Loudoun County Water and Wastewater Needs Assessment

January 11, 2011

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Executive Summary:

Clean and sufficient drinking water and adequate treatment and dispersal of sewage for our community needs are critical to protect the public's health, the environment, and the quality of life in Loudoun County. Every citizen depends on water and sewer facilities to operate properly and consistently on a day-to-day basis. Unfortunately, some areas of the County have concerns, to at least some extent, with one or both of these critical needs.

The Board of Supervisors recognized the need for a detailed, systematic approach to solve existing and potential future water and wastewater problems in the County and requested that a plan be developed to address these issues. This needs assessment identifies water and wastewater issues in the County and proposes potential approaches to the Board of Supervisors for pursuing further action. The assessment identified existing onsite water and wastewater systems in several areas of eastern Loudoun that have been bypassed by Loudoun Water's central system and a variety of issues with water and wastewater systems in other, primarily western, areas of the county. Included in this needs assessment is a summary of existing water and wastewater systems in the county and current State and County regulations.

An inventory of water and wastewater systems in the County includes public systems such as Loudoun Water and its central system, small systems serving towns and subdivisions, and private systems with individual wells and sewage disposal systems. Systems that tend to have concerns include older communities in eastern Loudoun by-passed by newer development and not connected to Loudoun Water's central system; and other older communities, often in the central and western areas of the county that, due to age and/or poor soil conditions, have water or wastewater systems that could experience problems.

Community surveys by the Loudoun County Health Department have identified 16 communities that either have concerns or are at risk of having concerns with their water and/or wastewater system. Another 20 communities have not yet been surveyed but could potentially have water and/or wastewater concerns. To date, two communities have had their water and wastewater problems successfully addressed. All of these communities are listed by Policy Area with a brief synopsis of the community and potential water or wastewater concern.

Through the County's Capital Needs Assessment and Capital Improvement Program, the Board of Supervisors will be provided with the information they need to plan budgets for funding these water and wastewater infrastructure projects. A number of potential funding options are available.

Nine specific recommendations are listed in the Needs Assessment in three categories; Policy, Planning, and Implementation.

Policy Recommendations:

1. Develop a long-term agreement between the County and Loudoun Water that clarifies the roles and responsibilities of each organization in a revised Charter.

2. Designate Loudoun Water as the provider and responsible management entity for water and wastewater infrastructure projects undertaken by the Board of Supervisors.

3. Develop policies to ensure communities that are served by onsite water and wastewater systems are converted to central water and wastewater systems as they become available.

4. Develop procedures to integrate the detection and elimination of wastewater illicit discharge to the storm water management system.

Planning Recommendations:

5. Use the Ten-Year Capital Needs Assessment and Six-Year Capital Improvement Program planning and budgeting processes as the tools to identify water and wastewater infrastructure project(s) in the County. The Ten-Year Capital Needs Assessment identifies the specific water and wastewater infrastructure needs to be addressed. The Six-Year Capital Improvement Program identifies the funding strategies the County will implement to address those needs. Identify the water and wastewater treatment needs by planning policy area (Suburban, Transition, Rural).

6. Fund improvements to the maximum extent possible from external revenue sources such as tax districts, tax incremental financing, grants, and proffers with specific funding recommendations identified within the Six-Year Capital Improvements Program.

Implementation Recommendations:

7. Develop an implementation manual that assists the Board of Supervisors with prioritizing proposed improvements.

8. Use inter-jurisdictional collaboration to maximize efficiency efforts and financial means of state and local agencies and private institutions.

9. Develop a public awareness and educational program through the Public Information Office and Loudoun Water's educational services to its customers.

The Appendices contain a variety of technical information which may be useful for a more detailed understanding of some of the issues.

Chapter 1: Purpose and Background

The purpose of this Needs Assessment is to provide an overview of existing water and wastewater systems in the County and to identify potential water and wastewater needs in the County. The Needs Assessment also provides implementation recommendations including the education of citizens and community leaders, funding options, and utilization of existing Board of Supervisor capital infrastructure planning tools.

Loudoun County has a long history of working with citizens, communities, state and federal agencies, and nonprofit organizations to solve water and wastewater problems in the County. A recent success involved providing indoor plumbing, adequate sewage disposal, and safe drinking water for the small community of Willisville, located in the southwestern portion of the County. Although ultimately successful, the project took 7 years to complete and required significant County funding, direct County management, as well as substantial support from Loudoun Water and the Windy Hill Foundation. In response to this project, the Board of Supervisors recognized the need for a detailed, systematic approach to solve water and wastewater problems in the County.

Water and wastewater facilities, along with their related service activities, are critical to achieving the County's social welfare and economic objectives. Every person in the County relies on these facilities to operate without fail, 24 hours a day, 365 days a year. This component of infrastructure may be the most important in terms of direct human impact.

On May 15, 2007, the Board of Supervisors requested County Administration to develop a task force to create a community onsite water and wastewater infrastructure plan. In June 2007, the County Administrator directed the formation of the task force with representatives from the departments of Building & Development, Family Services, General Services, Health, Planning, Management & Financial Services, and the Offices of Capital Construction and Solid Waste Management.

Chapter 2: Existing Water and Wastewater Conditions

Water & Wastewater System Descriptions and Inventory

Water Systems

Public water supply refers to water withdrawn by public and/or private water suppliers and delivered to users. Public water suppliers provide water to domestic, commercial, and industrial users and are commonly referred to as central systems, which typically serve a complete jurisdiction. Some towns and subdivisions are served by public water systems commonly referred to as community systems. Individual private systems (wells) typically serve one or two dwellings. As of 2009,

15,141 private drinking water wells were known to exist in Loudoun County. EPA regulations that protect public drinking water systems do not apply to privately owned wells. As a result, owners of private wells are responsible for operating, maintaining, and monitoring the well and ensuring that their water is safe from contaminants.

Central, Community, and Individual Wastewater Systems

Central wastewater systems serve regional areas, cities, and towns. Wastewater systems that serve small towns and subdivisions are commonly referred to as community systems. Individual systems typically serve one or two dwelling units. Individual systems have further been classified as conventional onsite sewage disposal systems, non-conventional onsite sewage disposal systems, and alternative discharging systems.

Conventional Onsite Sewage Disposal Systems

The conventional onsite sewage disposal system is one of the simplest and least expensive means of onsite sewage treatment and dispersal approved in Virginia. As of 2009, 13,245 conventional onsite sewage disposal systems were known to exist in Loudoun County. Typically the conventional system is a passive system, meaning the movement of material is driven by forces of gravity throughout the process. However, conventional systems may also utilize a pump to overcome elevation and lift the material from one location to another, where gravity forces will again take over. The conventional system, especially when a pump is not involved, can be the easiest system to forget about and neglect because the system may be entirely under the ground surface; out of sight, out of mind. According to the *United States Environmental Protection Agency (U.S. EPA) Onsite Wastewater Treatment Systems Manual* (2002), the typical life span of a conventional system is 20–30 years. Systems may last longer or shorter depending on maintenance, use, and abuse (See Figure 1, Onsite Sewage Systems Older Than 30 Years).

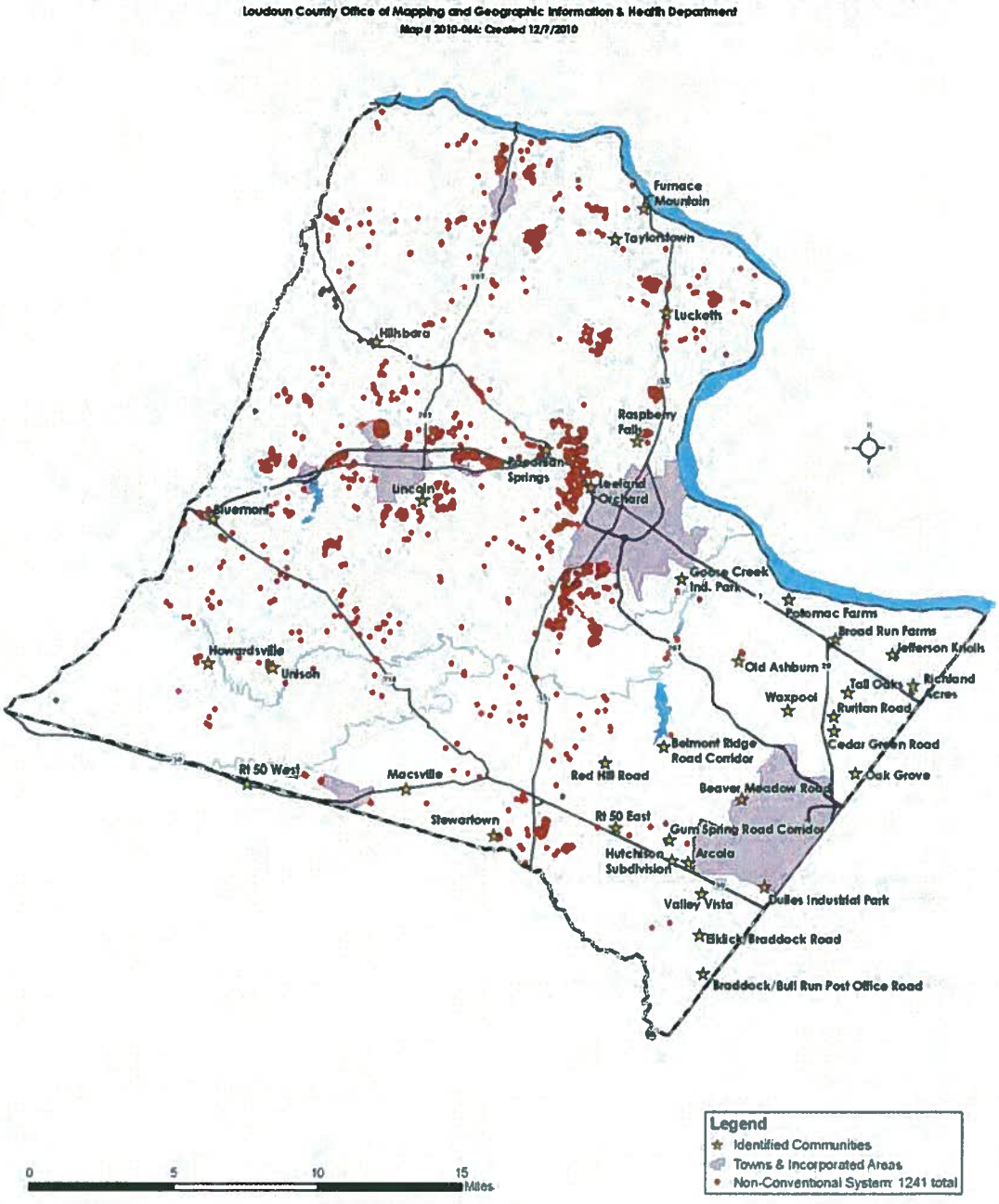
Figure 1: Onsite Sewage Systems Older Than 30 Years

Loudoun County Office of Mapping and Geographic Information & Health Department
Map # 2010-067: Created 12/7/2010

Non–Conventional Onsite Sewage Disposal Systems

A non-conventional onsite sewage disposal system is any onsite sewage system that is not a conventional system. As of 2009, there were 1,273 known non-conventional systems in operation in Loudoun County, many of which are in the western portion of the county (See Figure 2, Non-Conventional Onsite Sewage Disposal Systems).

Figure 2: Non-Conventional Onsite Sewage Disposal Systems



Approximately 85 percent of the non-conventional systems were installed after 2000. They are often the solution when older conventional systems fail and a new system is needed. Many of the lots with conventional systems older than 30 years have challenging soils or landscapes and a non-conventional system is needed to serve the existing dwelling.

In November 2008, the Loudoun County Board of Supervisors adopted Chapter 1067 of the Loudoun County Codified Ordinances. Chapter 1067 requires owners of non-conventional onsite sewage disposal systems to have their system inspected annually. For further information, see Chapter 1067 of the Loudoun County Codified Ordinances.

Alternative Discharging Sewage Systems

An alternative discharging sewage system is a system that serves a single-family dwelling with flows less than 1,000 gallons per day and results in a point source discharge of treated sewage into a waterway.

As of 2009, there were 35 active alternative discharge systems that discharge into Loudoun County waterways, including Goose Creek, Beaver Dam Creek, Broad Run, Potomac River, North Fork of Catoctin Creek, South Fork of Catoctin Creek, Butchers Branch, Cattail Branch, Sycolin Creek, Sugarland Creek, and a tributary of the Little River.

There are other individual small systems that discharge less than 1,000 gallons per day of treated sewage effluent into Loudoun waterways; however they do not meet the definition of an alternative discharging system. Systems serving gas stations, antique shops, or firehouses are examples that fall outside this designation. Currently, there are 33 discharge systems in Loudoun County that meet this classification.

