DECREASED SPERM COUNTS
Associated with Waterborne Contaminants in the Developed World

Inside:
101st Annual Conference Recap
Plate Settlers Clean Up Ortonville Water
Lessons Learned in Blaine
**ANNANDALE’S BIOAUGMENTATION SUCCESS STORY**

Team Lab’s bioaugmentation contain three basic elements needed to quickly and effectively break down waste. These three elements are NUTRIENTS, FREE ENZYMES, and BACTERIAL CULTURES.

**LOCATION:** Annandale, MN

**PLANT:** Activated Sludge

**AVERAGE DAILY FLOW:** 600,000 gpd

**PROJECT DETAIL**

Customer wanted to see if by adding Team Lab’s T197 Mega Bugs Plus HC™ bioaugmentation product, it would improve both the settling and reduce the amount of sludge to be hauled.

- Added 4 lb per week
- Added at the head of the aeration basin

Results are as follows:

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallons Sludge</td>
<td>1,137,598</td>
<td>542,000</td>
<td>52%</td>
</tr>
<tr>
<td>% Solids</td>
<td>2.58%</td>
<td>1.67%</td>
<td>35%</td>
</tr>
<tr>
<td>Dry Tons</td>
<td>124</td>
<td>38</td>
<td>70%</td>
</tr>
</tbody>
</table>

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**CITY OF BROWERVILLE’S SLUDGE REDUCTION SUCCESS STORY**

**Problem:** 200 ft X 100 ft sludge island

**Solution:** Team Lab’s sludge reduction bug program

**Location:** Browerville, MN

**System:** Wastewater Treatment Ponds

City of Browerville was faced with the “sludge island” and started Team Lab’s T195 Mega Bugs Plus bioaugmentation program to see if the “sludge island” could be reduced.
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Visit us at www.mnawwa.org
Something Old, Something New…

The saying has been used by many for good luck on their wedding day. I’d argue we in the Minnesota Section apply this saying for success at our annual conference and during the entire year.

Something Old – Don’t fix it, if it ain’t broken
We have a lot of great traditions at our annual conference, including recognizing our volunteers for their dedication and commitment to the Minnesota Section. Without them, our Section wouldn’t be the strong, vibrant community that it continues to be. Thanks to everyone who commits their time and energy to get involved in the Section.

Something New – Life is like underwear, change is good
Each year at the conference we consider and implement new ideas to try to improve the experience for conference attendees. This year we used a new website, www.sli.do.com, which gave attendees the ability to use their phones and devices to crowdsource the best questions during some of the training sessions, as well as engage in live polls and surveys. Based on the great results, we plan to use sli.do again next year.

“Jim Sadler “won” the honor of wearing the Viking hat. But obviously my attempts to sell the crowd on how good Mona Cavalcoli would look in the red gnome hat and beard fell on deaf ears, because the audience decided to go with a different choice…”

Before the keynote presentation we introduced people to how the website worked. We gave people the power to select which two people would wear a hat of honor during the first two hours of the Vendors Exhibit. Jim Sadler “won” the honor of wearing the Viking hat. But obviously my attempts to sell the crowd on how good Mona Cavalcoli would look in the red gnome hat and beard fell on deaf ears, because the audience decided to go with a different choice… boy, was that fake beard itchy on my face.

Periodically, the Section looks at and considers if strategic changes are needed to improve how work is conducted. This year the Board has created an ad hoc committee to review and make recommendations for the organizational structure of our board, councils and committees. We can expect recommendations from the ad-hoc committee within the year.

If there is anything new you would like to see in the Section or Association, please contact me or other Section board or committee members and we will work with you to determine how to implement those ideas.

Something Borrowed – Take what you receive and “Pay it Forward”
When I accepted the chair’s gavel at the conference, I spoke of how we in the water industry are given knowledge, expertise, and perhaps even a passion for the industry from mentors, mentees and others. We’ve “borrowed” that for a time and we can’t pay it back to the person who gave it to us, as they already have those skills. But we can pay it forward to someone else. We can return what we have “borrowed” to others in the water industry. Consider how you can pay it forward for all you have received from others.

Something Blue – Water
One of the Association’s strategic objectives is, “Advancing public awareness and clarity on water issues and the value of water.” It’s what we need to keep doing, and we will.
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Message from the Director

Another September has come and passed; the 101st Annual Conference in Duluth was an amazing accomplishment. As a Section we just continue to get better each year. It is a pleasure to be a member of such a great organization. Our Section volunteer coordinator Mona Cavalcoli did an outstanding job working with the many factions of our Section to be successful.

The Minnesota Section was honored to have American Water Works Association President Brenda Lennox in attendance. Based on her comments and observations she is very pleased with how our councils and committees function and interact with each other. Often, Brenda noted that the leadership on the council and committee level was “so outstanding,” how lucky we must be to have such strong leaders working on each level of our Section.

In reflection, this was a real eye-opener. Each meeting, large or small, Brenda and I were met with quality volunteers who displayed a passion for our cause and commitment to our Section. These are the volunteers, the people, who make us successful.

Pre-conference activities were also a huge success. A record number of participants were a true reflection of the effort our Section put forth. The philanthropic committee must be pleased with over $30,000 raised this year for the Water Equation and Water For People.

David Brown has assumed the role of Section chair and Eric Volk as chair-elect. Both will be outstanding for our Section in the coming terms. Tony Belden moves into the past-chair role after completing a busy and well-organized term as chair. For those of you who were at the Section banquet it was clear that David Brown has a vibrant direction for the Section and plans to put the wheels in motion.

