City of Lancaster Advanced
Wastewater Treatment Facility

Site Map

Legend

1. North Primary Clarifiers
2. North Activated Sludge System
3. North Final Clarifiers
4. Dewatering Building
5. Lime Stabilization Building

5a. Biofilter Odor Control System

6. Oxygen Plant
7. South Main Pumping Station
8. Screening and Grit Building
9. South Primary Clarifiers
10. Gravity Thickener (abandoned)
11. South Activated Sludge System
12. Control Building
13. Maintenance Building
14. South RAS Building
15. South Final Clarifiers
16. Chlorine Contact Tanks
17. Chlorination/Dechlorination Building

Advanced Wastewater Treatment Facility, City of Lancaster, Pennsylvania

History

The City of Lancaster Advanced Wastewater Treatment Plant (AWWTP) is owned and operated by the City of Lancaster. The plant is permitted to discharge an average monthly flow of 32.08 million gallons per day (mgd) to the Conestoga River. Wastewater is collected and treated from the City of Lancaster and portions of Manheim Township, Lancaster Township, East and West Lampeter Townships, Strasburg Borough, Strasburg Township, Upper Leacock Township, West Earl Township, Manor Township, Pequea Township, and East Hempfield Township.

The City's first sewers, designed to collect both sewage and storm water, were constructed in the 1860s and 1870s. These early sewers were constructed of brick and stone with diameters as large as 12 feet. After the mid 1920s sewers were constructed of concrete or vitrified clay. Until the City of Lancaster's North and South Wastewater Treatment Plants began operating in 1935, these sewers discharged directly into the Conestoga River at two main locations. These two outfalls would serve as the locations for the North and South Wastewater Treatment Plants. Eventually, in 1988, the North Treatment Plant was abandoned and a pumping station and force main were constructed to convey the sewage to the South Plant which was upgraded and expanded to treat the entire wastewater flow created by both the City and the surrounding Townships. The City also operates and maintains 22 pumping stations.

Headworks

Portions of the City of Lancaster service area are served by a combined sewer system. This can result in significant amounts of larger sized contaminants in the wastewater especially during storm events. A mechanically cleaned bar screen is used to screen these larger objects from the wastewater. These screenings are transferred to a dumpster for storage until they can be disposed of in a landfill.

Primary Clarifiers

Primary clarifiers, both the round units in the North Plant and the rectangular units in the South Plant, are used to remove settleable solids and floatable solids and grease from the raw wastewater prior to biological treatment. Use of primary clarifiers helps to reduce the strength of the waste which allows smaller biological treatment units.

Biological Treatment Units

Following primary clarification, both the North and South Plants use Kruger's OASES high purity oxygen activated sludge (biological treatment) process to further remove organic material, as well as nutrients in the form of nitrogen and phosphorus from the wastewater. This treatment process uses a combination of anaerobic, oxic and anoxic conditions to achieve a high degree of treatment. Covered tanks are needed to create these various conditions by either keeping oxygen away from the activated sludge or keeping a high purity oxygen atmosphere trapped above the activated sludge. Vertical shaft mixers are used to keep the activated sludge/wastewater (mixed liquor) thoroughly mixed, while surface aerators are used to help add the oxygen to the activated sludge system.

High Purity Oxygen Plant

The biological treatment units receive oxygen rich gas (>98% oxygen) which is produced by the cryogenic oxygen generator. The 37 tons/day oxygen generator is on-site along with liquid oxygen storage as a backup to provide an uninterrupted supply of oxygen rich gas. The gas flow can be controlled manually or automatically to the treatment units.

Final Clarifiers

Three 150 -foot diameter final clarifiers for the North Plant and two 100-diameter final clarifiers for the South Plant are used to separate the mixed liquor suspended solids of the activated sludge system from the treated wastewater, thereby producing a clear effluent. The majority of the biological solids are reused to treat more incoming wastewater, but a portion of these solids are removed (wasted) from the treatment system to maintain the required activated sludge levels in the biological treatment units.

South Plant Flow Diversion

A unique feature of the Lancaster AWWTF is the South Plant Flow Diversion. Because Lancaster has a combined sewer system, the facility received a permit to partially treat by screening and primary clarification, some of the wet weather flows in excess of the South Plant design flow capacity. A programmable logic controller (PLC) is used to monitor flow rates and maintain an operator specified flow through the South Treatment Plant. A motor operated gate is used to divert the excess partially treated wet weather flow. A chlorine solution is added to the diverted flow prior to combining with the flow from the chlorine contact tanks.

Biosolids Processing

Solids from the North and South primary clarifiers and waste activated sludge from the North and South final clarifiers are pumped to a sludge holding tank with a vertical shaft mixer prior to dewatering by one of four 2-meter belt filter presses. Following dewatering, a lime stabilization system is used for pathogen and vector attraction reduction prior to hauling off-site for beneficial reuse or disposal.

Odor Control System

Since there is a high potential for odors to form when dewatering raw sludges and during the lime stabilization process, an ammonia scrubber has been installed to reduce the ammonia concentration from approximately 6,000 CFM of air from the lime/sludge mixing area. A large biofilter was also constructed to further treat potential odors from approximately 32,000 CFM from the dewatering operation and the lime stabilization process.

Chlorination and Dechlorination

After final clarification, treated effluent from the North and South Plants combine as it enters the chlorine contact tanks. A gas chlorination system is used for disinfection of the treated effluent. A sodium bisulfite solution is then added to de-chlorinate the effluent prior to discharge to the Conestoga River.