Theme 2: Infrastructure

Mission

Water supply and conveyance systems will be developed to provide safe and plentiful water for current and future demands of the residents and businesses of Orange. Sewage treatment and conveyance systems will be reconstructed to reduce fiscal and environmental impact. Solid waste treatment systems will return naturally-occurring compounds to the earth and recycle non-natural ones. The Town will manage rainfall at the source to mimic a site's predevelopment hydrology. Low Impact Development (LID) design will be used to infiltrate, filter, store, evaporate, and detain runoff to reduce flooding and provide baseflow to surrounding streams. Power and telecommunication systems will serve the emerging needs of commerce. We will invest in technologies, such as broad band, to attract high-paying employers.

Raw Water Storage Basin Ground Breaking

Water System

Goal I1: Provide safe and clean drinking water for all residents of the Town of Orange.

Analysis:

Water Treatment and Storage

The water treatment plant is located northwest of Town on Route 633 near the Rapidan River, which provides the raw water for the system. The rated capacity of the treatment plant, built in 1960, is 2.0 MGD (annual average) with maximum daily withdrawl of 2.7 mgd, and current average daily demand fluctuates between 1.3 and 1.7 mgd serving 2200 connections. The RSA agreement (see below) allocates 1.1 mgd to Gordonsville and .9 mgd to Orange. The maximum demand in 2005 for Orange averaged .6 mgd while the maximum month demand for Gordonsville averaged .3 mgd. Town staff estimates that the new raw water supply basin provides approximately 40 days of supply of average demand and 80 days of supply for demand under mandatory conservation. Historical analyses of the Rapidan River (see Theme 6: Environmental Assets) show that drought flows of approximately 30 days occur on the average of at least once per decade. Potential residential development projects (see Theme 10: Population and Housing) planned or under discussion for the Town and Joint Planning Area may increase demand an additional .3 mgd. This increased demand will reduce the drought supply of the raw water basin for conservation demand to 30 to 40 days. A standpipe and underground reservoir at Marshall Heights has a combined rated storage capacity of 2 million gallons. A new storage tank behind Prospect Heights Middle School has a capacity of 1 million gallons and is currently kept approximately 2/3 full. The overflows for each of theses systems are at identical elevations. This will limit development of areas at a higher elevation, unless separate pressure bands are developed. In 2006 the Town and County took a first step toward a contemporary assessment of the area's surface water resources and future water demand.

The Rapidan Service Authority (RSA) has an additional tank south of Town to the west of Rt. 15, which serves Gordonsville and Ridgid-Kollman. The capacity of this facility is .5 million gallons.

In 2004, the Virginia Department of Health began requiring testing for Halo-acetic acids and tri-halo methanes, disinfection by-products of chlorination of water. These tests showed that water in the Town's system exceeded maximum contaminant levels for these compounds. Once discovered, the Town took the following immediate steps:

- Greater turnover of water in storage (from 4 days to 2 days);

- Conducted engineering study (required by Health Department) to design change in pre-chlorination to reduce contact with organic materials.

The new raw water storage basin is also expected to reduce the potential for these by-products. Additional steps, such as change in pre-disinfection methods may also be implemented depending on efficacy of the steps taken above and continued research into health effects of such alternatives to chlorination.

Water Supply to Rapidan Service Authority

In 1999, a revised contract between the Town of Orange and the Rapidan Service Authority was approved with the following conditions:

- 25 year term until September 30, 2023
- Maximum of 1.1 million gallons per day
- Rate of 105% of the Town's unit cost of production
- Unit cost includes all expenses incurred by Town for operation and maintenance, administration, annual depreciation. This does not include debt service or capital costs related to the purchase/construction of expanded facilities to service non-RSA users.

The RSA serves customers in Gordonsville and the U.S. Route 15 corridor south of Orange. It also serves customers east of the Town by a water line adjacent to Virginia Route 20 extending to the Orange County Airport.

Water Transmission

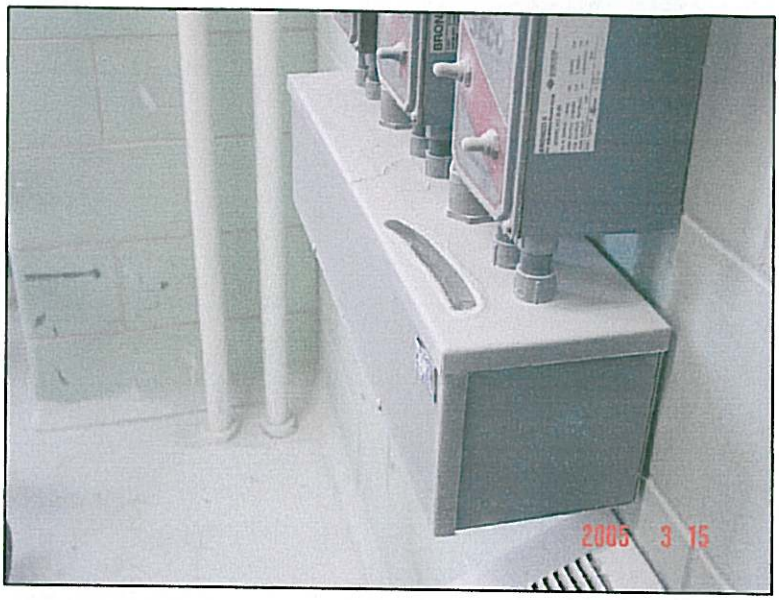
The first water line in the Town of Orange was constructed around 1920. Made of cast iron, these old lines still comprise the majority of water lines in the Town (60-70%). These lines, while not thought to leak, do become less efficient as they age due to scale build-up. Some parts of Town, such as Main Street, are thought to have greater build-up than other areas and should be scheduled for replacement.

Another issue is water line loop connections. A few areas of Town remain that need closing of transmission loops. These include Byrd Street, Rt. 20 east, and completion of the prospect line to Rt. 20.

Also, a blockage or reduction in flow is reported to exist in the water line between the plant and Spicer's Mill Road. This has been tested by the Public Works Department and has yet to be proven. Further monitoring may be desirable.

Action I1.1: Convert powder chemical feed to liquid feed (Capital Item 2006 CIP).

Dry Feed Residue on Equipment



Indicator I1.1.1: Liquid feed of water treatment chemicals
Benchmark I1.1.1: Liquid chemicals used on routine basis

Progress I1.1.1:

Responsible Party I1.1.1: Town of Orange Water Department
Implementation I1.1.1: 2007-2008

Action I1.2: Construct SCADA communications system (Capital Item 2006 CIP).

Indicator I1.2.1: Remote monitoring of water level and quality
Benchmark I1.2.1: Data continuously monitored

Progress I1.2.1:

Responsible Party I1.2.1: Town of Orange Water Works
Implementation I1.2.1: 2007-2008

Action I1.3: Pre-disinfect water using alternative method to chlorine (Capital Item 2006 CIP).

Indicator I1.3.1: Halo-acetic acids (HAA5s) and tri-halo methane (THM)

Benchmark I1.3.1: Elimination of compounds (below MCLs) from finished water system

Progress I1.3.1: 

Responsible Party I1.3.1: Town of Orange Water Department
Implementation I1.3.1: 2007-2008

Action I1.4: Repair concrete at water treatment plant (Capital Item 2006 CIP).

Concrete spalling at mixing basin

Indicator I1.4.1: Concrete mixing basin
Benchmark I1.4.1: Basin repaired

Progress I1.4.1: 

Responsible Party I1.4.1: Town of Orange Water Department
Implementation I1.4.1: 2007-2008

Action I1.5: Construct Raw Water Basin.

Raw Water Basin

Indicator I1.5.1:	Raw Water Basin
Benchmark I1.5.1:	Construction Complete
Progress I1.5.1:	
Responsible Party I1.5.1:	Town of Orange Water Department
Implementation I1.5.1:	2006

Action I1.6: Complete a Town Water Supply Availability Study.

