facility.

1.5 Alternatives for Financing Improvements

Currently there are very few alternatives to provide mechanisms to finance utility improvements through grant funds. The County has received some funding through programs such as Community Development Block Grant; however, there are considerable stipulations placed on the County for use of the funds and they are primarily for the benefit of low income communities. The County has also obtained loans through the Virginia Revolving Loan program that provides a 20 year loan at relatively low rates. Alternatives that are in use in Virginia communities that may be considered are proffers, developer required improvements, tap fee credits, capacity fees and prepayment of tap fees.

1.5.1 Virginia Clean Water Revolving Loan Fund

Programs Overview

The Virginia Clean Water Revolving Loan Fund (VCWRLF), previously known as the Virginia Revolving Loan Fund, was created in 1987. The Department of Environmental Quality, on behalf of the State Water Control Board (SWCB), manages the VCWRLF, administering the policy aspects of the Fund, receiving applications and providing funding recommendations to the SWCB. The Virginia Resources Authority (VRA) serves as the financial manager of the Fund.

The Virginia Clean Water Revolving Loan Fund (CWRLF) reduces interest rates for local governments for projects that improve water quality or prevent future problems. Benefits of the CWRLF include:

- Below-market interest rates
 - 1% below "AA" rates
 - 0% loans for some localities meeting eligibility criteria
- No bond issuance costs
- Payment waiver during construction

The Department of Environmental Quality administers the program and policy aspects of the fund on behalf of the SWCB. VRA serves as the financial manager of the fund: underwriting loans, issuing bonds, investing monies, closing loans, making disbursements, and maximizing economic benefits.

Wastewater Loan Program

Loans are provided to Virginia local governments to assist with wastewater treatment plant and/or collection system improvements. Localities may apply for a loan from the VCWRLF Wastewater Loan Program for any expansion, upgrade, extension, replacement, repairs, rehabilitation, and/or additions to publicly-owned wastewater collection and treatment facilities; construction of any needed new facility or new conveyance system; and any planning and/or design costs associated with the above improvements.

The VRLF is a self-perpetuating loan fund which provides a low interest financing option to Virginia cities, towns and wastewater authorities for the upgrade, expansion, extension, replacement, repair, rehabilitation, and/or additions to public wastewater collection and treatment facilities.

The program has been designed so that any cost determined to be reasonable and necessary in the planning, design and/or construction of needed wastewater facilities improvements is allowed. Loan funds can be requested to cover most of the needed expenses for the County's approved wastewater system improvement program. DEQ may reduce loan eligibility and the scope and size of a project to insure the greatest financial benefit to as many counties/communities as possible.

New Collection Sewer

DEQ will evaluate loan allow ability for new collector sewers on the basis of sewer needs as they relate to the elimination of public health hazards, ground water contamination and other factors related to water quality problems that exist due to the lack of central sewerage facilities in the area. Allow ability will be limited to sewer lines including wyes and tees and line stubs for residential connections. Allow ability is limited to area determined to be maintained under municipal ownership. Service laterals from property boundary to structures remain ineligible under the program.

The purchases of land, easements and/or right-of-ways are not considered allowable costs under the Revolving Loan Program unless the land is considered an integral part of the treatment process. In addition, legal, administrative, and engineering expenses related to these purchases are also ineligible. Land purchases needed for spray irrigation, or other means of land application and disposal of wastewater and sludge would be considered an integral part of the treatment process and allowable for inclusion in the loan amount. The procurement of such land must be in conformance with the Federal Uniform Relocation and Real Property Acquisition Policies Act of 1970 (Uniform Act).

Any interest costs associated with funds borrowed for the planning, design, or construction of the project are ineligible for loan funding and will be disallowed.

1.5.2 Virginia Resources Authority

Virginia Resources Authority (VRA) provides cost-effective financial solutions to local governments and other public bodies for projects that improve the quality of life of Virginians. Created by the General Assembly in 1984, VRA supports community investments in the areas of water and wastewater. Financing solutions draw on VRA's unique ability to provide revolving fund loans to localities at below-market interest rates and to issue bonds backed by the moral obligation of the Commonwealth. The VRA staff offers extensive experience and expertise in a variety of financings and provides ongoing assistance to localities and their public projects.