There are other larger discharging systems that are covered by a Virginia Pollutant Discharge Elimination System (VPDES) permit. They typically discharge over 1,000 gallons per day. According to the Virginia Department of Environmental Quality, there are 29 discharge systems in Loudoun County that meet this classification.

All discharging systems, regardless of size, include a secondary treatment unit and are required to disinfect the wastewater to meet water quality standards for fecal coliform.

Pump and Haul

A pump and haul system is comprised of a sealed septic tank with an alarm system. When the tank becomes full, it must be pumped out by a sewage pump truck. The typical pump and haul system is used to alleviate a potential public health problem caused by a failing onsite sewage disposal system. Sewage pump and haul systems are typically utilized when no other means of sewage disposal is available. The Health Department conducts an annual onsite inspection of each facility. The total number of permanent pump and haul systems is 69 as of April 1, 2010 (See Figure 3, Permanent Sewage Pump and Haul Locations).

Figure 3: Permanent Sewage Pump and Haul Locations

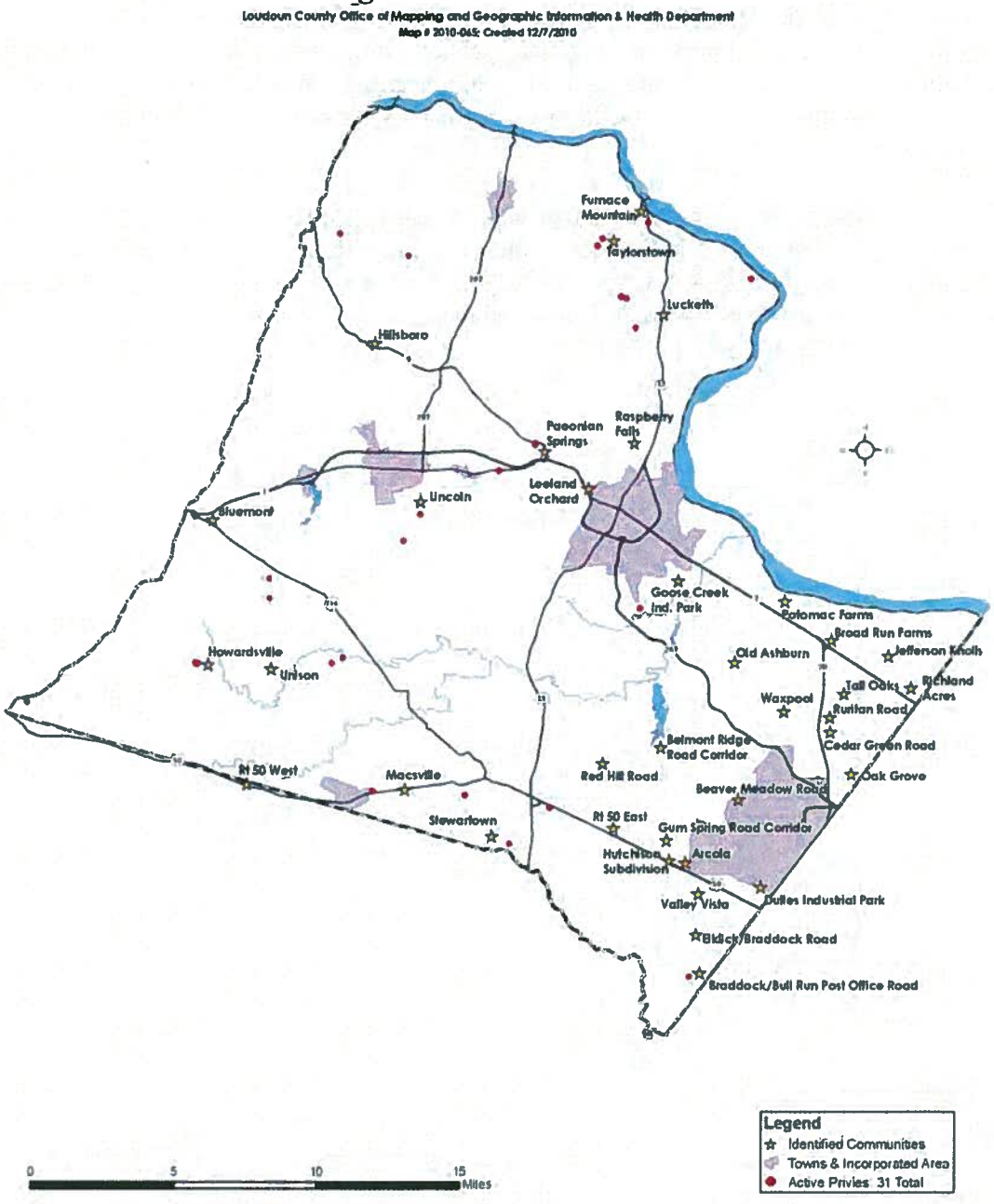
Privies

Outhouses or privies are a primitive means of sewage disposal. They are not connected to public sewer systems or septic systems. In the early to mid 20th century, privies were commonly utilized in rural areas where public sewer systems were not available.

The use of privies as a means of sewage disposal can have negative environmental and public health implications. Privies are generally used for homes that do not have indoor plumbing. Dwellings that use privies commonly lack proper facilities for bathing, hand washing, food preparation and cleaning. Where plumbing is present in homes with privies, the wastewater may be discharged onto the ground surface or into a stream.

At one time there were over 400 privies in use in Loudoun County. Over time, a majority of the privies have been replaced by onsite sewage disposal systems and public sewer systems. As of April 1, 2010, there were 31 known privies still in use in Loudoun County (See Figure 4, Active Privies).

Figure 4: Active Privies

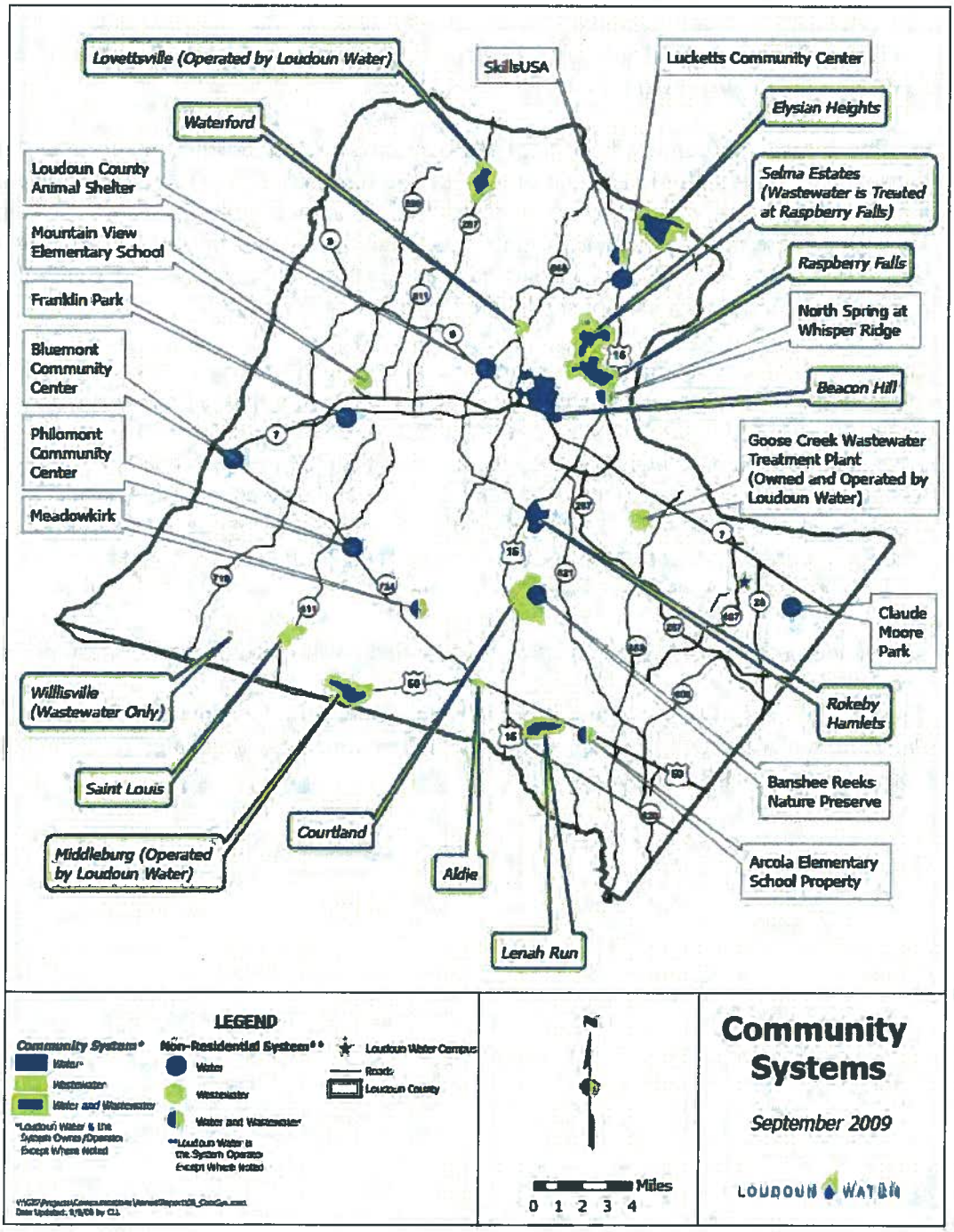


Community Water & Wastewater Systems

The terms community water system and community wastewater system are generic and not defined; for the purposes of this document, these terms mean a water or wastewater system that serves a community, group of homes, or multiple facilities. In addition, Loudoun Water typically refers to any small water or wastewater system that they operate as a community system.

Currently, Loudoun Water operates a total of 23 community water and /or wastewater treatment systems in the County (See Figure 5, Community Systems - Loudoun Water, September 2009).

Figure 5: Community Systems - Loudoun Water, September 2009



Identified Communities

There are areas in the County that are surrounded by public water and sewer, but have not been connected. These "by-passed communities" are typically older developments in the eastern portion of the County. In some cases, individual sewage systems have failed within these communities. Many of these individual sewage systems have been replaced with non-conventional onsite sewage systems due to poor site and soil conditions. This may discourage homeowners from paying the fees required to connect to the public system.

In other cases, communities have not been bypassed by public water or sewer, but the properties are served by individual onsite sewage disposal systems that are at risk for failures or currently experiencing problems with their water or wastewater systems. Typically, these are stand-alone communities that are located in the western part of Loudoun County. Unlike the "by-passed communities" in the east, the stand-alone communities in the west are not surrounded by public water and sewer.