Analysis: see Theme 6: Environmental Assets

Goal I2: Provide adequate additional water source and storage for future growth and emergency needs.

Action I2.1: Complete water storage and location study (Preliminary Engineering Report).

Analysis:

Water storage should be adequate to meet emergency needs and maintain reliable system pressures. The intent of this study is to determine the feasibility of upgrade of the Marshall Heights underground tank vs. the construction of new storage, perhaps on Red Hill Road. The study is needed due to deterioration of the Marshall Heights tank.

Indicator I2.1.1: Water storage options evaluated
Benchmark I2.1.1: Preferred site identified

Progress I2.1.1: 

Responsible Party I2.1.1: Town Engineer
Town Superintendent of Public Works
Implementation I2.1.1: 2007-2008

Action I2.2: Design and construct new water storage tank (Capital Item 2006 CIP).

Indicator I2.2.1: Water storage tank design and construction
Benchmark I2.2.1: Tank constructed

Progress I2.2.1: 

Responsible Party I2.2.1: Town Engineer
Town Superintendent of Public Works
Implementation I2.2.1: 2009-2011

Action I2.3: Construct Water Tank Storage Telemetry (Capital Item 2006 CIP).

Indicator I2.3.1: Telemetry
Benchmark I2.3.1: Telemetry installed on new and old tanks

Progress I2.3.1: 

Responsible Party I2.3.1: Town Engineer
Town Superintendent of Public Works
Implementation I2.3.1: 2009-2011

Goal I3: Upgrade failing and obsolete water transmission lines.

Analysis:

The Town needs to better understand two water transmission concerns:

- The cause of reduced flows along Main Street
- Flow abnormalities between the standpipe and the new tank

Action I3.1: Replace obsolete water lines on Rt. 20 extending from the Presbyterian Church to west corporate limits (Capital Item 2006 CIP).

Indicator I3.1.1: % of total to be replaced per year
Benchmark I3.1.1: 10% per year

Progress I3.1.1: 

Responsible Party I3.1.1: Town of Orange Public Works
Implementation I3.1.1: 2011 and beyond

Action I3.2: Create new transmission loops to improve reliability.

Indicator I3.2.1: # feet of Byrd Street loop
Benchmark I3.2.1: 100% replacement

Progress I3.2.1: 

Responsible Party I3.2.1: Town Superintendent of Public Works and staff
Implementation I3.2.1: 2011 and beyond

Indicator I3.2.2: # feet of Rescue Squad loop
Benchmark I3.2.2: 100% replacement

Progress I3.2.2: 

Responsible Party I3.2.2: Town Superintendent of Public Works and staff

Implementation I3.2.2: 2011 and beyond

Indicator I3.2.3: # feet of Twyman loop
Benchmark I3.2.3: 100% replacement

Progress I3.2.3: 

Responsible Party I3.2.3: Town Superintendent of Public Works and staff
Implementation I3.2.3: 2011 and beyond

Indicator I3.2.4: # feet of Red Hill loop
Benchmark I3.2.4: 100% replacement

Progress I3.2.4: 

Responsible Party I3.2.4: Town Superintendent of Public Works and staff
Implementation I3.2.4: 2011 and beyond

Indicator I3.2.5: # feet of Round Hill loop
Benchmark I3.2.5: 100% replacement

Progress I3.2.5: 

Responsible Party I3.2.5: Town Superintendent of Public Works and staff
Implementation I3.2.5: 2011 and beyond

Indicator I3.2.6: # feet of Phase II (Prospect to Rt. 20)
Benchmark I3.2.6: 100% replacement

Progress I3.2.6: 

Responsible Party I3.2.6: Town Superintendent of Public Works and staff
Implementation I3.2.6: 2011 and beyond

Action I3.3: Conduct water conveyance system long-term capital needs study.

Indicator I3.3.1: Water conveyance study
Benchmark I3.3.1: Study complete

Progress I3.3.1: 

Responsible Party I3.3.1: Town Superintendent of Public Works and staff
Implementation I3.3.1: 2008-2010

Goal I4: The Town of Orange will reserve adequate water capacity for in-town needs at build-out before considering extension of Town services to areas in the County.

Analysis:

A Master Plan is needed to determine the direction and timing of expanded water and wastewater services to customers outside the Town limits. The Plan should contain a build-out analysis of current Town zoning and Future Land Use linked to water and sewer demand. The Plan should be coordinated with land use plans for both jurisdictions to ensure that trunk line capacities meet future demands. Should sufficient water and sewer capacity exist, service delivery areas outside of Town should be delineated and costs of construction determined. Utility service extensions should be coordinated with other infrastructure and public facility improvements to ensure that new development does not overburden existing resources and facilities. This Comprehensive Plan would need to be updated to reflect the completion of the Utility Plan.

In the spring of 2006, the Cox Company, working for Carl Owens (owner of Round Hill Farm) completed a Preliminary Master Plan base map for the Joint Planning Area (JPA) (see Theme 7: Town and County Partnerships) west of Town. This map provides planimetric mapping of the JPA. This map will be a valuable tool to assist the Town in a consideration of how the proposed Round Hill Farm project will connect with the JPA.

To complete this study, the Town has applied for a 4-year grant from the Virginia Department of Conservation and Recreation (DCR) to create a "Conservation-based Master Plan" of the JPA, to design and construct local and regional stormwater facilities, and to create a pro-rata share program to fund their maintenance.

Action I4.1: Create a Town-County Master Planning Workgroup for the Joint Planning Area.

Indicator I4.1.1: Master Planning Workgroup
Benchmark I4.1.1: Town Council and Board of Supervisor endorsement of group

Progress I4.1.1: 

Responsible Party I4.1.1: Town Council
Board of Supervisors
Town and County Staffs

Implementation I4.1.1: 2007-2008

Action I4.2: Create a Conservation-based Master Plan of the Joint Planning Area.

Indicator I4.2.1: JPA Master Plan

Benchmark I4.2.1: Completion of Plan

Progress I4.2.1: 

Responsible Party I4.2.1: Town Manager
Town Planner
Town Consultant
Orange County Planner
Director of Public Works

Implementation I4.2.1: 2007-2008

Future Water Infrastructure Map

Future Water Infrastructure Map

Goal I5: Construct impoundment serving the Towns of Orange and Gordonsville.

Action I5.1: Reconvene meetings of the Water Committee to create technical and political vision to construct reservoir .

Analysis:

The Water Committee began meeting again in the fall of 2004.

Indicator I5.1.1:	Water Committee Meetings
Benchmark I5.1.1:	Quarterly Meetings (4 per year)
Progress I5.1.1:	
Responsible Party I5.1.1:	Water Committee Members Town/County Planners Towns/County Administrators Towns/County Planning Commissioners Rapidan Service Authority Staff
Implementation I5.1.1:	2006

Action I5.2: Review history of RSA agreement.

Analysis:

The RSA contract, discussed above, is much discussed among Town residents. There is a concern that the Town loses money to RSA as a result of the terms of the contract. Proposed herein is a reexamination of the RSA agreement to ensure that the terms of the agreement allow the continued necessary operation and maintenance of the plant for the benefit of all parties that depend on it.

Indicator I5.2.1:	RSA-Town-County Findings White Paper
Benchmark I5.2.1:	Completion of Paper
Progress I5.2.1:	
Responsible Party I5.2.1:	Town Staff Rapidan Service Authority Staff County Planning Staff
Implementation I5.2.1:	2006

Action I5.3: Conduct feasibility study to identify water supply watershed alternatives including recommendations and preliminary costs.

Indicator I5.3.1: Recommendation of preferred impoundment site
Benchmark I5.3.1: Approval of site by Towns and County and RSA

Progress I5.3.1: 

Responsible Party I5.3.1: Town/County Planners
Towns/County Administrators
Consultant
Town Councils
Board of Supervisors

Implementation I5.3.1: 2006

Action I5.4: Towns of Orange and Gordonsville, Orange County, relevant landowners, and the Rapidan Service Authority, create agreement to construct impoundment.

