ABSTRACT

AN INTERNSHIP IN WATER UTILITY STAKEHOLDER RELATIONS

by Micah Vieux

This report summarizes my activities as a Community Relations Specialist for Loudoun Water, a public sewer and water service provider in Loudoun County, Virginia. During my internship, I gained valuable insights into the complexity of environmental management, the regulatory frameworks of the Safe Drinking Water Act and the Clean Water Act, and effective utility management. During my internship experience I worked on a variety of capital projects related to water supply, storage and distribution, and I produced the annual water quality report for the utility’s drinking water customers.
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SECTION 1
INTRODUCTION

Population pressure and surging demand for more water present critical challenges related to water supply planning, maintaining water quality, infrastructure replacement and development, and affordability. The water utility sector—comprised of drinking water and wastewater service providers—is largely tasked with developing constructive responses to these challenges. Increasingly, water utilities are developing new models for operational optimization, financial stability, and community sustainability with stakeholder outreach playing a larger and more important role than ever before. From the development of new rate structures to the development of innovative public-private partnerships, water utilities are becoming more visible and more active in the communities they serve. Water utilities’ “Announce and Defend” decision making paradigm is slowly being replaced by a collaborative decision making paradigm marked by open stakeholder communication and utility transparency. In Loudoun County, Virginia the local Water and Wastewater Authority, Loudoun Water, is committed to this new paradigm and sees stakeholder outreach as an essential component of effective utility management.

Employment with Loudoun Water was immediately appealing to me because their stakeholder outreach philosophy overlapped with my own. Furthermore, my talents—government relations and project management—fit their needs, and my interests—water resources and sustainability—were inherent to their service mission and community purpose. With Loudoun Water, I felt that I could leverage my policy, project management and stakeholder negotiation skills to help move forward unique and challenging initiatives like water reuse, demand management, water supply planning, and source water protection. I considered Loudoun Water to be uniquely positioned to establish novel programs, deploy best technologies and to be an innovator in utility management. After all, they were the water and wastewater service provider in one of America’s fastest growing and wealthiest counties. In sum, I imagined it to be wonderful and challenging place to work.

By securing a position with Loudoun Water, my interest in water resources and my academic focus in environmental management could finally converge. Importantly, that convergence would happen at two primary intersections of the built and natural environment: the drinking water treatment plant and the water reclamation facility. At the former,
from a nature, treated, and distributed for safe drinking; at the latter, water returns from its human uses to be cleaned once again before returning to the natural environment.

Water and wastewater utilities are responsible for operating and maintaining a community’s drinking water and sewer systems. I consider it to be among the most important services provided to any community. Its civilizing effect on public health and the environment cannot be overstated. Further, water and wastewater utilities must plan for future needs and ensure that systems operate in compliance with increasingly complex and stringent regulations, all while maintaining affordable rates. It’s a challenging endeavor, the success of which increasingly depends on interdisciplinary staff that can balance environmental management and engineering demands with tight regulatory standards and activist communities.

“…Utilities have more of an effect on the health and vitality of a community than almost any other facility or service. Cleaning and protecting Virginia’s waters is an important and enormous task. …Such actions help achieve the broader goal of restoring and maintaining the chemical, physical and biological integrity of our waters so that they can support the protection and propagation of fish, shellfish, wildlife and recreation. Wastewater treatment also contributes to the economic health of a community by providing opportunity for residential and business expansion.” (Virginia Water Environment Association, 2006)

My internship experience centered on delivering effective stakeholder relations for Loudoun Water and underscoring Loudoun Water’s contributions to community vitality. Working under the Executive Director of Stakeholder Relations, I was tasked with developing and implementing an ongoing program for communication with stakeholder interest groups in the government, private, and community sectors. My primary focus was in providing stakeholder outreach to community groups and regulatory agencies for the purpose of permitting capital projects. In this capacity I analyzed and interpreted governmental, political and citizen attitudes in relation to infrastructure planning, organizational and regulatory policy, community sustainability and public perception.
SECTION 2
ORGANIZATIONAL INFORMATION

History of Loudoun Water

Loudoun Water is headquartered in Ashburn, an unincorporated area of Loudoun County, Virginia (Figure 1). Loudoun Water provides water and wastewater services to residents in the unincorporated areas of the county. Loudoun Water is a public body, politic and corporate created and organized under the provisions of the Virginia Water and Waste Authorities Act. Loudoun Water was created by an act of the Board of Supervisors of Loudoun County, Virginia and was chartered by the State Corporation Commission on May 27, 1959. Loudoun Water was created for the purpose of acquiring, constructing, operating and maintaining water systems and wastewater treatment and sewage disposal systems for the County and to exercise the powers conferred by the State (Loudoun Water Board of Directors, 2012).

Figure 1: Loudoun Water is located in Ashburn, Virginia and provides water and wastewater services to residents in the unincorporated areas of Loudoun County east of Route 15 and south of Leesburg, Virginia.
As a Service Authority in the State of Virginia, Loudoun Water is self-sustaining and independent of tax support. Loudoun Water is funded exclusively by the fees and charges it collects for providing water and sewer services. As a not-for-profit, community-owned utility, Loudoun Water is governed by a nine-member appointed Board of Directors. Loudoun Water’s Board establishes policy, sets rates and governs how the utility operates. Rates and fees are designed to cover the cost of operating and maintaining its customer's water and sewer systems. Operations are executed by a staff of 219 employees and managed by the General Manager and Deputy General Managers for Engineering, Finance and Administration.

Originally incorporated as Loudoun County Sanitation Authority, Loudoun Water was in part to provide sewer and water service to the then-under-construction Dulles Airport, as well as to Loudoun County’s first large-scale planned community, Sterling Park. Having no infrastructure at the time of incorporation, Loudoun Water entered into a service agreement with the Town of Fairfax for drinking water from the Goose Creek Water Treatment Plant. The Authority also entered into a service agreement with the District of Columbia for use of the Potomac Interceptor which conveys wastewater to Blue Plains Treatment Plant. By 1962, Dulles Airport was operational and 290 residential accounts were being served by the utility. These customer accounts would become the foundation of the Central System, or primary service territory of Loudoun Water. Growth in Sterling Park steadily increased and by 1969 water storage was needed to satisfy state regulations. The 2 million gallon capacity Sterling Standpipe was constructed to provide daily storage and equalization, emergency storage, and fire-flow for emergency response in the community (Loudoun Water, 2009).

The story of Loudoun Water is deeply intertwined with planning and population growth in the county. By 1980, Central System customer accounts had grown from 290 accounts to 6,090. By 1985, in response to continued, consistent growth, Loudoun Water entered into an Intermunicipal Agreement with the District of Columbia to utilize up to 8.8 million gallons per day (MGD) of capacity at Blue Plains Treatment Plant. Thirty years after its creation, Loudoun Water adopted its first rate increase, initiated its first bond issuance, and purchased an additional 10 MGD of drinking water capacity from Fairfax County Water Authority (FCWA) (Loudoun Water, 2009).

In 1989, to serve its 32,000 customer accounts, Loudoun Water structured agreements to provide for its customers 20 MGD of drinking water from FCWA, as well as 7 MGD from the
City of Fairfax. At this time Loudoun Water also entered into an agreement with DCWASA, the District of Columbia Water and Sewer Authority, to increase wastewater treatment capacity at Blue Plains Water Treatment Plant to 13.8 MGD. As important as these developments were in securing the future of Loudoun County, Loudon Water’s strategic acquisition of land—352 acres along Broad Run in 1989 and 23 acres along the Potomac River in 1993—and its vision of self-reliance best demonstrated the critical role of planning in utility management (Loudoun Water, 2009).

