# Appendix D

# Waste Water Treatment Plant Description

## South San Luis Obispo County Sanitation District

**Wastewater Treatment**

Clean water is one of our most precious natural resources. Yet every time we flush a toilet, pour oil down the drain or clean with strong household chemicals, we contaminate that resource. Before wastewater can be safely released back into our waterways, it must first be adequately treated. That treatment consists of subjecting the wastewater to a series of physical, chemical, and biological processes. Typically those processes occur at an industrial-scale wastewater treatment plant.

The treatment of sewage is a multi-stage process to renovate the wastewater before it either; reenters a body of water, is applied to the land or is reused. The goal is to reduce or remove organic matter, metals, solids, nutrients, disease-causing organisms and other various forms of pollutants.

The typical processes involved in wastewater treatment are *preliminary treatment, primary treatment, secondary treatment and final treatment*. During each of the first three processes settled solids, or *sludge,* is removed from the liquid waste stream and further treated within a sludge digester.

*Preliminary treatment* is the first form of treatment that the wastewater undergoes upon arrival at a treatment plant. Sticks, rags, large food particles, sand, gravel, toys, etc. are removed at this stage to protect the pumps and other various facilities used within the treatment plant.

*Primary treatment* is the second step in the treatment process and is intended to separate the suspended solids and greases from the wastewater. In this process, wastewater is passed into large circular tanks called primary clarifiers and held for several hours before being released for further treatment. The long detention times within these low velocity tanks allows for the heavier solids to settle to the bottom as sludge, while the lighter solids float to the surface as scum. Mechanically rotating arms collect the sludge and solids, allowing for distribution to the sludge digester for further treatment. The clarified wastewater remaining is now ready for the secondary treatment process.

*Secondary treatment* is a biological treatment process to remove dissolved organic matter from wastewater. Sewage microorganisms are cultivated and added to the wastewater. The microorganisms absorb organic matter from sewage as their food supply. Three separate approaches can be used to accomplish secondary treatment; *fixed film, suspended film and lagoon systems*.

*Fixed film systems* grow microorganisms on substrates such as rocks, sand or plastic. The wastewater is spread over the substrate, allowing the wastewater to flow past the film of microorganisms fixed to the substrate. As organic matter and nutrients are absorbed from the wastewater, the film of microorganisms grows and thickens. Trickling filters, rotating biological contactors, and sand filters are examples of fixed film systems.

*Suspended film systems* stir and suspend microorganisms in wastewater. As the microorganisms absorb organic matter and nutrients from the wastewater they grow in size and number. After the microorganisms have been suspended in the wastewater for several hours, they are settled out as sludge. Some of the sludge is pumped back into the incoming wastewater to provide "seed" microorganisms. The remainder is wasted and sent on to a sludge treatment process. Activated sludge, extended aeration, oxidation ditch, and sequential batch reactor systems are all examples of suspended film systems.

*Lagoon systems* are shallow basins which hold the waste-water for several months to allow for the natural degradation of sewage. These systems take advantage of natural aeration and microorganisms in the wastewater to renovate sewage.

*Final treatment focuses* on the removal of disease-causing organisms from the wastewater. Treated wastewater can be disinfected by adding chlorine or by using ultraviolet light. High levels of chlorine may be harmful to aquatic life in receiving streams. Treatment systems often add a chlorine-neutralizing chemical to the treated wastewater before stream discharge.

*Sludge* is generated throughout the sewage treatment process. Primary sludge, material that settles out during primary treatment, often has a strong odor and requires treatment prior to disposal. Secondary sludge is the extra microorganisms from the biological treatment processes. The goals of sludge treatment are to stabilize the sludge and reduce odors, remove some of the water thereby reducing volume, decompose some of the organic matter, thereby reducing volume, kill disease causing organisms and disinfect the sludge.