On the Association level, as of August 30, we continue to be strong in our membership numbers with 51,033 members. Despite the legislative stalemates, the Association continues working diligently on Safe Drinking Water issues, including legislation on lead and guidance on disinfection alternatives. There remains a push for resilient and safe water, including a direct response to the hurricanes that have devastated Texas and Florida. Our AWWA has been active in Water and Wastewater Agency Response Network (WARN) procedures and getting assistance to the troubled areas.

Cybersecurity remains a challenge and a sound water infrastructure, which develops new coalitions and improves EPA partnerships, is active. On the water resource management side of things, we continue to work with the United States Department of Agriculture on conservation program and agricultural enhancements that protect drinking water.

I am looking forward to the challenges of a new year, a new leadership direction, and the success of an organization that cares.

Congratulations to this year’s award winners!

• Pat Shea from Saint Cloud is the George Warren Fuller Award winner;
• Steve Schneider of Saint Paul is the Leonard N. Thompson awardee;
• Roger Hagman from the city of Bemidji took home the Operator Meritorious Service award;
• Paul Thom from Core & Main received the Benjamin G. Mason Award of Excellence;
• Brian LeMon from Barr Engineering received the Jon B. Eaton Excellence in Volunteer Service Award.

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Message from the Editor

Almost Trivia Champs

Along with many of you, I had a great time at the Minnesota AWWA conference in Duluth. One of the highlights was Thursday night when I joined my brainy co-workers (which chose a team name that was slightly-bawdy enough that it remains unprintable) in the trivia contest put on by the Young Professionals committee. Our team tied for first and then lost in a tiebreaker to a team from Minneapolis. However, we won one round—the topic was space—and for our efforts each team member got a bottle from Tnemec Companies, which makes coatings. I looked forward to taking it home to paint my water tower. However, upon my return, I found that it wasn’t paint; it was barbecue sauce. At least one member of our family liked it.

The Young Professionals did a great job with this, and I look forward to joining my colleagues in defending our second-place finish next year.
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Governing Board Highlights

From the Governing Board Meeting, July 12, 2017, Conference Call

Participating: Dave Brown, Tony Belden, Jim Sadler, Pete Moulton, Ben Feldman, Anna Schliep, Jeanette Boothe, Dan Portlock, Bob Stark, Stew Thornley, Nancy Zeigler, Rob Isabel, Michelle Stockness, Eric Volk, Scott Fronek, and Mona Cavalcoli.

Financial Report
Minnesota AWWA has $71,604.81 in its checking account. It had approximately $121,000 in the account at this time a year ago. In the investment accounts, the section portfolio is $492,001.84. The value at the time of the last board meeting in April was $484,813.32.

Training Agreement with Minnesota Department of Health (MDH)
Randy Ellingboe of MDH joined the call regarding the training agreement Minnesota AWWA has had with MDH since 1992. Randy reported that MDH could no longer take in funds and pass them through to Minnesota AWWA for training events. MDH still supports section-training programs and can provide staffing but cannot take in money. An ad-hoc committee of Ellingboe, Dave Brown, Stew Thornley, Anna Schliep, Eric Volk, and Bob Smude was formed to develop a new agreement.

H2O for Life Poster Contest
Minnesota AWWA has been considering financial support to H2O or Life for its annual water poster contest. However, Thornley was concerned about other donations to the group being used primarily for administrative costs. He had proposed to H2O for Life that Minnesota AWWA might consider a donation of a bottle-filling station as a prize; however, H2O for Life declined the offer. Thornley suggested that Minnesota AWWA not commit any funding to the contest at this time. Sadler moved and Thornley seconded to suspend any donation to the poster contest this year and review a proposed donation next year. The motion passed unanimously.

Membership Council Position on the Board
As a follow-up from the April board meeting – when Eaton, Brown, and Cavalcoli volunteered to perform a holistic review of the councils and committees and consider an upgrade of the membership committee to a council position – the group had discussions while at the AWWA Annual Conference and Exposition (ACE) in Philadelphia. There is not a set date for completion, but the group will present information to the board as progress continues.

STEM/WETT Committee
Volk sought approval, which was granted, to add a STEM/WETT Committee to the Training and Education Council. A funding request of $2,100 will be made for the 2018 budget.

Governing Board Meeting of Tuesday, September 12, 2017

Council/Committee Reorganization
The section has created an ad-hoc committee to examine the current structure of the governing board and possible changes for the board. The committee will meet and make recommendations to the governing board at its next meeting.

Professional Operator Development
The board approved a one-time spending of $8,300 to fund an eight-week Professional Operator Development Course with anticipated revenue generation of $5,000 for the first course and similar revenue for additional courses.

2018 Budget
The 2018 budget, which was approved by the board, includes the $8,300 start-up expense for the committee to conduct the Professional Operator Development course noted above. The approved budget projects $384,300 in income and $402,750 in expenses.

Training Agreement with Minnesota Department of Health (MDH)
An ad-hoc committee has been working on updating a 1992 agreement between Minnesota AWWA and MDH (see details in the recap of the July 12, 2017 conference call). Dave Brown reported they hope to have a new five-year agreement to present at the next board meeting.
Financial Report
For the 2016 calendar year, section income was $382,874; expenses were $426,672. Investments were up in 2016 by $27,853. The result was a year-end loss of $15,945 although the board had approved a one-time increase in expenses of $30,000 in 2016 to be used for the 100-year anniversary of the conference.

