

# *Delafield-Hartland Water Pollution Control Commission*

*416 Butler Drive  
Delafield, Wisconsin 53018*



**From the “General Manager’s Desk”**

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## **From the “General Manager’s Desk”**

Welcome to Delafield-Hartland Water Pollution Control Commission’s new website. I hope the information on the following links help you understand what goes on at a wastewater treatment plant. I will be posting different subject matters on my desk (this link) of what impacts the plant from time to time. I hope you take the time to check back and read the articles; you will be surprised at what I see coming down the sewer and the effects it has on the entire system and you.

Scott Luczak  
General Manager

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## **Little Bit of History**

The Delafield-Hartland Water Pollution Control Commission's facilities started operations in July 1980 and included a Wastewater Treatment Plant, Intercepting Sewer, Five Pumping Stations and an Outfall Sewer.

The treatment plant was originally designed to treat an average daily flow of 2,200,000 gallons per day with a Biological Oxygen Demand (BOD) and suspended solids load equivalent to that produced by 22,000 people as calculated in the design year 2000. The treatment plant removes over 95 percent of the BOD and suspended solids and over 90 percent of the ammonia from the raw wastewater during treatment.

The original Intercepting Sewer System included pumping stations providing for the conveyance of raw wastewater from the City of Delafield, the Village of Hartland, and the Village of Nashotah to the treatment plant located in the City of Delafield. The outfall sewer discharges the plant effluent into the Bark River downstream from area lakes.

## **The Wastewater Treatment Plant**

This treatment plant is an advanced wastewater treatment facility. A higher degree of treatment is required to protect the receiving water environment in the Bark River. This is accomplished through a more complete removal of BOD, suspended solids, and ammonia than would be achieved by a conventional treatment plant.

Raw wastewater is first pumped from the influent pumping station to the comminutor which cuts and grinds large objects typically found in raw sewerage. The wastewater then passes through a flow measuring device enroute to the aerated grit tank which removes sand, stones, and bits of glass or metal.

The effluent then flows to two primary settling tanks where the velocity is reduced so that solids previously held in suspension will settle to the bottom. Settled primary sludge is then pumped to the primary digester. Primary settling removes approximately 30 percent of the BOD and about 50 percent of the suspended solids in the wastewater.

The primary effluent then flows to four tanks, each of them employ seven rotating biological contactors. An advanced degree of BOD and ammonia removal is accomplished in this process biologically. Micro-organisms attach to the plastic media, absorb solid particles and dissolved

matter from the primary effluent, and then use these materials as a food source. Biological solids that slough off the contactors are conveyed with the flow of wastewater to the final clarifiers. Here these biological solids settle to the bottom to allow the relatively clear effluent to flow over the weirs.

The final clarifier effluent flows to the sand filter units. These filters are shallow bed automatic backwash sand filters that accomplish an advanced degree of suspended solids removal. Sand filter effluent then flows to the chlorine contact tank for disinfection with chlorine, post aeration, and then to the effluent pumping station. The total length of time it takes the wastewater to flow through the treatment plant under average daily flow conditions is approximately twelve hours.

Finally, the plant effluent is discharged to the Bark River via an 18,000 foot long outfall force main with a cascade reaeration structure located near the discharge location. Sludge removed during primary and biological treatment are stabilized in the anaerobic digestion process, dewatered in four sludge dewatering cells, and applied to agricultural lands either in dewatered form or in liquid form as received directly from the digester.

## **Intercepting Sewer System**

The major components of the intercepting sewer system include the Delafield-Hartland Main Interceptor, the Nashotah Interceptor, and four outlying pumping stations.

The Delafield-Hartland Main Interceptor reaches from the Village of Hartland and through the eastern and southern portions of the City of Delafield collecting raw wastewater to convey to the treatment plant. It consists of over 32,000 feet of gravity sewer and force main pipe ranging in size from 18 to 42 inches in diameter. Two of the four outlying pumping stations are located along this interceptor route.

The Nashotah Interceptor serves the Village of Nashotah and the western portion of the City of Delafield, conveying raw wastewater to the Delafield-Hartland Main Interceptor. It consists of over 13,000 feet of gravity sewer and force main pipe ranging in size from 8 to 21 inches in diameter. The two remaining outlying pumping stations are located along this interceptor route.

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## **Why the Plant Upgrade?**

The construction of the Delafield-Hartland Water Pollution Control Commission's original wastewater treatment plant was completed in 1980. In the 1990s, new effluent limits set by the Wisconsin Department of Natural Resources requiring phosphorus removal and lower Biological Oxygen Demand (BOD) concentrations forced changes to be made to the system. In addition, rapid population growth in the community and a new sanitary sewer district requesting connection brought the existing daily flow close to the calculated plant capacity. Also, sludge storage facilities were reaching full capacity.