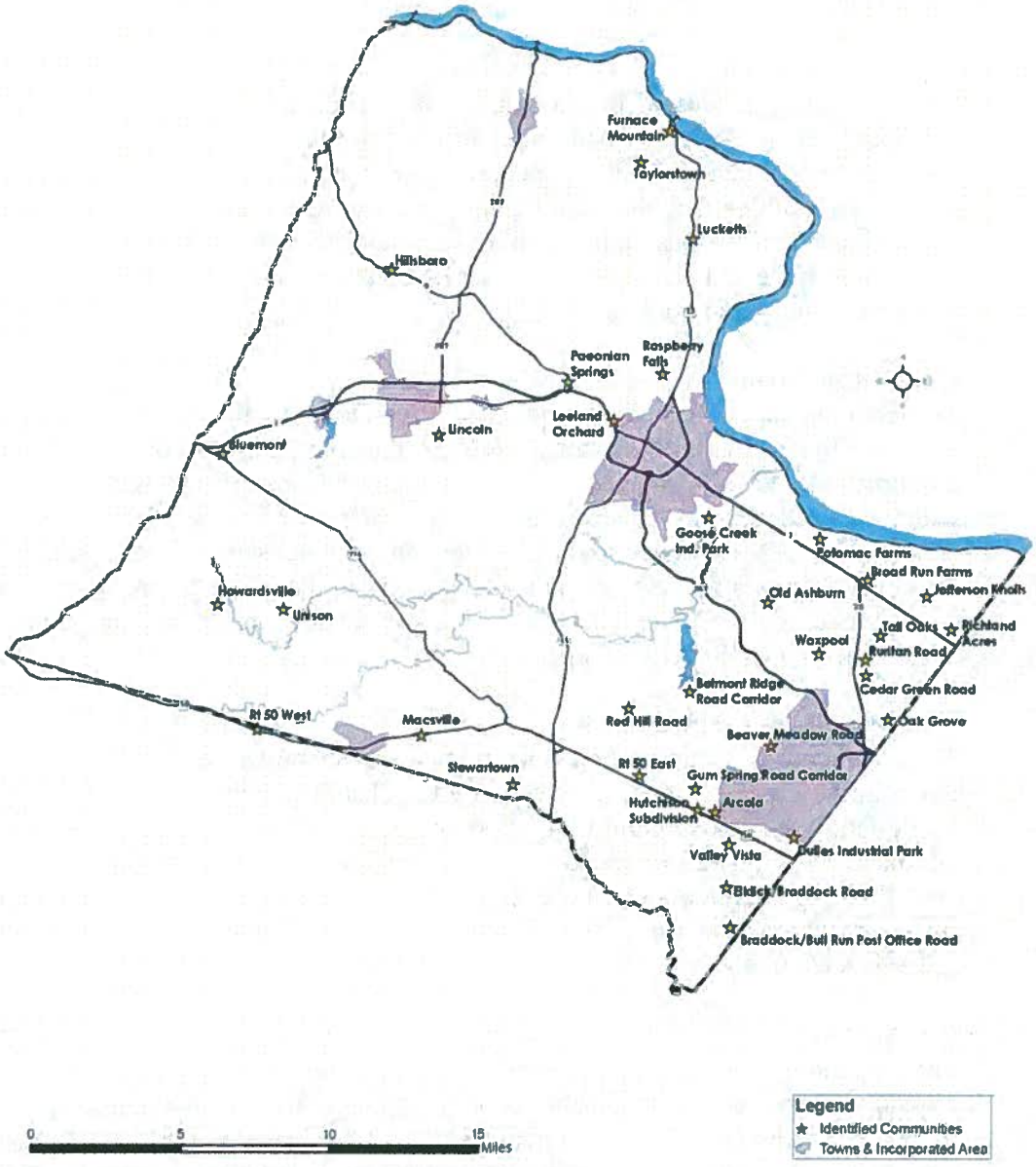
There are numerous stand alone or by-passed communities in the County that have or could, in the future, express concern to the Loudoun County Board of Supervisors about their community water or wastewater needs. This needs assessment includes these identified communities but does not assign a degree of risk to the communities. Assigning a degree of risk to the communities is beyond the scope of this project and could be performed after the development of an implementation plan. The task force used three criteria to determine if a community should be listed in the water and wastewater needs assessment. These criteria are:

The Loudoun County Health Department identified a water or wastewater need during a community survey.
There is a history of failing water or wastewater systems in the community.
The community has expressed concerns about their water or wastewater systems to the County or the Board of Supervisors.

Identified communities are shown below (See Figure 6, Identified Communities).

Figure 6: Identified Communities

Loudoun County Office of Mapping and Geographic Information & Health Department
Map # 2010-062 Created 12/7/2010



A brief synopsis of each community is listed below. The estimated solution costs shown in this section are preliminary estimates provided by Loudoun Water in 2004.

Community Surveys

Suburban Policy Area

Arcola

The community is located in the vicinity of the intersection of Evergreen Mills Road and Gum Springs Road just north of Route 50. The community is comprised of 75 single-family and commercial properties served by onsite water and sewer facilities including discharge, pump and haul, and drainfield systems. The estimated cost for extending public water and sewer is $1,731,000. Loudoun Water has since extended sewer to serve much of this area; however, some properties have yet to hook up.

Broad Run Farms

The community is located along Broad Run Drive to the north of Route 7. Surveyed by the Health Department in 1992, the community is comprised of 425 properties served by onsite water. This community is now served by public sewer with the exception of a few onsite wastewater systems at the rear of the community. The estimated cost for extending public sewer to the remaining dwellings is unknown. Numerous wells adjacent to the Hidden Lane Landfill are contaminated with trichloroethylene. This area is now an active Environmental Protection Agency Superfund site.

Jefferson Knolls/Arl Keith

The community is located along Oak Lane and Jefferson Drive off Potomac View Drive in the Cascades area. Surveyed by the Health Department in 2001, it is a single-family home community of 38 properties served by onsite water and sewer facilities. Several properties have had to undergo drainfield repairs in recent years, relying on alternative technology as a solution. Public sewer and water surrounds the community. The estimated cost for extending public water and sewer is $678,000.

Old Ashburn

The community is located along Ashburn Road in the vicinity of the W&OD Trail crossing. Surveyed by the Health Department in 2001, it is a community of 50 properties of residential and commercial use. The Health Department surveyed this community in 2001. The estimated cost for extending public water and sewer is $1,549,000.

Potomac Farms
The community is located on Smith Circle off of Route 7 just west of Loudoun County Parkway. Surveyed by the Health Department in 2001, the community is comprised of approximately 156 homes. The estimated cost for extending public water and sewer to homes served by onsite sewage systems and private wells is $964,000. Public facilities are nearby but are not currently available to all properties. Approximately half of homes in this community are served by a privately operated water system. The Virginia Department of Health has received complaints about this water system from customers. Complaints generally concern low water pressure and aesthetic water quality issues. The cost estimate for replacing the privately operated water system is $3,900,000.

Richland Acres
The community is located on Cedar Drive and Lakeland Drive off Route 7. Surveyed by the Health Department in 2001, it is comprised of 121 properties served by onsite water and 21 properties served by onsite wastewater. The estimated cost for extending public water and sewer is $749,000.

Route 50 East
The area is located east of Route 15. The area is comprised of 54 properties of mixed use, mostly commercial properties, utilizing onsite water and sewer facilities. This area has the highest concentration of pump and haul operations in the County. The estimated cost for extending public water and sewer is $2,101,000. Public sewer has gradually been installed in some of the area, however not all properties have hooked up or have access.

Valley Vista/Mountain View
This community consists of 30-35 properties served by onsite water and sewer facilities. Public sewer extension may already be available for connection. The estimated cost for extending public water and sewer has not been determined.

Rural Policy Area

Bluemont
This community is located at the western end of Snickersville Turnpike at the western end of the county. It is a community of 88 commercial and residential structures. Surveyed by the Health Department in 1999, it was found to have 32% unsatisfactory sewage disposal systems and 23% systems of unknown status. The estimated cost for a community water and sewer system is $2,795,000.

Hillsboro
The Town of Hillsboro is located along the western portion of Route 9. Surveyed by the Health Department in 1999, it is comprised of 48 habitable structures served by onsite sewer and water, where 33% of sewage systems are of unsatisfactory status. The Town water system is comprised of a spring and a drilled well. The Town has been on a Boil Water Notice since 2000, meaning the

water is not safe to consume unless it is boiled first. The estimated cost for a community water and sewer system is $2,400,000.

Howardsville
The community is located in the vicinity of Trappe and Trapp Crossroads. Surveyed by the Health Department in 2003, it is comprised of 9 structures served by onsite water and sewer facilities. Nearly half of the sewage systems were found to be unsatisfactory. The cost for a community water and sewer system has not been determined.

Leeland Orchards
The community is located on Leeland Orchard Road off Route 7, just west of Leesburg. Surveyed by the Health Department in 2001, 5 structures were identified with 0% of unsatisfactory sewage disposal systems and 20% of unknown status. The estimated cost for a community water and sewer system is $538,000.

Lincoln
The community is located south of Purcellville along Lincoln Road. Surveyed by the Health Department in 1999, it is comprised of 60 structures. Thirty-three of the sewage disposal systems are unsatisfactory. The estimated cost for a community water and sewer system is $3,225,000.

Lucketts
The community is located along Route 15, north of Leesburg. Surveyed by the Health Department in 1998, it is comprised of 23 structures served by onsite water and sewer systems, 23 percent of the sewage systems are of unsatisfactory status. The estimated cost for a community water and sewer system is $1,250,000.

Paeonian Springs
This community is located north of Route 7 in the vicinity of the Route 7 and Route 9 intersection. Surveyed by the Health Department in 2000, it is comprised of 116 structures served by onsite water and sewer facilities. These properties are small with older facilities where 13% are of unsatisfactory status and 27% of unknown status. The estimated cost for a community water and sewer system is $4,569,000.

Unison
This community is located in the southwest portion of the county along Unison Road. Surveyed by the Health Department in 1998, it is comprised of 36 habitable structures served by onsite water and sewer facilities, where 8% of the sewage systems were unsatisfactory and 33% were of unknown status. The estimated cost for a community water and sewer system is $998,000.

Communities Not Surveyed

Suburban Policy Area

Beaver Meadow Road
These homes are located off of Old Ox Road and adjacent to Dulles Airport property. The community is comprised of 15 properties served by onsite water and sewer facilities. The estimated cost for public water and sewer extension is $1,253,000.

Belmont Ridge Road Corridor
These homes are located along Belmont Ridge Road. There are an unknown number of properties served by onsite water and sewer facilities. Some of this area has been developed and has access to public utilities.

Cedar Green Road
These homes are located to the southeast of the intersection of Route 28 and Church Road West. The community is comprised of 10-15 properties served by onsite water and sewer facilities. The estimated cost for extending public water and sewer has not been determined.

Dulles Industrial Park
These homes and/or commercial properties are located in the vicinity of Dulles International Airport. The community is comprised of 25 properties served by onsite water and sewer facilities. Many of the developed properties are on pump and haul. The estimated cost to extend public sewer and water is $1,028,000.

Elklick/Braddock Road
These homes are located in the South Riding area. The community is comprised of 8-10 properties served by onsite water and sewer facilities. Public sewer is available to most of this area.

Gum Spring Road Corridor
These homes are located along Gum Spring Road. There are an unknown number of properties served by onsite water and sewer facilities. Some of this area has been developed and has access to public utilities.

Hutchison
These homes are located just east of Gum Spring Road along the north side of Route 50. The community is comprised of 13 properties served by onsite water and sewer facilities. The estimated cost for a community water and sewer system is $519,000.

Oak Grove
These homes are located east of Route 28 along the north side of Old Ox Road. The community has 43 properties served by onsite sewer and water facilities. The estimated cost for public water and sewer extension is $427,000.

Ruritan Road
These homes are located along Ruritan Road and Ruritan Circle, off Church Road West. The community is comprised of 21 properties served by onsite water and sewer facilities. There may be conflicts with the W&OD Trail. The estimated cost of public water and sewer extension is $379,000.

Tall Oaks
These 10 properties are located along Woodland Road off of Cascades Parkway. The community is served by onsite water and sewer. Over half of these properties are on pump and haul. The estimated cost of public water and sewer extension is $703,455.

Waxpool
These homes are located along Waxpool Road. The community is comprised of 15 properties served by onsite water and sewer facilities. The estimated cost for public water and sewer extension is $711,000.

Transition Policy Area

Braddock/Bull Run Post Office Road
These homes are located in southeastern Loudoun County. The number of properties served by onsite water and sewer facilities is unknown.

Goose Creak Industrial Park
These homes and/or commercial properties are located along Cochran Mill Road and Durham Court. The community is comprised of 15 properties served by onsite water and sewer facilities with at least one alternative onsite sewage discharge system. The estimated cost for a community sewer system is $500,000.

Red Hill Road
These homes are located along Red Hill Road off Evergreen Mills Road. The community is comprised of 18 properties served by onsite water and sewer facilities. The estimated cost for a community water and sewer system is $774,000.

Rural Policy Area

Furnace Mountain Area
These homes are located along Furnace Mountain Road between Lovettsville Road and Taylorstown Road. The community is comprised of 15-18 properties

served by onsite water and sewer facilities. The cost for a community water and sewer system has not been determined.

Macsville
These homes are located just east of Middleburg along Route 50. The community is comprised of 12 properties served by onsite water and sewer facilities. The cost for a community water and sewer system has not been determined.

Raspberry Falls
The community is located north of Leesburg on Route 15. It is comprised of 132 dwellings served by community water and wastewater systems that are operated by Loudoun Water. There are currently 25 properties served by individual wells. In November 2010, the Virginia Department of Health determined that one of the public wells that had been serving this community was Groundwater Under the Direct Influence of Surface Water.

Route 50 West
These homes are located west of Aldie along Route 50. The community is comprised of 34 properties served by onsite water and sewer facilities. The estimated cost for a community water and sewer system is $1,764,000.

Stewartown
These homes are located in the vicinity of Stewartown Lane along Route 764 in the southwestern portion of the county. The community is comprised of 9 properties served by onsite water and sewer facilities. These systems are old and located in an area of poor soils. The cost for a community water and sewer system has not been determined.

Taylorstown
This community is located in the vicinity of the intersection of Taylorstown Road and Loyalty Road in the northern portion of the county. The community is comprised of 22 habitable structures served by onsite water and sewer facilities with 95% of the sewage systems of satisfactory status and 5% of unknown status. The cost for a community water and sewer system has not been determined.

Communities Already Addressed

Rural Policy Area

Aldie
This community is located on Route 50, west of Route 15. It is comprised of 55 properties that were served by onsite water and sewer. The community is now served by public sewer.