As of June 2017, section income for the year has been $158,319 and expenses have been $143,574. Investments are up since the beginning of the year by $30,690, resulting in net income of $45,435 as of the end of June.

The general fund balance at the end of June was $233,894, well above the goal of 50 percent of budgeted expenses (which, for 2017, are $392,855). The endowment fund balance at the end of June was $258,147, which exceeds the record high set in June 2014 of $257,733. The endowment fund goal is $180,000.

Governing Board Meeting
of Friday, September 15, 2017

Awards
The board confirmed the following awards and competition winners:

- George Warren Fuller Award – Pat Shea, City of St. Cloud
- Leonard N. Thompson Award – Steve Schneider, St. Paul Regional Water Services
- Operator Meritorious Service Award – Roger Hagman, City of Bemidji
- Benjamin G. Mason Award of Excellence – Paul Thom, Core & Main
- Jon Eaton Excellence in Volunteering Award – Brian LeMon, Barr Engineering
- Best in Glass Award – City of Bloomington
- Meter Madness – Brent Massmann, City of Eagan
- Pipe Tapping – Great Lakes Tappers of Duluth
- Hydrant Hysteria – Bloomington Gladiators

Appointments
Anna Schliep of the Minnesota Department of Health was appointed secretary-treasurer. Outgoing secretary-treasurer Ben Feldman of St. Paul Regional Water Services was appointed assistant secretary-treasurer. Feldman was recognized and thanked for his service as secretary-treasurer and received numerous encomiums and a heartfelt handshake from a high-ranking official.

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BENJAMIN G. MASON AWARD OF EXCELLENCE
Paul Thom, Core & Main

OPERATOR MERITORIOUS SERVICE AWARD
Roger Hagman of Bemidji

L. N. THOMPSON AWARD
Steve Schneider, St. Paul Regional Water Services

GEORGE WARREN FULLER AWARD
Pat Shea, St. Cloud Public Utilities

JON EATON EXCELLENCE IN VOLUNTEERING AWARD
Brian LeMon, Barr Engineering

BEST IN GLASS
City of Bloomington

METER MADNESS
Brent Massmann, City of Eagan

PIPE TAPPING
Great Lakes Tappers, City of Duluth

HYDRANT HYSTERIA
Bloomington Gladiators
New chair Dave Brown with outgoing chair Tony Belden.

Pat Shea - Fuller Award recipient.

Taste Test judges Jon Eaton, Brenda Lennox, Bulldog Sadler.

Tony Belden presents L N Thompson Award to Steve Schneider.

Water bar at AWWA.

Pat Shea - Fuller Award recipient.
Brauny guy with cool inks during Hydrant Hysteria

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Industry News

From the *Waterline*, newsletter of the Minnesota Department of Health

**Water and Sports**

**Baseball**
The newly refurbished Valley View water tower in Bloomington was a backdrop for the Minnesota Class A amateur baseball tournament in August. The rehabilitation of the 50-year-old tower included removal and replacement of coatings, structural repairs, and safety upgrades. The tower is surrounded by a security fence behind the left-field fence. A long home run by the St. Paul Capitals’ Ryan Abrahamson – which broke a scoreless tie with the Minneapolis Angels in the 12th inning on Sunday, August 14 – landed next to the tower. The ball was retrieved by a city crew the next day. The Minnesota Class C tournament opened in Green Isle the following weekend beneath that city’s water tower.

**Hockey**
The Minnesota Wild is expanding the sources of water for its ice at Xcel Energy Center. Since the arena opened in 2000, the team has used St. Paul water to make the ice its rink. “It’s really good for making ice,” said Travis Larson, the manager of ice operations for the arena.

This season, however, the team is allowing Minnesota fans to bring water to be mixed in as part of their ice surface. More than 2,400 fans of all ages brought water for the Wild’s “This Is Our Ice” launch event on Saturday, September 16. The Wild had its Zamboni in the lobby of the arena, and fans deposited three ounces of their hometown water – from taps, wells, ponds, lakes, and streams – to fill the ice-resurfacing machine. The water came from 299 cities, mostly from Minnesota but also from such distant sites as Maine, New York, California, North Carolina, and Hawaii.

The water was filtered to remove solids, disinfected, mixed with St. Paul water in the 190-gallon Zamboni tank, and used to resurface the ice the next day. Larson said they make ice for the upcoming season with hoses and a flood tank around Labor Day each year. A one-inch sheet of ice takes about 10,000 gallons of water. The ice remains all season and is covered when other events are held on top of it. The ice is frequently resurfaced, especially during games, with the Zamboni shaving off and putting on a new layer.

The campaign will continue during the 2017-2018 season. Fans can deposit their water before each home game. After filtering and disinfecting, the water will be used in the resurfacing after the second period.

“It’s been an interesting process, and we’ll make it work,” said Larson. “Fan support for this campaign has been tremendous.”
Industry News

From the Waterline, newsletter of the Minnesota Department of Health

Water at the Fair

Members of the Minnesota Section of American Water Works Association (AWWA) were on WCCO Radio following the Great Minnesota Tap Water Taste Test, which was held on the Sustainability Stage in the Eco Experience building at the State Fair on Monday, August 28, a competition that Minnesota AWWA has held since 2012. This year, Lake Elmo won the contest. St. Louis Park, Plymouth, and North St. Paul were the other finalists.

The Lake Elmo water was brought to WCCO’s State Fair studio and put through another competition as WCCO audience members sampled water from a number of different cities and once again picked Lake Elmo as the best tasting.