The steady and predictable growth in customer accounts managed by Loudoun Water would soon be replaced with a housing boom and a surge in population growth. In the period from 2000 and 2010 Loudoun County would lead the nation in population and employment growth. In response, Loudoun Water began preliminary design of the Broad Run Water Reclamation Facility (BRWRF), an advanced wastewater treatment plant and pioneering water reuse facility. With nearly 48,000 customer accounts in 2004, Loudoun Water began construction on the BRWRF. Loudoun Water also entered into its fifth water service agreement with Fairfax Water (formerly FCWA) to expand treatment capacity to 30 MGD. The surge in customer accounts necessitated the construction of additional water storage tanks, as well as expansion of water distribution mains and wastewater collection lines, pump stations, pressure reducing vaults, and supervisory control and data acquisition (SCADA) equipment. In 2006, for just the second time in its history, Loudoun Water increased rates and charges for sewer and water services (Loudoun Water, 2009).

The authority had an historic year in 2008. Loudoun Water moved its administration office from Leesburg, Virginia to Ashburn, Virginia, collocating operations with the BRWRF and Operations & Maintenance Services (Figure 2). BRWRF was commissioned and began releasing reclaimed water into Broad Run. At this time, Loudoun Water also opened the Aquiary, a 3,500-square-foot environmental education center and 10-acre interpretive trail intended to help community members learn more about water’s critical role in society and the natural landscape. Finally, Loudoun Water entered into an agreement with Luck Stone Corporation to acquire quarries for future raw water storage (Loudoun Water, 2009).
Today, Loudoun Water serves over 64,000 customer accounts and is moving forward with the design of its own 20-MGD drinking water treatment plant. The drinking water treatment plant is expected to be commissioned in 2016. The treatment plant is just one element of the Potomac Water Supply Program (PWSP). Loudoun Water’s PWSP will provide sustainable drinking water that protects health, the environment and quality of life in Loudoun County while satisfying customer’s maximum daily water demand (Figure 3).
Figure 3: To meet the projected maximum daily water demand of its customers, Loudoun Water developed an Interim Water Supply Strategy to improve supply and delivery capacity. The spike in supply capacity in 2016 represents the commissioning of the PWSP drinking water treatment plant.

PWSP is not only a means for Loudoun Water to keep up with growing water demand. It is also an opportunity to bring innovation to water resource management in Northern Virginia. PWSP’s transformative element is the utilization of retired rock quarries to store billions of gallons water (Figure 4). This stored water gives customers water security in times of drought by sustaining drinking water supplies and returning flows to the Potomac River. Known as “water banking,” the water stored in the quarries will better position Loudoun Water for continued customer growth, climate resiliency and effective response to water supply emergencies.
Figure 4: Luck Stone’s Quarry A is the first “water bank” to be acquired by Loudoun Water and will have a storage capacity in excess of 1,000,000,000 gallons.

Authoritative Powers of Loudoun Water

The Water and Wastewater Authorities Act and Loudoun Water’s Articles of Incorporation provide that Loudoun Water is authorized to (Loudoun Water Board of Directors, 2012):

- Acquire, construct, reconstruct, improve, extend, own, operate and maintain any water system, or sewer system, or sewage disposal system, or any combination of such systems, within or partly within and partly without Loudoun County, Virginia;
- Issue revenue bonds to pay all or part of the cost of any of the facilities of Loudoun Water, such bonds to be repayable solely from revenues;
- Fix charge and collect rates, fees and charges for the use of its facilities or for the services furnished by any system operated by Loudoun Water in accordance with the provisions of the Act; and
- Enter into contracts or agreements with any unit including counties, cities and other authorities, relating to the furnishing of services of Loudoun Water.

**Loudoun Water Service Area Description**

Loudoun Water is chartered to serve the entirety of Loudoun County (approximately 522 square miles) with the exception of the incorporated towns. Loudoun Water currently provides public water and sewer service to the unincorporated areas of Loudoun County that are with the County’s Suburban Policy and Transition Policy Zones, primarily east of Route 15 and south of Leesburg, Virginia (Figure 5). These areas make up the Central System with Loudoun Water owning and operating all facilities necessary to serve these areas of the County. The incorporated towns within the County operate independent water and wastewater systems known as Municipal Systems. Loudoun Water also supports many Community Systems, which are self-sustaining community wells and packaged wastewater treatment plants designed to serve small-scale development such as villages, hamlets, clusters and other uses as defined by County zoning ordinances and the General Plan (Loudoun Water Board of Directors, 2012).
Figure 5: The Map of Planned Land Uses demonstrates the Loudoun County Board of Supervisors vision for growth within the county. To preserve the rural character of western Loudoun County and to encourage growth and density in eastern Loudoun County, Loudoun Water may not extend centralized water or wastewater services into the areas defined as Rural in the County General Plan.
A. Central System

The Central System includes all of the water mains (Figure 6), sewer mains (Figure 7), pumps, pipe, vaults, meters, water storage tanks and SCADA equipment needed provide water and waste water service to customers. The boundary of Loudoun Water’s Central System is determined by the County General Plan. The plan limits the extension of central utilities to two of Loudoun County’s three planning Policy Areas. Central utilities may be extended in the Suburban Policy Area and the Transition Policy Area, but not to the Rural Policy Area. As such, Loudoun Water’s Central System is generally located east of Route 15 and south of Leesburg in Loudoun County, Virginia (Loudoun County Board of Supervisors, 2011).

The Central System is divided into three pressure zones for drinking water service: the 510 Zone, 538 Zone, and 600 Zone. The numeric identifier in each pressure zone is reflective of the hydraulic grade line (expressed in feet) needed to deliver water at 40 psi of pressure when a customer opens the tap. When water passes from one pressure zone to the next, the pressure within the pipe is augmented by either a booster pump or a pressure reducing vault. Loudoun Water’s sewer collection system is predominantly a gravity-fed system with occasional force mains serving low lying areas.

Although Loudoun Water is developing its own drinking water treatment plant, it currently exists as a sequential drinking water provider, meaning that the drinking water provided by the utility is purchased wholesale and then distributed to customers. The drinking water supplied to Central System customers comes from two surface water sources: The Potomac River and Goose Creek. The Potomac River is supplemented by reservoirs in Maryland, Virginia and West Virginia through a shared supply agreement coordinated by the Interstate Commission on Potomac River Basin. Water sourced from the Potomac River is purchased from Fairfax Water. Water sourced from Goose Creek is purchased from the City of Fairfax.
Figure 6: The Central System Water Distribution Network is growing every day. Loudoun Water added 247 new water service connections in March 2013 alone.
Figure 7: The Central System Wastewater Collection Network delivers wastewater flows to DCWASA’s Blue Plains Water Reclamation Facility, as well as Loudoun Water’s BRWRF.
There are currently over 64,000 Central System customer accounts. The average daily demand for drinking water in the winter of 2012 was 18.1 MGD. The maximum daily demand for drinking water in winter of 2012 was 18.4 MGD. The average daily demand for drinking water in the summer of 2012 was 24.2 MGD. The maximum daily demand for drinking water in summer of 2012 was 36.6 MGD (Figure 8). Sewer flows returned to BRWRF averaged 4 MGD regardless of season, as Loudoun Water’s sewer flows are predominantly routed through the Potomac Interceptor and delivered to DCWASA’s Blue Plains Treatment Plant as a more cost-effective treatment option.