Analysis:

The proposed agreement will fold the technical findings of the feasibility study mentioned above with new institutional policies developed to meet the emerging water supply needs of the Towns and County. These policies will define the parties and their responsibilities for water supply in the new millennium.

Indicator I5.4.1: Water for the New Milennium Agreement
Benchmark I5.4.1: Signature of Agreement

Progress I5.4.1: 

Responsible Party I5.4.1: Town/County Planners
Towns/County Administrators
Rapidan Service Authority Staff
Consultant
Orange Town Council
Gordonsville Town Council
Orange County Board of Supervisors
Rapidan Service Authority Board of Directors
Relevant Landowners

Implementation I5.4.1: 2006

Action I5.5: Permit and Construct Impoundment.

Indicator I5.5.1:	Impoundment
Benchmark I5.5.1:	Reservoir Constructed
Progress I5.5.1:	
Responsible Parties I5.5.1:	Towns/County Planners Towns/County Administrators Rapidan Service Authority Staff Orange Town Council Gordonsville Town Council Orange County Board of Supervisors
Implementation I5.5.1:	2011 and beyond

Wastewater System

Goal I6: Upgrade the Town's wastewater treatment system to meet long-term community demands and state and federal effluent standards.

Analysis:

Wastewater Treatment Plant History: 1990-2004

The Town of Orange Wastewater treatment plant is located near Route 633 northwest of the Town limits near the confluence of Poplar and Laurel Runs. The collection system included twenty miles of gravity and forced mains and five pump stations. Improvements to the wastewater treatment plant during 1990 increased rated secondary level treatment capacity, using trickling filter technology, to 1.5 million gallons per day (MGD).

At that time, the average treatment flow was 0.6 MGD from 1,417 connections, 200 of which were outside the corporate limits. Considering state environmental standards at that time as shown below, it was estimated that the plant was capable of serving a community of approximately 7,500 residents, which was thought to provide 15-20 years of growth.

Total Nitrogen: No standard
Phosphorous: No standard
Copper: No standard
Biological Oxygen Demand: 25 mg/L
Total Suspended Solids: 25 mg/L

Unfortunately, because the headworks capacity was not sized to accommodate flows greater than .75 mgd, the actual capacity of the plant is half of this estimate.

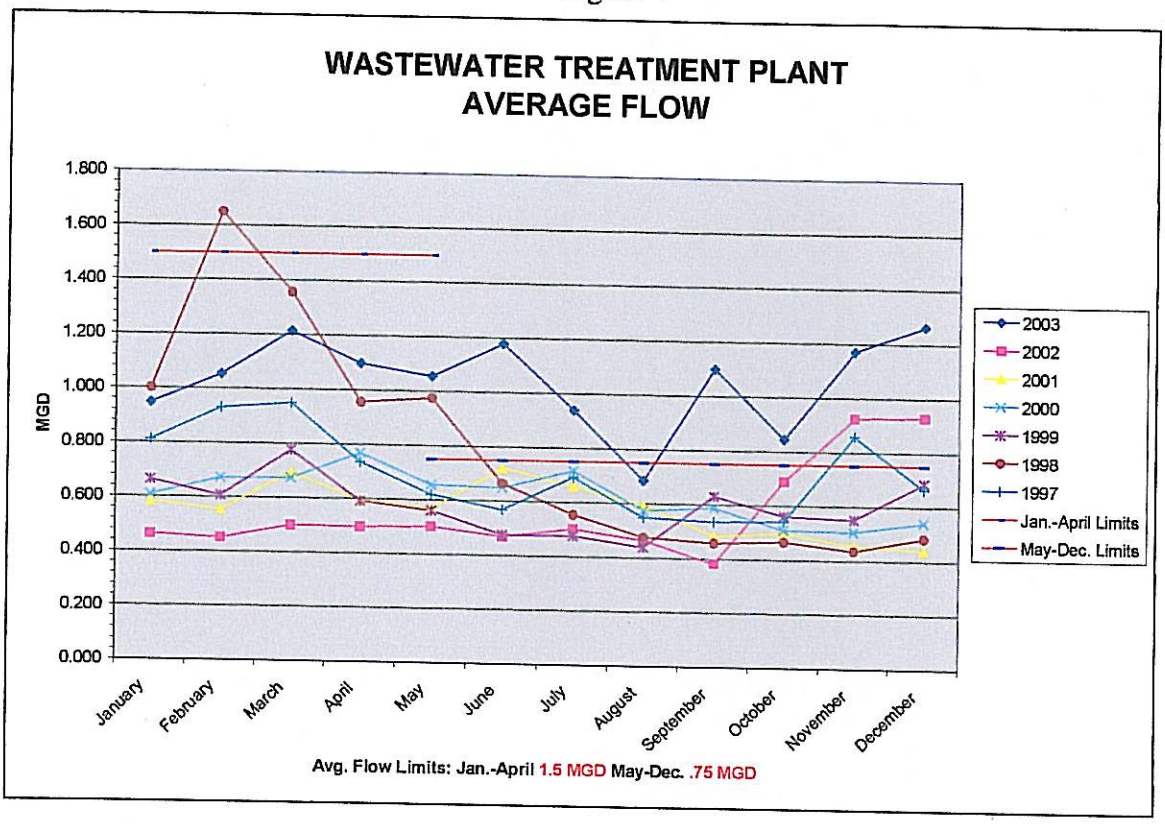
Since the 1991 permit was issued, the state has implemented increasingly more stringent water quality regulations. In 2001, Copper and heptachlor limits were proposed to be implemented by 2005. In 2006, phosphorous and nitrogen limits will likely be proposed to be implemented by 2010.

In 2003, the Town violated the "95% Capacity Reopener" portion of its permit and was notified by the Virginia Department of Environmental Quality-Northern Valley Regional Office (NRVO):

> *A written notice and a plan of action for ensuring continued compliance with the terms of this permit shall be submitted to the DEQ-NRVO when the monthly average flow influent to the sewage treatment plant reaches 95% of the design capacity authorized in this permit for each month of any three consecutive month period. The written notice shall be submitted within 30 days and the plan of*

action shall be received at the DEQ-NVRO no later than 90 days from the third consecutive month for which the flow reached 95% of the design capacity.

Figure 4



This special condition on the permit was based on data submitted by the Town showing that the plant was operating above hydraulic capacity (.75 mgd from May-December, and 1.5 mgd from January-April) limit for three consecutive months in 2003. This occurred as a result of increasing WWTP demand and rainwater infiltration and inflow (I&I). While the particularly wet year of 2003 has a significant impact on the problem, it should be noted that the hydraulic limits for the plant were also exceeded in 2002, 1998, and 1997.

As a result of these conditions, the Virginia Department of Environmental Quality (DEQ) required the Town to immediately implement steps to bring the hydraulic flows back into alignment with the permit. In 2004, the Town engaged Wiley and Wilson Engineers to develop plans for expansion of the plant to accommodate anticipated growth within the Town.

Impact of Proposed Chesapeake Bay Standards on Plant

In response to EPA requirements under the Chesapeake Bay Act, the Commonwealth of Virginia Department of Environmental Quality (DEQ) proposed regulations which will have profound implications for the Town of Orange. There are three separate proposals: 9 VAC 25-260 "Virginia Water Quality Standards"[1] sets out standards for evaluation of waters of the Chesapeake Bay. 9VAC 25-40 "Regulation for Nutrient Enriched Waters and Dischargers Within the Chesapeake Bay Watershed" which "provides for the control of dischargers of nutrients from point sources affecting state waters that…are located within the Chesapeake Bay Watershed,…." This regulation specifies that the annual total nitrogen and total phosphorus waste load allocation shall not exceed the requirements of the third proposed regulation: 9 VAC 25-720 "Water Quality Management Planning Regulation", which establishes for each sewer plant, or "point source discharger" an annual total Waste Load Allocation (WLA) in terms of total pounds of each of these nutrients. This third regulation is the primary focus of this paper.