Willisville
This community is located in the vicinity of Willisville Road and Welbourne Road in the southwestern portion of the county. It is a community of 10

residential properties that were served by onsite water and sewer facilities. This community project has been completed. The solution was to install a community wastewater system. The properties are still served by onsite water. Some new wells were drilled to serve homes with inadequate or nonexistent water supplies.

Chapter 3: Funding Options

Loudoun County has implemented an integrated approach to land use and fiscal planning that supports a process to identify the County's capital facility and public infrastructure needs. The Capital Needs Assessment (CNA) is completed biennially by the Board of Supervisors to identify the type and number of capital facilities that will be needed to serve the County's growing population over a period of ten fiscal years.

The CNA includes a Community Infrastructure section which identifies water and wastewater infrastructure projects that the County should monitor in each of the County's ten planning subareas as a potential capital infrastructure need. This project inventory is expected to change throughout the ten-year planning period as the Board of Supervisors makes actual funding decisions through its Six-Year Capital Improvement Program (CIP). The CIP is a six-year funding plan to achieve the Board's capital facility and infrastructure development plans. The identification of the water & wastewater infrastructure needs in the CNA will enable the Board of Supervisors to plan for which projects the County will fund or participate in funding in its CIP. This integrated planning process will enable the Board of Supervisors to identify water and wastewater infrastructure expenditures that need to be accounted for in future budgets and determine the sources of revenue appropriate to fund the improvements.

A blend of funding methods is recommended to support the implementation of water and wastewater infrastructure projects in the CIP. Funding sources recommended in this Needs Assessment as sources of funding for water and wastewater infrastructure projects include:

General Fund Appropriations

Revenues from local taxes typically comprise the General Fund which funds most activities performed by local governments. Annually, the local government divides the general fund revenues based on local priorities. The Board of Supervisors has adopted a Fiscal Policy that requires a minimum of 10% of the total expenditures in a fiscal year for capital projects be allocated with local tax funding. As the Board of Supervisors reviews its Capital Improvement Program funding plan, it may designate local tax funding in whole or part to fund water and wastewater infrastructure projects. Loudoun Water staff has indicated that it is vital that long term financial sustainability of any proposed solution is considered. Simply constructing the initial improvements is not sufficient to serve the customers. Major financial considerations must be managed from the onset.

Debt Financing

Loans or bonds are a means for borrowing money for a specific purpose. Loan or bond funds are typically paid back over a 10-to-20-year period with interest charges. Despite interest and principle charges, loans and bonds are often a financially sound method for funding capital improvement projects. Typically loans and bonds are used for capital improvement projects that cannot wait until local funds are available. Water and wastewater infrastructure projects are excellent candidates for this type of funding when the upfront expenditure may be less than the long-term expense of damage or possible environmental impact from inaction on funding the improvement.

General Obligation Bonds – General Obligation Bonds are issued based on the "taxing powers" of the local government, therefore no assets are required as collateral. These bonds require voter approval in a referendum and are subject to local administrative policy regarding the County's debt issuance guidelines and debt ceilings. Most bonds are financed over a 20-year period with interest payments based on the County's bond rating. Loudoun County's rating in 2010 is AAA which enables the County to borrow money at the lowest rates.

Revenue Bonds – Revenue Bonds are issued based on revenues generated by a specific revenue-generating source being designated to fund the capital improvement. The governing board takes action to dedicate a tax source or fees to repay the bonds. Because revenue bonds typically exclude property tax revenues, the interest rate on revenue bonds is typically higher.

Tax Incremental Financing or Special Tax Assessment Districts – All taxes levied and collected are pledged to finance the costs of infrastructure installation. For Tax Incremental Financing (TIF), the County uses the increased property values created by the infrastructure improvements to finance the improvements. The increased real estate tax collections related to the increased value is used to pay off the financing, usually over a 20-year period. In a Special Tax Assessment District, property owners are assessed an additional tax per $100 of assessed valuation annually to amortize the debt financing incurred for the infrastructure improvements. One or a combination of both of these methods of financing may be used to fund infrastructure improvements.

Loans – There are federal and state low interest loan programs available to finance water and wastewater infrastructure improvements. The Virginia Department of Environmental Quality and Virginia Department of Health oversee these programs.

As Community Water & Wastewater Infrastructure projects are identified in the Capital Needs Assessment, an analysis of appropriate funding options and sources should be included to assist the Board of Supervisors in determining what if any County commitments are planned for specific projects. Projects identified with County participation will appear in the County's six-year Capital Improvement Program for funding consideration. The Capital Improvement Program will include a project description that defines the scope, funding, and stakeholders for implementing

the completion of the project. Appendix #5 identifies federal and state funding sources that may be appropriate for Community Water and Wastewater Needs Assessment projects.

Chapter 4: Legislative and Regulatory Issues

Code of Virginia

Section 15.2 of the Code of Virginia allows local governments to regulate sewage collection, treatment, or disposal service and water service. Local regulations can include exclusive service areas for water and sewer service. In addition, Section 15.2 of the Code of Virginia allows localities to require the installation, maintenance, and operation of, regulate and inspect onsite sewage systems when public sewer systems are not available. The Code of Virginia allows localities to adopt ordinances that include a schedule of civil penalties that can be issued to property owners who fail to properly maintain an alternative onsite sewage disposal system. The ability for localities to administer civil penalties has the potential to be an effective enforcement tool.

Amendments to the state code are initiated by members of the General Assembly. Bills are typically referred to committees in the General Assembly and ultimately voted on by House and Senate members. The Governor has the option of signing or vetoing the bill. Loudoun County has successfully obtained sponsorship for many bills related to water and wastewater issues.

Local Ordinances

Loudoun County has local ordinances that contain standards for water and wastewater systems in the County as well as prohibitions against illicit discharges to our lakes and streams. These ordinances are described in greater detail in Appendix #4. Some localities have a need to have standards more stringent than the standards required by the state law. Localities may have specific environmental concerns, unique soils, geology or landforms, or may have a natural resource that they are interested in protecting.

Local ordinances are typically drafted by the Office of the County Attorney after review and input from various stakeholders. Draft ordinances are normally reviewed by a committee of Board of Supervisor members, followed by a public hearing and ultimately the ordinance is adopted, or not, by the Board of Supervisors.

Chapter 5: Inter-Jurisdictional Collaboration & Community Education & Awareness

The idea of inter-jurisdictional collaboration is to maximize the efficiency of efforts and financial means of state and local government agencies and private institutions, while still maintaining a high level of service to Loudoun County citizens.

It may be in the best interest of all involved in a project to discuss the specific needs for the project from start to finish. This will help to identify solutions to some of the common pitfalls or roadblocks incurred when multiple jurisdictions are involved: funding, providing service, regulation, final operation, responsibility and control. One of the major obstacles in any project is funding, such as who will pay for what and how much assistance the government or an agency can provide. With adequate planning, jurisdictions and agencies may be able to share costs or combine monies for such projects where available in respective budgets. This may be an effective means to save costs.

Education and public awareness are essential to effective water & wastewater resources management. Local, state and federal agencies routinely provide information and educational materials to citizens of Loudoun County. Traditional methods are utilized such as websites, brochures, and media releases. These can be used for educational aspects of water and wastewater programs.

Chapter 6: Recommendations

The following is a list of recommendations to the Board of Supervisors in an effort to address the issues set forth in this Needs Assessment. Nine specific recommendations are listed in the Needs Assessment in three categories; Policy, Planning, and Implementation.

Policy Recommendations:

1. Develop a long-term agreement between the County and Loudoun Water that clarifies the roles and responsibilities of each organization in a revised Charter.

2. Designate Loudoun Water as the provider and responsible management entity for water and wastewater infrastructure projects undertaken by the Board of Supervisors.

3. Develop policies to ensure communities that are served by onsite water and wastewater systems are converted to central water and wastewater systems as they become available.

4. Develop procedures to integrate the detection and elimination of wastewater illicit discharge to the storm water management system.

Planning Recommendations:

5. Use the Ten-Year Capital Needs Assessment and Six-Year Capital Improvement Program planning and budgeting processes as the tools to identify water and wastewater infrastructure project(s) in the County. The Ten-Year Capital Needs Assessment identifies the specific water and wastewater infrastructure needs to be addressed. The Six-Year Capital Improvement Program identifies the funding strategies the County will implement to address those needs. Identify the water and wastewater treatment needs by planning policy area (Suburban, Transition, Rural).

6. Fund improvements to the maximum extent possible from external revenue sources such as tax districts, tax incremental financing, grants, and proffers with specific funding recommendations identified within the Six-Year Capital Improvements Program.

Implementation Recommendations:

7. Develop an implementation manual that assists the Board of Supervisors with prioritizing proposed improvements.

8. Use inter-jurisdictional collaboration to maximize efficiency efforts and financial means of state and local agencies and private institutions.

9. Develop a public awareness and educational program through the Public Information Office and Loudoun Water's educational services to its customers.

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Glossary

Alternative Onsite Discharging System - Any device or system which results in a point source discharge of treated sewage for which a permit may be issued authorizing construction and operation when such system is regulated by the State Water Control Board pursuant to a general Virginia Pollutant Discharge Elimination System permit issued for an individual single family dwelling with flows less than or equal to 1,000 gallons per day.

Alternative Onsite Sewage System or **Alternative Onsite System** - A treatment works that is not a conventional onsite sewage system and does not result in a point source discharge.

Blue Baby Syndrome - Blue-baby syndrome (or infant cyanosis) occurs in infants who drink water with a high concentration of nitrate or are fed formula prepared with water containing high nitrate levels. Excess nitrate can result in methemoglobinemia, a condition in which the oxygen-carrying capacity of the blood is impaired by an oxidizing agent such as nitrite, which can be reduced from nitrate by bacterial metabolism in the human mouth and stomach. Infants in the first three to six months of life, especially those with diarrhea, are particularly susceptible to nitrite-induced methemoglobinemia.

Clean Water Act - The Clean Water Act is the primary federal law in the United States governing water pollution. Commonly abbreviated as the CWA, the act established the symbolic goals of eliminating releases to water of high amounts of toxic substances, eliminating additional water pollution by 1985, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1983.

Communal System - A water or wastewater system owned or operated by Loudoun Water or a public water or wastewater utility as defined in Chapter 10.1 or 10.2 of Title 56 of the Code of Virginia that is designed to serve small-scale development, including clusters. Such system may serve only one lot, where a communal system is required for a specific use.

Conventional Onsite Sewage Disposal System - A treatment works consisting of one or more septic tanks with gravity, pumped, or siphoned conveyance to gravity distributed subsurface drainfield.

Eutrophication – A process by which lakes and streams are enriched by nutrients (usually phosphorus and nitrogen) which leads to excessive plant growth.

Escherichia coliform (E. coli) - One of the species of bacteria in the coliform group. Its presence is considered indicative of fresh fecal contamination.

Failure (Sewage System) - A situation where the sewage effluent is not treated to a sufficient standard before entering groundwater or surface waters, or where inadequately treated effluent rises to the ground surface (usually near the onsite system) or backs up into plumbing fixtures. The failure of an onsite system may cause a risk to human health or the environment.

Fecal coliform - Bacteria present in waste from warm blooded animals (mammals or birds) and used as an indicator of pollution in water.

Illicit Discharge – Any discharge to the storm water management system that is not composed entirely of storm water, except discharges pursuant to either a VPDES permit or discharges resulting from firefighting activities.

Individual Onsite Sewage System – Any sewage dispersal system serving a single lot.

Karst Topography - A landscape shaped by the dissolution of a layer or layers of soluble bedrock, usually carbonate rock such as limestone or dolomite.

Non-Conventional Onsite Sewage Disposal System – A "treatment works" that is not a conventional onsite sewage disposal system or an alternative discharging sewage system. The term does not include (1) any communal system serving three or more lots or users and approved in conformance with any applicable federal, state and local regulations, or (2) any treatment works maintained by a public entity.

Pathogen - A bacterium, virus or parasite that causes or is capable of causing disease. Pathogens may contaminate water and cause waterborne disease.

Private Water System – A water system that serves no more than 25 people at least 60 days of the year and has no more than 15 service connections.

Public Water System (PWS) – A system that provides piped water for human consumption to at least 15 service connections or serves an average of at least 25 people for at least 60 days each year. PWSs can be community, nontransient noncommunity, or transient noncommunity systems.

Reserve/Repair Area - An area of suitable soil that is reserved to be used when the Onsite Sewage Disposal System fails.

