

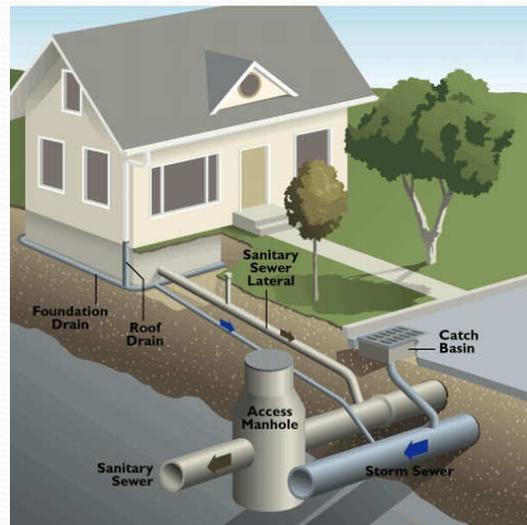
Wastewater Treatment

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Sewer System

- The sewer system carries domestic wastewater and a proportion of industrial effluent to the wastewater treatment plant.
- If the sewer system is a combined sewer then it will also carry urban runoff (stormwater) to the sewage treatment plant.

Separate Sewer System



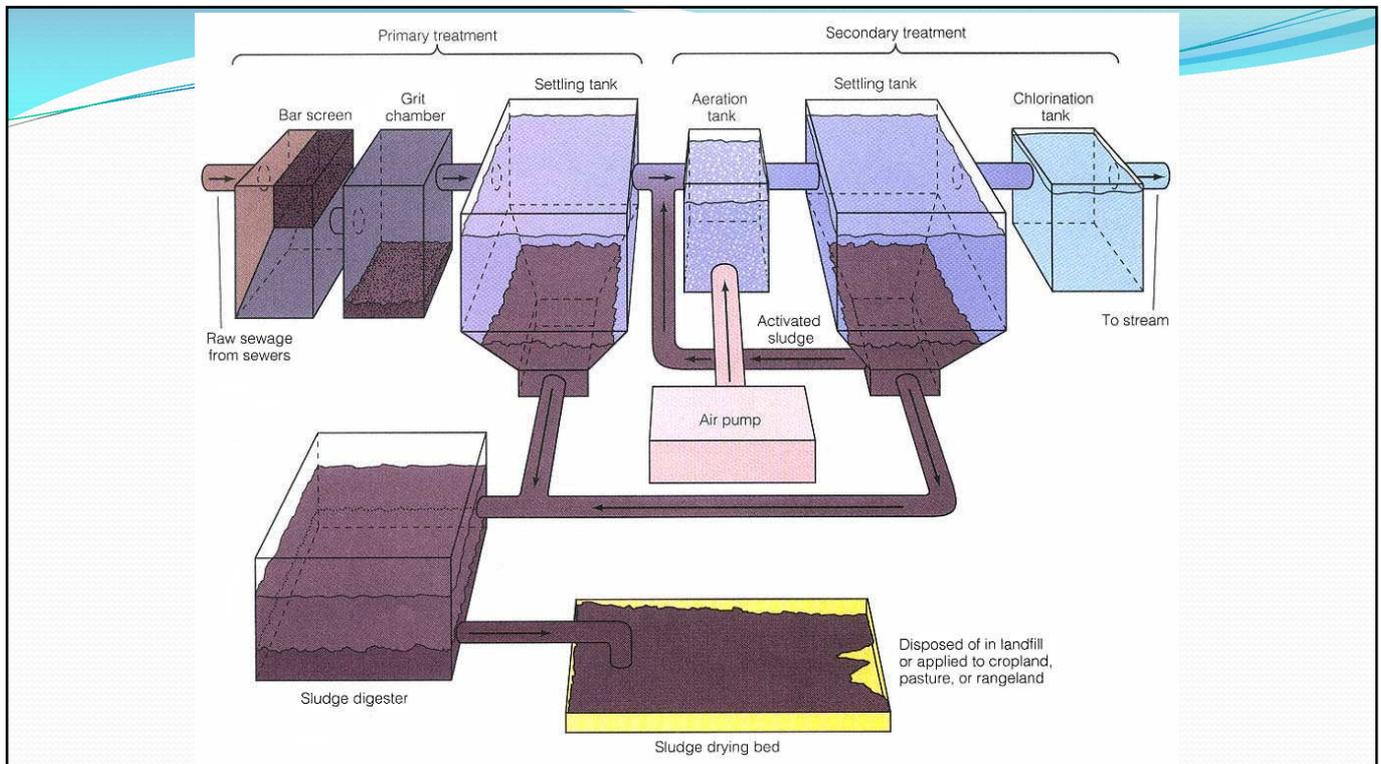
Wastewater (Sewage) Treatment

- The process of removing contaminants from wastewater, primarily from household sewage.
- It includes physical, chemical, and biological processes to remove these contaminants and produce environmentally safe treated wastewater (or treated effluent).