Copies of these regulations may be downloaded at: 9 VAC 25-40 40 "Regulation for Nutrient Enriched Waters and Dischargers Within the Chesapeake Bay Watershed" (http://www.deq.state.va.us/bay/9vac2540.pdf) and 9 VAC 25-720 "Water Quality Management Planning Regulation" (http://www.deq.state.va.us/bay/9vac25720.pdf), and http://www.deq.virginia.gov/wqs/pdf/baylang04.pdf

The methodology used by DEQ in determining the waste load allocation for each sewer treatment plant in the Bay watershed is as follows: For nitrogen, the VPDES **permit design flow** of each plant times a concentration of 4.0 mg/l determines an annual limit in terms of pounds of nitrogen per year. For phosphorus, the VPDES **permit design flow** times a concentration of 0.3 mg/l likewise determines the annual limit for pounds of phosphorus per year. For the Town of Orange these calculations result in total annual discharge limits of 18,000 pounds of nitrogen, and 1,400 pounds of phosphorus, based on a design flow of 1.5 million gallons per day (MGD). The concentrations used in these determinations will be very expensive to achieve, and in fact, they are only slightly higher than the lowest levels achievable with current best available technology (3.0 mg/l nitrogen, 0.1 mg/l phosphorus). In addition, these regulations, effectively putting a volume cap on allowable wastewater discharges, will be taking effect just as the Town is designing a plant expansion to treat significantly more than the current 1.5 MGD.

The Town of Orange faces the future in a difficult position. Hydraulic flows to the plant have reached greater than 2 mgd. On a monthly basis, the plant is currently near, at, or above flow capacity, and the Town has begun a period of growth in population not seen for a half-century.

In 2005, the Virginia Department of Environmental Quality granted the Town of Orange a "Waste Load Allocation" (WLA) of 3 MGD. This allocation doubles original design

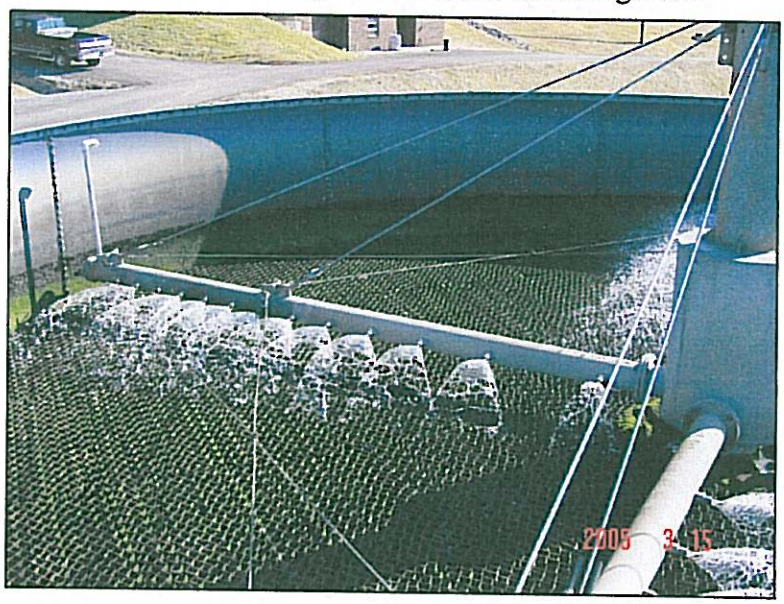
capacity of the plant and should provide adequate capacity for 50 years of growth in and around the Town of Orange, according to Wiley and Wilson engineers.

This is based on the following:

- 2006 plant accommodates 1500 connections.
- With minor modifications, 2100 connections are possible @ .9 MGD*
- A new plant constructed to treat approximately 3 MGD will accommodate approximately 8500 connections*
- The projected number of connections at 2% growth rate in 2054 is 4545.
- The projected number of connections at a 3% growth rate in 2054 is 7591.
- Build out of the Town and Joint Planning Area is estimated to be 2300 additional units.

* It is important to note that consideration of stormwater infiltration significantly reduces this capacity and that the "95% capacity reopener" portion of the permit would likely be exceeded prior to 2056 with plant capacity less than 3 MGD.

Town of Orange Sewer Plant Trickling Filter



Wastewater Treatment Plant Upgrade: 2005-2006 Interim Improvements

Based on violation of the Capacity Reopener, the Town of Orange must develop a plan to bring the plant back into compliance. The plan will need to address the hydraulic problems that triggered the Reopener and the new Copper standards for 2006.

The Town hired Wiley and Wilson Engineers in 2004 to design preliminary and final engineering reports for plant improvements, and related preparation of materials required for the 2006 permit (Phase I Study, see Action I6.1 below). It is expected these

improvements will be constructed in late 2006, leading to approval of the Town's VPDES permit sometime in the 2007-2008 timeframe. Current discussions for these interim improvements include the installation of blowers and diffusers to reduce copper concentrations, and reduction in I&I to add hydraulic capacity.

Wastewater Treatment Plant Upgrade: 2008-2010 Improvements

For the following reasons, a new Wastewater Treatment Plant will need to be constructed:

- In a completely closed system, water out would equal wastewater in. If the Town were able to eliminate 100% of the I&I problem, according to historic water plant production figures, .6 mgd for the current population (approximately 4200) customers is needed, leaving .15 mgd available hydraulic capacity. This would allow growth of approximately 1000 persons. Unfortunately, 100% reduction in I&I is impossible, thus, hydraulic available capacity of the head works is well under 1000 persons.

Bar Screen Empty into Garbage Can for Manual Dump into Refuse Container

Bar Screen Contents

- The trickling filter technology is incapable of reducing nitrogen, phosphorous, and copper concentrations to 2010 limits required by the state.

In the summer of 2005, the Town began discussions with DEQ on a "Consent Order" to build a new sewer plant. The Order is essentially a contract between the Town and the Commonwealth to build a plant by a certain date. In exchange for the promise to build, the state would allow the Town to continue to construct homes, even if flows should exceed the permit, as long as effluent concentrations are met.

The Order also contains provisions for Preliminary and Final Financial Analyses to determine if the Town can borrow enough funds to pay for the plant. This analysis is expected to be completed by Spring, 2006, once the Town has learned about grant awards from DEQ.

Action I6.1: Conduct Phase I study of the Town's Wastewater Treatment Plant (WWTP) and sanitary sewer system.

Analysis:

As mentioned above, the Town contracted with Wiley and Wilson engineers in 2004 to conduct a Phase I study. The study was completed in May of 2005. The Preliminary Engineering Report (PER) considered the following aspects of the system:

- Infiltration and Inflow: As noted above, there is a recognized problem with I&I in the Town sanitary sewer system. Peak flows into the plant are highly correlated to rainfall events and to spells of generally above

average wet weather. Based primarily on analysis of flows at the WWTP, it appears that there is significant infiltration as well as inflow. The study will address sources of the problem and prioritize implementation measures.

- Laboratory/Office Space: Currently the operator staff at the WWTP utilize a single room for administrative functions, lunch room, and plant laboratory. The unsanitary conditions inherent in a wastewater treatment plant laboratory make it unsuitable for use as a lunch room. In addition, all administrative functions must be carried out in the shared space. Any confidential conversations between staff and supervisors must take place outdoors or in operational areas of the plant which are not suitable for the purpose. An area away from the laboratory for administrative functions and for a lunch room needs to be provided. Enhanced control of temperatures and humidity in the laboratory shall also be considered in this portion of the study.