Revised General Plan - The Revised General Plan and other supporting documents and ordinances together comprise the Loudoun County Comprehensive Plan (Revised General Plan, Preface, text). The policies and methods of implementation of the Revised General Plan are intended to ensure the long-term fiscal balance of the County, to protect

its environment and natural resources, to create high-quality communities, and to provide adequate levels of public services and facilities. The Revised General Plan is the foundation for amendments to County ordinances to ensure that the County's goals are implemented through the regulatory process.

Rural Policy Area - A planning area identified in the County's Revised General Plan which extends west of the Transition Policy Area to the county boundaries, encompassing 227,904 acres, which represents about 67 percent of Loudoun County's total land. The majority of the Rural Policy Area is served by onsite water and wastewater.

Safe Drinking Water Act - The Safe Drinking Water Act (SDWA) was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The law was amended in 1986 and 1996 and requires many actions to protect drinking water and its sources: rivers, lakes, reservoirs, springs, and ground water wells. SDWA does not regulate private wells which serve fewer than 25 individuals.

Secondary Treatment – Treatment of effluent that is designed to reduce five-day biochemical demand to 30 mg/l or less, total suspended solids to 30 mg/l or less and oils and grease to less than 5 mg/l. Secondary treatment processes can include wastewater aeration, such as aerated wastewater treatment systems, treatment and filtering media, disinfection, and other technologies.

Suburban Policy Area - A planning area identified in the County's Revised General Plan which includes the eastern part of the county where higher density residential, business and commercial uses are planned. The majority of the Suburban Policy area is served by central water and sewer.

Transition Policy Area - A planning area identified in the County's Revised General Plan which serves as a visual and spatial transition between the Suburban Policy Area to the east and the Rural Policy area to the west. A small percentage of the Transition Policy Area is currently served by central water and sewer; however, utilities may be extended across the entire planning area.

Treatment Works - Any devices and systems used for the storage, treatment, recycling or reclamation of sewage or liquid industrial waste, or other waste or necessary to recycle or reuse water, including intercepting sewers, outfall sewers, sewage collection systems, individual systems, pumping, power and other equipment and their appurtenances; extensions, improvements, remodeling, additions, or alterations; and any works, including land that will be an integral part of the treatment process or is used for ultimate disposal of residues resulting from such treatment; or any other method or system used for preventing, abating, reducing, storing, treating, separating, or disposing of municipal waste or industrial waste, including waste in combined sewer water and sanitary sewer systems.

Water Treatment Residuals - Water treatment residuals are sediment-containing byproducts leftover from purification of raw water in municipal treatment plants.

Appendices

Appendix 1 - Loudoun County Water & Wastewater Planning Process

Water and Wastewater - Loudoun County Revised General Plan

The Loudoun County Revised General Plan divides the County into three basic planning areas; the Suburban Policy Area, the Transition Policy Area, and the Rural Policy Area. The Revised General Plan anticipates that the Suburban and the Transition Policy Areas will be served by central water and wastewater systems. Communal and individual onsite water and wastewater systems will serve most properties in the Rural Policy Area with the towns being served by central water and wastewater. Key underlying goals of the Revised General Plan are the safe distribution of potable drinking water and to efficiently collect, treat and dispose of wastewater in a fashion that protects both the health of the public and the environment. The Revised General Plan policies state that "the County will continue to identify, survey and quantify areas in need of improvements to sewage disposal and water systems and will work with communities to identify and implement appropriate solutions such as installing systems, upgrade or replace failing systems, and, where appropriate, design, build and install communal systems" (Revised General Plan, Chapter 2, General Water and Wastewater Policies, Policy 5).

Extensions of public water and wastewater systems:
The Revised General Plan requires that the County work with Loudoun Water and officials of the towns to continually evaluate and plan for expansion of, and improvement to, both central water and wastewater systems. The Revised General Plan envisions that central water and wastewater systems will be extended throughout the Transition Policy Area and areas surrounding towns within the Rural Policy Area that are within the Joint Land Management Area (JLMA). Central sewer and water systems are the preferred systems in the Suburban Policy Area.

Communal and individual water and sewer systems:
The Revised General Plan encourages the use of clustered development utilizing communal water and wastewater systems in the Rural Policy Area, however, the plan also allows for the use of individual water and wastewater systems.

Appendix 2 - Organizations that Play a Role in the Management of Water and Wastewater

Loudoun Water

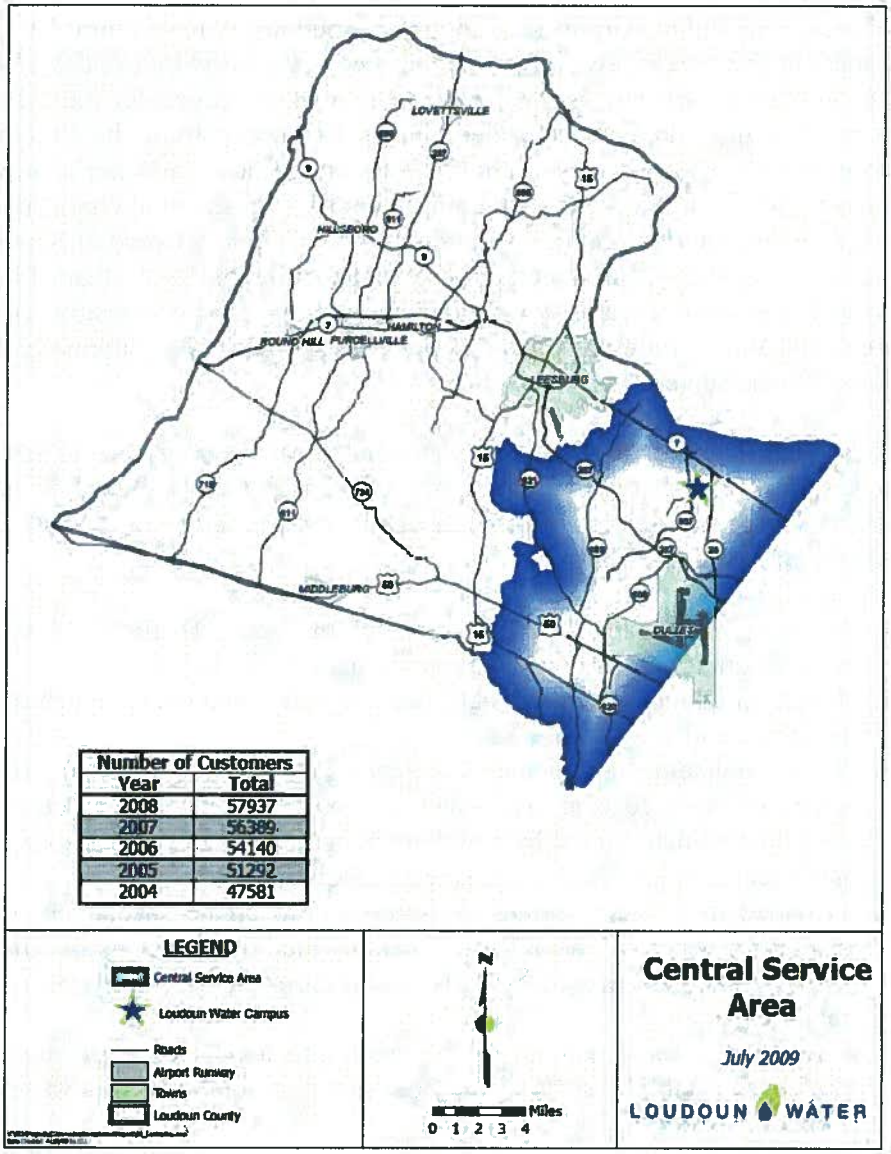
Loudoun Water is the largest entity managing centralized water and wastewater systems in Loudoun County. Loudoun Water provides water and wastewater services to over 175,000 citizens of Loudoun County. The infrastructure falls into two categories; centralized and community systems. Loudoun Water provides centralized

public water and sewer service to residents of the unincorporated areas of Loudoun, primarily living East of Route 15 to the Fairfax County line, not including The Town of Leesburg and Dulles Airport (See Figure 7, Loudoun Water Central Service Area). Customers in this area receive water that has been purchased by Loudoun Water from the City of Fairfax and Fairfax Water. The City of Fairfax gets its water from Goose Creek in Ashburn and Fairfax Water obtains its supply from the Potomac River. Loudoun Water supports many community systems. Loudoun Water's current policy is to serve community systems with a minimum of 15 residential connections, unless there is an express written request from the Loudoun County Board of Supervisors. It appears that several projects contemplate connection of fewer than 15 residents. Loudoun Water also operates two municipal systems, four community center water supplies, and three community park systems (See Figure 5, Community Systems - Loudoun Water, September 2009).

Loudoun Water's policy on financing water and wastewater systems to replace failed onsite systems states that at the request of the Loudoun County Board of Supervisors, Loudoun Water will attempt to provide public water and/or wastewater systems to replace failed onsite systems:

1. In areas declared a health hazard by the State Health Commissioner of Virginia and in other areas in a case-by-case basis; and
2. Where Loudoun Water, at its election, may own and operate such replacement facilities; and
3. Where financing arrangements are available to fund the total project costs, such that those costs are not subsidized by existing Authority customers, and such that as determined by Loudoun Water, the total project costs funded do not affect Loudoun Water's financial condition; and
4. Provided the County agrees, if necessary, to create special tax, service, or sanitary districts to guarantee payment of total project costs by imposition of taxes or charges secured by liens upon real estate served by the replacement facilities; and
5. The County and Loudoun Water enter into a Service Agreement for each project to establish terms for the repayment of total project costs incurred by Loudoun Water.

Figure 7: Loudoun Water Central Service Area



Towns

The Towns of Hamilton, Hillsboro, Leesburg, Lovettsville, Middleburg, Purcellville, and Round Hill provide water and/or wastewater to their citizens.

Town of Hamilton

The Town of Hamilton provides water and wastewater services to its residents and to some residents on the outskirts of the Town. Hamilton operates eight wells that vary in depth from 800 to 1,000 feet. The pumping equipment, in many of the wells, is approaching forty years old. Parts to maintain the equipment have

become scarce, qualified service technicians have retired, and the task of maintaining these wells has become a concern. By conserving usage, the Town attempts to avoid major equipment failures. The Town has begun construction of a new waterline running from Well 14 in the Stone Eden subdivision, through Hamilton Acres and extending to a new school site. Water from both Well 14 and the treatment facility is expected to serve the new elementary school as well as provide an improvement in the quality of the Town's water. The completion of the Well 14 project will allow several of the less productive wells to be taken off-line and the restrictions removed. Hamilton is planning for many of the capital improvements necessary to maintain the Town's infrastructure and to anticipate the necessary funding required.

Town of Hillsboro

The Town of Hillsboro provides water only. The Town water source consists of a spring and a drilled well. It is a small public system with significant problems from potential contamination, inadequate quantity, and failing infrastructure. The onsite and alternative discharging systems in Hillsboro are a concern due to their age, small lots, and lack of sites for onsite replacement and relationship to the failing drinking water infrastructure as well as the Catoctin Creek, which has been determined to be polluted due to excessive coliform bacteria.

Town of Leesburg

The Town of Leesburg provides water and wastewater services within the Town's corporate limits and several parcels outside its boundaries. The Town website provides a full description of water and wastewater services, programs, and requirements. The current capacity of the water treatment facility is 15 million gallons per day (MGD) and contains two additional storage tanks. The current system obtains water from the Potomac River and includes 203 miles of water main with three storage tanks and one well. The 7.5 MGD Water Pollution Control Facility has been designed for expansion to meet anticipated growth needs. The facility recently added a nutrient removal upgrade. The Wastewater Treatment Facility has established the use of an environmental management system (EMS) to systematically manage their environmental and health safety matters. The EMS is built on the "Plan, Do, Check, Act" model.

The Town of Leesburg is pursuing the development and implementation of its EMS in a phased approach with the thought that it may become a Town-wide program. The Water Pollution Control Division kicked off the first EMS program for the Town in February 2005. The Division's effort is part of a two-year program in conjunction with Virginia Tech's Center for Organizational and Technological Advancement (COTA). The second EMS initiative will include the other three divisions within the Utilities Department. The third EMS Initiative would include other Town of Leesburg departments.

Town of Lovettsville

The Town of Lovettsville's water and waste water system is owned by the Town, but day to day operations are managed by Loudoun Water. The Town's water supply comes from a series of wells located throughout the community. A source water assessment of the water system was conducted by the Virginia Department of Health. Based on the criteria developed by the state in its approved Source Water Assessment Program, the wells were determined to be highly susceptible to contamination. Because of this risk, a well head protection plan was developed and a program for source water protection is now in place. The Town is expanding the waste water treatment facility built in 2000, from 250,000 gallons per day (GPD) to 375,000 GPD. This involves the installation of a third treatment module and new filters that will improve the removal of nitrogen and phosphorous to meet limits set by the Commonwealth of Virginia to help protect and improve the water quality in the Chesapeake Bay.