Water Bar (below) was a hit at the State Fair. The bar provided tasting of water from cities around the state and the chance for volunteers to talk with visitors about their water.
The Annual Drinking Water Institute for Educators drew 20 teachers for a three-day workshop at the Lakeville Water Treatment Plant. Water superintendents and representatives Jodi Wallin of St. Paul, Paul Coone of Roseville, Dana Bjork of Lakeville, Mark Peine of Hastings, and Todd Osweiler of Rochester attended on one of the days to meet with teachers from their cities. The 2018 Drinking Water Institute will be August 6-8 in Rochester. Information on the institute is at [www.health.state.mn.us/water/institute/index.htm](http://www.health.state.mn.us/water/institute/index.htm).

**MDH Adopts GRAPS**

Supported by the Clean Water Fund, the Minnesota Department of Health is developing a Groundwater Restoration and Protection Strategies (GRAPS) process.

The purpose of GRAPS is to translate data from ongoing groundwater and drinking-water programs to the watershed scale and to work with other agencies to develop watershed-scale groundwater and drinking-water management strategies to integrate into local water management plans.

MDH released its first report, on the North Fork River Watershed, in June 2017 and is working on GRAPS reports for the Cannon River and Missouri River Basin watershed.

The North Fork Crow River and other maps and information are on-line at [www.health.state.mn.us/divs/eh/water/dwp_cwl/localimplem/index.html](http://www.health.state.mn.us/divs/eh/water/dwp_cwl/localimplem/index.html).
Industry News

From the Waterline, newsletter of the Minnesota Department of Health

Lewis & Clark Shooting for the Moon

The Lewis & Clark Regional Water System (LCRWS) marked its five-year anniversary of delivering water in July. The start of operations was the culmination of many years of planning and construction as a way of serving water-challenged areas in South Dakota, Iowa, and Minnesota. The Lewis & Clark project takes water from a series of wells that tap into an aquifer adjacent to the Missouri River near Vermillion, South Dakota. The water is delivered to communities as far away as 125 miles.

LCRWS executive director Troy Larson says that the project has delivered 21.3 billion gallons of water since its start up and that it set a new daily record on July 17 with 23.4 million gallons.

The water made its way to Minnesota in May 2015, reaching Rock County Rural Water District outside Luverne. Larson notes that Rock County is the only county in the state without a naturally occurring lake, which “reiterates the importance of getting water to the county and area.”

LCRWS water in Minnesota has since reached Magnolia and Adrian, a connection point to Lincoln-Pipestone Rural Water System, which supplies water to 38 communities in 10 counties. Worthington is expected to be connected by the end of 2018.

“Looking ahead, it sure would be great if we could get the remaining members connected before we hit our 10-year anniversary,” Larson said. “That’ll be our version of a ‘moon shot.’”

Construction on the Rock County pump station, part of the Lewis & Clark Regional Water System.
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DECREASED SPERM COUNTS

Associated with Waterborne Contaminants in the Developed World
Efforts to track the quantity and quality of sperm in populations shows a steady decline in recent decades. Sperm counts worldwide have decreased by more than 50 percent and some fertility experts claim there is an epidemic of infertility. The phenomenon, however, is occurring most significantly in developed nations compared to the developing world. Although still controversial, associations with sperm-count decline and exposures to complex chemicals (i.e., plasticizers, pesticides, fire retardants, etc.) continue to be reported.

Sperm on a steady decline

“Why did American men lose 59.3 percent of their sperm?” This was the teaser headline for the August 12 broadcast of the internationally syndicated Michael Olson Food Chain Radio show with guest Irina Mindlis, MPH, co-author of a recent publication on the topic. A meta-analysis of sperm count and fertility trends reported in 185 studies with over 42,000 men from 1973-2011 was conducted. Results indicated that sperm counts declined significantly over the approximately 40-year span. Carlsen, et al., asked the same questions in 1992, following a review of 61 papers published between 1938 and 1991, including results from nearly 15,000 men that showed an overall decline in semen quality during the 50-year span.

In the more recent study, men were categorized geographically with those from western regions (i.e., North America, Europe, Australia, New Zealand) and those from other regions (i.e., South America, Asia and Africa). Those from the more developed western regions were marked by an average loss of 1.6 percent of total sperm counts per year – and still declining. The study found that total sperm count and concentration per mL of semen followed similar trends. In the first survey year, the average sperm count of western men was 99 million/mL compared to other regions averaging 73 million/mL and the last survey year at 47 million/mL and 62.6 million/mL, respectively. Sperm count is highly correlated with fertility and counts ranging below the 40 million/mL mark are associated with decreased probability of conception. In western men, sperm concentrations are less than half what they were in the 70s, with no sign of the trend leveling off, but there are no significant declines in men from South America, Asia and Africa.

Chemical interferences

While the recent sperm-decline study did not investigate potential causes of the results, environmental contaminants, such as endocrine disrupting compounds (EDCs) and pesticides, along with high-risk behaviors (such as smoking) have long been associated with low sperm counts. Saying something is associated with a health outcome does not mean it is proven. Other factors such as poor diet, stress and obesity also have negative impacts on both the quantity and quality of sperm. Determining which risk factor is driving the adverse outcome is a difficult task.

By definition, EDCs are chemicals or chemical compounds that can interfere with hormones in the body. The list of endocrine-disrupting compounds we are exposed to via, food, water and air is long, as they are commonly used compounds found in thousands of products. Exposures begin in the womb (continuing throughout our lifetime) but are generally found in very low levels where acute health effects do not occur. Exposures to low doses over long periods of time are difficult to assess as are the rather vague, suspected health effects, such as hormonal or developmental disorders.