Population growth within the Central System first triggered the construction of the BRWRF to keep up with sewer flows. With maximum daily demand steadily increasing from 2006-2013, developing a secure and sustainable drinking water supply through the PWSP is now the primary capital project for the utility. At the current estimated cost of $400 Million, the assets developed through the PWSP are needed to provide for max day demand in 2020, estimated to be between 55 and 60 MGD. By 2040, the max day drinking water supply needs for the Central System have been projected to be as high as 90 MGD.

Figure 8: Central System daily water demand peaks in the summer months. Outdoor water use comprises 60% of daily water demand during the months June, July and August.
**B. Community Systems**

Community Systems exist primarily in the County-defined Rural Policy Zone. Loudoun Water owns or operates community systems in eleven communities (Figure 9). Community water and wastewater systems are small scale, free-standing water and wastewater systems developed to service small, rural communities. Community drinking water systems source their drinking water from a well or wells. Wastewater is treated in community systems by “package plants,” small pre-engineered, modular wastewater treatment systems. Treated wastewater from a package plant (effluent) is discharged in most cases on site or, in a few cases, to local streams.

Community system capacities for drinking water are generally limited 500 gallons per day for each customer account. Community drinking water systems are not designed to provide all of the services offered by that of the Central System, such as fire flow and water for lawn irrigation. Since the County General Plan dictates that community systems must be financially self-supporting, developing the capacity to provide for fire and irrigation uses is considered cost prohibitive.
Figure 9: Loudoun Water owns and operates eleven Community Systems.
C. Water Reuse System

The use of highly treated reclaimed water is a sustainable alternative to using drinking water for irrigation, cooling tower coolant and other non-potable uses. Reclaimed water is available from Loudoun Water’s BRWRF. Some key benefits of using reclaimed water for non-potable uses is that it conserves drinking water, reduces water withdrawals from rivers, reduces nutrient loading to the Chesapeake watershed and is a more cost effective alternative to using drinking water for non-potable applications.

Loudoun Water’s authorization to produce and distribute reclaimed water is administered by the Virginia Department of Environmental Quality (DEQ). DEQ’s Virginia Pollutant Discharge Elimination System (VPDES) permit is issued for BRWRF and the standards and conditions for producing and discharging reclaimed water are incorporated into the permit. In July 2011 Loudoun Water initiated reclaimed water service to its first reuse customer.

Figure 10: Reuse water mains, commonly called “purple pipe,” must be Pantone 522 in the State of Virginia.
Utility Governance and Management

The Loudoun Water Board of Directors are appointed to terms of up to four years by the Loudoun County Board of Supervisors, as stipulated in the Water and Waste Water Authorities Act. Members may be reappointed for additional terms. There are no limits on the number of terms a member may serve. The Board of Loudoun Water guides and monitors the values, goals and strategies of the organization by setting policy. As the governing body for the agency, the Board considers the agency’s strategic vision, principal goals, legal and financial matters, and environmental and planning strategies (Loudoun Water Board of Directors, 2012).

Policies are established in a manner to provide an adequate and economical system for its users. Conformance to federal and state statutes, health and environmental regulations, and the County Board of Supervisors’ planning and legislative mandates is paramount. The Board establishes policy and provides oversight through regular meetings of the full board and its various Committees. There are currently four standing committees of the Board: Finance, Capital Improvement Program, Personnel/Nominating, and Audit. The Board Chair may establish additional ad hoc committees for defined purposes. The Board appoints and supervises the utility’s General Manager who bears responsibility for implementing policies established by the Board and those required under various regulatory frameworks. The General Manager manages the day-to-day operations and affairs of Loudoun Water (Loudoun Water Board of Directors, 2012).
SECTION 3
INTERNSHIP EXPERIENCE

Role and Duties

Loudoun Water’s Stakeholder Relations activities are organizationally accountable to the Board, General Manager, and Deputy General Manager for Administration. The Stakeholder Relations team includes the Executive Director for Stakeholder Relations and the Community Relations Specialist. This team works as part of the General Manager’s Office to anticipate and resolve stakeholder issues related to every facet of utility management including environmental compliance, policy, permitting, planning, capital projects and technology, as well as organizational structure and finance.

As the Community Relations Specialist for Loudoun Water, I served as the sole support for Loudoun Water’s Executive Director of Stakeholder Relations. My primary role has been to strengthen the visibility, reputation and recognition of Loudoun Water through creating and maintaining relationships with stakeholders impacted by our policy, services, products or capital programs. In this capacity I initiate and develop stakeholder outreach activities for both internal and external parties. My role is to communicate complex policy, regulatory or technical information to a variety of audiences including customers, community groups, county staff, planning commissioners, county supervisors and state delegates among others. As such, my role touches most major initiatives of the organization through public and government relations and project support.

I support capital projects and land development for the Engineering Department. This support is primarily given for the Potomac Water Supply Program, Dulles North Interim Water Booster Pump Station, and 600 Zone Tanks. Specific duties range from drafting and delivering letters to stakeholders, to making public presentations for community groups and governing bodies, to negotiating easements and compensation. I also develop the annual water quality reports for the utility. This involves coordination and development of lab reports, narrative content, design, layout and production of the report to meet or exceed regulatory standards.

Less related to Environmental Management, I support the Operations and Maintenance Department by handling stakeholders issues for meter replacement (Loudoun Water is currently in the midst of replacing over 64,000 meters) and SCADA deployment. I serve on Loudoun
Water’s Emergency Response Team. I support the Finance Department by coordinating public outreach for rate increases, as well support production of the Comprehensive Annual Financial Report.

The Community Relations Specialist role also represents Loudoun Water to external stakeholders through participation in educational programs like Aquiary tours, the Loudoun Green Business Challenge, Family Stream Day, and the George Washington University Teachers in Industry Program. In addition to these activities, I represent Loudoun Water as an Interested Party on the Policy and Government Affairs Committees of Virginia Water Environment Association (VWEA) and Virginia Chapter, American Water Works Association. I currently serve VWEA’s Communications Committee as an editor and contributor for Conduit, the quarterly association magazine.

Potomac Water Supply Program

Loudoun Water’s Potomac Water Supply Program (PWSP) is a $400 million capital program aimed at developing a drinking water supply to serve the needs of Loudoun Water customers into the year 2040. I supported the PWSP by developing stakeholder outreach opportunities. Stakeholder understanding and support for capital projects is critical to the long-term success of the utility. Stakeholder outreach efforts help not only to achieve these aims, but also serve to minimize risk for projects by identifying communication improvement opportunities.

Land use plans and related demographic projections for Loudoun County have been used by Loudoun Water to forecast that 90 MGD will be needed to meet future demand in the Central System by 2035-2040, even as efforts continue to reduce peak demands through implementation of a wise water use program and proactive demand management strategies. Loudoun Water’s Potomac Water Supply Program consists of individual components: a new intake and pump station at the Potomac River; a water treatment plant located near the Dulles Greenway at Goose Creek; and raw, non-potable water storage in a quarry owned by Luck Stone Corporation located near the W&OD Trail at Goose Creek.

Through my internship experience I supported the evolution of the Potomac Water Supply Program by assisting in stakeholder outreach activities. I served as the primary point of contact for impacted landowners who would be affected by the alignment of raw water mains,
the pipes carrying water from the Potomac River to either the quarry or the treatment plant. In my capacity I was responsible for creating an FAQ website for impacted stakeholders (this website is located at: http://www.loudounwater.org/loudounwater/landownerPWSP/), identify those stakeholders, initiating contact through a certified letter, and then served as an ongoing point of contact for stakeholders with questions. I did not receive direct feedback from many of the stakeholders; however, the letters mailed to them served as the first formal contact that PWSP had with landowners along the alignment. The effort further supported a contactor tasked with negotiating easements so that the water mains could eventually be constructed.