Town of Middleburg

The Town of Middleburg's water and wastewater system is owned by the Town, but day to day operations are managed by Loudoun Water. The Town currently has over 450 water and wastewater customers. The Town's water supply comes from a series of three wells located within the Town limits. Current capacity for this water treatment facility is 150,000 GPD. A second water treatment facility for the Salamander Resort is currently under construction. When completed, this facility will have a capacity of 130,000 GPD. The Town's current wastewater treatment facility is 35 years old and has a capacity of 135,000 GPD with an average flow of 80,000 GPD. A new wastewater treatment facility is currently under construction. The wastewater treatment facility is being funded by the Salamander Resort through an agreement with the Town of Middleburg. The new wastewater treatment facility is slated for completion in 2010 and will have a capacity of 250,000 GPD. Current capital projects include replacement of some of the older water distribution mains and replacement of the sewer collection system.

Town of Purcellville

The Town of Purcellville provides water and wastewater services to residents and businesses in Purcellville. The Town currently has a water conservation program in place, including rebates and free low-flow shower heads and faucet aerators, because the amount of water required by the Town is not available from current sources. The operational capacity of the water treatment facility that treats J.T. Hirst Reservoir water is 300,000 GPD and the capacity of the six wells is 368,000 GPD for a total capacity of 668,000 GPD. The wastewater treatment facility is required by decree to upgrade its treatment process to remove nutrients. The facility will be upgraded for enhanced nutrient removal and expanded from 1.0 MGD to 1.5 MGD. Current projections estimate the facility expansion will be completed in 2010. Purcellville has significant wet weather inflows to the wastewater treatment facility. The 2004 Infiltration and Inflow Study, and subsequent implementation, has resulted in improvement. The plan for a

Capacity, Management, Operation and Maintenance (CMOM) database is being developed; 7,600 linear feet of slip lining and 1,200 linear feet of new sewer line have been installed; 52 cleanout caps were repaired; and 30 manholes were rehabilitated resulting in significant decreases in the amount of inflow to the wastewater treatment facility.

Town of Round Hill

The Town of Round Hill provides water to customers within the Town corporate boundaries, and to areas of Loudoun County that are within the Joint Land Management Area (JMLA), and the Planned Development Housing (PDH) zoning district adjacent to the Town. The Town is supplied with water from at least eight active wells. The Town of Round Hill owns and operates a 0.5 MGD wastewater treatment facility.

Loudoun County Public Schools

The Loudoun County Public School system operates five water systems, contracts for the operation of an alternative treatment system, operates alternative discharging treatment systems, and is responsible for onsite wastewater treatment systems. Management of wells and wastewater system operation is under their Facility Services Director.

Virginia Department of Health – Loudoun County Health Department

The Virginia Department of Health operates with divisions which function centrally within the state (such as the Drinking Water Division) and through Health Districts located across the state. The Loudoun County Health Department is officially the Loudoun Health District.

The mission of the Virginia Department of Health and the Board of Health is to achieve and maintain optimum personal and community health by emphasizing health promotion, disease prevention, emergency preparedness, and environmental protection. The focus of public health, as it relates to sewage and water-borne illnesses, is to prevent rather than treat a disease through proper management and protection of water resources and wastewater treatment systems.

The Health Department focus is toward wastewater facilities where the treated water goes back into the soil. It promulgates regulations to govern technology and practices in the installation of systems. The Health Department is developing regulations to govern operation and maintenance of these facilities. With respect to wells, the Health Department promulgates regulations for public water systems and monitors the water quality. Private drinking water wells must be installed to meet requirements intended to reduce the risk of surface water contamination. Locally, the Loudoun County Health Department issues permits for the installation of all proposed wells and insures their correct location, installation and construction. Unused wells are properly abandoned to reduce the risk of pollution of aquifers.

The Department of Environmental Quality

The Department of Environmental Quality (DEQ) is dedicated to protecting Virginia's environment and promoting the health and well-being of the citizens of the Commonwealth. DEQ administers the federal Clean Water Act and enforces state laws to improve the quality of Virginia's streams, rivers, bays and ground water for aquatic life, human health and other water uses. Permits are issued to businesses, industries, local governments and individuals that take into account physical, chemical and biological standards for water quality. DEQ has many programs to monitor, assess, and improve water quality in Virginia.

The Department of Conservation and Recreation

The Department of Conservation and Recreation (DCR) administers the Virginia Stormwater Management Program (VSMP). The program includes both erosion and sedimentation control as well as stormwater management. It was developed to protect citizens, property and natural resources from unmanaged stormwater runoff. DCR issues permit for stormwater discharge under VSMP Permit Regulations. As mandated by the Clean Water Act and the code of Federal Regulations, federal permitting requirements have been incorporated into these regulations.

Appendix 3 - Water & Wastewater Regulations, Management Issues, and Health Effects

Water and wastewater is a public health concern across the country and around the world. Wastewater was a concern of the US Congress as far back as 1948 when the Water Pollution Control Act was established. Congress enacted the Safe Drinking Water Act in 1974. Federal, state and local authorities have a role in the oversight and management of water and wastewater systems. Appendix 4 contains a brief description of state and local regulations related to management of water and wastewater systems in Virginia.

Table 3.1 Common Pathogens Found in Water and Untreated Sewage (Heymann, 2008)

Microorganism Type	Microorganism	Acute Effects	Chronic or Ultimate Effects
Bacteria	*E. coli 0157:H7*	Diarrhea	Death, Hemolytic Uremic Syndrome
	Legionella pneumoniae	Fever, pneumonia	Elderly: Death
	Helicobactor pylori	Gastritis	Ulcers and stomach cancer

Microorganism Type	Microorganism	Acute Effects	Chronic or Ultimate Effects
	Vibrio cholerae	Diarrhea	Death
	Vibrio vulnificus	Tissue infection	Death in those with Liver Problems
	Campylobacter	Diarrhea	Death: Guillain-Barre Syndrome
	Salmonella	Diarrhea	Reactive arthritis
	Yersinia	Diarrhea	Reactive arthritis
	Shigella	Diarrhea	Reactive arthritis
	Cyanobacteria	Diarrhea	Potential Cancer
	Leptospirosis	Fever, headache, Chills, muscle Aches, vomiting	Weil's Disease, kidney damage, liver failure, death
	Aeromonas hydrophila	Diarrhea	
Parasites	*Giardia lamblia*	Diarrhea	Children: Failure to develop physically and mentally
	Cryptosporidium	Diarrhea	Immunocompromised: death
	Toxoplasma Gondii	Newborn syndrome, hearing & visual loss	Dementia, seizures, mental retardation
	Acanthamoeba	Eye infections	
	Microsporidia	Diarrhea	
	Entamoeba	Amebiasis, amoebic Dysentery	
	Cayetanensis	Abscess in liver or other organs	
Viruses	*Hepatitis viruses*	Liver infection	Liver failure
	Adenoviruses	Eye infections, Diarrhea	Respiratory failure
	Caliciviruses	Diarrhea	
	Coxsackievviruses	Encephalitis, Aseptic meningitis	Heart disease, diabetes
	Echoviruses	Aseptic meningitis	
	Polyomaviruses		Cancer of the colon

In addition to pathogens, the high nutrient levels in untreated sewage can cause illness when they cause algal blooms or rapid plant growth, in waterways and high nitrate levels in the ground water. Surface waters are subject to eutrophication when exposed to high levels of nutrients causing rapid plant growth referred to as algal blooms. Algal blooms are rapid increases in the population of phytoplankton algae, or single-celled plants that serve as an important food source to other organisms. The nutrients in sewage act as fertilizers and cause the number of algae to swell. Some algae produce toxins that are dangerous to humans, fish and animals that can come in contact with them from eating shellfish or swimming or boating in contaminated water. Symptoms from exposure include memory loss, vomiting, diarrhea, abdominal pain, liver failure, respiratory paralysis, and coma. Fish kills due to the lack of oxygen in the water created by the massive die-off and decomposition of the inflated algae population, affect both lakes and estuaries.

Groundwater, confined in an aquifer or free in a saturation zone, can be contaminated with pathogens and excess nutrients if not properly protected. High levels of nitrates in drinking water can cause "blue baby syndrome" which can be fatal to infants. If an affected person does not receive proper medical attention, some toxins can be fatal.

Contamination to the groundwater can occur when a sewage disposal system is located in an unsuitable location and leaches into the water table or groundwater prior to the effluent being properly treated. Poorly constructed or installed sewage disposal components, such as tanks and pipe work, can degrade, break or crack and leak untreated sewage into the groundwater. Systems installed in areas of karst topography or increased limestone deposits and cavern formations have an increased risk of contaminating ground water if not properly designed. Well location or inadequately constructed wells can also be a source of ground water contamination. Wells improperly located in karst topography or in the vicinity of sewage disposal systems, livestock feed lots, areas of refuse and garbage disposal, and dwellings or other structures can become conduits for direct contamination into a confined groundwater source. Wells of poor construction, such as shallow bored or dug wells and drilled wells where the casing or grout is not properly bedded into the underlying bedrock, can also become contaminated; the risk increases when such wells or water supplies are located too close to a potential pollution source. Dry wells or unused wells, which have not been properly abandoned, can become improper and unsanitary dumping sites for sewage, refuse, and chemicals. When confined ground water supplies become contaminated, it can take a very long time to remediate and may never recover as a safe water supply.

Appendix 4 – Regulations that Govern Water and Wastewater Management

Virginia Department of Health, Loudoun County Health Department

The Virginia Department of Health and the Loudoun Health District are tasked with administering many different sets of regulations and ordinances as they work to protect the public's health and the environment.

State Regulations

Sewage Handling and Disposal Regulations

These regulations were promulgated by the State Board of Health in order to assure that all sewage is handled and disposed of in a safe and sanitary manner. In addition, it guides the State Health Commissioner in determining whether a permit for handling or disposing of sewage should be issued or denied. It is also used to guide property owners in the requirements necessary to secure a permit for the handling and disposing of sewage.

Single Family Home Alternative Discharging Regulations

These regulations were promulgated by the State Board of Health to help protect citizens and the environment by ensuring that all residential, direct-discharging sewage disposal systems do not adversely impact the waterways of the Commonwealth.

Authorized Onsite Soil Evaluator (AOSE) Regulations

These regulations were promulgated by the State Board of Health in order to guide Onsite Soil Evaluators and Professional Engineers in the processes and site documentation procedures necessary to secure timely responses to applications submitted to the department

Private Well Regulations

These regulations were promulgated by the State Board of Health to ensure that all private wells are located, constructed, and maintained in a manner which does not adversely affect ground water resources or the public welfare, safety, and health; guide the State Health Commissioner in determining whether a permit for the construction of a private well should be issued or denied; guide the owner or his agent in the requirements necessary to secure permit for the construction of a private well; and to guide the owner or agent in the requirements necessary to secure an inspection statement following construction.

Waterworks Regulations

These regulations are administered by the Virginia Department of Health, Office of Drinking Water and have been promulgated by the Board of Health to ensure that all water supplies destined for public consumption be pure water, to guide the commissioner in his or her determination of whether a permit for a public water supply or waterworks should be issued, and to assist the owner or his authorized engineer in the preparation of an application, plans, specifications, reports, and other data.

Water and Wastewater - Ordinances and Standards of Loudoun County

The Loudoun County Zoning Ordinance:

The Loudoun County Zoning Ordinance implements many of the policies contained in the Revised General Plan. The Zoning Ordinance specifies where individual, communal and central utilities can be approved in the various zoning classifications specified in the Zoning Ordinance.

The Land Subdivision and Development Ordinance (LSDO):

This ordinance establishes subdivision and site plan procedures for most all unincorporated areas of Loudoun County. The purpose of the LSDO is to ensure that residential, industrial, and business centers are developed with adequate highway, utility, health, educational, and recreational facilities. The LSDO requires that where public water and sewer are required by the Zoning Ordinance or are available, the public utilities shall be extended to all lots within the proposed subdivision. Where individual onsite sewage systems and water supplies are proposed, the LSDO requires approval of the facilities prior to approval of a Preliminary Subdivision Plat.

The Facilities Standards Manual (FSM):

This document assists the public and development community in determining the policies that apply to land development in the County. It contains information primarily related to design, construction standards, and guidelines for improvements related to subdivisions and site plans. The manual requires that any subdivision that will be served by onsite sewage disposal systems must have the sewage disposal system sites approved by the Loudoun County Health Department prior to submission of a Preliminary Plat to the Department of Building and Development. This requirement tends to drive developments that use individual onsite sewage disposal systems rather than communal onsite sewage disposal systems.