In 2015, the Endocrine Society (a global group of academic researchers and physicians) issued a second scientific statement on EDCs, citing great research advances over the past five years leading to a better understanding of the adverse effects of common EDCs such as bisphenol A (BPA) and phthalates. BPA and phthalates are often used as plasticizers with the function of making plastics more pliable. Food containers and water bottles are two potential sources of exposure as the compounds can leach into the consumed contents, particularly when plastics are heated. Their individual human health effects at low-level exposures appears to also be acceptably low.

Previous studies in rats showed that high doses of phthalates resulted in adverse effects in reproductive biomarkers. Human exposure doses, however, tend to be low and chronic and humans are not rats. Thus, the question remains: what is the risk to humans? One study in humans looked at phthalate concentrations excreted in urine and correlated levels with sperm count and quality. Results indicated that increasing phthalate concentrations were significantly associated with lower total sperm counts, concentrations and quality as measured by head size and motility. The effects of phthalates on fertility were not established in the latter study and thus, the researchers caution against an over-interpretation of the results where confounding factors are likely.

Similarly, BPA doses in rats resulted in a wide range of adverse effects from cancer to abnormal sexual behavior to disrupted reproductive cycles. Studies in humans have indicated insufficient evidence for developmental and reproductive toxicity and minimal concern for low-level adult exposures but some concern for exposures to fetuses, infants and children. As a precautionary approach, however, industries and manufacturers began phasing out the use of BPA around 2006 in food and water storage containers with tax credit incentives from US EPA and the Food and Drug Administration.

Drinking water options

Given the paucity of data linking hormonal effects to plasticizers, many bottled water companies continue to use bottles containing BPA and phthalates. Data from the literature generally supports that bottled water is not a significant source of either of these compounds. They may contribute, however, to an additive effect along with other environmental sources. Because of these uncertainties, both sides of the issue passionately debate the next best step forward.

Although definitive human health risks from phthalates and BPA have not been proven, many consumers are advocating for their removal from food and water. Avoiding these and other endocrine disrupting compounds in drinking water,
may be difficult given that distribution piping and storage containers may contain a variety of suspect compounds. A resin code of seven on plastic containers indicates it may contain BPA. Consumers can self-select the types of bottles they choose to purchase if they are concerned about EDCs in packaging. Further, POU treatment of tap water with a properly installed and maintained NSF-certified water filter can decrease the levels of many EDCs, including phthalates and BPA.

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Stationed on Big Stone Lake in Ortonville, a 1933 building originally housed pumps to get water from a pair of wells to residents in higher parts of the city.

High levels of iron and manganese in the groundwater prompted the city to add filters and transform the facility into Ortonville’s first water treatment plant in the 1960s.

In 1997 Ortonville teamed with Big Stone City, across the lake in South Dakota, to open the Big Stone Area Treatment Plant, one that serves both cities. Two wells in sediment in the river plain pump water to the treatment plant, which is farther inland than the previous one and on a hill about 400 feet higher than the wells.

The new plant included a flocculation basin, unlike the direct filtration in the original plant, to allow detention time for contaminants, reducing the amount of iron and manganese that reaches the filters. The plan for the 1997 facility was to add lime softening, but the process was dropped because of the cost. The hardness of the water in the ground is approximately 1,100 parts per million (ppm) as calcium carbonate. Residents of Ortonville have water softeners in their homes.

The raw water also has 5 ppm of iron and .5 ppm of manganese, both high enough to cause noticeable aesthetic effects in the water. The new plant did its job in lowering the iron and manganese levels while producing about 1,000 gallons per minute. High service pumps delivered water across the state line to Big Stone City, which has a smaller population (about 450) but also provides water to an ethanol plant.

However, the filter runs at the plant were short, often only five hours. John Thorn of SEH, Inc. Vadnais Heights, Minnesota, says the raw water is high in organic matter, causing problems with the oxidation of the iron in pre-treatment. The result was short-circulating in the...
flocculator, resulting in too much load on the filters.

SEH, Inc. worked with Ortonville on a pilot study to explore remedies and chose plate settlers as the solution. The city considered but rejected the costly option of adding to the building. Instead, it moved a stairway, put in flocculation basins, and reused the old detention tanks as plate settlers.

“The new plant included a flocculation basin, unlike the direct filtration in the original plant, to allow detention time for contaminants, reducing the amount of iron and manganese that reaches the filters.”

Plate settlers have long been used in wastewater treatment. Their more-recent use in water plants has been for backwash reclaim. “Here, they are used for the iron and manganese removal,” said Thom, who explained that incoming water is aerated and then has chlorine, permanganate, and a polymer added as it enters the flocculation basin. “Then it flows in under the plate settler, and the particles rise. The plates are slanted. Particles travel up in a straight line, settle to a plate, and fall back into the sludge collector. Clear water comes off the top.”

Rather than 4 to 5 ppm of iron reaching the filters, now only about .5 ppm gets there, a 90 percent reduction in filter loading. Manganese dropped from .5 ppm to .1 ppm because of the plate settlers. “Instead of short filter runs, they are now pushing 100 hours although they will backwash at least once a week,” said Thom. “Before, they couldn’t recycle the water. It was all going to ponds. Now only the sludge goes out.”