After extensive evaluation for the surrounding community's needs and current working treatment systems that could meet those needs, the Commission decided to upgrade its existing plant. The existing plant structures were remodeled and adapted for the new treatment system using an activated sludge process and included raw wastewater pumping, primary clarifiers, final clarifiers, tertiary filters, disinfection, and anaerobic digestion.

During construction the plant was modified to continue full operation and even with its temporary set-up and pumping facilities was able to operate below the design discharge limits.

The wastewater treatment system upgrade was designed and constructed below its estimated cost and ahead of schedule. The new activated sludge process went online in 2005.

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## **Challenges for Upgrading the Plant**

A major challenge to this project required changing the biological process from Rotating Biological Contactors (RBCs) to activated sludge. The change required that the RBCs be maintained for treatment usage while the activated sludge process was being built. Once a portion of the activated sludge process was operational, the RBCs were then demolished and the remainder of the activated sludge process was completed.

Converting the existing two-stage conventional anaerobic digesters to a Temperature Phased Anaerobic Digestion (TPAD) design to meet Class A criteria was another challenge. Improved heating capacity, sludge mixing, and an innovative operating system allowed the existing digesters to be converted to a TPAD process.

Other challenges included addressing the sludge drying capacity of the upgraded plant by installing sludge dewatering facilities with provisions to haul dewatered sludge on-site to the sludge drying beds for further drying. The resulting Class A sludge could be used for agricultural, commercial, or residential applications.

The adjacent elementary school located nearby the architecturally restricted downtown area of Delafield posed another challenge. The site plan approved by the City of Delafield planning committee incorporated architectural and lighting treatments to the buildings and landscaping. The lighting plan helped minimize offsite light. In addition, the plan featured odor control facilities for the headworks and sludge handling areas.

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## **Wastewater Treatment Processes**

### **1. Preliminary Treatment**

The septage/recycle (hauled waste) storage tank allows high strength wastes to be fed slowly to control the impact on the wastewater treatment process. The influent raw wastewater pumps have the capacity for emergency high peak flows. A mechanical bar screen removes solids larger than an inch, then the wastewater continues through an aerated grit removal system.

### **2. Primary Clarifiers**

Most of the solids suspended in the raw wastewater are removed in this process. The primary clarifiers are designed for efficient gravity settling of the wastewater solids. Then the settled solids are transferred to the sludge digestion process for stabilization.

### **3. Activated Sludge**

The activated sludge process provides biological removal of organic material: Biological Oxygen Demand (BOD), ammonia, and phosphorus. The following equipment is used in the activated sludge process:

- Anaerobic Tank with no dissolved oxygen or nitrate
- Anoxic Tank with no dissolved oxygen
- Aerobic Tank with dissolved oxygen
- Blowers controlled by dissolved oxygen concentration
- Fine bubble aeration for energy efficiency

### **4. Final Clarifiers**

The final clarifiers provide for solids separation of the mixed liquor from the activated sludge. However, most of the settled sludge is returned to the activated sludge process with some sludge wasted to the sludge handling process. High efficiency features in this process include:

- Peripheral baffles for improved hydraulics
- Inlet energy dispersion well
- Spiral scraper arms
- Peripheral chlorine feed for disinfection and algae control

## **5. Tertiary Filters**

Tertiary filters provide for the removal of suspended solids from the final clarifier effluent. A traveling bridge type system is used with sand media for maximum filtration.

## **6. Disinfection**

In this process liquid sodium hypochlorite is used for wastewater disinfection and for tertiary filter maintenance. In addition, liquid magnesium bisulfite is used to reduce the residual chlorine in the effluent before it is discharged into the Bark River.

# **Intercepting Sewer System**

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The Town of Summit Force Main discharges directly at the plant into an equalization basin to control the immediate impact on the plant.

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## **Sludge Treatment Processes**

### **1. Waste Activated Sludge**

The waste activated sludge is pumped to a storage tank. Sludge from the storage tank is then thickened in a gravity belt thickener and stored for the digestion process.

### **2. Primary Sludge**

Sludge from the primary clarifiers is pumped to a storage tank to be mixed with thickened waste activated sludge. The mixed sludge is then pumped to the anaerobic digestion process.

### **3. Anaerobic Digestion**

The two anaerobic digesters are operated in a temperature phased process. The first digester is operated at a thermophilic temperature of 131°F and the second digester is operated at a mesophilic temperature of 98°F. This process produces Class A sludge suitable for distribution.

### **4. Sludge Dewatering/Drying**

In this process, anaerobically digested sludge is dewatered using a belt filter press. The sludge cake is then transferred by truck to the sludge drying beds for storage. The sludge in the drying bed is spread and mechanically turned and agitated to enhance drying. The treated and dried sludge is then transported to the sludge storage building for distribution.