- Standby generator: The existing generator on the plant site is not capable of powering the entire treatment plant. When the generator is started, it energizes relays which kick out breakers on much of the operating equipment on the plant site. Notable areas which are without standby power are the recirculation pumps for sludge generated in the secondary clarifiers, and heaters in the digester. Extended power outages threaten to compromise treatment adequacy.

- Digester: The single cell digester must be periodically taken out of service for cleaning. This results in excessive downtime, and there is considerable expense involved in dealing with solids while the digester is off line. A second digester would avoid this expense, and may also allow for better digestion of solids before they are discharged to the dewatering operation.

- Solids handling: Dewatering of solids is accomplished through a "Somat" mechanical dewatering unit, as well as on drying beds. The Somat does not reliably produce high-solids-content sludge, and it requires substantial operator attention in order to achieve acceptable results. The drying beds are in need of rehabilitation, and may be undersized for the volume of solids being generated. Alternative mechanical dewatering technologies may be more appropriate to the waste stream being treated, and it may be that an expansion of the drying beds is warranted.

- Water Plant sludge: Periodically the Town's Water Treatment Plant discharges to the WWTP sludge generated by filter backwash and sediment basin washdown. This sludge is low in organics, and apparently has led to premature overcharging of the digester at the WWTP. An acceptable alternative to disposing of water plant sludge at the WWTP needs to be determined.

- Future Plant Expansion: It is expected that there will soon be a large increase in sanitary sewer flows generated by Town customers. There are several relatively large developments which are currently in the planning and development stage.

The findings of the study were the following:

- For the Town to continue to develop prior to construction of a new plant, modifications to the trickling filters are required. This will provide approximately an additional 600 connections.
- Future development considered in the study included the following:
  - Parkview Apartments
  - Poplar Forest
  - Orange Estates
  - Porterfield II
  - Round Hill
  - Miscellaneous additional residential areas
  - Nursing Home expansion
  - Round Hill Commercial
  - Miscellaneous additional commercial areas
  - Andrusia development
  - Joint Planning Area
  - Airport Area
  - Rt. 15 industrial development
- Future required capacity for sanitary flows are:
  - 25 year (5700 connections) 1.98 MGD
  - 50 year (8500 connections) 2.82 MGD
- Three sites were evaluated:
  - Existing plant site will not accommodate 50 year projection and is difficult to construct
  - Construction of new facility on new site presents land acquisition issues and is the most expensive option
  - Upgrade portion of existing plant and construct new facilities on expanded site with 2-3 MGD range of capacity
- Approximately 1 MGD I&I during wet weather periods
- I&I is system-wide

Indicator I6.1.1:	WWTP Study Phase I
Benchmark I6.1.1:	Completion of Phase I
Progress I6.1.1:	
Responsible Party I6.1.1:	Town Manager

Town Engineer
Chief Wastewater Treatment Plant Operator
Town Planner
Consulting Engineer

Implementation I6.1.1: 2005

Action I6.2: Design 2-3 MGD wastewater treatment plant.

Analysis:

This Comprehensive Plan calls for the Town to be a growth area for Orange County. The Town cannot fulfill this mission without construction of a new wastewater plant.

The project consists of final engineering design for a new Sewage Treatment Plant that can meet the following objectives:

- Hydraulic capacity to meet long-term needs of the Town and, depending on future policy discussions, portions of the County.
- Nutrient removal requirements for the 2011 VPDES Permit.

Indicator I6.2.1: WWTP Design Study
Benchmark I6.2.1: Completion of Design

Progress I6.2.1: 

Responsible Party I6.2.1: Town Manager
Town Engineer
Chief Wastewater Treatment Plant Operator
Town Planner
Consulting Engineer

Implementation I6.2.1: 2007-2008

Action I6.3: Construct 2-3 MGD wastewater treatment plant (Capital Item 2006 CIP).

Indicator I6.3.1: new wastewater treatment plant
Benchmark I6.3.1: WWTP constructed

Progress I6.3.1: 

Responsible Party I6.3.1: Town Manager

Town Engineer
Consultant
Wastewater Treatment Plant Manager
Construction Contractor

Implementation I6.3.1: 2009-2011

Action I6.4: Conduct infrastructure rate study for water and sewer.

Indicator I6.4.1: Fee study for water
Benchmark I6.4.1: Completion of study

Progress I6.4.1:

Responsible Party I6.4.1: Consultant
Implementation I6.4.1: 2005

Indicator I6.4.2: Fee study for sewer
Benchmark I6.4.2: Completion of study

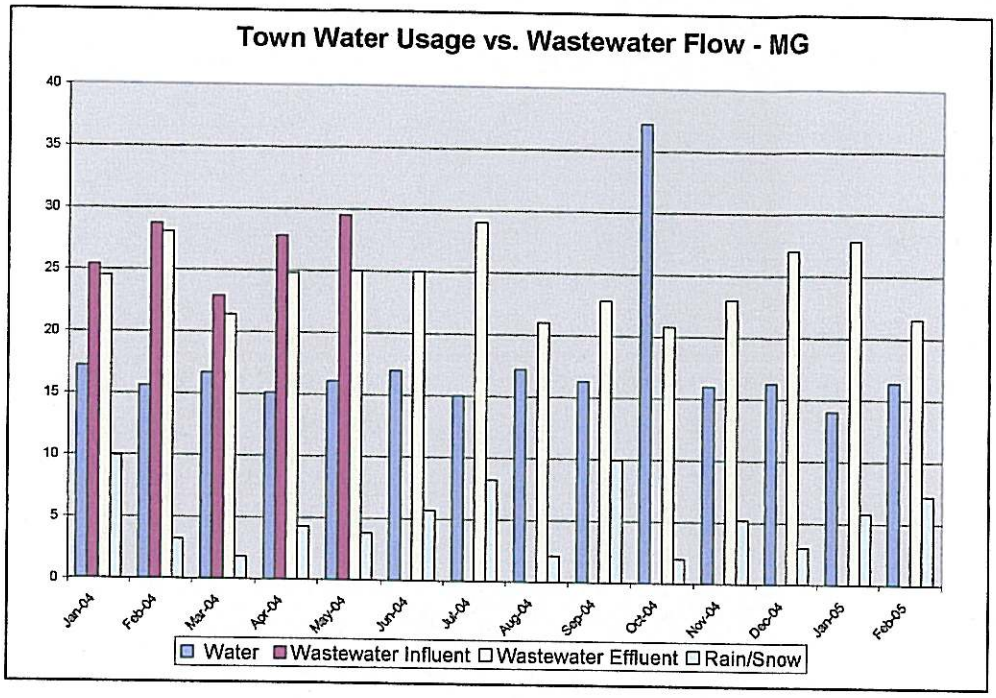
Progress I6.4.2:

Responsible Party I6.4.2: Consultant
Implementation I6.4.2: 2005

Action I6.5: Begin Infiltration and Inflow Correction Program (Capital Item 2006 CIP).

Analysis:

An Infiltration and Inflow analysis is a portion of the Phase I study conducted by Wiley and Wilson. The program is required per DEQ consent order.



Indicator I6.5.1: Wastewater Influent
Benchmark I6.5.1: 30% reduction

Progress I6.5.1:

Responsible Party I6.5.1: Town Engineer
Director of Public Works
Superintendent of Public Works
Implementation I6.5.1: 2012 and beyond

Action I6.6: Improve laboratory/office space.

Indicator I6.6.1: Lab/office space expansion
Benchmark I6.6.1: 800 sq. ft. addition constructed

Progress I6.6.1:

Responsible Party I6.6.1: Wastewater Treatment Plant Manager
Implementation I6.6.1: 2009-2011

Action I6.7: Upgrade wastewater treatment plant emergency power system.

Indicator I6.7.1:	Emergency power system
Benchmark I6.7.1:	Installation of system sized for New Treatment Plant
Progress I6.7.1:	
Responsible Party I6.7.1:	Wastewater Treatment Plant Manager
Implementation I6.7.1:	2007-2008

Action I6.8: Complete system-wide sewer conveyance system analysis to identify long-term capital improvements.

