

City of Dowagiac Wastewater Treatment Plant 29250 M-62 West

The City of Dowagiac is located in northwestern Cass County, in southwestern Michigan. The City has a population of approximately 7,000 persons. Land use in the area is mainly agricultural with a significant industrial base located within the corporate limits of the City.

In 1961 the City of Dowagiac began primary treatment of its wastewater. From 1976-1979 the City expanded the wastewater plant to incorporate secondary and tertiary treatment. On October 21, 1986, the Village of Cassopolis began discharging wastewater to the City for treatment. The City began treating wastewater from Indian Lake (5 miles west of the corporate limits) in 1990. Also in 1990 the City extended an interceptor five miles north of town. Diamond Lake, a user of Cassopolis interceptor began discharging in July 1991, with Donnell Lake connecting to the Cassopolis interceptor August 1997. The Village of Vandalia connected to the Cassopolis interceptor and began discharging in October 1999.

The City of Dowagiac has both combined and sanitary sewer systems, which discharges domestic, industrial, and storm water to the Dowagiac plant. Because of the combined sewer system, the plant has been designed to detain all wastewater flowing at rates exceeding 4.0 MGD in a storm water lagoon. When flows to the plant decrease to treatable levels, diverted stormwaters are returned from the lagoons for treatment to the primary settling tanks.

The Dowagiac Wastewater Treatment Plant is a **Conventional Activated Sludge Process** with phosphorous removal plus tertiary filtration. The plant is designed to remove approximately 90% of the carbonaceous organic materials, suspended solids, total phosphorus and ammonia nitrogen. The maximum design flow is 4.0 MGD; average design flow is 2.5 MGD, with the **average flow being 1.3 - 1.5 MGD.** The design of the facility is based on a population equivalent of 15,000 for the year 2000. The plant is staffed 8 hours per day, including weekends and holidays, and operates automatic the remaining time with an alarm system monitoring pertinent processes throughout the plant. All personnel at the plant are certified by the Michigan Department of Environmental Quality (MDEQ).

<u>STATISTICS:</u>	Maximum Design Flow	4.0 MGD
	Average Design Flow	2.5 MGD
	Average Daily Flow	1.3 - 1.5 MGD
	Two (2) Anaerobic Digesters:	128,447 Gallons Each
	Two (2) Aerobic Digesters:	293,590 Gallons Each
	Storm Water Detention Lagoon:	5.0 million gallons
	Ferrous Chloride Used/day:	100-150 gallons,
		9 - 12% Iron
	Chlorine Used/day:	25 - 40 lbs./day
	Sulfur Dioxide:	10 - 15 lbs./day

The Wastewater plant consists of the following treatment units:

Note: Figure 1 contains a flow schematic diagram of the Dowagiac Wastewater Treatment Plant.

- 1) **Influent Diversion Chamber** (Automatic operated valve)
- 2) **Parshall flume** w/metering
- 3) **Grit Chamber** (grit collector & grit screw)
- 4) **Communitor** w/bar screen
- 5) **Primary Clarifiers** (rectangular) (2)
- 6) **Anaerobic Digesters** (2)
- 7) **Aeration tanks** (3)
- 8) **Final Clarifiers** (circular) (2)
- 9) **Aerobic Digesters** (2)
- 10) **Chlorination** Contact Tanks (circular) (2) Chlorine Gas used
- 11) **Tertiary Filters** (anthracite/gravel) (4)
- 12) **Dechlorination** (SO₂) Sulfur Dioxide used

- 13) **Final Effluent Parshall Flume** w/ metering
- 14) **Storm Water Lagoon** w/metering

Sampling: All composite sampling is automatic (flow proportional).

- 1) **Influent** is sampled after communitation.
- 2) **Primary Effluent** is sampled at the end of primary settling tanks.
- 3) **Secondary Effluent** is sampled following the final clarifiers.
- 4) **Final Effluent** is sampled following filtration, and prior to chlorination.
- 5) **Chlorine residue** is continuously monitored following the chlorine contact tanks.
- 6) **Dechlorination** (Final Cl₂ residue) is continuously monitored prior to the final effluent parshall flume.

Treatment: (settling/clarification & disinfection)

The **primary settling** tanks remove scum (floating matter from the surface of the tanks) and store it in a wet well. All primary **sludges (biosolids)** are pumped to the anaerobic digesters for treatment and storage until land applied.