Loudoun County Ordinances:

Chapter 1040 of the Loudoun County Codified Ordinance

This ordinance was promulgated by the Loudoun County Board of Supervisors to ensure that all private wells are located, constructed, and maintained in a manner which does not adversely affect ground water resources or the public welfare, safety, and health. This ordinance is administered in conjunction with the Virginia Department of Health, Private Well Regulations.

Chapter 1042 of the Loudoun County Codified Ordinance

This ordinance ensures that new water systems or an extension of a previously approved water system shall be made, serving three or more connections, without having a detailed plan of the proposed new system or proposed extension with proof of capacity to serve. It also states that the detailed plans shall be filed with, and a permit obtained, from the Board of Supervisors.

Chapter 1046 of the Loudoun County Codified Ordinance

The purpose of this ordinance is to provide for the necessary curtailment of water usage through voluntary and mandatory restrictions or prohibitions during a water supply shortage situation affecting the County and any adjacent areas that are served in whole or in part by the Loudoun County Sanitation Authority, doing business as Loudoun Water, or portions thereof.

Chapter 1060 of the Loudoun County Codified Ordinance

This ordinance ensures that new sewerage systems or an extension of a previously approved sewerage system shall be made, serving three or more connections, without having a detailed plan of the proposed new system or proposed extension with proof of capacity to serve. It also states that the detailed plans shall be filed with, and a permit obtained, from the Board of Supervisors.

Chapter 1064 of the Loudoun County Codified Ordinance

This ordinance establishes the requirements for the use of sewers. It prohibits the dumping of any human excrement, garbage or other polluting waste in an unsanitary manner upon public or private property within the County. It requires the owners of all houses, buildings or properties used for human occupancy, employment, recreation or other purposes, to install suitable toilet facilities and to connect such facilities directly with the proper public sewer provided that the public sewer is within 100 feet of the property line and not more than 300 feet from the nearest house, building or property to be served.

Chapter 1066 of the Loudoun County Codified Ordinance

This ordinance was promulgated by the Loudoun County Board of Supervisors in order to assure that all sewage is handled and disposed of in a safe and sanitary manner. In addition, it guides the Health Director in his or

her determination of whether a permit for handling or disposing of sewage should be issued or denied. It is also used to guide property owners in the requirements necessary to secure a permit for the handling and disposing of sewage. This ordinance is administered in conjunction with the Virginia Department of Health, Sewage Handling and Disposal Regulations.

Chapter 1067 of the Loudoun County Codified Ordinance

This ordinance was promulgated by the Loudoun County Board of Supervisors in order to limit the use of non-conventional sewage disposal systems and to insure that these systems are maintained and inspected.

Chapter 1068 of the Loudoun County Codified Ordinance

This ordinance sets forth uniform requirements for direct and indirect contributors into the wastewater collection and treatment systems of the publicly owned treatment works (POTW) in the County or serving the County, and enables the POTW to comply with all applicable state and federal laws required by the Clean Water Act of 1977 and the General Pretreatment Regulations (40 CFR Part 403).

Chapter 1070 of the Loudoun County Codified Ordinance

This ordinance established sewer service districts for Broad Run Farms, Aldie, and Hamilton. It also authorized a special assessment to fund water and sewer improvements at Dulles Industrial Park.

Chapter 1096 of the Loudoun County Codified Ordinance

This ordinance established the stormwater management system, provided for County maintenance of the system, defined and created prohibitions against illicit discharges, and established penalties.

Virginia Department of Environmental Quality

Sewage Collection and Treatment (SCAT) Regulations

These regulations were promulgated by the State Board of Health in order to assure that all sewage is handled and disposed of in a safe and sanitary manner and regulate larger systems such as mass drainfield and associated treatment works. The Virginia Department of Health, Division of Wastewater Engineering in the Office of Environmental Health Services and The Virginia Department of Environmental Quality administer and enforce this regulation.

Virginia Pollution Abatement Permit Regulations

These regulations are administered by The Department of Environmental Quality (DEQ) and govern the land application of sewage sludge, industrial waste (sludge and wastewater), municipal wastewater, and animal waste.

Virginia Pollution Discharge Elimination System (VPDES) Permit Regulations
Section 402 of the Clean Water Act established the National Pollutant Discharge Elimination System to limit pollutant discharges into streams, rivers, and bays. In the Commonwealth of Virginia, DEQ administers this program as it relates to point source discharges from industrial activities.

Virginia Department of Conservation and Recreation

Virginia Stormwater Management Program (VSMP) Permit Regulations
Section 319 of the Clean Water Act established the Nonpoint Source Management Program to limit stormwater pollution discharges into state and federal waters. In the Commonwealth of Virginia, DCR administers the program as the VSMP.

Appendix 5 – Grants & Loans

A wide variety of financing options and resources are available through federal, state, and county programs for both water and wastewater projects. Some of these programs are funded by grants that often require that the grantee provide a matching portion of the funds. Some of the grants are based on the income of the grantee where a given percentage of the grant is paid for by the grantor and the remainder is paid by the grantee, often in the form of a low interest loan. Other programs are administrated entirely through low interest loans that are made available through federal, state and county agencies and private organizations. Information provided in this section is current as of April 2010.

Virginia Clean Water Revolving Loan Fund (VRLF) Program for Publicly Owned Wastewater Treatment Facilities and Collection Systems
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.

Individual Household Well Loan Program
The Southeast Rural Community Assistance (RCAP's) Loan Fund provides low-interest loans to low-income rural communities for predevelopment costs, system upgrades, and new construction of water and wastewater services and facilities. Loans are also available for housing and community development.

The household water well system loan program is designed to assist low to moderate income individuals needing loans to construct, refurbish, and service their household well systems. The purpose of the program is to target loans to significant numbers of homeowners in seven states whose geographically isolated households lack water service, but for whom it is not feasible to be connected to new or existing community water systems.

National Trust for Historic Preservation

Through its National Trust Loan Funds, the National Trust for Historic Preservation funds loans to acquire and/or rehabilitate historic buildings, establish revolving or re-lending programs, or to otherwise help protect threatened National Historic Landmarks. Eligible properties must be listed in a local, state, or national historic register, either individually or as a contributing building in a certified historic district. Eligible borrowers include: local, regional, or state governments; community-based or preservation nonprofits; revitalization organizations or developers working in certified Main Street communities; and for-profit developers of older or historic buildings.

Other Grants

Grant Program Name: Virginia Department of Housing and Community Development

Grant Program Name: Virginia Community Development Block Grants (VCDBG)

Grant Program Name: Save America's Treasures

Grant Program Name: Save America's Treasures Preservation Planning Fund

Additional Funding Options

Indoor Plumbing Rehabilitation Programs

In this program, the Virginia Department of Housing & Community Development (DHCD) contracts with sub-recipients, such as local governments, housing authorities, or nonprofits in eligible localities that administer the local program. Applicants are given zero interest, forgivable loans and loan repayments are determined by an applicant's ability to pay. The purpose of this program is to install plumbing in owner-occupied substandard houses that lack plumbing, have incomplete plumbing, or where the existing plumbing has failed. The program also supports general rehabilitation and accessibility improvement in substandard houses. For this program, the condition of the house is factored into the question, so incomes higher than 80% of the median income of the area might qualify.

StEPP Foundation Offering Funding for Projects that Benefit the Environment
The StEPP Foundation is looking to fund projects that improve air and water quality, reduce solid waste, or connect land use to the ecosystem or public health. Projects must have significant, measurable environmental benefits. Project ideas will be kept in the foundation's pipeline and may be matched to funding sources as available.

Table 5.1 Federal Funding Sources

Provisions	Emergency & Imminent Community Water Assistance Grants	Recovery Act: Build America Bonds	Southeast Rural Community Assistance Loan Fund	Targeted Watersheds Grant Program: Capacity Building	Targeted Watersheds Grant Program: Project Implementation	Water Quality Cooperative Agreements (Region 3)
Grant or Loan	Grant	Tax Credit & Direct Payment Bonds	Loan	Grant	Grant	Grant
Who can apply	Public bodies and nonprofit corporations serving rural areas	Local Government	Local Government Nonprofits	Consortia, academic institutions, Local government, nonprofits, private sector	Consortia, academic institutions, Local government, nonprofits, other groups	Consortia, academic institutions, Local government, nonprofits
What it will fund	Construct or improve drinking water facilities	Capital projects	Soil & water tests, sewer & water line extensions, system repairs & improvements, storage tank restoration	Solutions to restore and protect water sources through strategic planning & implementation	Implementing on-ground water restoration or protection projects; water quality activities	Development, implementation and demonstration of innovative approaches relating to water pollution (watershed, stormwater
Match required	None	None		Yes - 25%	Yes - 25%	None
Special Conditions	Applications obtained through state field offices	Program intended to stimulate the economy	Limited geographic eligibility - includes VA	Priority given to Great Plains, Arid West, and Appalachia	Projects must focus on implementation & measuring effectiveness	Virginia is in Region 3; Projects must be broad in scope
Income Data Required	Yes	No	Yes	No	No	No
Reporting requirements	Varies	Yes	Yes	Yes - quarterly	Yes - quarterly	Yes - quarterly
Application Due Date	Rolling	Rolling	Rolling	October	November	February
Average Award	Unspecified	Unspecified	$1,000 - $500,000	$400,000 - $800,000	$600,000 - $900,000	$50,000- $136,044
Contact	www.wdc.usda.gov Jim.Maras@wdc.usda.gov	Carla Young (202) 622-3980 U.S. Dept. of Treasury	www.sercap.org (540) 345-1184	US EPA - Office of Wetlands, Oceans, & Watersheds www.grants.gov	US EPA - Office of Wetlands, Oceans, & Watersheds www.grants.gov	US EPA - Office of Wetlands, Oceans, & Watersheds www.grants.gov

Table 5.2 State Funding Sources

Provisions	Water Quality Improvement Fund (Part A)	Water Quality Improvement Fund (Part B)	Drinking Water State Revolving Fund (Part A)	Drinking Water State Revolving Fund (Part B)	Virginia Pooled Financing Program
Grant or Loan	Grant	Grant	Grant	Loan (3% to 1% below current market rate)	Loan through bonds
Who can apply	Local Government, Soil & Water Cons. Districts, Planning district commissions, Nonprofits, Individuals	Local Government	Private and public owners of community waterworks that meet specific criteria	Public & Private owners of community waterworks and nonprofit, noncommunity waterworks	Local governments - Counties, cities, towns and water and waste authorities
What it will fund	Strategic Nonpoint Source Water Quality Initiatives; projects with statewide or regional transferability	Cooperative Nonpoint Source Pollution Programs: i.e., Stormwater retrofits, Replacement of failing septic systems	Preliminary engineering, design of plans & specifications, performance of studies, drilling test wells, technical assistance	Construction, planning & design, 1452 (k) Source Water Protection Initiatives	Construction, planning & design, revitalization
Match required	Yes - 50%	Yes - 50%	None	None	None
Special Conditions	Cannot use more than 20% for staff costs; have 2 years to expend all funds; agency prefers majority of funds for construction	Cannot use more than 20% for staff costs; have 2 years to expend all funds; agency prefers majority of funds for construction	Must serve fewer than 3,300 persons, show non-compliance with drinking water standards of other regulations or protections	No more than 30% of award may be used for forgiveness of principal	Includes access to VRA's Interim Loan Program
Income Data Required	No	No	Yes	Yes - program is for underserved, small, rural & financially stressed communities	No
Reporting requirements	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly

Provisions	Water Quality Improvement Fund (Part A)	Water Quality Improvement Fund (Part B)	Drinking Water State Revolving Fund (Part A)	Drinking Water State Revolving Fund (Part B)	Virginia Pooled Financing Program
Application Due Date	Check with Funding Agency	Check with Funding Agency	Check with Funding Agency	Check with funding agency	Rolling
Application Due Date	Check with Funding Agency	Check with Funding Agency	Check with Funding Agency	Check with funding agency	Rolling
Award Information	$25,000 to $200,000	$25,000 to $200,000	Up to $25,000	$100,000	Minimum of $500,000/maximum of $100 million
Contact	VA Dept. of Conservation & Recreation www.dcr.virginia.gov (804) 225-3785	VA Dept. of Conservation & Recreation www.dcr.virginia.gov (804) 225-3785	Virginia Department of Health, www.vdh.virginia.gov (804)864-7501	Virginia Department of Health, www.vdh.virginia.gov (804) 864-7501	Virginia Resource Authority www.VirginiaResources.org (804) 644-3331

Appendix 6 - Loudoun Water Community Systems – Operating Water and Wastewater Plants