This ability to maximize value for local communities with cost-effective and innovative financing options has made VRA the choice provider of infrastructure financing for Virginia communities. The VRA through its Virginia Drinking Water State Revolving Fund (DWSRF) provides low interest loans, as well as some grants, for drinking water projects to local governments and privately organized water suppliers. The fund receives U.S. EPA grants and state matching and is permanent and perpetual, similar to the Virginia Clean Water Revolving Loan Fund. Virginia Department of Health administers the program, while VRA acts as financial administrator and services the loans.

1.5.3 Department of Agriculture Rural Utilities Service

Water and Waste Disposal Programs

The Rural Utilities Service (RUS), the Rural Business-Cooperative Service, and the Rural Housing Service comprise USDA's Rural Development mission area. As the name suggests, the three agencies' programs are designed to meet the needs of people who live in rural areas – including infrastructure, housing, health and medical, education, and employment. The Rural Utilities Service's Water Programs Division has four programs which provide financial and technical assistance for development and operation of safe and affordable water supply systems and sewage and other forms of waste disposal facilities:

- Water and Waste Disposal Loans and Grants
- Emergency Community Water Assistance Grants
- Technical Assistance and Training Grants

These programs are administered by USDA Rural Development offices. There are 47 State Offices, as well as Local or Area Offices. Brief descriptions of the programs are provided below.

Water and Waste Disposal Loans and Grants

RUS provides loans, guaranteed loans, and grants for water, sewer, storm water, and solid waste disposal facilities in cities and towns up to 10,000 people and rural areas with no population limits. Recipients must be public entities. These can include municipalities, counties, special purpose districts, Indian tribes, and corporations not operated for profit, including cooperatives. A new entity may be formed to provide the needed service if an appropriate one does not already exist. Applicants must:

- Be unable to obtain needed funds from commercial sources at reasonable rates and terms.
- Have the legal capacity to borrow and to repay loans, to pledge security for loans, and to operate and maintain the facilities.
- Propose facilities that are consistent with any development plans of the State, multi-jurisdictional area, counties, or municipalities where the project is to be located.

Loan and grant funds may be used to:

- Construct, repair, modify, expand, or otherwise improve water supply and distribution systems and waste collection and treatment systems, including storm drainage and solid waste disposal facilities. Certain other costs related to development of the facility may also be covered.
- Acquire needed land, water sources, and water rights.
- Pay costs such as legal and engineering fees when necessary to develop the facilities.

The law authorizing the program allows a maximum repayment period of 40 years. Three interest rates are used. They are set periodically based on an index of current market yields for municipal obligations. The poverty interest rate is currently 4.5 percent. The poverty rate applies when the primary purpose of the loan is to upgrade existing facilities or construct new facilities required to meet applicable health or sanitary standards; and the median household income (MHI) of the service area is below the poverty line for a family of four or below 80 percent of the Statewide Non-metropolitan MHI.

Applicants must demonstrate that a significant decline in quantity or quality of water occurred within two years of the date the application was filed with RUS. Public bodies and nonprofit corporations serving rural areas, including cities or towns whose population does not exceed 10,000 people may be eligible. Public bodies include Indian Tribes on Federal and State reservations and other federally recognized Indian Tribal groups.

Funds may be used to:

- (1) Extend, repair, or perform significant maintenance on existing water systems; construct new water lines, wells or other sources of water, reservoirs, and treatment plants; replace equipment; and pay costs associated with connection or tap fees.
- (2) Pay related expenses such as legal and engineering fees and environmental impact analyses, or acquire rights associated with developing sources of, treating, storing, or distributing water.
- (3) Achieve compliance with the requirements of the Federal Water Pollution Control Act (33 U.S.C. 1 et seq.) or with the Safe Drinking Water Act when noncompliance is directly related to a recent decline in quality of potable water.

