

City of Virginia- A Legacy for Minnesota Water Protection

The City of Virginia, Minnesota is historically known for its mining and logging industry. Iron ore initially drew settlers to the area in the 1890s and the lumber business grew to its height in the 1920s when the population was nearly double today's 8,900 people. At one time Virginia had both the largest White Pine Mill in the world and the biggest ore producing mine (Mesaba Mountain) in the world. The area attracted celebrities such as Mae West, Roy Rogers, and WC Fields to perform in what is now the Lyric Center, a national landmark building. Along with this flourishing town, came the need to protect human health and the local waters. In 1914, Virginia built a secondary wastewater treatment facility (WWTF), a trickling filter – the second secondary treatment facility constructed in the state.

While the population declined after the last logs were milled in 1929, Virginia

continued to be a leader in protecting its waterways with advanced wastewater treatment. In the 1970s, the city completed a significant upgrade to the trickling filter system to meet effluent limits of 5 mg/L BOD, 5 mg/L TSS, and 1 mg/L total phosphorus; limits more stringent than many facilities see today in Minnesota. This upgrade, designed by Banister, Short, Elliott, Hendrickson and Associates, was a secondary activated sludge system with phosphorus removal and chemical stabilization of the solids. The initial design used lime for phosphorus removal in the primary clarifiers, followed by a recarbonation step to reduce the pH prior to secondary treatment. The phosphorus removal process was later revised to add alum prior to the secondary clarifiers. The 1970s facility also had dual media filters to ensure the city met the stringent effluent limits. Anaerobic digestion improvements

were also included in other upgrades.

In the 1980s, the receiving water was reclassified from Class 2 to 7, and the effluent limits were modified to 15 mg/L BOD, 25 mg/L TSS, with no change in the total phosphorus limit of 1 mg/L. The city continued to meet or discharge below these limits. With little growth in the area, the city did not have the pressure to upgrade the WWTF facilities for capacity reasons and was able to repair and replace equipment for many years until it was clear it was time for improvements. The plant superintendent, Michael Appelwick, worked with the city council and staff beginning in 2005 to prepare for rate increases to fund improvements. Along with the need to upgrade aging facilities was the need to meet proposed mercury effluent limits. The City of Virginia rose to this challenge, and was the first WWTF in the state to receive a TMDL



grant for mercury removal and to accept their NPDES permit mercury limit without requesting a variance.

A facility plan was completed in 2009 by Short Elliott Hendrickson, Inc. (SEH) and the improvements recommended in the facility plan are under construction by Rice Lake Construction today, with substantial completion scheduled for March 2013. The improved plant is designed to meet 15 mg/L BOD, 25 mg/L TSS, 1 mg/L total phosphorus, and 1.8 ng/L mercury with a 4.3 mgd treatment capacity. The facilities are planned to handle lower phosphorus limits.

The improvements to the facility

touch on each treatment unit from the headworks to disinfection, and include sludge handling. With the last significant wastewater treatment upgrade occurring in 1987 (over 25 years ago), a large portion of the \$15-million improvement project addresses aging infrastructure and equipment. The improvements also address the new effluent limits (mercury) and capacity bottlenecks.

For the liquid process, the improvements include additional equalization volume allowing the city to better handle peak flow events. A new pretreatment building provides fine screening, influent pumping, and grit

removal, as well as new laboratory space and staff areas. New aeration basins with fine-bubble diffusers replace the previous aging, overloaded aeration basin. New primary and final clarifiers have been added, along with new equipment for existing clarifiers. New chemical feed and storage facilities and four dual-media filters together address the phosphorus and mercury limits. A new UV disinfection system replaces the existing gas chlorine system.

The improvements also address biosolids. Improvements to the existing primary digester include a new heating system, new pumped mixing system, and a dual-membrane gas holder cover. A new, larger belt filter press improves sludge dewatering. A new covered sludge storage area allows the city better ability to store and manage biosolids on site.