Wastewater Treatment Plant

Wastewater treatment generally involves two or three stages:

- Primary treatment
- Secondary treatment
- Tertiary treatment



Primary Treatment

- As sewage enters a plant for treatment, it flows through a **screen**, which removes large floating objects such as rags and sticks that might clog pipes or damage equipment.
- After sewage has been screened, it passes into a **grit chamber**, where cinders, sand, and small stones settle to the bottom.

Primary Treatment

- After screening is completed and grit has been removed, sewage still contains organic and inorganic matter along with other suspended solids. These solids are minute particles that can be removed from sewage in a **sedimentation tank**.

Secondary Treatment

- After the sewage leaves the settling tank in the primary stage, it is pumped into an **aeration tank**, where it is mixed with air and sludge loaded with bacteria and allowed to remain for several hours.
- During this time, the bacteria break down the organic matter into harmless by-products.

Secondary Treatment

- The secondary stage of treatment removes about 85% of the organic matter in sewage by making use of the bacteria in it. The principal secondary treatment techniques used in secondary treatment are the **trickling filter** and the **activated sludge** process.
- The partially treated sewage flows to another **sedimentation tank** to remove excess bacteria.

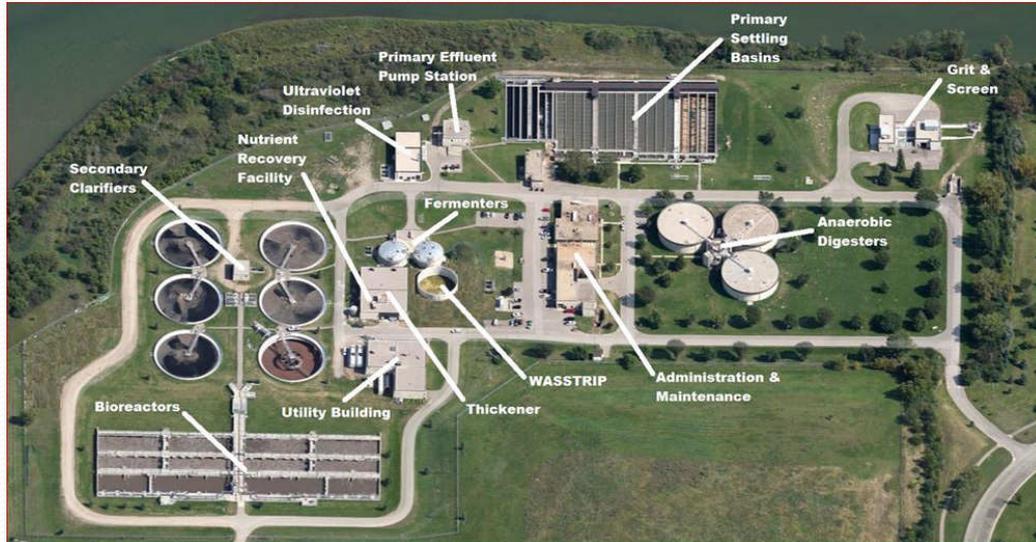
Secondary Treatment

- To complete secondary treatment, effluent from the sedimentation tank is usually disinfected in the **chlorination tank** before being discharged into receiving waters.
- Chlorine is fed into the water to kill pathogenic bacteria, and to reduce odor.
- Alternatives to chlorine disinfection, such as **ultraviolet light** or **ozone**, are also being used in situations where chlorine in treated sewage effluents may be harmful to fish and other aquatic life.

Tertiary Treatment

- Tertiary and/or advanced wastewater treatment is employed when specific wastewater constituents which cannot be removed by secondary treatment must be removed.
- Individual treatment processes are necessary to remove nitrogen, phosphorus, additional suspended solids and heavy metals.

Wastewater Treatment Plant



<https://www.saskatoon.ca/services-residents/power-water/water-wastewater/wastewater/wastewater-treatment-plant>

Sewage Sludge

- A by-product of sewage treatment is usually a semi-solid waste or slurry, called sewage sludge, that has to undergo further treatment before being suitable for disposal or land application.