From that point, I was tasked with drafting a general brochure and presentation banner for stakeholders to explain the purpose, vision, and program elements of the PWSP. Working with design consultants, the brochure and banner have taken many forms. Each is currently under final review; final drafts are featured on the following pages (Figures 11a, 11b, 11c, and 12).
Figure 11a: The Potomac Water Supply Program brochure cover couples PWSP the program outcome with an image of a child drinking water.
The Potomac Water Supply Program is Loudoun Water’s sustainable approach to ensuring a reliable and affordable drinking water supply for our customers. We are building pipelines and pumping stations to store water from the Potomac River in retired rock quarries and to deliver raw water directly to a new LEED® Gold certified water treatment plant. The new water treatment plant will supplement our current water supply by cleaning and delivering up to 20 million gallons of healthy drinking water per day. The Potomac Water Supply Program is the result of years of planning to provide clean drinking water while protecting our environment, economy, and quality of life.

Figure 11b: The Potomac Water Supply Program brochure gatefold features project engineers at the future site of Loudoun Water’s drinking water treatment plant. The gatefold narrative underscores the environmental, economic and social dimensions of sustainability.
I continue to support the PWSP team in coordination with consultants BrandPlanet and Apertures, Inc. Together we are developing a formal stakeholder outreach plan, messaging platforms, and a suite of products to improve support and minimize risk for PWSP. Most recently, I created a new draft website (http://mvieu3.wix.com/pwsp#!/) to serve as “the face” of PWSP. Aimed at making technical information understandable to a lay audience, the effort is representative of many of Loudoun Water’s stakeholder outreach efforts.
Figure 12: The Potomac Water Supply Program banner will be used as a visual aid in public presentations.
Dulles North Interim Water Booster Pumping Station

The Dulles North Interim Water Booster Pumping Station project is a mission-critical capital program that will ensure reliable water pressure for Loudoun Water’s customers. I lead stakeholder outreach efforts for the project to ensure project permitting, acquisition of easements, and open communication with government and community interests.

Water supply planning is an overarching goal for Loudoun Water. Supply is fundamentally important, as is treatment, to successfully meeting customer demand for drinking water. However, assets for water distribution are of equal importance. Growth in Fairfax County, home of Loudoun Water’s primary water supplier, along with expansion of the regional rail system has necessitated that Loudoun Water upgrade its first feed pump station capacity for the 510 Zone by the Summer of 2013. Predictable water pressures can no longer be guaranteed by our supplier, Fairfax Water, during the summer months when water use as its highest levels. In April 2012, Loudoun Water filed an application with Loudoun County to build the needed pumping station to boost the pressure back to its current level in order to ensure that adequate pressure and fire flow service was maintained for Loudoun Water customers throughout the Central System.

The initiative to construct this pump station has been dubbed the Dulles North Interim Water Booster Pump Station (DNIWBPS) project. At the project site for DNIWBPS, Loudoun Water is connected to Fairfax Water’s drinking water system via a 36-inch transmission main and two underground valve pressure reducing vaults. These assets have been in place on a small vault easement located in the Chatham Green Condominium (Chatham Green) since 1993.

The Chatham Green property was chosen as the site for DNIWBPS because of its proximity to the existing waterline that serves Loudoun County and the fact that additional time and resources would not need to be expended in extending waterlines to a more distant location. To meet the long term needs of Loudoun County residents, a permanent pump station is being planned, either in Loudoun County or cooperatively along with Fairfax Water in Fairfax County. However, it was not possible to finish the analysis, site selection, design, and construction within the timeframe needed to bring the pump station online by the summer of 2013. The interim pumping station is expected to remain in operation for the next 10 to 15 years.

While construction of the pump station is a permitted use on the parcel, County Planning Department staff determined that a Commission Permit was necessary for this project. As such, I
began work with a Loudoun Water Senior Planner and Senior Engineer to initiate stakeholder outreach activities to both secure the commission permit from the County and to secure the site for the project from Chatham Green. As a key team member on this project, I supported a variety of county land use planners, planning consultants and engineering consultants to develop site plans and designs for the pump station. These site plans, building renderings, and pump station characteristics were shared with community and government stakeholders in an iterative fashion (Figure 13). Ultimately, County Planning Staff, the District Planning Commissioner, County Supervisor and Chatham Green Condominium Association had to be satisfied with all aspects of our proposed project.

Figure 13: The DNIWBPS easement plat defines the metes and bounds of the property use easement granted to Loudoun Water.
Loudoun Water was awarded a Commission Permit (CMPT) by Loudoun County, and was lauded as “a model for stakeholder involvement” by County Supervisor, Eugene DelGaudio. This professional achievement and recognition helped to establish my reputation within the organization as a capable and committed team member. In addition to supporting the CMPT, I worked with our internal team to develop a County mandated floodplain boundary study and floodplain adjustment to support the use on the condominium parcel. Once the CMPT was issued, I had to work toward securing the project site.

Doing so entailed numerous meetings with Chatham Green to win their Board’s support for our project. Specifically, I was tasked with securing an expanded easement from Chatham Green. The pumping station needed to be located in the easternmost portion of an area approximately 1.49 acres in size, which was open space owned by Chatham Green. The parcel was encumbered by a number of existing easements: Loudoun Water sanitary sewer, water, access and maintenance easements, as well as a Loudoun County stormwater easement. The existing water transmission main, which serves as the entry point for water from Fairfax County and Loudoun Water’s two existing valve vaults were located within the existing easement area.

The proposed pumping station was to be contained in a 30’ by 60’ building sited within the easement area I was trying to secure. As a result of negotiation with Chatham Green, the building will be acoustically treated to address noise from pumping operations. A total of nine evergreen trees will be displaced by construction, but tree cover between the residential building and the pump station and in the floodplain area to the south will remain. Most important to the Planning Commissioner, the building had to be architecturally compatible with nearby development (Figure 14).

Securing the easement ultimately took several rounds of negotiation before fair terms could be agreed upon. I then worked with Chatham Green to gain endorsement of the floodplain alteration and coordinated their deed of vacation with Loudoun County. To supply power to the site, I worked with the adjacent commercial property owner, Bowl America, and Dominion Virginia Power to develop a powerline easement. This easement was also recently granted, meaning Loudoun Water can lay the duct bank to feed electricity to the pump station.

Today, the project is underway. Crews are working 12-hour shifts, 5 days per week to aggressively reroute the water transmission line (Figures 15 and 16). Yard piping will follow, along with foundations, building construction and pump integration. Foundational stakeholder
work to ensure environmental compliance, community support and government buy-in was fundamental to getting the project started and remains central to the ongoing success of the project. While it is early in the timeline, the project is on schedule and should deliver the needed upgrades to our customers by August of 2013. Throughout the construction period I will monitor best management practices (BMPs) to ensure contractor compliance with all laws and agreements (Figure 17).

Figure 14: The DNIWBPS Site Plan Concept was vetted through the Chatham Green Board, the District Planning Commissioner, and the District Supervisor before Loudoun Water approached Loudoun County Department of Planning for a formal Site Plan Amendment.
Figure 15: Before the pump station construction could begin crews had to expose the existing 36” water main and affix a tee-segment so that the pipe could tie-in to the pump station.