1.5.4 Utility Agreements with the Development Community

King William has utilized Public Utility Water and Wastewater Service Agreements based on similar agreements utilized in other jurisdictions. To date these agreements have worked successfully for a number of projects. These agreements require the developer to construct all

the water and wastewater facilities at the developer's expense and dedicate the utilities to the County. The county agrees to credit to the developer a portion of the tap fees for the over sizing (excess capacity) of any offsite utility. This allows for the expansion of the water and wastewater system without the County borrowing money and the County is not paying for any interest or carrying costs of the expansion. The added advantage is that the developer is taking the risk if there are not enough lots sold to pay for the construction costs.

1.5.5 Capacity Fees

Some utilities have adopted availability fees. These fees are required over and above the tap fee. The availability fees are intended to recoup a proportional cost of the existing systems capacity that a new development will be utilizing. In general, the availability fee will be set aside to construct new facilities when needed to maintain adequate water supplies of wastewater treatment.

1.6 Management Issues

1.6.1 Acceptance of Private Utilities

To date the County has not been faced with acceptance of ownership and operation of private water and wastewater systems. When faced with a request to takeover ownership and operation of a private utility it is generally due to customer complaints due to poor service and water quality or for many small utilities it is the fact that the utility does not have the money to upgrade the system or operate the system at the required levels. If faced with the decision of accepting a private system it would be preferable that the utility system meet all the standards and criteria of the County's Utility Regulations. However, the final decision may be based on the welfare of the County citizens.

1.6.2 Operation and Maintenance of County Utilities

Staffing

Currently the public water system is operated and maintained by the County's buildings and grounds staff. Basically this is two staff members who must respond to significantly more than utility problems. Soon they will have responsibility for operating and maintaining five well facilities (three in Central Garage, one at the industrial park and one at Mount Olive), the water tank, water lines and wastewater collection system. The three systems are some distance from each other and therefore, the travel time between them must be taken into consideration. Maintenance responsibilities for the utility staff include the following:

- daily checks on the wells
- maintaining chlorination solution tanks
- reading meters
- performing water quality tests
- mark lines for Miss Utility
- perform system maintenance
- responding to various customer requests
- record keeping

Other emerging counties have discovered that eventually this type of arrangement will not work adequately and eventually form a separate utility department. The County's utility systems are growing to a point that a full time licensed (water) operator should be added to the County's staff.

Equipment

The County is responsible for maintenance of the water system and wastewater collection system. They will also be responsible for connecting new customers to the system (where not installed by the developer). The new connections will require connection to the main line, installation of service lines and meters on the water system. The wastewater system will require connection to the main line, installation of laterals and installation of cleanouts. Besides the normal hand tools required, the County will need the following:

- Backhoe
- small backhoe or "ditchwitch"
- Truck with trailer to haul equipment
- Remote meter reading equipment (this equipment can save considerable labor costs)

It should be noted that there are areas where the water lines are deep enough to require trench boxes (such as along State Route 360 where lines cross under Route 360). Repair of lines over 8 feet in depth may require special consideration.

Contract Maintenance

Considering that the system is relatively new and should have relatively few leaks, and the cost of equipment as well as the potential for dealing with deep pipe, it is be to the County's advantage to outsource the maintenance and major repair work. Currently the County has a repair and maintenance contract.

Water Conservation

The County has a water conservation plan. The plan addresses how drought situations will be handled. However, many communities are considering or have implemented requirements for low pressure irrigation systems. Some Counties are no longer allowing sprinkler systems to be installed in order to conserve the ground water resources. With the limited amount of ground water available to King William, some irrigation restrictions should be considered. These restrictions would include items such as:

1. No deduct meters allowed.
2. Only USEPIT Water Sense Certified irrigation systems may be used suggest verbiage is a follows:

The following provisions shall apply to all residential irrigation within the Central Garage Water System.