Recovering the backwash water will result in less water usage, enough that the savings in water will cover the project cost, approximately $750,000, in six or seven years. Said Thom, “We got a big impact with a small outlay of dollars.”
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The city of St. Anthony Village recently completed an addition to its water treatment plant that uses ultraviolet (UV) light technology to remove 1,4-dioxane, a contaminant of emerging concern, in the city’s municipal wells. The plant is one of the first in Minnesota to use UV technology and hydrogen peroxide together in a potable water system, although it is being used successfully in dozens of other treatment systems across the country to remove the contaminant from more than 250 million gallons of drinking water each day.

Patented by the Dow Chemical Company, 1,4-dioxane was widely used as a stabilizing additive for trichloroethylene (TCE), a chlorinated solvent used as a degreaser. The use of these chemicals for many years at the Twin Cities Army Ammunition Plant in Arden Hills was found in 1987 to have contaminated soil, sediments, surface water, and groundwater. St. Anthony Village’s water treatment plant already removes TCE from the municipal water system.

The health risk limit of 1 part per billion (ppb) established by the Minnesota Department of Health (MDH) for 1,4-dioxane was exceeded for the first time in one of the city’s three wells, Well No. 4, in June 2015. It has not been detected in the distribution system. The well was immediately shut down; however, ongoing testing indicated that levels in the other two wells were slowly rising as the dioxane plume moved southwest.

WSB & Associates of St. Paul was retained in July 2015 to evaluate the options available to the city to address the problem, based on objectives set by the city council. Five options included blending water from the city wells to dilute 1,4-dioxane to below Minnesota Department of Health guidance limits; extending existing wells or constructing new wells into the deeper Mount-Simon Hinckley aquifer; purchasing water from Minneapolis; purchasing water from St. Paul Regional Water Services; and implementing treatment.

WSB’s Water/Wastewater Group studied Environmental Protection Agency pilot plant studies employing treatment technologies for 1,4-dioxane and concluded that modifying the plant to treat the contaminant with ultraviolet light and hydrogen peroxide (H2O2) was the most cost-effective solution for the city. When added to water in a vendor-supplied UV reactor, the hydrogen peroxide absorbs UV light, producing hydroxyl radicals that break down 1,4-dioxane into nontoxic compounds consisting of carbon dioxide, water, and residual chloride. This advanced oxidation process is also effective in treating other volatile organic compounds (VOCs) that may be present, including TCE.

In the presence of MDH officials, WSB engineers and representatives of Trojan Technologies Inc. conducted a pilot treatment in August 2015 using a sample tap downstream of the plant’s greensand filters, which treat turbidity and remove iron and manganese. The water was spiked with dioxane to test whether the treatment would remove more than 99.9 percent of the contaminant and piped into Trojan’s UVPhox unit. Following UV oxidation, the water was routed back to the plant’s existing granular activated carbon filters (GAC) to quench any excess hydrogen.
peroxide and remove TCE and any remaining VOCs.

The benefits of pursuing UV light technology were considerable. The treatment physically destroys and removes dioxane from the environment and does not create other contaminants that require disposal as hazardous materials; in other words, the treatment cleans the aquifer, reducing risk to other users of the aquifer located downstream of St. Anthony Village. It can not only be used in conjunction with the city's other treatment processes, but enhances those processes to remove TCE and other contaminants. Use of the city's three existing wells can continue, including Well No. 4; the pilot study demonstrated that the treatment system can successfully treat increases in dioxane levels. The city also remains in control of its own municipal water supply system.

Design began in April 2016. Siting a new building within the small footprint of St. Anthony Village’s existing treatment plant site necessitated the removal of a pumphouse and installation of new booster pumps inside the new plant addition. Its ideal location adjacent to the GAC filter building also required that a specially designed foundation system be located beneath the filter building. Plans called for three UVPhox units to accommodate a design flow of 3,000 gallons per minute (gpm) and an average flow of 1,250 gpm, a chemical storage room with two 3,000-gallon bulk storage tanks, a 60-gallon day tank, and a hydrogen peroxide feed system. Flow from the greensand filters is metered and split between treatment units in response to water demands using automated control valves via an expanded plant automation control system. Water is then routed back to the GAC filters to complete treatment.

Construction began late that summer; challenges included keeping the existing treatment processes in service and minimizing disruption to the plant. Complete tie-in was accomplished during the off-season over two separate days. At a cost of $6.7 million, well below the engineer’s estimate of $7.2 million, construction was finished in July 2017, just two years after Well No. 4 was removed from service.
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PART I

At 8:25 a.m. on Sunday, January 8, George Linngren got a call every utilities superintendent dreads. The on-call duty officer for the city of Blaine, a northern Twin Cities suburb, told Linngren that residents were calling because they weren’t getting water. The outage was not localized; the calls were coming from across the city.

Linngren headed for his office and found that all of the city’s towers were empty. (Blaine has four towers, and one was out of service.) Two pumps at one of the treatment plants had failed the night before. The SCADA system had worked as it should – indicating the empty towers – but the WIN 911 dialer had not called out to indicate the alarms.

Crews went to work, turning on other wells in addition to starting up auxiliary wells that had been taken out of service for the winter. The adjacent suburbs of Spring Lake Park and Coon Rapids opened their emergency bypasses, and water was flowing to Blaine again.

Linngren contacted the state duty officer and talked to David Weum, an engineer from the Minnesota Department of Health. Weum advised Linngren to issue a boil water advisory in case bacteria had entered the system during the time the...
pressure had been low. Social media was a valuable tool for getting the word out, and local television stations put a crawl at the bottom of the screen advising Blaine residents to boil their water before using it for drinking or cooking.