Figure 16: This image reveals the pipe cutting necessary to prepare the water mains for tie-in. Pipe segments and valves are meticulously cleaned and disinfected prior to commissioning.
Figure 17: The silt fence is a stormwater best management practice in use at the DNIWBPS construction site. The drainage ditch on the other side of the silt fence conveys water to Sugarland Run, which in turn empties into the Potomac River.

The 600 Zone Water Tanks

Construction of the 600 Zone Water Tanks is necessary to ensure adequate water storage for our growing customer base. I lead stakeholder outreach efforts to support this project by developing and delivering presentations to community stakeholders and by coordinating regular meetings with the County Supervisor who represents community interests in and around the project site.
Water storage facilities are essential components of a water distribution system. They supply water to satisfy daily peak-hour customer water demands and accommodate additional reserves for emergency and fire flow conditions. Water storage facilities can help to maintain water service to customers in the event of disruptions elsewhere in the system. They are also needed to satisfy Virginia Department of Health (VDH) water storage standards. Elevated water storage facilities are typically sited in a central location of the area to be served, proximate to the water supply source, and at the highest possible ground elevation so as to minimize tank height and reduce energy requirements as water is distributed throughout the system by gravity flow.

Water distribution systems that are located in an area with widely varying elevations, such as Loudoun Water’s Central System, are usually divided into more than one pressure zone so as to provide customers with water at the desirable pressure in each zone. Loudoun Water’s 2002 Water Utility Master Plan established three service pressure zones in the Central Water Supply System. The three zones were established based on hydraulic grade lines at elevations of 510, 538 and 600 feet above sea level. Elevated water storage tanks have been constructed to serve Loudoun Water’s 510 and 538 pressure zones. The initiative to construct 600 Zone tanks was unveiled to the public on November 19th, 2012 at a public meeting with stakeholders—most of whom would not be served by the tanks because their properties were located in the Loudoun County’s Rural Policy Zone.

A parcel of land within The Grant at Willowsford subdivision was identified as the optimal site for locating the 600 Zone Tanks. The parcel occupies a central location within the 600 Zone, was generally free of environmental permitting concerns and demonstrated sufficient elevation upon which to site water storage tanks. Further, the site is also located equidistant to two water sources: the Brambleton and Dulles South pump stations.

Loudoun Water analyzed two sites within The Grant at Willowsford before determining the location for the proposed water storage tanks. One site was located in the northeastern portion of the subdivision near Evergreen Mills Road. Another site was the Application Property, located in the southwestern portion of the subdivision. Both sites were located at high elevations for the area. Tanks located at either location would be visible from public roadways. The south site was identified as the preferred site because no trees would have to be cleared for tank construction, and it would ultimately be more accessible to future public roads as build-out occurred. The site was also more centrally located within the 600 Zone service area (Figure18),
Figure 18: The map of Loudoun Water pressure zones indicates that the majority of Loudoun Water’s customers are served in the 510 and 538 pressure zones. Water storage in the 510 and 538 zones is primarily served by the Dulles South, Brambleton and Broadlands water tanks. The proposed 600 Zone Water Tanks will be centrally located within the zone to optimize pump efficiencies.
The proposed tank height of 188 feet was determined by three factors: hydraulic grade line of 600 feet above sea level, actual tank height and height of appurtenant structures, and the potential need for site grading to accommodate a flat surface for construction of the two tanks. The proposed water storage tanks will be located over 320 feet from existing residential lots located to the west, and over 188 feet from any future residences within The Grant at Willowsford (Figure 19).

Figure 19: The 600 Zone Water Tanks project location map illustrates the close proximity of the proposed tank site to existing and planned development.

My role in supporting this project was to initiate stake holder outreach to area residents at a public meeting. The meeting for determining the project location drew over 50 local residents, as well as the County Supervisor. Loudoun Water’s intended site was strongly objected to during the meeting and subsequently a citizens’ opposition group was formed (Move The Towers Coalition, 2013). The Supervisor for the District, in response to constituent concerns, has also become deeply involved in the siting issue.
My job has been to coordinate communication with these interests as Loudoun Water generates additional alternative to the proposed tank site. Since the formation of the opposition group, Loudoun Water has initiated a review of 65 alternative properties, 5 of which emerged as potentially viable sites. Negotiation with landowners has narrowed the viable sites down to a single property suitable as an alternative tanks site location.

Loudoun Water’s Land Development Program has moved forward with a term-sheet for the alternative location property owner. Should the acquisition of the alternative site fall through, Loudoun Water will move forward with permitting the original proposed site.

**Water Quality Reports**

Drinking water quality reports demonstrate to customers that the water they are consuming meets or exceeds regulatory standards for quality. The report is an important assertion that product quality is consistent with recognized health and safety standards. I developed the 2013 water quality reports for Loudoun Water.

The SDWA requires drinking water providers to annually issue a water quality report to its customers. This report, formally known as the Consumer Confidence Report (CCR), includes detailed information about SDWA regulations, federally designated MCLs, laboratory analysis of required parameters, source water assessment information and, if applicable, notices of SDWA violations.

The United States Environmental Protection Agency (USEPA) issued new rules regarding production and distribution of the CCR in 2013. Drinking water providers are able to avoid publishing CCRs for each bill-paying customer. Instead customers may be directed to a URL where a .pdf of the report resides (USEPA, 2013). Preparation for e-distribution of the CCR involved my participation in a USEPA webinar on the rule change, as well as a regional round table of Northern Virginia drinking water providers that collectively participated in an American Water Works Association webinar on the topic.

Through collaboration with Loudoun Water’s Water Quality Manager, it was decided that Loudoun Water would attempt to be the first drinking water provider in the region to attempt e-distribution of the CCR. A work with Loudoun Water’s Water Quality Manager to produce water quality reports for Loudoun Water’s Central System and for its seven Community Systems that provide drinking water. I initiated layout and design of the report, wrote all narrative content and
coordinated many vendors in this effort. This involved bill stuffer design of CCR availability notification, printing services for bill stuffer, inclusion of CCR notification in monthly, quarterly, and e-billing statements, design of CCRs, Spanish translation of CCR, and print publication of CCRs.

The regulatory deadline for CCR distribution is July 1st of each year. Through ambition, strong collaboration, and project management techniques, I transformed the 2013 CCR from concept to reality in 5 weeks and make the report (Figure 20) available to Loudoun Water Customer on April 1st, 2013. The copy of the Central System CCR can be found online at: http://www.loudounwater.org/uploadedFiles/WQReport.pdf.

![2013 Drinking Water Quality Report](http://www.loudounwater.org/uploadedFiles/WQReport.pdf)

Figure 20: Loudoun Water’s Central System Water Quality Report is now accessible online.

**Regulatory Frameworks and Primacy Agencies**

To be successful in my position, and ultimately to be of value to the stakeholders I work with, I had to master the laws and regulations affecting drinking water and wastewater service providers. Service Authorities such as Loudoun Water are highly regulated by federal and state agencies. All work performed at Loudoun Water takes place in the context of permitted activity,
regulated process and regulatory consequences. Simply put, understanding and compliance of regulation and permitted activity is fundamental to effective utility management.

A. Drinking Water Regulations

Loudoun Water permits its drinking water facilities through the Virginia Department of Health (VDH). VDH is the primacy agency for drinking water in the State of Virginia. As such, VDH holds the regulatory authority in the state to monitor and enforce compliance with the federal Safe Drinking Water Act (SDWA). The SDWA of 1974 established limits for contamination in drinking water. The SWDA was amended in 1986 and 1996 and requires many actions to ensure the safety of drinking water, as well as the protection and health of its surface water and ground water sources.

