

Wayland Water Department Membrane Filtration Water Treatment Facility

Background

The Town of Wayland Board of Water Commissioners contracted Tata & Howard, Inc. for the design of a 1.5 million-gallon per day Membrane Filtration Water Treatment Facility at the Baldwin Pond Wells site.

Why Do We Need a New Water Treatment Facility?

The Town of Wayland is currently faced with increasing challenges in maintaining the water quality of their existing sources. High levels of iron and manganese have been detected at the Baldwin Pond Wells site.

Additionally, based on micro-particulate testing completed at the Baldwin Pond Wells site, these sources exhibit signs of being groundwater sources under the influence of surface water.

The existing water treatment methods at the Baldwin Pond Wells site only treat the water by adding chemicals to it. The new membrane filtration (ultrafiltration) treatment process will provide a physical barrier to contaminants, which will be important as new regulations are implemented by State and Federal agencies.

The EPA currently considers membrane processes to be a "Best Available Technology" for treatment, due to the physical barrier, which they present to microorganisms, solids and certain contaminants.

Ultrafiltration has been shown to be a reliable and cost effective method for advanced treatment of municipal water that provides a high quality and consistent product. It is also a cost effective, compact and automated water treatment process that requires minimal operator attention.

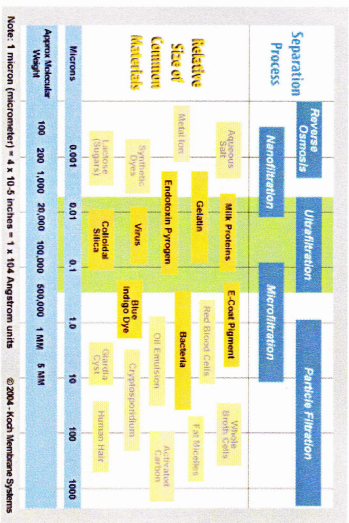
More and more, communities throughout Massachusetts and the country are selecting membrane filtration for advanced treatment of municipal water to meet State and Federal regulations.

PROS:

- Superior water quality.
- Provides physical barrier to microorganisms, solids and certain contaminants.

CONS:

- High cost.



DEP Consent Order

Due to repeated water quality violations associated with positive bacteria testing results within the Town's distribution system, DEP issued a consent order to the Wayland Water Department.

The consent order requires the Town of Wayland to submit final design plans for the construction of the Baldwin Pond Treatment Facility to DEP by December 30, 2006.

The Project Plan Treatment System Pilot Testing

In June 2005, with prior approval from the DEP, pilot testing began at the Baldwin Pond Wells site.

The primary goal of the pilot testing was to assist the Wayland Water Department in selecting a treatment process that would produce water that consistently meets State and Federal drinking water standards under current and anticipated future demand conditions.

Based on testing results of the membrane filtration pilot system, iron and manganese concentrations were reduced to levels below the secondary maximum contaminant levels (SMCLs) of 0.3 milligrams per liter (mg/l) and 0.05 mg/l respectively. Additionally, this treatment process provided for a physical barrier against microbiological contaminants such as bacteria, cryptosporidium and viruses.

Treatment Plant Design

In March 2006, the Board of Water Commissioners received the Pilot Test Report submitted to DEP. This report provided a description of the processes tested, a discussion of the results and recommendations for the construction of a treatment system at the Baldwin Pond Wells site.

The results of the pilot study also provide specific operational and performance characteristics for the treatment process. These results will assist in the design of the full-scale treatment facility.

Tata & Howard, Inc. is currently in the design phase of the project and the design will be completed by December 2006.

Bid Process & Construction

Competitive bids from contractors are tentatively scheduled to open in March 2007, at which time the anticipated cost for completion of the project will be known. Upon careful evaluation of the submitted bids and contractor experience, an award recommendation would be made and construction would begin.

Construction of the Baldwin Pond Wells Treatment Facility is scheduled to begin in the Spring of 2007.

Estimated Project Cost

Costs associated with the construction of the Baldwin Pond Wells Treatment Facility are estimated to be approximately \$7.5 million dollars. It should be noted that this is a preliminary figure, as the project has not yet been publicly bid.

The increase in annual cost associated with the operations and maintenance of the treatment facility is estimated to be approximately \$250,000.

The construction of a new water treatment facility will significantly improve the overall water quality throughout the Town. However, this project will also have an effect on water rates. The water rates are estimated to increase approximately 40%. This increase includes the cost of construction associated with the treatment facility and also the anticipated operations and maintenance cost.

Existing O & M (Estimated)

Labor	\$30,000
Chemicals	\$17,000
Electricity	\$3,000
Maintenance	\$10,000
Total:	\$60,000

Future O & M (Estimated)

Labor	\$75,000
Chemicals	\$45,000
Electricity	\$65,000
Maintenance	\$25,000
Sludge Removal	\$100,000
Total:	\$310,000

These costs reflect the estimated increase of approximately \$250,000 from current costs.

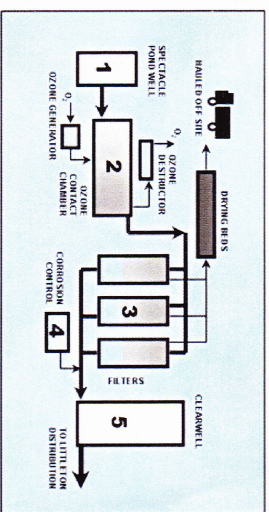
Why We Treat the Water.

We are treating the water from our Baldwin Pond Wells to remove dissolved iron and manganese. Over the years, concentrations of iron and manganese in town well water have increased greatly. Because of this increase, what were once rare occurrences of "black water" have become common.

What is "black water"?

Iron and manganese that have come out of solution form a buildup on the inside of water mains. Occasionally, a piece of this black "stuff" breaks off and disperses into

the water. This creates localized cloudy, gray/black water. Although perfectly drinkable, the black water can cause staining on fixtures and laundry.



(Simplified Schematic Diagram)

HOW IT WORKS:

Step 1 – Well Water

Water from the well is pumped into the water treatment plant. This water contains naturally occurring dissolved iron and manganese. Concentrations of these minerals have been increasing each year.



Step 2 – Ozonation

Ozone (O3) is created by sending electricity through very dry air. Thus created, the ozone is bubbled through the well water in the ozone contact chambers. Ozone causes the iron and manganese to form solids, which can be filtered out. Any remaining ozone is converted back to oxygen (O2) before being released.



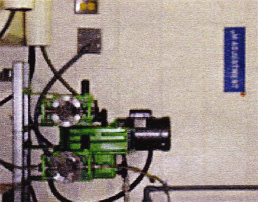
Step 3 – Filtration

Ozonated water is forced through filters, which block the solid particles of iron and manganese. Periodically, these particles are washed from the filters, dried and trucked away. The process has been designed to minimize the amount of water that is wasted.



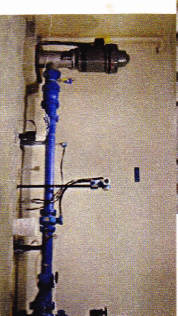
Step 4 - Corrosion Control

As with the other existing well sites, minute amounts of potassium hydroxide (KOH) are added to adjust the pH for corrosion control.



Step 5 - Distribution

The filtered water flows into a clear well and from there into water mains. The capacity of the plant is 1.5 million gallons per day, which could easily meet the water demand of the entire town.



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We appreciate you taking the time to familiarize yourself with the history of this project and that you are excited about the benefits it will bring to our community.

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For More Information:

- <http://www.lclwd.com/>
- http://www.kochmembrane.com/pdf/CaseStudy_Littleton.pdf