Indicator I6.8.1:	Sewer system analysis
Benchmark I6.8.1:	Completion of study
Progress I6.8.1:	
Responsible Party I6.8.1:	Wastewater Treatment Plant Manager
Implementation I6.8.1:	2012 and beyond

Action I6.9: Construct WWTP trickling filter blowers and outfall pipe diffuser (Capital Item 2006 CIP).

Indicator I6.9.1:	New blower and diffuser
Benchmark I6.9.1:	Installation of blowers and diffuser
Progress I6.9.1:	
Responsible Party I6.9.1:	Wastewater Treatment Plant Manager
Implementation I6.9.1:	207-2008

Goal I7: Upgrade existing wastewater conveyance system.

Action I7.1: Replace Town interceptor (Capital Item 2006 CIP)

Indicator I7.1.1: feet of line replaced
Benchmark I7.1.1: 10,000 feet

Progress I7.1.1: 

Responsible Party I7.1.1: Department of Public Works
Implementation I7.1.1: 2007-2008

Town Interceptor Overflow during rain storm

Action I7.2: Replace Byrd Street Force Main (Capital Item 2006 CIP)

Indicator I7.2.1: feet of line replaced
Benchmark I7.2.1: 3600 feet

Progress I7.2.1: 

Responsible Party I7.2.1: Department of Public Works
Implementation I7.2.1: 2007-2008

Goal I8: Expand wastewater conveyance system.

Action I8.1: Construct Houseworth sewer line (Capital Item 2006 CIP).

Indicator I8.1.1: feet of line
Benchmark I8.1.1: 900 ft. for gravity
800 ft. for force main
Pump station

Progress I8.1.1: 

Responsible Party I8.1.1: Town of Orange Department of Public Works
Implementation I8.1.1: 2008-2010

Action I8.2: Construct Route 15 south gravity sewer.

Analysis:

Current plans are for the private sector to construct the line.

Indicator I8.2.1: feet of sewer line
Benchmark I8.2.1: 50% per year

Progress I8.2.1: 

Responsible Party I8.2.1: Private Sector
Implementation I8.2.1: 2007-2008

Action I8.3: Construct pump and gravity system to Orange County Airport.

Indicator I8.3.1: sewer line and pump station
Benchmark I8.3.1 100% complete

Progress I8.3.1: 

Responsible Party I8.3.1: Town of Orange Department of Public Works
Implementation I8.3.1: 2007-2008

Action I8.4: Expand gravity system to Andrusia Farm Development.

Analysis:

This expansion could only occur if the Town's Sewer Financial Analysis should find that the Town can afford to build a 2-3 MGD plant.

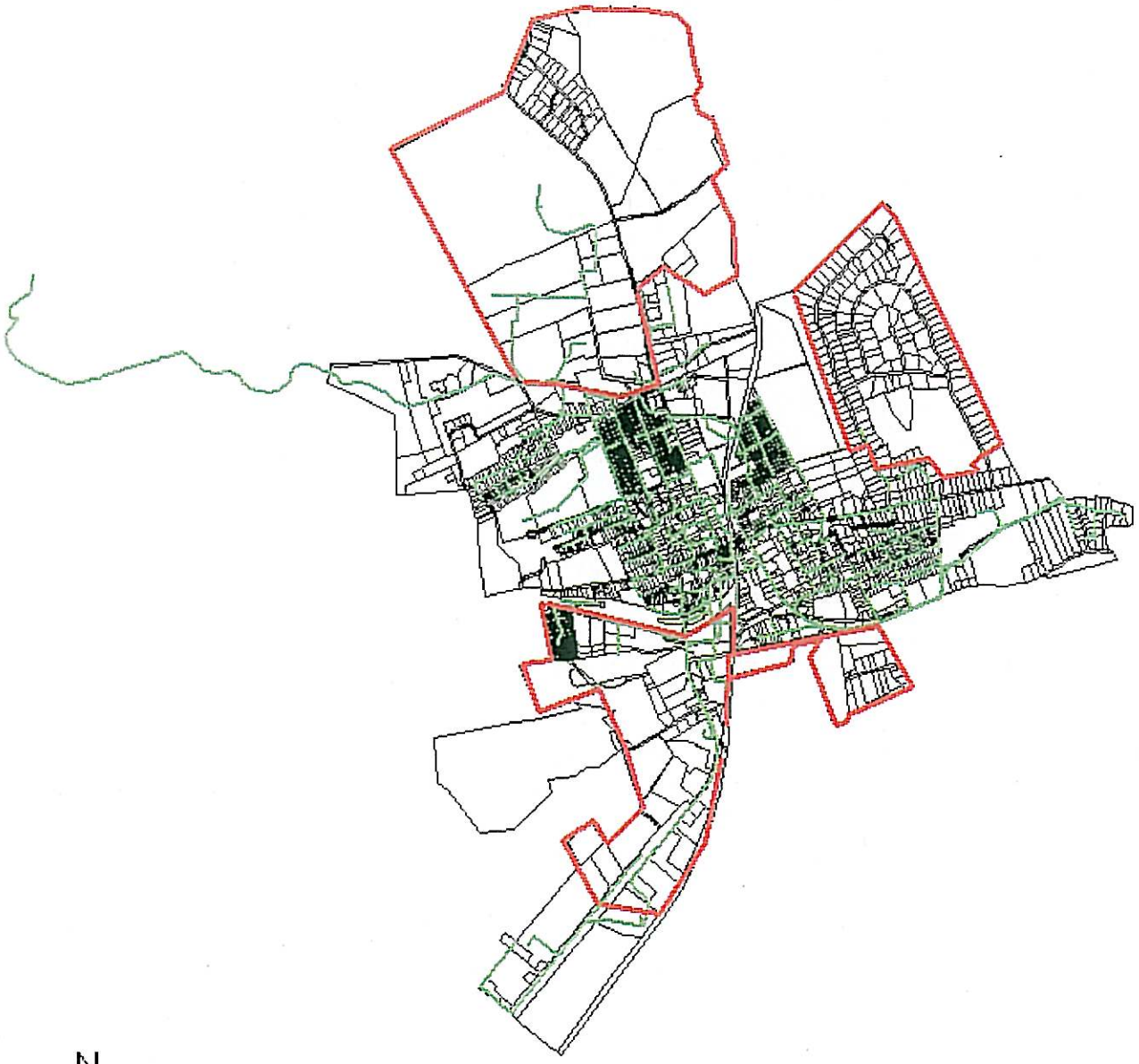
Indicator I8.4.1:	sewer line extension
Benchmark I8.4.1	100% complete
Progress I8.4.1:	
Responsible Party I8.4.1:	Town of Orange Department of Public Works
Implementation I8.4.1:	2009-2011

Action I8.5: Expand gravity system to the Northwest, West, and Southwest of Town per Joint Planning Area Master Plans (see Theme 7: Town and County Partnerships).

Indicator I8.5.1:	sewer line extensions
Benchmark I8.5.1	per master plan and capacity availability
Progress I8.5.1:	
Responsible Party I8.5.1:	Town of Orange Department of Public Works
Implementation I8.5 .1:	2012 and beyond

Future Waste Water Infrastructure Map

Future Sewer Infrastructure Map



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Future Sewer Lines-Extension Area

Existing Sewer Lines

Solid Waste

Goal I9: Explore policy and technology alternatives to public landfill.

Analysis:

The Orange County landfill collects and disposes of 50 to 60 tons of trash per day. The 30-acre landfill is approximately 30 years old. Recently, the County has begun exploration of new policy and technology options based on changing regulatory and business climate for landfills. Four policy options should be considered:

- **Regional approach**: Regional efforts will yield better results than localized solutions, especially with high costs and capital needs for operations. Joint contracting, collection, disposal and recycling operations can provide budget and resource savings. Regional incineration is one option that has been discussed. According to staff at the Rappahannock-Rapidan Planning District Commission, however, for many reasons, localities in region are currently seeking local solutions to their solid waste needs.