Irrigation of homeowner lots utilizing public water sources shall require the use of low water volume systems. Any system, regardless of type, shall be equipped with devices to measure natural rainfall and meter irrigation water usage and timing, and either shut off the system or not turn it on if sufficient rainfall has been received. All irrigation systems and irrigation installers shall be USEPA Watersense certified. The County shall approve the type and installation design of any irrigation system installed on the Central Garage Water System.

King William County imposes water billing structure to discourage excess water usage by not allowing deduct meters to measure irrigation water separately. The County will encourage alternate sources of waterground for irrigation. Homes may be outfitted with rain barrel systems and cisterns. In an average rainfall year in this area a 2,000 square foot roof can shed over 70,000 gallons of water, which may in return be used for homeowner irrigation. Rain barrel/ cistern systems would not be subject to water use restrictions imposed by the County and/or Commonwealth of Virginia in the event of a declared water emergency. While low volume irrigation is encouraged in conjunction with rain barrel/cistern capture systems, it is not mandated.

Design Standards

King William has in place Utility Design Standards. These standards should be review every few years to determine if they meet current State regulations and current utility practices being used in King William County.

APPENDICES

APPENDIX A
DATA ON LAKE ANNA REQUIRED
RELEASES

c. **Lake Anna Releases:** The Virginia Power-North Anna Nuclear Power Station operates Lake Anna, located on the North Anna River, a tributary to the Pamunkey River. The VPDES permit under which Virginia Power operated was due to expire on 2 October 2000. An application for the re-issuance of the permit was received by DEQ on 5 April 2000 and forwarded to EPA for comment. A public meeting was held on 7 June 2000, the draft Lake Level Contingency Plan (LLCP) was sent for comments on 1 August 2000, and a public hearing was held on 6 November 2000. According to a DEQ memorandum dated 17 November 2000, EPA and the Virginia Department of Health notified DEQ that they had no objections to the re-issuance of the permit.

The DEQ memorandum also stated that recent legislation required any VPDES permit issued for a surface water impoundment designed to provide cooling water to power generators must contain a Lake Level Contingency Plan (LLCP). The LLCP contains measures to minimize adverse impacts to downstream users in the event releases must be reduced during drought conditions. The LLCP provides for the operators of Lake Anna to reduce flows from 40 cfs to 20 cfs when the lake water level drops below designated levels due to drought conditions. The LLCP stipulates that flows may not be reduced below 20 cfs and that DEQ and the downstream users (Hanover County Public Utilities, Bear Island Paper Company, Engel Farms, Inc. and the Pamunkey Indian Tribal Government) must be notified 72 hours in advance. Releases from Lake Anna may not be such that established water quality standards downstream are impaired or numeric criteria for poc's violated. DEQ requires monitoring in the North Anna River when flows are reduced below 40 cfs. Furthermore, if a downstream user identifies an adverse effect and DEQ concurs, releases must be returned to 40 cfs in 5 cfs increments.

During public comment on the LLCP, DEQ addressed the potential for reduced flows from Lake Anna to affect the Totopotomoy wastewater treatment plant's compliance with its VPDES permit. In their response to comments, DEQ stated that the wastewater treatment plant's VPDES permit and its compliance with the permitted effluent limitations should not be affected.

Although DEQ was not aware that flows from Lake Anna would be reduced when the VPDES permit was issued for the Totopotomoy wastewater treatment plant, DEQ has since stated that the limits allowed under 10-10-3 protect water quality regardless of river flow or effluent discharge rate. DEQ does not believe that these flow changes would interfere with the capacity of the waterbody to assimilate and process pollutants or to maintain State-established water quality standards.