### **5. Sludge Disposal**

The sludge is processed to a Class A level which allows for numerous types of disposal. The Class A sludge can be used for lawns and gardens in residential areas as a top soil amendment or as an agricultural fertilizer. The Commission has made this Class A sludge available to local residents for their use.

### **6. Biogas Recovery**

The anaerobic sludge digestion process produces biogas that can be used for energy. Most of the biogas is recovered and used in a boiler to heat the sludge to the required temperature. Excess biogas is also reused for building heat as well as the methane generator that provides power for one of the raw wastewater pumps.

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## **Benefits**

One of the major benefits to the Delafield-Hartland Water Pollution Control Commission is receiving a significant upgrade to the facility at an affordable price. The new plant design offers flexibility and energy efficiency. The site plan allows for additional future expansion up to build-out conditions for the sewer service area. In addition, the Class A sludge provides worker and user safety while expanding the alternatives for ultimate sludge disposal. Hydraulic improvements to the primary and final clarifiers have resulted in higher solids removal efficiency.

## **New Plant Specifications**

### **Effluent Limits**

Parameter Effluent Limitations:

BOD5 6.5 mg/l in summer; 11.4 mg/l in winter

TSS 10 mg/l in summer; 14 mg/l in winter

Ammonia 1.7 mg/l in summer; 8.5 mg/l in winter

Phosphorus 1.0 mg/l

### **Design Capacity**

Average flow 3.26 MGD

Peak Flow 7.6 MGD

BOD5 5,538 Lbs/day

TSS 6,849 Lbs/day

### **Cost**

The final cost of the redesign and upgrade to the treatment plant was about \$15,400,000.

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## **BIOSOLIDS: What and Where are They Available?**

### **A Simple Q & A on Del-Hart's Biosolids:**

**Q:** What are biosolids?

**A:** Biosolids are a byproduct of wastewater treatment. Ninety-nine percent of the solid material in wastewater is removed, digested, thickened, and dried; then class "A" biosolids are ready for distribution to the public.

**Q:** What good are the biosolids to the public?

**A:** They are an excellent source of fertilizer for your lawns, shrubs, trees, and flower beds. The substantial nutrient content will help supply plant needs for nitrogen, phosphorus, and potassium; nutrients necessary for healthy plant growth. We do not recommend that they be used on any crops ingested by humans.

**Q:** Are biosolids harmful to children and pets?

**A:** We ask that you follow the precautions that you would with any other fertilizer product.

**Q:** Will the biosolids have any kind of odors?

**A:** Yes, they will have an earthy or barnlike smell at first, but usually after one or two rain falls the smell will disappear.

**Q:** If you wanted to seed or reseed a lawn, how would it work?

**A:** We recommend mixing the biosolids with topsoil at a 50-50 rate; however, some people have told us that they spread about 1-1.5 inches of biosolids over dirt or partial grown grass. They then seed, water, and new growth can be seen within a week.

**Q:** Where and when can I get some biosolids?

**A:** You can stop in at the Delafield-Hartland Wastewater Treatment Facility located at 416 Butler Dr. Delafield, WI 53018 between 7:00 a.m. and 3:00 p.m. Monday thru Friday or call the General Manager at 262-646-4364 Ext. 2 to schedule a pick-up.

**Q:** Do you offer any kind of delivery of biosolids?

**A:** Yes, if you want 1-5 yards of biosolids there would be a \$15.00 delivery charge for anyone located within the sewer service area, and a \$25.00 delivery charge for anyone located out of the sewer service area. If you want more than 25 yards (5 truck loads) there would be no charge for anyone located in the sewer service area and a \$15.00 delivery charge per truck load for anyone located out of the sewer service area.

If you have any further questions please feel free to call me, Scott Luczak, General Manager at 262-646-4364 Ext. 2.

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## **What You Should and Should Not Put Down the Sewer!**

For quite a few years some people have assumed that if it will go down the toilet, it belongs in the sewer, WRONG!!!!

With the invention of the paper towel, disinfecting wipes, baby wipes, and similar products, people think that these items belong in the sewer. If the label does not say biodegradable, the product does not belong in the sewer. There are only two things you should put in the toilet: human waste and toilet paper (toilet paper is treated to break down in water). Another nasty culprit that clogs our sewer pumps are feminine products. I do not think that I need to go into detail, but everyone knows that plastic and cardboard should not be in the toilet. That material is specifically designed for the garbage. And it will eventually end up there, but at a much higher cost to our sewer users.

At the treatment plant I have seen a lot of solids coming in lately, including whole cherry tomatoes, orange slices, celery sticks, and chunks of meat. Ideally, I should not see anything larger than a quarter inch in diameter in our sewer pipes. All of the area restaurants "should" have strainers in place to eliminate this problem.