- **Increased recovery:** Recovery of a larger percent of valuable material, such as recyclables and organic matter, leads to a better balance sheet and longer disposal facility lifetimes.

- **Reduce total waste**: Source reduction, reuse and recycling decrease the need for disposal, which is generally not considered a desirable option. In order to limit the negative impacts our communities have on others, the total volume of waste disposed of must be kept to a minimum.

- **Material Recovery Facility (MRF):** Establishment of a MRF to separate recyclables and other valuable material from commingled collection would increase recovery rates.

See the Thomas Jefferson Planning District Commission's 2004 Solid Waste Management Plan for further explanation and analysis of solid waste management options (http://www.tjpdc.org/pdf/rep_envi_solidWaste04.pdf).

Action I9.1: Assist Orange County with exploration of new options to current operation of public landfill.

Indicator I9.1.1:	Offer to help County consider options
Benchmark I9.1.1:	Staff time spent on assistance
Progress I9.1.1:	

Responsible Party I9.1.1: Town Manager
Town Planner
Town Engineer

Implementation I9.1.1: 2007-2008

Action I9.2: Provide stronger enforcement of litter laws.

Storm Water

Goal I10: Foster Low Impact Development (LID) practices in all new development.

Action I10.1: Provide grant resources to private property owners for Low Impact Development assistance.

Analysis:

The Virginia Department of Conservation and Recreation (DCR) funds grants to local governments, soil and water conservation districts, planning districts, state agencies and private, nonprofit conservation and watershed organizations in Virginia's Chesapeake Bay watershed. For 2004, DCR has established the *Low Impact Development and Innovative Urban BMP Projects* grant program to establish tangible and innovative projects to improve water quality through better local land-use, and prevention of nonpoint source pollution (NPS) in support of Virginia's commitments in the *Chesapeake 2000 Bay Agreement (Chesapeake 2000).*

Eligible projects must support low impact development (LID) site designs or demonstrate innovative urban best management practices (BMP) for long term or permanent NPS pollution reductions. DCR is interested in funding demonstration projects that retrofit, restore, or implement innovative stormwater practices. DCR will only fund activities not required by federal, state, or local laws or regulations. Projects are expected to go beyond the minimum requirements by law and to serve as demonstrations for new NPS pollution reducing technologies and approaches.

The Commonwealth recently revised and continues to refine and implement tributary strategy plans to serve as basin-specific nutrient reduction plans. These new plans identify significant NPS pollution reductions to be achieved by 2010. All projects funded through this RFP must support tributary strategies by demonstrating non-traditional development methods for dealing with stormwater thereby advancing these practices. The projects should help bring about greater

acceptance and adoption of the stormwater BMPs needed to accomplish the tributary strategy goals.

The Town of Orange submitted a proposal for these funds in August, 2004. The project received full funding in December, 2004.

Indicator I10.1.1:	LID development projects
Benchmark I10.1.1:	LID incorporated into one project
Progress I10.1.1:	
Responsible Party I10.1.1:	Town Planning Staff Real Estate Developers Virginia Department of Conservation and Recreation (DCR)
Implementation I10.1.1:	2006

Action I10.2: Provide grant resources to the Town of Orange for funds to revise zoning codes and ordinances to conduct demonstration projects on how to revise zoning codes and ordinances to incorporate environmentally sensitive approaches to new development and to infill and redevelopment.

Indicator I10.2.1:	Groundwater-infiltration friendly policies and codes
Benchmark I10.2.1:	Adoption of revised Comprehensive Plan and related ordinances that are more groundwater recharge friendly
Progress I10.2.1:	
Responsible Party I10.2.1:	Town Planner DCR
Implementation I10.2.1:	2006

Action I10.3:	Create a multi-stakeholder Low Impact Design Committee.
Indicator I10.3.1:	LID committee
Benchmark I10.3.1:	LID demonstration day at site in Orange
Progress I10.3.1:	

Responsible Party I10.3.1: Town Planner
Implementation I10.3.1: 2006

Action I10.4: Revise zoning ordinance to facilitate low impact development practices.

Indicator I10.4.1: Revised LID-friendly zoning ordinance
Benchmark I10.4.1: Ordinance adopted by Town Council

Progress I10.4.1: 

Responsible Party I10.4.1: Town Planner
DCR
Implementation I10.4.1: 2007-2008

Goal I11: Mitigate effects of increasing impervious surface in the Baylor Creek Drainage Basin (Spicer's Mill and Madison Road areas of Town) in Town and in the Joint Planning Area.

Analysis:

As the town has developed, impervious surface cover has increased. Like nearly every other community in Virginia, the town has historically dealt with these flows through channelization of storm runoff. As the town continues to grow, however, reliance on this exclusive strategy will lead to greater potential for private property damage within and outside of the Town limits.

The following mitigation strategies have been under consideration by the Town:

- Baylor Creek Storm Water Planning and Engineering Study
- Spicer's Mill Road Box Culvert Reconstruction
- Baylor Creek Floodplain Restoration
- Baylor Creek Infiltration Basin

Based on site visits with the Corps of Engineers and Virginia Department of Environmental Quality, the first three of these options have the greatest feasibility.

Funds from the Round Hill Meadows Special Use Permit contribution and from the VDOT revenue sharing program are expected to be utilized for this project.

Action I11.1: Complete Phase I Engineering Study of Baylor Creek Stream and Floodplain restoration.

Analysis:

Development is rapidly occurring in the northwest sector of Town. Baylor Creek and its floodplain at the intersection of Spicer's Mill Road in Town has little or no additional stormwater capacity. Capacity of the stream and floodplain in this area can be enhanced through stream floodplain redesign and reconstruction.

Funds from the LID grant from the Virginia Department of Conservation and Recreation will be used to complete this study.

Indicator I11.1.1: Phase I engineering study
Benchmark I11.1.1: Completion of study

Progress I11.1.1: 

Responsible Party I11.1.1: Town Planning Staff
Engineering consultant
Implementation I11.1.1: 2006

Action I11.2: Augment stormwater capacity of Baylor Creek and floodplain immediately below Spicer's Mill Road.

Indicator I11.2.1: Reconstruction of limited area below Spicer's Mill Road (Capital Item 2006 CIP)
Benchmark I11.2.1: Complete construction

Progress I11.2.1: 

Responsible Party I11.2.1: Town Planning Staff
Engineering consultant
Contractor
Implementation I11.2.1: 2007-2008

Action I11.3: Complete Phase II Baylor Creek Storm Water Planning and Engineering Study.

Analysis:

The Town of Orange has submitted a grant proposal to the Virginia Department of Conservation and Recreation (DCR) to create a Comprehensive Watershed Management Program. If awarded, the grant will provide approximately $800,000.00 to the Town, matched by in-kind (non-cash) labor and resources from the private and public sectors.

This project will not only fund Baylor Creek stormwater planning but will also fund creation of a conservation-based Master Plan for the entire Joint Planning Area.

- Prioritize watersheds
- Design conservation practices
- Create storm water code and study dedicated storm water funding source
- Create conservation -based zoning and subdivision code
- Inventory BMPs and Illicit Discharges
- Provide education and outreach through Or*ange StreamWatch*
- Create new conservation institutional capacity
- Create conservation-based Master Plan of JPA
- Design and Construct Baylor Creek Storm Water Facilities

Indicator I11.31.1:	Stormwater Management Program
Benchmark I11.31.1:	Completion of Program
Progress I11.3.1:	
Responsible Party I11.3.1:	Town Planner Private Developers Engineering Consultant
Implementation I11.3.1:	2009-2011

Action I11.4: Reconstruct Spicer's Mill Culvert (Capital Item 2006 CIP).

