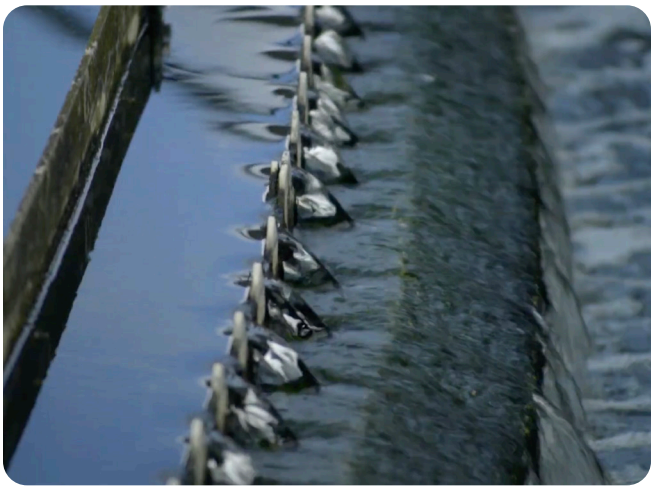
CITY OF GRAND RAPIDS | Environmental Services Department

Water Resource Recovery Facility

Tour & Process Guide

Water Resources — Utility of the Future

We are a clean water utility leading the way towards resource recovery, improved operational efficiency, and sustainability to support a safe, healthy, and thriving community, environment, and economy.

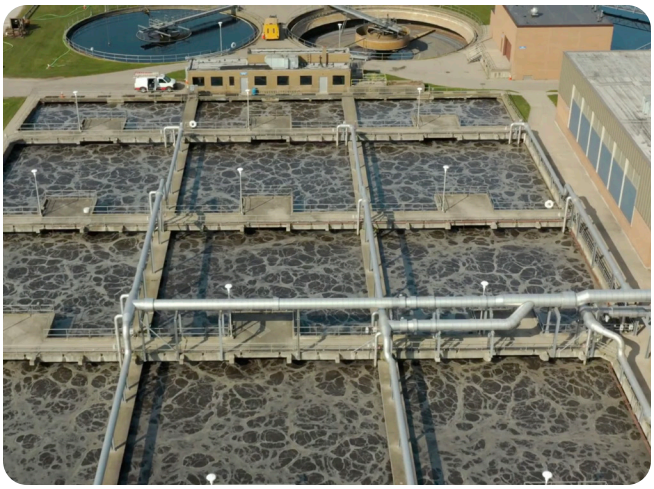


Managing the Waste We Produce Every Day

The Water Resource Recovery Facility treats an average of 40 million gallons of water a day. That's equivalent to 100,000 bath tubs!

Resource Recovery

We're capturing valuable resources that would otherwise be lost. Methane produced by the anaerobic digester is captured and turned into renewable natural gas. A combined heat and power system produces thermal energy to heat the digester tanks, and provides electricity to power the facility.



Protecting Our Natural Resources

Grand Rapids values its water resources above all else. By cleaning wastewater and recovering resources at our facility, we are doing our part to keep the Grand River and our watersheds clean, for all to enjoy.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Process Overview

Municipal Waste Treatment

1 Influent

This is the headworks, where an average 40 million gallons of wastewater enters the Water Resource Recovery Facility for treatment every day.

2 Preliminary Treatment

Bar Screening Wastewater passes through bar screens that remove any material greater than ¼ inch wide.

Grit Removal Wastewater passes slowly over grit chambers allowing small, dense solids, like sand, to settle to the bottom.

3 Primary Treatment

Primary Settling Tanks Wastewater moves very slowly in these tanks so that solids can settle to the bottom. At the same time, fats, oils and grease float to the surface where it is skimmed off.

4 Secondary Treatment

Microorganisms Flow from primary treatment enters the aeration tanks. Microbes are introduced.

Aeration Air is pumped into the tanks to provide oxygen to the microbes. These microbes consume the remaining solid organic material.

Final Clarifier Any remaining scum floats to the surface to be skimmed off, while solids settle to the bottom of the tank. Some solids are sent back for treatment, while other solids are sent to the biodigester as waste activated sludge.

UV Disinfectant Treated water passes through bright ultraviolet lights that sterilize any remaining harmful bacteria.

Biodigestion Process

1 Sludge Thickening

In the process of cleaning wastewater, treatment plants produce, as a byproduct, a slurry of water and solids. Sludge is put through a process called thickening, which reduces its water content and concentrates the solids. The thickened sludge is then pumped to the anaerobic biodigester process.

2 Biodigestion Tanks

The anaerobic biodigester process consists of large tanks containing specialized groups of bacteria that convert the thickened sludge to methane and carbon dioxide (biogas) as well as water. The biodigesters are continuously mixed and heated to approximately 98° F.

The biodigester process in Grand Rapids includes three digester tanks. Two of the digesters are dedicated to processing the thickened sludge. The third digester is utilized for the treatment of high strength industrial wastewater received at the plant.

3 Biogas Storage

The biodigestion process generates a biogas which is stored until it goes to the refining process and turned into renewable natural gas.

Beneficial Use Of Biogas

1 Renewable Natural Gas

The biodigestion process generates a biogas which is converted to a Renewable Natural Gas (RNG). In order for the biogas to be considered as RNG it needs to be treated. The treatment process includes the removal of moisture and chemicals that make the gas impure and have an offensive smell such as volatile organic compounds and hydrogen sulfide. After treatment, the RNG is injected into the gas utility's pipeline. RNG sales generate revenue for the City.

2 Combined Heat and Power Engines

Combined Heat and Power (CHP) engines are used at the plant to generate electricity and capture the heat that would otherwise be wasted. The captured heat provides useful thermal energy — such as steam or hot water. They use natural gas to produce electrical power which can be used to meet some of the facility's energy needs. The heat generated by the engines is used to produce hot water which is in turn used to maintain the biodigester temperature at approximately 98° F.

3 Phosphorus Recovery

During the conversion of sludge to biogas, phosphorus contained in the organic part of the sludge is released. The released phosphorus can be recovered and used as a soil fertilizer.

CO2 Release Process Phosphorous recovery starts by adjusting the pH of the digested biosolids by removing dissolved carbon dioxide. The biosolids are then dewatered by spinning them in a centrifuge. The water produced in this step, called centrate, still contains a high amount of phosphorus and has a high pH.

Phosphorus Recovery Reactor Centrate is pumped to a reactor tank where magnesium chloride is added. The magnesium chloride reacts with the phosphorus in solution to form a solid compound called struvite. The struvite phosphorous crystals are harvested and can be sold to fertilizer companies.

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