By 11:00 a.m. messages started appearing on the city’s Facebook site from residents reporting that their water was returning, although the boil water advisory would have to remain until the city could get sample results back.

As part of activating Blaine’s Emergency Operations Center, Linngren got calls from a joint terrorism task force of the FBI and Homeland Security. The task force wanted to make sure the situation was caused by a mechanical failure and not from anyone with malicious intent. The police department collected some computers and downloaded the hard drives on others to see if the system had been hacked. (It hadn’t.)

Linngren also learned a lesson about having emergency phone numbers for its laboratories. Unable to connect with the utility’s regular labs, Linngren was able to reach the laboratory for St. Paul Regional Water Services. The city collected samples Sunday afternoon and took them to St. Paul.

Schools in Blaine were closed on Monday, and later in the day the processing of the water samples was complete, with no contamination detected.

Life with water was able to return to normal for Blaine residents, although the utility remained busy, assessing what happened and taking steps to prevent a repeat of the problem.

Following emergency procedures already in place, Blaine was able to get through the crisis in a timely manner.

PART II

Five weeks later Linngren received one of those calls that produces a “You gotta be [excrement]-ing me” reaction. At 5 p.m. on Sunday, February 12, his 52nd birthday, Linngren was notified that there was no pressure in the system again. A battery backup failed, and the alarms that were generated didn’t make it to the automatic dialer.

Linngren and the city went through the same routine again, although this time the process was a bit smoother, in part because of lessons learned from the first time, such as having backup numbers for the labs. With no way to be certain if the pressure had dipped below 20 pounds per square inch, and, if so, for how long, the city issued another boil water notice and worked with MDH to sample the water.

They got the samples to the lab by 11:00 that night, and the samples came back clean within 24 hours but not before Blaine schools had to close again for a day.

More lessons have been learned, and Linngren said their communication through social media and other means produced “a lot of understanding from the public.”

Blaine continues to assess what went wrong and what the city will do to prevent such problems again. As Linngren summarized, “The first time it’s painful. The second time it’s real painful.” •
The superintendent of an average 4 million gallon per day (MGD) activated sludge wastewater treatment plant (WWTP) reports that his or her preference for using chlorine gas as the most cost-effective option for primary disinfection has been further supported by enhanced management of gas leak risk.

“We are operating 24/7 within 200-300 yards of residences, as well as a youth baseball complex,” noted Wayne Lee, superintendent of the wastewater plant in Slidell, Louisiana, “and we also have a high regard for the safety of our employees. We haven’t had any serious gas leak issues since the plant opened in 1984, and we have a trained hazmat team on call for emergencies, but we were pleased to be able to enhance that response insurance with cost-effective, on-site physical containment readiness.

“That leaves us much better prepared for any off-hours event, when there would be only one plant operator, and it would take longer to assemble the hazmat team.”

PLANT OPERATION

The incoming wastewater stream for the design 6 MGD plant passes from the headworks into a grit chamber, followed by two primary clarifiers, and then aeration tanks, before final clarifiers that are linked to an anaerobic digestion loop. The clear water leaving the final clarifiers goes to the chlorine contact chamber.

Chlorine is pumped to injectors at the rate of 125 lbs./day, with injection performed at the final clarifiers “to give it more time to work, and also use less that way,” said Lee. He added that gas was his preferred option for chlorine addition, with the plant too big for tablets or powder and bleach likely costing twice as much.

Two one-ton cylinders of chlorine are stored in a covered building. Sulfur dioxide, used at the end of the plant process for dechlorination, is stored inside an enclosed building.

Each chlorine cylinder was placed inside a special vessel apparatus in 2010. Each sulfur dioxide cylinder was placed inside a special vessel apparatus in 2012. The special apparatus contains and processes any leaks. The cylinder containment vessels, supplied with loaders, scale systems, and instrumentation, were manufactured by TGO Technologies of Santa Rosa, California.

“That vessel containment was much preferred to a scrubber-type solution, which would require major building modifications,” Lee noted. “A scrubber system would also have required a special six-member, trained response team to be available to deal with a leak within the building.”

“With the vessels, it is all done automatically, with minimal personal exposure. And with two tanks for each gas, we don’t have to suffer any plant process interruption if there is leak containment going on in one of them.”

LEAK CONTAINMENT

Lee said the procedures for leak management were not difficult, with the container manufacturer helpful with training.

“We got used to it during some minor episodes that occurred during cylinder deliveries,” he recalled. “They had been placed in the containment, so we just bypassed to the other cylinder while the gas leak was vacuumed out.”
The containment vessels were positioned on a concrete pad and bolted down. With any accidental leaks of chlorine kept within the containment vessel, no atmospheric venting is generated. The vessels are ASME-rated pressure tanks, and any leaks are recycled to the injection system at a normal flow rate. A fail-safe valve ties into the chlorine sensor, so that in the event of an external release, the failsafe valve will close and sense it is under vacuum.

Any leak or release of chlorine gas from the vacuum line downstream of a vacuum regulator will lose the vacuum condition and cause the vacuum regulator to close, stopping the flow of chlorine gas to the vacuum line. The maximum release of chlorine gas will be the amount of chlorine gas that is the length of the vacuum line to the chlorine injector, not drawn into the water solution by the suction of the injector.