Analysis:

The box culvert below Spicer's Mill road is unable to handle increasing storm flows from Town. The Town must work with VDOT and private developers to find funds to construct new culverts for Baylor Creek to pass through. Funds from the Round Hill Meadows Special Use Permit contribution are expected to be utilized to fund a portion of this project. Other funds contemplated include VDOT revenue-sharing dollars.

Baylor Creek Flooding at
Spicer's Mill

Indicator I11.4.1: New culvert
Benchmark I11.4.1: Completion of construction

Progress I11.4.1: 

Responsible Party I11.4.1: Town Planning Staff
Engineering Consultant
Private Developers
VDOT

Implementation I11.4.1: 2009-2011

Goal I12: Mitigate effects of increasing impervious surface throughout Town.

Analysis:

Projects for Town-wide stormwater planning and projects will be funded in part using funds from the DCR Comprehensive Stormwater Management Program grant.

Action I12.1: Complete Town-wide Stormwater Management Plan.

Indicator I12.1.1: Town-wide Stormwater Management Plan

Benchmark I12.1.1: Completion of Plan

Progress I12.1.1: 

Responsible Party I12.1.1: Town Planner
Town Engineer
Engineering Consultant
DCR

Implementation I12.1.1: 2009-2011

Action I12.2: Allocate storm water costs fairly to new developers.

Indicator I12.2.1: Storm water pro-rata share study

Benchmark I12.2.1: Completion of pro-rata share study

Progress I12.2.1: 

Responsible Party I12.2.1: Town Planner
Town Engineer

	Engineering Consultant DCR
Implementation I12.2.1:	2009-2011

Action I12.3: Build Town-wide Stormwater Facilities.

Indicator I12.3.1:	Town-wide facilities
Benchmark I12.3.1:	Completion of facilities
Progress I12.3.1:	
Responsible Party I12.3.1:	Town Planner Town Engineer Public Works Contractor DCR
Implementation I12.3.1:	2011 and beyond

Action I12.4: Construct solution to Fire Company Storm Water problem.

Analysis:

During certain storm events, the water table at the Fire Hall rises to the point where flooding occurs in the basement. This is a result of inadequate storm water conveyance along Rt. 20. According to Fire Company representatives, the problem has increased since construction of the new middle school and road extension.

Relevant issues include:

- Virginia Code requires detention for 2 and 10 year storm events only. This detention impacts peak flow rate, not total volume of water leaving the site. New construction at the school, or anywhere in Town, for more severe storms (less frequency than 2-10 years), can legally provide a greater total volume of storm water onto downstream property owners. For less severe, more frequent storms, a greater volume and peak rate of water can be passed along to downstream property owners than existed in a pre-development condition.
- Town staff and Fire Company representatives have discussed this problem in the past without reaching agreement. Parties were unable to reach agreement about funding responsibilities.

Additonal funds are needed to construct a solution to this problem. A pro-rata share program, or grants, or dollars through proffers or special use permit

contributions should be considered (see Theme 7: Town and County Partnerships and Theme 8: Public Safety, Community Health, and Government).

Indicator I12.4.1:	Fire Company Storm Water Design
Benchmark I12.4.1:	Plan approved by Town and Fire Company
Progress I12.4.1:	
Responsible Party I12.4.1:	Town Planner Town Engineer Director of Public Works Fire Company respresentatives
Implementation I12.4.1:	2007-2011
Indicator I12.4.2:	Fire Company Storm Water Improvement
Benchmark I12.4.2:	Improvement constructed
Progress I12.4.2:	
Responsible Party I12.4.2:	Town Planner Town Engineer Director of Public Works Fire Company representatives
Implementation I12.4.2:	2008-2010

Power

Goal I13: Construct underground utilities wherever possible.

Analysis:

Placement of utilities underground is expensive. As an alternative, removal of lines on tourist corridors and placement on less traveled roads is proposed.

Action I13.1:	Move overhead lines from Madison Road to May Fray Extended.
Indicator I13.1.1:	Removal of overhead lines
Benchmark I12.1.1:	Lines removed from Main to Nelson Street

Progress I13.1.1: 

Responsible Party I13.1.1: Town Planner
Town Engineer
Public Works Contractor

Implementation I13.1.1: 2007-2008

Action I13.2: Place utilities in ground when roads and sidewalks are significantly reconstructed.

Analysis:

Utilities should be placed underground when the Town undertakes large scale reconstruction of streets. In prior years, however, the Town attempted to place conduit under sidewalks when small sections were replaced. Several thousand feet on Madison Road has not been used as the depths and locations were not coordinated with service lines and other utilities.

Future attempts to undertake this type of project should be designed through the sector Master Plans proposed in this Comprehensive Plan.

Indicator I13.2.1: % of major street renovation lineal feet in which conduit is replaced and utilized.

Benchmark I13.2.1: 100%

Progress I13.2.1: 

Responsible Party I13.2.1: Town Planner
Town Engineer
Public Works Contractor

Implementation I13.2.1: 2011 and beyond

Action I13.3: Require underground utilities for new development.

Analysis:

Underground utilities for new construction are required by the Town per 2001 Zoning Ordinance.

Indicator I13.3.1: % of new construction with underground utilities.

Benchmark I13.3.1: 100%

Progress I13.3.1:	
Responsible Party I13.3.1:	Town Planner Town Engineer Public Works Contractor
Implementation I13.3.1:	2011 and beyond
Action I13.4:	Develop power policy as a companion to Town street light policy.
Indicator I13.4.1:	Power policy.
Benchmark I13.4.1:	Policy approved by Council.
Progress I13.4.1:	
Responsible Party I13.4.1:	Town Planner Town Engineer
Implementation I13.4.1:	2007-2008

Street Lighting

Goal I14: Construct architecturally compatible and night-sky friendly lighting along major roads in Town (see Theme 5: Architectural Assets and Aesthetics for related policies).

Analysis:

Street lights in Town are, in general, of two types:

- Poles and lamps selected and installed by the Town of Orange
- Poles and lamps installed by Virginia Power

It is less expensive, in the long-term, for the Town to select and install street lights, and for Virginia Power to install meter base. This is an alternative method to selection and installation of street lights by Virginia Power. The Town needs to select street pole and fixture designs, along with lamp type and wattage, for different areas of Town. Lighting needs on Madison Road, for instance, are different than those for a residential area.

Some of this work has already been completed. Architecturally-compatible lamps and poles (styled for the Town's industrial history) were constructed on Madison Road. The spacing, wattage, and height of these, however, are thought to be less than optimum.

Alternatives have been suggested, which include the use of a low gas light type lamp with occasional higher overhead lights, using a metal halide lamp. TEA-21 grants have been approved by VDOT for the construction of lights in parts of Town where there are currently no lights and renovation of architecturally insensitive lighting in other pars of Town.

Action I14.1:	Select street light poles, fixtures, and lighting specifications for all areas of Town.
Indicator I14.1.1:	Lighting specifications
Benchmark I14.1.1:	Specifications included in Public Facilities Manual
Progress I14.1.1:	
Responsible Party I14.1.1:	Town Planner Planning Commission Town Council
Implementation I14.1.1:	2006
Indicator I14.2.1:	TEA-21 funds for enhanced lighting

Analysis:

As compared to other capital projects listed in this Plan, funding of street lights can reasonably be considered to have a low priority. With other capital projects identified in this Plan, it will be difficult for the Town to afford the match required for grant funds. Phasing or reduced TEA-21 matching contributions, rather than elimination, should be considered to reduce the Town's contribution in any one year while protecting eligibility for future projects, such as the Railroad Avenue rehabilitation.

Benchmark I14.2.1:	Construction of new street lights
Progress I14.2.1:	
Responsible Party I14.2.1:	Town Manager Town Planner Town Engineer
Implementation I14.2.1:	20012 and beyond

Telecommunications

See Theme 1: Economy