While a lot has changed in the City of Virginia since 1914, the location of the city's wastewater treatment facility has remained. This posed challenges for constructing the new treatment components, but has also provided opportunities to reuse existing infrastructure. An existing blower building was reused for chemical feed equipment, the existing filter foundation was reused for the new dual-media filters, the previous chlorine contact tanks were reused for filter backwash/clearwell storage, and the existing digestion facilities were brought up to current fire code. Staging construction of all of these components, while also trying to reuse existing infrastructure, was a challenge. Construction has uncovered remnants from the earlier eras, and the site piping was a challenge to sort out. Through these challenges, the new pretreatment system, aeration basin, and final clarifier have been brought online recently.

The Virginia WWTF is operated and managed by Michael Appelwick of Northeast Technical Service, Inc. (NTS). Mike currently is or has been responsible for the operation of numerous water and wastewater treatment facilities in northeastern Minnesota. The mechanical WWTFs include Marble, Keewatin, Buhl, Mt. Iron, Keewatin Taconite, United Taconite, Hibbing Taconite, Duluth North Shore Sanitary District, Pike Lake Sanitary Sewer Collection System and Little Falls located in central Minnesota. Stabilization pond

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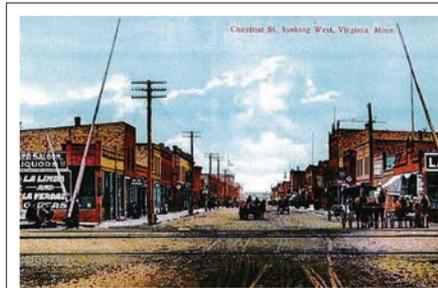
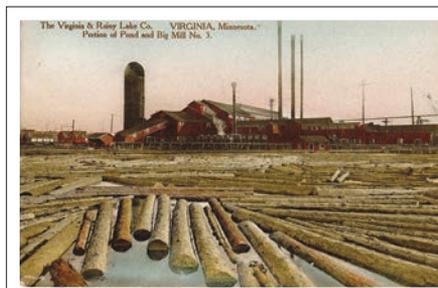
systems include Biwabik, Mckinley, Iron Junction Caribou Highlands Lodge.

In the late 1970s, 1980s and 1990s Mike worked with the EPA WWTF start-up and operator training program assisting communities and engineering consultants with new WWTF start-ups. Mechanical WWTFs included Marble, Keewatin, Chisholm, Buhl, Mt. Iron, Eveleth, Orr, Gilbert, Aurora and Hoyt Lakes. Stabilization pond systems include Mckinley, Iron Junction, Chisholm, Cook, Big Fork and Kettle River. Mike also has experience with a wetland treatment system followed by soil treatment at the Charles L. Sommers Wilderness Canoe Base in Ely and a Municipal Solid Waste leachate treatment system including stabilization ponds and spray irrigation with soil treatment for the Northern St. Louis County Regional Landfill. He also operates the Virginia, Biwabik and Mckinley water treatment systems and has previously managed the Chisholm water treatment system. Mike was an active participant in the pilot plant studies evaluating mercury removal at the City of Virginia and Hibbing. Mike and other NTS were responsible for the operation of the pilot plants and the data analysis.

Like the City of Virginia, Mike's career serves as a legacy of protecting Minnesota's water resources. Mike entered the wastewater field in 1972 through the wastewater treatment technology program at St. Cloud Technical College. He worked for the City of Duluth during summer breaks and upon completing his degree he worked for Black & Veatch on a pilot plant study evaluating removal of asbestos-like fibers from Lake Superior drinking waters. He then worked for the

City of Virginia, Serco Laboratories, Abe W. Mathews Engineering, and started his own company, NTS.

NTS provides a variety of services with its foundation in the water and wastewater treatment industry for federal, state, township, city, and private sector entities. Mike also serves in other roles of benefit to our water resources. He currently serves as a member of the Minnesota Chamber Wild Rice/Sulfate Task Force and the MPCA Wild Rice/Sulfate Standards Development Advisory Committee. He participated and attended the MPCA Stakeholder Focus Group in Brainerd for the MPCA Strategic Plan. His excellence in operations and historic commitment to water quality protection earned him the MN Section CSWEA Operations Award in 2012. 





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