“Originally, SDWA focused primarily on treatment as the means of providing safe drinking water at the tap. The 1996 amendments greatly enhanced the existing law by recognizing source water protection, operator training, funding for water system improvements, and public information as important components of safe drinking water. This approach ensures the quality of drinking water by protecting it from source to tap.” (USEPA, 2012)

As with all state primacy agencies, the standards developed by VDH must be at least as stringent as those established by USEPA. The State of Virginia drinking water standards have been “adopted by reference,” meaning they are the same as the USEPA standards defined in the Safe Drinking Water Act.

Drinking water standards are formally known as the National Primary Drinking Water Regulations (NPDWRs). These are legally enforceable standards that apply to all public water systems. NPDWRs aim to protect public health by limiting the levels of contaminants in drinking water. NPDWRs do this by establishing Maximum contaminant Levels (MCL) and Maximum Contaminant Level Goals (MCLG) (USEPA, Drinking Water Contaminants, 2012).

A MCLG establishes the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals. MCL establishes the highest level of a contaminant that is
allowed in drinking water. Per USEPA directive, MCLs are set as close to MCLGs as feasible using the best available treatment technology. While USEPA takes financial burden into consideration when establishing MCLs, ultimately all drinking water providers must meet the standards that it sets forth. Currently, the NPDWRs establish MCLs and MCLGs for 7 microorganisms, 3 disinfectants, 4 disinfection byproducts, 16 inorganic chemicals, 54 organic chemicals and 4 radionuclides (USEPA, Drinking Water Contaminants, 2012).

Loudoun Water reports results of its analytical data and laboratory testing of drinking water to VDH. If these results indicate that our drinking water is in violation of the established standards, then federal law compels the utility to notify consumers that a violation of regulations has occurred. It is also likely that an enforcement action will be taken against the utility. With the aim of transparency for utility customers, the SDWA requires that utilities provide customers with an annual water quality report called a Consumer Confidence Report (CCR). This report details the previous year’s water quality and must be made available to customers by July 1st of each year.

The SDWA also establishes National Secondary Drinking Water Regulations (NSDWRs). Unlike NPDWRs, NSPWRs are non-enforceable guidelines regulating contaminants that may cause cosmetic effects or aesthetic effects in drinking water. USEPA recommends secondary standards to water systems but does not require systems to comply. States may choose to adopt these as enforceable standards (USEPA, Drinking Water Contaminants: NSDWR, 2012). Virginia has not done so.

In addition to standards and criteria developed by federal legislation, administrative rulemaking from USEPA also regulates many other aspects of drinking water compliance. For example, USEPA, in an effort to maintain public health protection while reducing regulatory burden, recently revised the Total Coliform Rule. In doing so, they have introduced an improved framework for developing approved sampling plans, determining monitoring and reporting frequencies, establishing analytical methodology, classifying violations by tier (Tier 1 is an MCL Violation, Tier 2 is a Treatment Technique Violation, and Tier 3 includes Monitoring and Reporting Violations), notifying the public, and keeping records (USEPA, Water: Total Coliform Rule, 2013).

Similarly, USEPA rulemaking established new practices for distribution of the CCR in 2013. For the first time, utilities will be able to forgo publishing and directly distributing a CCR
to each bill-paying customer. Under the new rule, utilities may notify their customers that their CCR is available online if they provide a direct URL to the report. Utilities may also directly email the report to customers if they have the necessary information to do so (USEPA, CCR Rule, 2013).

B. Wastewater Regulations

Congress enacted the Federal Water Pollution Control Act (FWPCA) in 1948 to “enhance the quality and value of our water resources and to establish a national policy for the prevention, control and abatement of water pollution.” The FWPCA of 1948 and was amended in 1956, 1965, 1966 and 1972. The 1972 amendments to the FWPCA restructured the authority for water pollution control by consolidating authority from 11 agencies and granting sole authority to the Administrator of USEPA. In 1977, the FWPCA was again amended and became known as the Clean Water Act (CWA) (Virginia Water Environment Association, 2006).

The CWA established the basic structure for regulating discharges of pollutants into the waters of the United States by making it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. Section 402 of the CWA established the National Pollutant Discharge Elimination System (NPDES) permitting system to control these point source discharges. The CWA also contained requirements to set water quality standards for all contaminants in surface waters.

Important to wastewater service providers and local governments, the CWA originally funded the construction of sewage treatment plants as part of its construction grants program. However, in 1987 revisions to the CWA phased out the construction grants program and replaced it with the State Water Pollution Control Revolving Fund, more commonly known as the Clean Water State Revolving Fund (CWSRF). Today, this revolving fund, capitalized by federal appropriation, provides long-term, low interest loans for the construction of treatment facilities. CWSRFs are administered by state agencies. These agencies make construction and improvement loans available through competitive and needs-based approaches. Access to CWSRFs capital allows wastewater utilities to avoid bond issuances and, in some cases, rate increases (Virginia Water Environment Association, 2006).

In the Commonwealth of Virginia, the CWA established the legal framework for regulating pollutant discharges to waters of the state. As with the SDWA, USEPA establishes the
criteria for compliance with CWA provisions. In Virginia, primacy over CWA programs has been granted to the WCB and the Department of Environmental Quality (DEQ), under the leverage of the State Water Control Law (SWCL) and Virginia Pollutant Discharge Elimination System Permit (VPDES). These agencies and regulations manage CWA programs in Virginia and use the VPDES permitting process to enforce environmental mandates (Virginia Water Environment Association, 2006).

The Virginia State Water Control Board was established in 1946 to regulate wastewater discharges into Virginia’s rivers. After the passage of the FWPCA in 1972, the WCB became the delegated Commonwealth of Virginia agency to administer the Clean Water Act. In 1992, the DEQ was created and incorporated the WCB staff. The WCB, however, continues to have responsibility for administering SWCL. The WCB is made up of seven Virginia citizens appointed by the governor. Virginia law requires the WCB to meet at least four times per year (Virginia Water Environment Association, 2006).

The WCB issues individual VPDES permits to wastewater facilities. Permit requirements, special conditions, effluent limitations and monitoring requirements are determined for each facility on a case-by-case basis in order to meet applicable water quality standards. VPDES permits durations are generally 5 years, after which applications are submitted for permit renewal (Virginia Water Environment Association, 2006).

The first step in establishing a VPDES permit is assessing the water body that is to receive reclaimed water discharges. Waters are assessed for criteria such as:

- **Use Designation:** Use designation defines the primary uses for a water body. This uses may include swimming, fishing, and consumption among others. Water bodies are categorized based on water quality and their ability to support designated uses. Permit discharge limits are influenced by the use designation of receiving waters. Category I waters support all uses while Category V waters are considered impaired and require stronger protection through more stringent permit requirements.

- **Water Quality Standards:** Water quality standards are developed by generating a detailed water quality analysis. These standards create the baseline for developing the discharge limits allowable by a VPDES permit.

