Working Together: A Collaborative Initiative Leads to a Single, More Effective Provider of Wastewater Collection, Conveyance and Treatment Services on the Range

Located in the northeast region of Minnesota, in St. Louis County, the participating communities of the Central Iron Range Sanitary Sewer District (CIRSSD) include the Cities of Buhl, Chisholm, Kinney, the Town of Great Scott, and state lands occupied by the Minnesota Discovery Center.

The mission of the CIRSSD is to create a single, regional provider of wastewater collection, conveyance and treatment services for its member communities. This partnership provides key benefits that each participant would otherwise struggle to establish on their own, namely, treatment capacity to accommodate future growth and the ability to comply with stringent discharge requirements of the Great Lakes Basin.

CIRSSD CONSOLIDATION

The CIRSSD was originally authorized by the Minnesota Legislature in conformance with Minnesota Statute 115 in May of 2002. In 2009, after several years of planning subsequent to the authorization, a group of participating communities settled on a path forward. Due to funding deadlines, the CIRSSD only had approximately eight months to reassess the previous planning efforts, initiate design, and prepare permitting documents and studies including an archaeological and historical study, Phase 1 and 2 Environmental Site Assessments, Environmental Assessment Worksheet (EAW), wetland permitting, NPDES permitting and funding documents. The Minnesota Pollution Control Agency (MPCA) and CIRSSD worked with the City of Chisholm to develop a creative strategy to incorporate the construction of the CIRSSD into the reissued Chisholm NPDES permit. This negotiated strategy also facilitated the transfer of the Chisholm NPDES permit to the CIRSSD following the transfer of wastewater flow. The strategy for this unique permit included development and negotiation of discharge limits for the newly constructed facility to include mercury compliance and the introduction of monitoring for "salty discharges" and bio-toxicity in the downstream wetlands with MPCA standards and permitting staff. The project received a Negative Declaration on the EAW in June of 2010, a draft NPDES permit was issued, and the CIRSSD also received approval of the plans and specifications for the new wastewater treatment plant (WWTP). The final NPDES permit was issued in August of 2010.

The approved plan called for the construction of a new WWTP located adjacent to the City of Chisholm's existing stabilization lagoon system, and the addition of a conveyance system capable of transporting wastewater from participating communities to the new WWTP.

Construction started with conveyance and began with the new Buhl Lift Station and Forcemain in the spring of 2011, with Kinney Lift Station Improvements, and the WWTP and Chisholm Lift Station beginning in the fall of 2011. The WWTP was commissioned in December 2013, with full flow diverted to the new WWTP in the spring of 2014. The WWTP was substantially complete in the fall of 2014.

QUICK FACTS

WWTP FEATURES:

- Fine Screening and grit removal rated for 10 MGD.
- Influent flow equalization ponds and return pumping.
- Sequencing batch reactors (SBRs) with 4 reactors, flow splitter box, and post equalization.
- 5 MGD disk filters for mercury removal.
- Chlorine disinfection and effluent reuse system.
- Aerobic digesters and sludge storage.
- Rotary drum thickener.
- Reed beds.
- Control building.

COLLECTION SYSTEM FEATURES:

- 6.2 MGD lift station to serve the City of Chisholm.
- 432,000 GPD lift station and 3 miles of force main to serve the City of Buhl.
- Improvements to the existing City of Kinney lift station.

ROAD TO MERCURY COMPLIANCE

The CIRSSD negotiated the reissuance of their National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit (MN0020117) which was subsequently issued on July 2, 2014 requiring compliance with final Total Mercury (THg) limits by March 23, 2017. The final THg limits contained in the permit are a calendar monthly average limit of 1.8 nanograms per liter (ng/L) and a daily maximum limit of 3.2 ng/L.

A pilot testing process had been previously negotiated and a sampling and testing protocol was defined with the MPCA when the City of Hibbing was a participating community in the CIRSSD. The pilots tested emerging technologies. At the end of the pilot testing, a comprehensive report was generated that compared the performance of the pilot tested technologies to achieve the final mercury removal limits and an opinion as to their anticipated life cycle cost. Three technologies were initially evaluated in those studies: Dual Media Filters (Anthracite and Sand), Upflow Continuous Backwashing Sand Filters with iron salt addition, and Ultrafilters (Membranes). Efforts were led to write an application for a Great Lakes Restoration Grant on behalf of the City of Hibbing and the GLI mercury stakeholder communities of Virginia, Two Harbors and the Central Iron Range Sanitary Sewer District.