In wrapping up this subject, I want you to know that this unwanted material costs a great deal of money and time to remove and creates excessive wear on the sewer equipment. So I would ask that everyone does their part to dispose of only biodegradable material down the sewers and keep our pipes free of all other destructive and expensive to remove materials.

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## **Water Softeners and the Environment**

### **Do you use a water softener?**

*If your answer is "yes," this information is for you on how to optimize its usage, resulting in lower salt costs for you and benefits for the environment.*

You can easily reduce high concentrations of salt which flow from your house to your septic system or your local wastewater treatment plant, and ultimately end up in neighboring lakes, streams, rivers, and groundwater. The cumulative effects of each homeowner's excess use of salt and resulting brine discharge can have toxic effects for aquatic plants and animals.

#### **Why is Water Softener Salt a Problem?**

Based on estimates from the Salt Institute of America, in 1994 Americans spent approximately \$240 million to purchase 2.6 million tons of salt for use in water softeners.

The primary salt utilized in home water softeners is sodium chloride, a naturally occurring and commonly used substance. Sodium chloride normally breaks down into sodium and chloride. These elements are discharged to septic systems or to your local wastewater treatment plant via sanitary sewers. It passes through these systems and is discharged to groundwater or surface water, where the chloride may impact freshwater organisms and plants, from plankton to fish, by altering reproduction rates, increasing species mortality and changing the characteristics of the entire local ecosystem. In addition, as chloride filters down to the water table, it can stress plant respiration and change the desirability of our drinking water.

#### **How Does a Water Softener Work?**

In many Wisconsin communities, people use water softeners to remove minerals from their water that cause hardness. An ion exchange process is the traditional method of removing hardness from water for household use. Hard water passes through a column of sodium charged resin, where hard water ions such as calcium and magnesium are removed from the water by exchanging places with the resin bound sodium ions. The water is then said to be "softened."

The resin is "exhausted" when it has given up all or most of its available sodium ions. The resin is then "recharged" with sodium ions during a process known as regeneration. During this process,

the resin is washed with a concentrated brine solution (most often sodium chloride) that reverses the hardness removal process. The total regeneration cycle includes backwash, brine regeneration and final rinse. Of the three steps in the cycle, brine regeneration is the part over which you, the homeowner, have the most control.

### **What Can I Do To Reduce My Salt Usage?**

Soften only the water that needs to be softened. If you are building a new house, remodeling bathrooms or kitchens, replacing old plumbing or installing a new water softener, consider where your water needs to be softened. Work with your plumber to connect your water softener to only those areas that need softened water.

Places to "feed" softened water are: Hot water heaters, laundry facilities, dishwashers, toilets (consider low flush models), and showers.

Places to bypass using the water softener include: Outside water spigots for yard use, and cold tap drinking water lines.

By softening more water than what is really needed, you increase the cost of operating your softener (in terms of increased payments for salt and energy), and ultimately, more salt will enter the environment as a result of increased softener regenerations.

### **Use Minimum Salt Dosage Needed For Regeneration**

Water softener regeneration is most efficient at the beginning of the brining cycle. The higher the salt dosage in the cycle, the lower the regeneration efficiency.

By setting your water softener to regenerate more frequently and using less salt for each regeneration, you may be able to increase your softener's regeneration efficiency, which could result in significant salt savings for you.

Consult with a qualified water softener representative for details on how to adjust your water softener to minimize salt usage while retaining enough softened water for normal household use.

### **Switch from a Timer to a Demand Initiated Regeneration Control**

Many water softeners regenerate based on a timer typically set to regenerate once every 2 or 3 days, depending on expected water usage and water hardness. By measuring actual demand on the water softener, "demand initiated regeneration" or DIR controls are much more efficient in the regeneration process. These controls use either a flow meter or a hardness sensor to determine when to begin the cycle. The "payback" period for adding a DIR control to your water softener from reduced salt usage can be as little as three years.

Check with your local qualified water softening representative to see what is appropriate for your particular needs. Even if a newer more efficient water softener is not in your immediate future, you can still optimize the efficiency of your home unit, resulting in savings for you and the environment.

To reduce or eliminate Sodium Chloride pollution, our best alternative is preventing the pollution at the source of its generation, before it creates a more serious environmental problem. Please do your part if you can.

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## **Contact Us**

### **Commission Members**

#### **City of Delafield**

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262-646-2907

Beth Leonard  
262-367-2434

Gerald Mac Dougall  
262-646-8774

Ray Putchinski (Alternate)  
262-646-4669

#### **Village of Hartland**

Karen Compton (Secretary/Treasurer)  
262-367-6287

Richard Landwehr (Vice Chair)  
262-367-6500

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262-367-4151

Rick Stevens  
262-367-3876

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### **Del-Hart Staff**

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