- **Load Allocations:** Once a water quality standard has been developed, specific allocations are established for a wide range of pollutants so that the water quality standard can be
met. Load refers to the number of pounds of pollutant that are discharged to a water body over a specific period of time. A load allocation is the amount of pollutant that a water body can safely assimilate over a period of time. This part of the process is very technical and often includes complex predictive modeling. Typical examples of permit parameters include:

- **Dissolved oxygen**: a direct measurement of the amount of oxygen available for organisms to use for respiration.
- **Biochemical oxygen demand (BOD5)**: tests the strength of wastewater based on the combined oxygen demand of chemical and/or microorganisms.
- **Total suspended solids**: quantifies the amount of solids in water determined by filtration.
- **Bioassay**: a “catch-all” test where organisms are exposed to a wastewater discharge and the impact on mortality and reproduction is measured.
- **Metals**: pollutants such as lead, copper, and mercury that can cause negative environmental or health effects.
- **Flow**: the amount of daily discharge. Flow is important as it is used to determine pollutant load discharged by the facility.
- **Disinfection**: treatment required of most wastewater plants to kill bacteria and disease causing organisms. Disinfection treatment techniques involve the use of chlorine, chloramines and ultraviolet light.
- **Nutrients**: nitrogen and phosphorous are of major environmental concern. Excessive nutrients can lead to algae blooms and abnormally high oxygen demands. (Virginia Water Environment Association, 2006)

Once the DEQ determines what pollutants to limit and in what quantities, a VPDES permit is drafted. The draft permit is given to the applicant and to USEPA for parallel review. The Code of Virginia, Section 9 VAC 25 Chapter 15, authorizes mediated dispute resolution for VPDES permits. However, most disputes are resolved by informal negotiation. After any changes have been enrolled into the draft permit, the draft permit is advertised to the public and the DEQ solicits public comment. A formal public hearing may be held on the draft permit if public comment is strong. DEQ can and will make modifications to the draft permit based on the
public. After all stakeholders have acted to modify the draft permit, the WCB will then be asked by the DEQ to take formal action. The WCB can issue the permit as recommended by the DEQ, approve a permit with modifications, or simply not issue the permit. Applications to renew VPDES permits must be submitted six months prior to the permit expiration date. All conditions of VPDES permits are re-evaluated during each process of permit renewal (Virginia Water Environment Association, 2006).

VPDES permit holders are required to monitor and analyze their facility’s discharge on a regular basis and explain any test results that are out of compliance with the terms of the permit. The Discharge Monitoring Report is the USEPA-established reporting protocol requiring VPDES permit holders to submit facility discharge test results on a monthly basis. The DEQ has a division to monitor these reports and take action when noncompliance occurs.

Penalties for not meeting permit limits vary greatly. The DEQ has a point system that triggers an official notice of noncompliance to permit holders and their customers. While minor infractions do not typically trigger action by the DEQ, chronic or severe violations result in strong penalties. Penalties can range from a Letter of Agreement to heavy monetary fines and judicial dictates. A commonly used judicial tool to remedy noncompliance is the Consent Order. A Consent Order dictates specific steps a VPDES permit holder must take to come into compliance. Typical elements of a Consent Order include requirements for improvements, interim effluent limits, time tables to achieve compliance, penalties, and provisions to be taken if the Consent Order is not followed. The goal of a Consent Order is to force improvement and accountability (Virginia Water Environment Association, 2006). The VPDES discharge permit limits for Loudoun Water’s BRWRF are below (Table 1).
Table 1: BRWRF VPDES Discharge Permit

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>DISCHARGE LIMIT</th>
<th>MONITORING</th>
</tr>
</thead>
<tbody>
<tr>
<td>COD - Chemical Oxygen Demand</td>
<td>15 mg/l per week</td>
<td>once daily</td>
</tr>
<tr>
<td></td>
<td>10 mg/l per month</td>
<td></td>
</tr>
<tr>
<td>TSS - Total Suspended Solids</td>
<td>1.5 mg/l per week</td>
<td>once daily</td>
</tr>
<tr>
<td></td>
<td>1.0 mg/l per month</td>
<td></td>
</tr>
<tr>
<td>TKN - Total Kjeldahl Nitrogen</td>
<td>1.5 mg/l per week</td>
<td>once daily</td>
</tr>
<tr>
<td></td>
<td>1.0 mg/l per month</td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td>0.5 NTU Monthly average</td>
<td>every eight hours, three daily</td>
</tr>
<tr>
<td>Ph</td>
<td>6.0 - 9.0</td>
<td>once daily</td>
</tr>
<tr>
<td>DO - Dissolved Oxygen</td>
<td>6.0 mg/l minimum</td>
<td>once daily</td>
</tr>
<tr>
<td>TP - Total Phosphorus</td>
<td>0.15 mg/l per week</td>
<td>once daily</td>
</tr>
<tr>
<td></td>
<td>0.1 mg/l per month</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3,350 lb. annual total</td>
<td></td>
</tr>
<tr>
<td>TN - Total Nitrogen*</td>
<td>4.0 mg/l</td>
<td>Average annual limit</td>
</tr>
<tr>
<td></td>
<td>134,005 lb annual total</td>
<td></td>
</tr>
<tr>
<td>E. coli</td>
<td>&lt; 2 n/100 mls</td>
<td>once daily</td>
</tr>
</tbody>
</table>

NTU = nephelometric turbidity unit

Biosolids and residuals are byproducts of wastewater treatment plants. Residuals are products such as grit, scum, rags and other solid debris that is screened out during the wastewater treatment process. Residuals are disposed of at landfills. Biosolids consist of primary and waste activated sludge that has been processed to reduce pathogens. Biosolids are generally land-applied for beneficial reuse on agricultural or forested lands (Virginia Water Environment Association, 2006).

In 1987, the CWA was amended by the addition of Section 405 to govern the disposal and use of biosolids. Section 405 established the formal program to reduce potential
environmental risks and to maximize beneficial uses of biosolids. Following comprehensive evaluation of pollutants contained in biosolids, the USEPA promulgated Part 503, the Biosolids Rule, in 1993. Part 503 established metals limits in biosolids, as well as management practices, reporting and record keeping requirements. Part 503 also created definitions for Class A and Class B biosolids. Class A biosolids must be void of detectable pathogen levels and must meet vector attraction reduction requirements. Class A biosolids are can be thought of as pasteurized. Class B biosolids may contain low levels of pathogens while also meeting vector attraction reduction requirements. Roughly 83% of biosolids generated from municipal wastewater treatment plants nationwide is land applied (Virginia Water Environment Association, 2006).

Disposal of biosolids in municipal landfills is regulated under 40 CFR Part 258. Under this regulation, biosolids can be approved by the governing state agency as a cover material in landfills. About 17% of biosolids generated from municipal wastewater treatment plants nationwide is disposed of in municipal landfills. In Virginia, state and local solid waste management regulations are applied to biosolids acceptance in landfills, meaning that biosolids must meet minimum requirements for quality and solids content (Virginia Water Environment Association, 2006).

Virginia has established site-specific biosolids management practices that go above and beyond the EPA’s Part 503 Rule. The site restrictions take into account items such as soil conditions, fertilizer requirements for crops, drainage patterns, and proximity to ponds, lakes, rivers or groundwater. Buffers set minimum distances between the biosolids application site and streams, wells, dwellings, roads and property lines. While all biosolids must meet federal and state standards for safety, the requirements for buffers provide an extra layer of protection to prevent negative environmental impacts, minimize public exposure and reduce potential nuisances to adjacent property owners (Virginia Water Environment Association, 2006).

VDH and the DEQ administer biosolids land application permit programs. The Virginia Supreme Court ruled in 2001 that localities may not chart local ordinances that conflict with or undermine Virginia’s comprehensive statewide program. However, the Virginia General Assembly has supported the rights of local authorities to address specific issues, while maintaining the uniform statewide programs. Virginia counties may now pass a local biosolids ordinance, as well as assign a monitor and test for environmental impacts resulting from land application of biosolids. Local biosolids monitoring activities can include reviewing permits,
performing site inspections, verifying sign notices and buffer distances, and collecting and testing samples (Virginia Water Environment Association, 2006). Biosolids from Loudoun Water’s BRWRF are regulated based on VPDES permit information below (Table 2).