Following the reauthorization of the CIRSSD in 2009, which the City of Hibbing declined to participate in, the CIRSSD took a fresh look at emerging technologies. Based on the previous results and wanting the best and most cost effective solution for the community, the CIRSSD considered another technology not previously evaluated, Cloth Media Disk Filters. Jar testing and pilot work completed in 2014 showed that Cloth Media Disk Filters could meet the anticipated Low Level Mercury Limits at a much lower cost.

In February 2015 the CIRSSD submitted its revised Facility Plan to the MPCA to document the CIRSSD efforts to identify and evaluate alternative mercury removal technologies for the WWTP. Based on the comparison of performance and financial considerations of the technologies, the CIRSSD selected Cloth Media Disk Filters. This technology has been shown to provide high quality effluent equal to or better than dual media filtration, and at lower capital and operating expense, with modest cost for chemical addition to assist in solids separation. The table in Exhibit A summarizes each technology that was tested and planning level capital costs for each.

TECHNOLOGY	PLANNING LEVEL CAPITAL COSTS OF NEW TERTIARY FILTER FACILITY - $/GALLON
Dual Media Filter	$1.8
Single Pass Continuous Backwashing Upflow Sand Filters	$1.8
Gravity Fed Ultrafiltration Membrane	$2.7
Disk Filters	$1.0

EXHIBIT A

The new Tertiary Filter Building that houses the disk filters is a much smaller footprint than the typical Dual Media type filter building footprint. Furthermore, with appropriate chemical addition, Disk Filters have the advantage of meeting relatively low phosphorus limits, potentially as low as 0.1 mg/l, which is one of the major pollutant parameters where lower limits are currently being considered in Minnesota and Wisconsin. Disk Filters also meet Title 22 reuse standards for California, and thus the treated effluent could potentially be used to some extent for irrigation purposes around the WWTP site or for sale to neighboring owners.

Design and Bidding of the new Tertiary Filter Building was completed by the end of 2015, with construction beginning in May 2016. The project is currently operational and substantially complete. The new treatment facilities will provide an economical, high quality effluent, meeting strict effluent standards for years to come and contribute to better water quality in the East Swan River Watershed and the Lake Superior Basin.

INFILTRATION & INFLOW

The CIRSSD's participating communities have historically experienced large wet weather flows and sustained high baseflows following precipitation events and runoff, i.e. infiltration and inflow (I/I). In the past, the City of Chisholm addressed part of the issue by incorporating an additional high flow system (pumping and facultative treatment lagoons) to handle flows exceeding the capacity of their now decommissioned wastewater treatment facility.

As with most Range communities, the City of Chisholm's collection system has been in place for approximately 70 to 80 years. About 80 percent of the sanitary sewer collection system is clay pipe with brick manholes. The system has been investigated revealing areas of identified deficient pipe lines and manholes. Several major street reconstruction projects with utility replacement have occurred in the last several years which have significantly reduced I/I. However, additional sections of the collection system need to be addressed to further reduce excessive I/I and replace severely deteriorated sewers and manholes.

Recommendations were made and implemented to conduct a Flow Monitoring Program to aid in the development of priorities for the phased replacement of the collection system. This process was deemed necessary to avoid resumption of a MPCA imposed development moratorium due to the collection system's inability to convey excess I/I and new sanitary flow contributions. Subsequent cleaning and televising was conducted in areas of concern. As a result of this investigation, a Facility Plan was prepared, identifying areas with the most significant issues and to prioritize proposed improvements in order to improve the condition of the Sewage Collection System.

In an effort to identify significant sources of I/I in other participating communities, the CIRSSD has turned to the City of Buhl to try to help identify high priority areas of concern in their collection system. Currently, flow metering equipment has been installed and is being closely monitored to determine what areas of the City have the highest I/I rates relative to baseflows.

PROJECT SNAPSHOT

1. Sherman Pit
2. Equalization Ponds - Help Store Flows Exceeding WWTP Capacity
3. Disinfection
4. Sludge Drying Beds
5. Sludge Storage
6. Control Building
7. Blower and Chemical Feed Building
8. Sequencing Batch Reactors, EQ and Aerobic Digesters- 2.5 MGD Avg. Flow
9. New Mercury Treatment Filters and Chemical Feed with up to 5 MGD Peak Flow Capacity
10. Mesabi Recreational Trail
11. Pretreatment Building Able to Screen and Remove Grit up to 10 MGD Peak Flow
12. Flow Diversion to EQ and WWTP

CONSULTANT
HR Green, Inc.: Mark Stone, PE
P: 651.659.7735 / E: mstone@hrgreen.com

OWNER
Client References: Scott Allison, Chairman / P: 218.969.4323
Mark Casey, Former City Clerk/Administrator / P: 218.628.6261