There can be a question of the integrity of the system from the outlet line, where chlorine gas penetrates the wall of the pressure vessel, to the location where the vacuum line leaves the outlet side of the pressure regulator. A study has shown this could release less than 0.0009 lbs. of chlorine gas. Should there be a gas leak inside a vessel, there is no waste, as the gas is processed at a normal rate until everything is used. •

Cliff Lebowitz heads Catalytic Reporting, LLC, which specializes in third-party case history reporting for industrial equipment manufacturers. Reporting is based on interviews of end users, and is approved by them for accuracy and completeness.
People

**Anna Arkin** has joined the Drinking Water Protection Section at the Minnesota Department of Health as a planner and health communicator. A native of Arlington, Virginia, Anna came to the Midwest for college (Washington University in St. Louis) and recently graduated with a master’s degree in public health from the University of Minnesota. She worked for the Minnesota Technical Assistance Program, providing technical assistance to Minnesota businesses on waste reduction and pollution prevention, and interned at the governor’s office, working on health policy. Anna has a husband, David, and a dachshund杰克 Russell terrier mix, Nellie. Anna has been to 40 states and is working on the final 10.

**Bob Cockriel** retired in August 2017 after nearly 40 years of municipal service in Minnesota. He had been the utilities superintendent in Bloomington since 1994 and held the similar position in Roseville for the prior five years. Cockriel was also an engineering technician for Woodbury and White Bear Lake from 1973 to 1989. He was was president of the Minnesota Chapter of the American Public Works Association and Minnesota Wastewater Operators Association. With the Minnesota Section of American Water Works Association, he chaired the Metro District, Administrative Policy Council, Water Utility Council, and Safety Committee. He was a member of the Water Environment Federation and Minnesota Training Coalition and a member of advisory boards for the geomatics and mapping program for St. Paul College and for the water environment technologies program for St. Cloud Technical College.

Cockriel also served on numerous task forces and advisory groups, including:
- Minnesota Water and Wastewater Agency Response Network (MnWARN)
- Metropolitan Council Metropolitan Area Water Supply Advisory Committee and Interceptor Reconveyance and Cost Sharing Task Force
- Minnesota Department of Health Commissioner’s Task Force on Terrorism, Water Operator Certification Council, and Drinking Water Revolving Loan Fund Advisory Group

**Steven R. Carleton** is the new president of Progressive Consulting Engineers of Minneapolis, the beginning of an ownership transition from Naeem and Nuzhat Qureshi, who founded the company more than 30 years ago. A native Minnesotan, Carleton has a background in urban planning, specifically in transit.

**Dave Hokanson** rejoined the Noncommunity Public Water Supply Unit at the Minnesota Department of Health as supervisor in August. Hokanson worked in the unit from 1998 to 2005 before becoming the deputy director of the Upper Mississippi River Basin Association. Prior to coming to Minnesota, he worked in the drinking water program for the Indiana Department of Environmental Management and was a Peace Corps volunteer in Botswana. Hokanson graduated from the University of Wisconsin, Madison, and got his master’s degree at Indiana University. Dave, his wife, and their two daughters live in St. Paul.

**William Siegel** has joined the board of directors of RJN Group, Inc., an engineering firm involved in collection and conveyance systems.

**Patricia Mathern**, **Dixon Seider**, **Larry P. Knathaus**, and **Lisa Traynor** have joined Batwawn LCC in Granite Falls, Minnesota, as project managers/engineers in the company’s water/wastewater division.
Good News and Bad News on the Bottled Water Ban in National Parks

The Winter 2015 Breeze contained an article on the National Park Service taking a stand by discouraging the sale of bottled water at its parks despite pressure on Congress from the International Bottled Water Association to cut off federal money the Park Service is using to install bottle-filling stations as an alternative to bottled water.

The follow-up to this story has good news and bad news. First, the good. The Washington Post reported September 26, 2017 that a National Park Service’s ban on the sales of bottled water resulted in annual savings of up to two million water bottles, which prevented 112,000 pounds of plastic from being sold and discarded each year “along with up to 140 metric tons of carbon dioxide emissions,” according to the Post.

However (and here’s the bad stuff), the Trump administration rescinded the ban in August 2016, the result of lobbying from the International Bottled Water Association.

The Park Service is still encouraging visitors to avoid bottled water by selling reusable bottles and installing bottle-filling stations in its parks. Meanwhile, Representative Mike Quigley of Illinois has introduced legislation to reinstate the ban on selling bottled water at National Park Service sites.

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- What other industry plants hundreds of millions of trees every year?
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- What other industry generates most of its own energy needs from renewable resources, including waste biomass, biogas, hydro and wind?
- What other industry uses a renewable resource and recycled stock as its main ingredients?
- What other industry has worked harder on improving its environmental performance with partners and advocates including governments, customers and environmental groups?

Paper is an essential part of human civilization. While we all use and depend upon electronic communications, it is easy to ignore that it comes at an environmental cost. Worldwide spam email traffic creates greenhouse gases equivalent to burning two billion gallons of gasoline yearly, with numbers rising. More than 200 million items of toxic e-waste are thrown away every year in the US alone, with a recycling rate of only 18% compared to 57% for paper. Estimates are that North Americans throw out more than 500,000 toxic computers and cell phones every day.

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<td>763-479-3121</td>
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<td>Ess Brothers and Sons Inc.</td>
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<td>Ferguson Waterworks</td>
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<td>612-850-9405</td>
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<td>General Repair Service</td>
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<td>800-767-5151</td>
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<td>GSOC</td>
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<td>800-252-1166</td>
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<td>Hawkins Water Treatment Group</td>
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<td>HRI Green, Inc.</td>
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<td>Metering and Technology Solutions</td>
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<td>952-831-4340</td>
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