

What is a Sewer System?

The collection and treatment of domestic sewage and wastewater is vital to public health and clean water. It is among the most important factors responsible for the general level of good health enjoyed in the United States. Sewers collect sewage and wastewater from homes, businesses, and industries and deliver it to wastewater treatment facilities before it is discharged to water bodies or land, or reused. (Environmental Protection Agency)

There are two (2) main types of sewer according to the Environmental Protection Agency or the EPA.

- 1. **Combined Sewers:** Combined sewers are designed to collect both sanitary sewage and storm-water runoff in a single-pipe system. These systems were designed to convey sewage and wastewater to a treatment plant during dry weather. Under wet weather conditions, these combined sewer systems would overflow during wet weather conditions when large amounts of storm-water would enter the system. State and local authorities generally have not allowed the construction of new combined sewers since the first half of the 20th century. (Environmental Protection Agency).
- 2. Separate Sanitary Sewers: The other major type of domestic sewer design is sanitary sewers (also known as separate sanitary sewers). Sanitary sewers are installed to collect wastewater only and do not provide widespread drainage for the large amounts of runoff from precipitation events. Sanitary sewers are typically built with some allowance for higher flows that occur when excess water enters the collection system during storm events. Sanitary sewers that are not watertight due to cracks, faulty seals, and/or improper connections can receive large amounts of infiltration and



inflow (I/I) during wet weather. Large volumes of I/I can cause sanitary sewer overflows (SSOs) and/or operational problems at the wastewater treatment facility serving the collection system. In addition, sewage overflows can be caused by other problems such as blockages, equipment failures, broken pipes, or vandalism. (Environmental Protection Agency).



Figure 1- Combined VS Separate Sanitary Sewer

<u>What is Inflow and Infiltration? What is a Sanitary Sewer</u> <u>Overflow?</u>

Inflow and Infiltration is water that has entered the sewer system through cracks in the sewer lines, fault seals or connections that have been done incorrectly. With this added flow, especially during a wetweather event, a wastewater treatment plant can receive much more flow than it is meant to handle, which leads to a sanitary sewer overflow or an SSO. <u>Sanitary Sewer Overflows</u> can potentially cause harm to the environment by polluting public swimming and drinking waters, which will pose a serious health threat.

cracking failing joints ground water

Figure 2- Example of How Inflow and Infiltration can happen

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What does the Government do to regulate these overflows?

"EPA works with its federal, state and tribal regulatory partners through a comprehensive <u>Clean Water Act compliance monitoring</u> <u>program</u> to protect human health and the environment by ensuring that the regulated community obeys environmental laws/regulations through on-site visits by qualified inspectors, and a review of the information EPA or a state/tribe requires to be submitted." (Environmental Protection Agency).

The EPA also created the Clean Water Act or (CWA), which, establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972. (Environmental Protection Agency).

EPA Celebrates Progress in Protecting America's Drinking Water



Figure 3- EPA Clean Water Act

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Under the CWA, EPA has implemented pollution control programs such as setting wastewater standards for industry. EPA has also developed national water quality criteria recommendations for pollutants in surface waters.

The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained:

- EPA's <u>National Pollutant Discharge Elimination System</u> (NPDES) permit program controls discharges.
- Point sources are discrete conveyances such as pipes or man-made ditches.
 - Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need a NPDES permit;
 - Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. (Environmental Protection Agency).

What Does a Wastewater Treatment Plant Do?

A Wastewater Treatment Plant or a WWTP is a form of pollution control and has a vast assembly of pumping stations, sewer lines, and the Wastewater Treatment Plant itself. The basic function of wastewater treatment is to speed up the natural processes by which water is purified. There are two basic stages in the treatment of wastes, primary and secondary, which are outlined here.

In the <u>primary stage</u>, solids are allowed to settle and removed from wastewater. The secondary stage uses biological processes to further purify wastewater. Sometimes, these stages are combined into one operation (Environmental Protection Agency). 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. (Environmental Protection Agency). After screening is completed and grit has been removed, sewage still contains organic and inorganic matter along with other suspended solids. I These solids are minute particles that can be removed from sewage in a sedimentation tank. When the speed of the flow through one of these tanks is reduced, the suspended solids will gradually sink to the bottom, where they form a mass of solids called raw primary biosolids formerly sludge). (Environmental Protection Agency).



Figure 4- Primary and Secondary Treatment

The secondary stage of treatment removes about 85 percent 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 activated sludge process speeds up the work of the bacteria by bringing air and sludge heavily laden with bacteria into close contact with sewage. 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. The sludge, now activated with additional billions of bacteria and other tiny organisms, can be used again by returning it to the aeration tank for mixing with air and new sewage. From the aeration tank, the partially treated sewage flows to another sedimentation tank for removal of excess bacteria. (Environmental Protection Agency).



Effluent from the sedimentation tank is usually disinfected with chlorine before being discharged into receiving waters. Chlorine is fed into the water to kill pathogenic bacteria, and to reduce odor. Done properly, chlorination will kill more than 99 percent of the harmful bacteria in an effluent. Some municipalities now manufacture chlorine solution on site to avoid transporting and storing large amounts of chlorine, sometimes in a gaseous form. Many states now require the removal of excess chlorine before discharge to surface waters by a process called dechlorination. 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. (Environmental Protection Agency).

References

Environmental Protection Agency. "How Wastewater treatment Works... The Basics." May 1998. https://www3.epa.gov/npdes/pubs/bastre.pdf. PDF File. 4 February 2023.

-. United States Environmental Protection Agency. 12 August 2022. Website. 4 February 2023.

Please do not hesitate to call the office for any questions or for a tour of the Wareham Water Pollution Control Facility. We are open Monday – Friday 7am to 3:30pm. (508) 295- 6144.