Ferrous Chloride is added prior to the **aeration tanks** for phosphorus removal. The plant also has the capability of using polymers for added flocculation. Diffused air is supplied to the aeration tanks via centrifugal blowers. Flow from the aeration tanks is distributed equally to the **final clarifiers**. Return activated sludge (food for incoming bacteria) is returned from the final clarifiers to the aeration tank wet well (thus the name -- activated sludge). Waste activated (unneeded) sludge is pumped to the aerobic digesters for treatment and storage until land applied.

Wastewater from the final clarifiers must now be disinfected to lower bacteria (MDEQ limits) prior to discharge. The city must chlorinate and dechlorinate to meet a limit of 0.038 mg/l residual chlorine and a total coliform count of 200 total coliform per 100 milliliters (mls) wastewater. The wastewater can be chlorinated then filtered, or filtered then chlorinated. The tertiary filters are gravity feed with anthracite/graded gravel media. **Chlorination** is

accomplished using chlorine gas, with dechlorination accomplished using sulfur dioxide. Both chemicals are automatically fed in proportion to metered final effluent flows. A metering system is installed at the influent diversion chamber, final effluent parshall flume, return activated and waste activated sludge lines, as well as the lagoon return structure for the purpose of monitoring flows throughout the plant.

Treatment of Sludges (Biosolids)

Sludge handling and disposal consists of two separate processes. The anaerobic digesters are used to digest sludges (biosolids) removed from the primary settling tanks. The anaerobic digesters are heated to 85 - 95 degrees, and mixed to enhance digestion. Aerobic digesters are utilized to digest the biosolids removed from the secondary clarifiers. Both anaerobic and aerobic biosolids are removed from the digesters and applied to agricultural land at agronomic rates semi-annually. Approximately 1.0 - 1.3 million gallons of biosolids are land applied semi-annually (May and November). The plant is capable of thickening the aerobically digested sludge, conditioned the mixed biosolids with lime and ferric chloride and dewatering on a coil filter. Disposal of the filter cake could be by land application or landfilling. A set of eight drying beds are also provided to back up the thickening /vacuum filtering processes. Land application of biosolids is an approved (MDEQ & EPA) method, and is practiced throughout the state. Land application saves not only the municipality money, it also is an economic benefit to the land owner/farmer. Prior to land application of the biosolids, they are analyzed for toxicity, heavy metals, and organic content. The land is also analyzed for what is needed in the line of nutrients, and as stated above, the biosolids are applied accordingly. The City of Dowagiac contracts (3 year) with a state certified commercial hauler for pumping and application of biosolids.

Industrial Pretreatment Program:

In 1984 the City of Dowagiac developed an **Industrial Pretreatment Program (IPP)** in accordance with the requirements established by the U.S. Environmental Protection Agency and the Michigan Department of Environmental Quality. The IPP is a program which the City of Dowagiac utilizes to **monitor, track and govern discharges from the industries**. The program is designed to prevent industries from discharging toxic materials, chemicals, heavy metals, and flows which may cause inhibition, interference or pass-through at the wastewater treatment plant, or damage the sewer system. In order for Dowagiac to have control of industrial discharges, the City upgraded its Sewer Use Ordinance (SUO) to incorporate the IPP program, which includes Industrial Categorical Limits mandated by the USEPA Code of Federal Regulations, the Local Limits mandated by the MDEQ. The Village of Cassopolis has upgraded its SUO to reflect the City of Dowagiac's IPP program.

Limits: City of Dowagiac NPDES Permit No. MI0022837

The **Michigan Department of Environmental Quality**, and the **Environmental Protection Agency (EPA)** are the governing entities which establish and enforce the discharge parameters and limits the City of Dowagiac Wastewater Treatment Plant must monitor and meet.

Below is a list of the parameters which the City of Dowagiac monitors, and the average results reported in 1998.

Final Effluent Limitations: Outfall 001 (To Dowagiac Creek)

Parameters	1998 Discharge Average		
	(lbs.)	(mg/l)	(% rem)
Carbonaceous BOD	28	3	98
Total SS	18	2	99
Ammonia Nitrogen	8.9	0.81	94
Phosphorus	-----	0.38	92
Residual Chlorine	-----	0.0045	
Fecal Coliform	(30 days avg. - 3/100)	(7 day avg. - 32/100)	
pH	6.8 su min.		7.2 su max.

Quarterly Monitoring (Averages for 1998)

Total Copper	0.0024 mg/l
Total Cadmium	0.0001
Total Lead	0.0006
Total Zinc	0.028
Total Nickel	<0.01 mg/l
Lindane	0.0048 ug/l