**Table 2: BRWRF VPDES Biosolids Permit**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>AVG</th>
<th>MAX</th>
<th>MONITORING FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>672 SOLIDS, TOTAL, AS PERCENT</td>
<td>NL</td>
<td>****</td>
<td>Bi-Monthly</td>
</tr>
<tr>
<td>680 ARSENIC, SLUDGE</td>
<td>41</td>
<td>75.0</td>
<td>Bi-Monthly</td>
</tr>
<tr>
<td>682 ZINC, SLUDGE</td>
<td>2800</td>
<td>7500</td>
<td>Bi-Monthly</td>
</tr>
<tr>
<td>683 LEAD, SLUDGE</td>
<td>300</td>
<td>840</td>
<td>Bi-Monthly</td>
</tr>
<tr>
<td>684 NICKEL, SLUDGE</td>
<td>420</td>
<td>420</td>
<td>Bi-Monthly</td>
</tr>
<tr>
<td>685 MERCURY, SLUDGE</td>
<td>17</td>
<td>57</td>
<td>Bi-Monthly</td>
</tr>
<tr>
<td>686 COPPER, SLUDGE</td>
<td>1500</td>
<td>4300</td>
<td>Bi-Monthly</td>
</tr>
<tr>
<td>687 CADMIUM, SLUDGE</td>
<td>39</td>
<td>85</td>
<td>Bi-Monthly</td>
</tr>
<tr>
<td>688 LEVEL OF PATHOGEN REQUIREMENTS ACHieved</td>
<td>****</td>
<td>****</td>
<td>Once per year</td>
</tr>
<tr>
<td>689 DESCRIPTION OF PATHOGEN OPTION USED</td>
<td>****</td>
<td>****</td>
<td>Once per year</td>
</tr>
<tr>
<td>690 VAR OPTION USED</td>
<td>****</td>
<td>****</td>
<td>Once per year</td>
</tr>
<tr>
<td>697 SELENIUM, SLUDGE</td>
<td>100</td>
<td>100</td>
<td>Bi-Monthly</td>
</tr>
<tr>
<td>693 ANNUAL PRODUCTION TOTAL</td>
<td>NL</td>
<td>NL</td>
<td>Once per year</td>
</tr>
<tr>
<td>694 ANNUAL AMOUNT LAND APPLIED</td>
<td>NL</td>
<td>NL</td>
<td>Once per year</td>
</tr>
</tbody>
</table>

NL = No limit
Loudoun Water’s reclaimed water is wastewater that has been highly treated to remove pollutants and pathogens that may be harmful to the environment or public health. Reclaimed water can be reused for a variety of purposes that don’t require water to be of potable quality. The DEQ regulates reclamation and reuse of wastewater based on criteria defined in the Water Reclamation and Reuse Regulations, 9VAC25-740-10 et seq.

Reclaimed water may be produced from either industrial or municipal wastewater. For municipal waterworks there are two sets of treatment standards: Level 1 and Level 2. Reclaimed water meeting Level 1 standards is suitable for reuse where there is potential for public contact. Thus, attaining Level 1 standards means the reclaimed water is more aggressively treated and disinfected. Reclaimed water meeting Level 2 standards is not as highly treated as Level 1 and is suitable for reuses where there is little or no potential for public contact. Loudoun Water currently distributes Level 2 reclaimed water to supply irrigation water and to supply water to recirculating cooling towers (Virginia General Assembly, 2008). VPDES permit limits for BRWRF’s water reuse program are featured in Table 3.
Table 3: Loudoun Water’s BRWRF VPDES Reclaimed Water Permit.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>DISCHARGE LIMIT</th>
<th>MONITORING FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>≤ 11 n/100 mls</td>
<td>5D/W Once daily grab</td>
</tr>
<tr>
<td></td>
<td>CAT: 35 n/100 mls</td>
<td>10:00 am to 4:00 pm</td>
</tr>
<tr>
<td>pH</td>
<td>6.0 - 9.0</td>
<td>Once daily - grab</td>
</tr>
<tr>
<td>BOD₅</td>
<td>≤ 10 mg/L</td>
<td>Monthly - grab</td>
</tr>
<tr>
<td>COD</td>
<td>≤ 50 mg/L</td>
<td>Once Daily - grab</td>
</tr>
<tr>
<td>Turbidity</td>
<td>≤ 2.0 NTU</td>
<td>Continuous - recorded</td>
</tr>
<tr>
<td></td>
<td>CAT: &gt; 5.0 NTU</td>
<td></td>
</tr>
<tr>
<td>Reclamation System Flow</td>
<td>Monthly MGD Average: NL</td>
<td>Continuous - TIRE</td>
</tr>
<tr>
<td></td>
<td>Monthly MGD Maximum: NL</td>
<td></td>
</tr>
<tr>
<td>Influent Flow</td>
<td>Monthly MGD Average: NL</td>
<td>Continuous - TIRE</td>
</tr>
<tr>
<td></td>
<td>Monthly MGD Maximum: NL</td>
<td></td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>NL</td>
<td>Once daily – 24 HC</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>NL</td>
<td>Once daily – 24 HC</td>
</tr>
</tbody>
</table>

CAT = Corrective action threshold  
NTU = nephelometric turbidity unit  
TIRE = Totalizing, indicating and recording equipment  
NL = No limit  
Grab = An individual sample collected over time not exceed 15 minutes.  
24H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 24-hour period.
SECTION 4
CONCLUSION

I’ve been fortunate to have wonderful experience at Loudoun Water. My internship has turned into a career. I’m lucky to have thoughtful and supportive coworkers and a manager who is invested in my growth. Through this internship, I’ve gain first-hand experience working as part of interdisciplinary teams to permit, design, build, and operate water infrastructure critical to serving the needs of society. I’ve also taken a lead role in my organization to monitor and advocate for regulations and laws beneficial to customers and the environment.

While I’m intrinsically motivated by my work, I’m also grateful to feel respected and well-compensated for the work that I do. My experience at Loudoun Water has been overwhelmingly positive. Importantly, I am able to apply and practice the theories and skills I developed while at the Institute for the Environment and Sustainability. I use the “Willeke Wheel” as a model for continuous stakeholder engagement. I leverage skills and tools from my Project Management course to guide planning and program execution. My Wetlands and independent study courses inform my ability to help select and permit sites for new infrastructure projects, and my Public Service Project prepared me to team with internal staff, consultants, and government representatives to deliver project success through targeted stakeholder engagement.

I believe that my future is bright at Loudoun Water. I’m now being asked to take on new and challenging work that leverages the hard technical skills I developed in graduate school. Environmental Statistics, Environmental Policy, study abroad coursework, GIS, Landscape Ecology, and Watershed Management courses have prepared me to help Loudoun Water solve complex problems associated with source water protection, water quality and demand management. Sustainable growth is perhaps the greatest challenge for Northern Virginia. I’m proud to say that I work for an organization that keeps this concept at the forefront of its planning and project goals. The only way to achieve and maintain sustainable growth is to balance stakeholders’ needs for environmental, economic, and community security. My job is to do just that. It’s pretty cool.
LITERATURE CITED

Loudoun County Board of Supervisors. (2011, March 15). Loudoun County Revised General Plan. Loudoun County Revised General Plan. Leesburg, Virginia, USA: Loudoun County Board of Supervisors.