LOUDOUN COUNTY SANITATION AUTHORITY

COMMUNITY SYSTEMS—OPERATING WATER AND WASTEWATER PLANTS

June 2007

1. LCSA's Operating Water and Wastewater Facilities

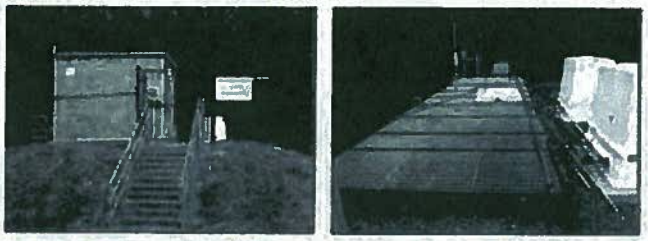
Aldie Wastewater Treatment Plant (WWTP)
Beacon Hill Water Treatment Plant (WTP)
Courtland WRF
Elysian Heights WTP & WWTP
Goose Creek WWTP
Lenah Run WTP & WWTP
Lovettsville WTP & WWTP*
Meadowkirk WTP & WWTP*
Mountain View Elementary WWTP*
Raspberry Falls WTP & WWTP
Rokeby WTP
St. Louis WWTP
Skills USA WWTP*
Waterford WWTP
Whisper Ridge Behavioral Health Center WTP & WWTP*
Willisville WWTP
Loudoun Co. Comm. Centers*: Arcola WTP & WWTP, Bluemont WTP, Lucketts WTP, Philomont WTP
Loudoun Co. Parks*: Banshee Reeks, Claude Moore, Franklin Parks WTPs

**Facilities operated on a contract basis (not owned)*

2. Wastewater Plants

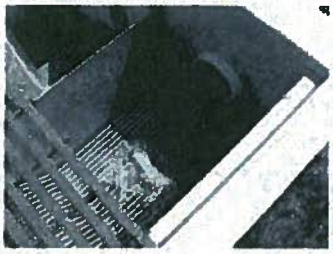
a. Aldie Wastewater Treatment Plant (WWTP)

System Type: Activated Sludge Extended Aeration
Design (Permit Flow): 15,000 gpd, average flow 3,487 gpd 2007
Disinfection Method: Ultraviolet Light
Number of Connections: actual 38, ultimate 55
Receiving Stream: Little River
Year in Service: 1997



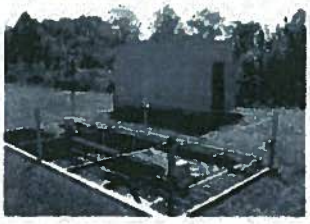
b. Elysian Heights WWTP

System Type: Activated sludge Extended Aeration
Design (Permit Flow): 120,000 gpd
Disinfection Method: Sodium Hypochlorite, Dechlorination by Sodium Bi-Sulfite
Number of Connections: actual 66, ultimate 314
Receiving Stream: Potomac River
Year in Service: 2007



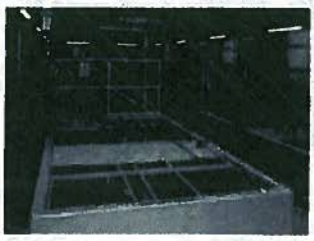
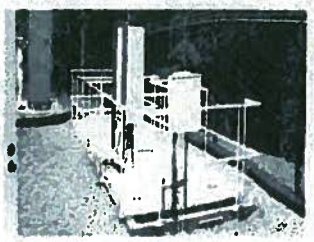
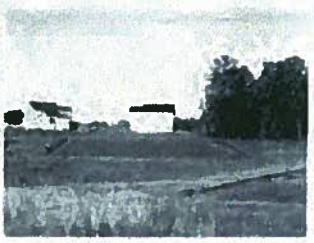

c. Goose Creek WWTP

System Type: Activated Sludge Extended Aeration (Lemna Process Pond)
Design (Permit Flow): 10,000 gpd, average flow 9,195 gpd per discharge
Disinfection Method: Calcium Hypochlorite Tablet Feeder, Dechlorination by Sodium Sulfite Tablet Feeder
Number of Connections: 12
Receiving Stream: Sycolin Creek
Year in Service: 1973




d. Lenah Run WWTP

System Type: Activated Sludge Extended Aeration, Deep Bed Denitrification, Low-pressure distribution system (drainfields)
Design (Permit Flow): 91,000 gpd, average flow 43,000 gpd 2007
Disinfection Method: Sodium Hypochlorite
Number of Connections: actual 258
Receiving Stream: Non-discharging facility – subsurface discharge
Year in Service: 2000

e. Lovettsville WWTP

System Type: Schreiber System (Activated Sludge)
Design (Permit Flow): 250,000 gpd, average flow 150,000 gpd 2007
Disinfection Method: Ultraviolet Light
Number of Connections: actual 500
Receiving Stream: Dutchman's Creek
Year in Service: 2001


f. Meadowkirk WWTP

System Type: Septic Tank followed by Re-circulating Sand Filter, Drip Dispersal System
Design (Permit Flow): 7,500 gpd
Disinfection Method: None
Number of Connections: 1 (commercial)
Receiving Stream: Non-discharging facility
Year in Service: 2007

g. Mountain View Elementary WWTP

System Type: Activated Sludge Extended Aeration Upflow Clarifier with Anoxic Zone, enhanced flow system drainfields
Design (Permit Flow): 5,000 gpd, average flow 2007 school session 3,200 gpd
Disinfection Method: none
Number of Connections: 800 student capacity
Receiving Stream: Non-discharging facility
Year in Service: 2004


h. Raspberry Falls WWTP

System Type: Sequencing Batch Reactor, Sand Filter
Design (Permit Flow): 60,000 gpd, average flow 20,000 gpd 2007
Disinfection Method: Ultraviolet Light
Number of Connections: actual 117, ultimate 180
Receiving Stream: Limestone Branch
Year in Service: 2003


i. St. Louis WWTP

System Type: Aerated Lagoon System (3 lagoons in sequence)
Design (Permit Flow): 86,000 gpd, average flow per discharge 86,000 gpd
Disinfection Method: Calcium Hypochlorite Tablet Feeder, Dechlorination by Sodium Sulfite Tablet Feeder
Number of Connections: actual 80
Receiving Stream: Beaverdam Creek
Year in Service: 1982



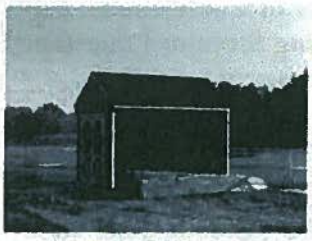
j. Skills USA WWTP (Vocational Industrial Clubs of America)

System Type: Activated Sludge Extended Aeration
Design (Permit Flow): 4,200 gpd, average flow 2,200 gpd per discharge
Disinfection Method: Sodium Hypochlorite, Dechlorination by Sodium Sulfite Tablet Feeder
Number of Connections: 1
Receiving Stream: Clark's Run
Year in Service: 1980


k. Waterford WWTP

System Type: Two Lagoon Aeration System
Design (Permit Flow): 58,000 gpd, average flow 49,000 gpd per discharge
Disinfection Method: Calcium Hypochlorite Tablet Feeder, Dechlorination Method by Sodium Sulfite Tablet Feeder
Number of Connections: actual 99
Receiving Stream: South Fork Catoctin Creek
Year in Service: 1981





l. Whisper Ridge Behavioral Health Center WWTP

System Type: Activated Sludge Extended Aeration
Design (Permit Flow): 10,000 gpd, average flow 6,400 gpd 2007
Disinfection Method: Sodium Hypochlorite, Dechlorination Method by Sodium Sulfite Tablet Feeder
Number of Connections: 1 (Commercial)
Receiving Stream: Limestone Branch
Year in Service: 1984


m. Willisville WWTP

System Type: Septic Tank followed by FAST System, Drip Dispersal
Design (Permit Flow): 3,500 gpd
Disinfection Method: none
Number of Connections: 8
Receiving Stream: Non-discharging facility
Year in Service: 2007

n. Loudoun County Community Centers and Parks:

Arcola Community Center WWTP

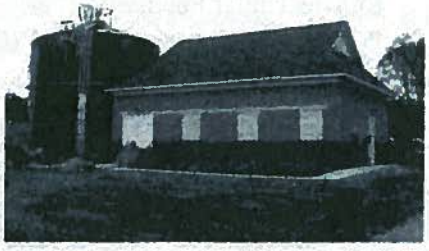
3. Water Plants

a. Beacon Hill Water Treatment Plant (WTP)

System Type: Groundwater Well System
Design Capacity: 61,200 gpd
average 31,947 gpd & maximum day 120,900 gpd 2007
Oxidation and Disinfection Method: Hypochlorination for Iron Oxidation, Potassium Permanganate for Manganese Oxidation, and Green Sand Filters for Iron and Manganese Removal
Number of Connections: actual 92, ultimate 97
Receiving Stream: Limestone Branch, UT
Year in Service: 2002

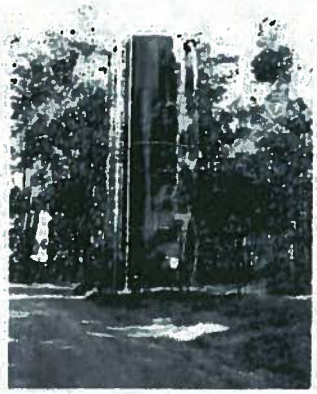
b. Elysian Heights WTP

System Type: Groundwater Well System
Design Capacity: 195,000 gpd
average 18,682 & maximum daily 81,400 gpd 2006
Disinfection Method: Sodium Hypochlorite
Number of Connections: actual 66, ultimate 314
Year in Service: 2006



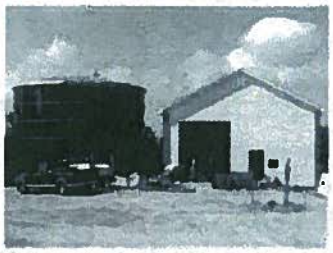
c. Lenah Run WTP

System Type: Groundwater Well System
Design Capacity: 145,969 gpd
average 95,029 gpd & maximum day 324,400 gpd 2007
Disinfection Method: Hypochlorination
Number of Connections: actual 258
Year in Service: 2000



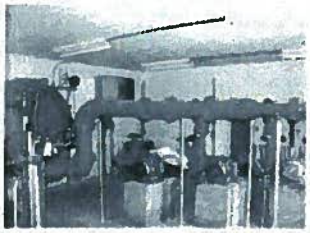
d. Lovettsville WTP

System Type: Groundwater Well System with Greensand Filters
Design (Permit Flow): 376,800 gpd
average day 120,175 & maximum day 306,800 gpd 2006
Oxidation and Disinfection Method: Sodium Hypochlorite Chlorination for Iron Oxidation, Potassium Permanganate for Manganese Oxidation, and Green Sand Filters for Iron and Manganese Removal
Number of Connections: actual 500
Year in Service: 1977 (first permit)



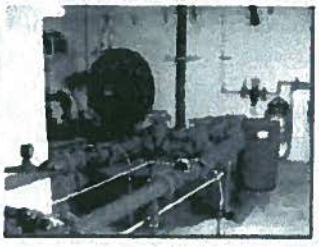
e. Meadowkirk WTP

System Type: Groundwater Well System
Design Capacity: 41,760 gpd
Disinfection Method: Sodium Hypochlorination
Number of Connections: 1
Year in Service: 2007

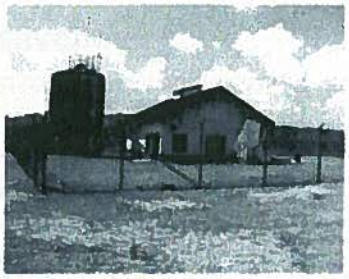


f. Raspberry Falls WTP

System Type: Groundwater Well System
Design Capacity: 139,200 gpd, average 56,667 gpd, max day 224,600 gpd 2007
Disinfection Method: Hypochlorination
Number of Connections: actual 117, ultimate 180
Year in Service: 2002



g. Rokeby WTP



System Type: Groundwater Well System
Design (Permit Flow): 49,100 gpd, average 20,289 gpd
Disinfection Method: Sodium Hypochlorite
Number of Connections: actual 57, ultimate 81
Year in Service: 2005

h. Whisper Ridge Behavioral Health Center WTP

System Type: Groundwater Well System
Design (Permit Flow): 57,600 gpd, average 10,288 gpd
Disinfection Method: Sodium Hypochlorite
Number of Connections: 1 (Commercial)
Year in Service: 1977

i. Loudoun County Community Centers and Parks:

Arcola Community Center
Bluemont Community Center
Lucketts Community Center
Philomont Community Center
Banshee Reeks Park
Claude Moore Park
Franklin Park