The District Engineer has concluded that DEQ appropriately considered the effect of reduced flows from Lake Anna on the effluent limits set for the Totopotomoy wastewater treatment plant. Furthermore, the District Engineer has concluded that sufficient administrative and regulatory controls are in place to ensure that water quality standards in the Pamunkey River are met downstream of Lake Anna.

d. **Federal Agency Comments on Water Quality:** In a letter dated 25 January 2002, commenting on application 01-V2032, the FWS expressed concern for the potential degradation of water quality and cited water quality issues that they believe should be addressed by the Corps in consultation with EPA: (1) federal listing under Section 303(d) of the Clean Water Act of the Pamunkey River as an impaired water due to violations of the dissolved oxygen (DO) water quality standard, (2) reduction in minimum releases from Lake Anna, (3) potential for impacts to anadromous fish spawning and nursery habitat from possible reduction in DO, and (4) determination that there are no anthropogenic sources causing or contributing to the dissolved oxygen deficit in the Pamunkey River. The FWS recommended that the Corps require that the EPA reevaluate this project and its effects on the water quality of the Pamunkey River.

APPENDIX B
EVALUATION OF THE RESERVIOR
ALTERNATIVE

Newport News Reservoir

King William will have the ability to utilize water from the proposed Newport News Reservoir. This reservoir is located approximately 16 miles from Central Garage (see Figure 7). In order to utilize this water supply a water filtration plant will be needed. Potentially, the permitting process should be easier than trying to permit a withdrawal from the Pamunkey River. However the cost of the 16 miles of pipe line may outweigh the permitting advantages. In building the 16 miles of pipeline to serve Central Garage, there is the potential that by having potable water available, pressures may be created for residential growth along the pipeline outside of Central Garage.

Future Water Allotment

Today, King William County residents rely on groundwater wells for their drinking water. However, groundwater is a limited resource, carefully monitored and regulated by the state. At some point, the County will need additional new water supplies and will probably wish to develop a public water system. When that time comes, the County will receive an allotment of up to 3 million gallons of untreated water per day and, at the County's request, Newport News will build a water treatment plant in the County to treat that water at the cost of service.

Project Components

- Residential-styled pump station building on the Mattaponi River
- Submerged & screened intake pipes, designed & controlled to protect fish
- Pumping curtailed during droughts and spawning seasons
- Dam & road across Cohoke Creek, about 1,000 feet south of West Rose Garden Road
- 1500-acre lake with 1500 acres of protected shoreline
- Public access at five locations for fishing, swimming, non-powered boating and other activities
- 1½-mile pipeline from Mattaponi to the lake, and 12-mile pipeline to Diascund Reservoir
- Wetland & stream compensatory mitigation program
- Mattaponi River long-term ecological monitoring & research program
- Historic & archeological research & protection program
- Fish hatchery and fish passage programs in cooperation with other agencies
- No homes or tribal lands submerged by the project
- About 100 properties affected, but only a portion to be acquired in most cases
- Approximately \$85 million will be invested in taxable improvements within the County

City-County Partnership

- County to acquire lake & shoreline, for lease to the City (50-year lease with automatic 25-year renewals; rent is 8% of appraised value at time of purchase; value rises with assessments)
- Net present value of rent payments for initial 50-year lease term is estimated \$69 million
- 3 MGD supply of untreated water is reserved for the County on pro-rated cost basis
- City will provide treatment for County's allocation of water if requested, at cost
- County to provide recreational facilities on the lake, except the first will be constructed by City
- 185-acre Scotland Landing is owned by County and City; was bought at City's expense
- Pipeline easement from Mattaponi will be bought at City's expense, held in joint ownership
- Pipeline easement to Diascund Reservoir is City's responsibility

- County responsible for land-use controls for reservoir protection
- City pays partial taxes and payments in lieu of taxes on all capital improvements

Schedule

- All major permits have been issued
- Scotland Landing was purchased in 1996
- Property acquisitions for lake & shoreline were put on hold in 1999
- Surveys, appraisals & acquisitions were complete in 2008
- Long-term pre- and post-operational river monitoring program began in 1998
- Wetland & stream compensatory mitigation plans are to be complete by 2010
- Cultural resources work continuing through all phases of the project
- Construction of dam, pipelines, intake & pumping station is projected to take place from 2013 to 2016
- Lake filled and entire project on-line by 2020