Untreated sludge is about 97 percent water. Settling the sludge and decanting off the separated liquid removes some of the water and reduces the sludge volume. Settling can result in sludge with about 92 to 96 percent water. More water can be removed from sludge by using sand drying beds, vacuum filters, filter presses, and centrifuges resulting in sludge with between 50 to 80 percent water. This dried sludge is called a sludge cake. Aerobic and anaerobic digestion is used to decompose organic matter to reduce volume. Digestion also stabilizes the sludge to reduce odors. Caustic chemicals can be added to sludge or it may be heat treated to kill disease-causing organisms. Following treatment, liquid and cake sludge are usually spread on fields, returning organic matter and nutrients to the soil.

Wastewater treatment processes require careful management to ensure the protection of the body of water that receives the discharge. Trained and certified treatment plant operators measure and monitor the incoming sewage, the treatment process and the final effluent to ensure regulatory compliance. You can help with that process by reducing the amount of water that you use throughout the day and by properly disposing of harmful chemicals. For more information on how user's can help protect our most valuable resource, please visit the *Environmental Programs* section of this web page.

**Collection System**

The District owns and operates nearly 9 miles of collection sewer referred to as the District Trunk Line. The purpose of this line is to allow for the collective transport of wastewater from the smaller municpal lines of the three member agencies to the final destination of the District's Wastewater Treatment Plant. The Trunk Line was initially constructed as part of the original District design of 1963. It is comprised of sewer pipe ranging in size from 15-30 inches in diameter.

The pipe segments are primarily composed of either Vitrified Clay Pipe or Asbestos Cement Pipe. Due to the the naturally sloping coastal topography and owing to careful consideration and planning during the design phase of the collection system, the District's collection system operates entirely as a gravity fed sewer. As a result, the District is not dependent upon the use of pumps at any point in the collection system to convey the wastewater. The result is reduced annual operating expenses which in turn are passed directly on to the District's customers.

Annual average daily flow passing through the collection system is in the order of 2.9 million gallons per day with peak daily flows of approximately 3.16 million gallons per day. Routine video inspection of the entire system is performed every 4 years by means of Closed Circuit Television cameras (CCTV). The videos resulting from those inspections are reviewed by system engineers and accurate assessments are made of the system. System abnormalities and/or deficiencies noted within the collection system are ranked and prioritized, assisting in the development of short term and long term rehabilitation plans. In addition, the collection system is also cleaned on average every 4th year as part of the District's preventative maintenance plan.

**Treatment Plant**

The wastewater collected within the District’s Trunk Sewer Line begins the treatment process in the influent pumping plant. There it is passed through a Parshall metering flume to measure the quantity of influent wastewater to the plant. Currently, average annual daily flow at the plant is on the order of 2.88 million gallons per day (mgd), with peak day dry weather flow of approximately 3.37 mgd and peak hour wet weather flows of 8.03 mgd.

Once measured, the wastewater passes through an in-channel screen to mechanically separate and remove the larger debris. Typically this debris consists of sticks, rags, large food particles, paper products, etc. The removed debris is collected, ground, and hauled offsite to a landfill for disposal. The screened wastewater is then distributed to the primary clarifiers by means of the four raw sewage pumping units located within the pumping station.

Prior to arrival at the clarifiers the wastewater enters the clarifier control box. Under normal operations, the control box is designed to separate the waste stream into equal parts for distribution into one of the two primary clarifiers. The control box has the added function of isolating flow to either of the independent clarifiers during periods of maintenance and repairs.

Clarification is achieved at the plant by means of two identical primary clarifiers; one constructed as part of the original 1965 project and the other as part of the 1990 expansion. Each primary clarifier is 55 feet in diameter with a side wall depth of 9 feet. These dimensions allow for a combined volume of 320,625 gallons. Under average annual daily flow, the combined overflow rate of the clarifiers is 610gpd/sf and the combined detention time between the clarifiers is 2.65 hours.

The clarifiers serve to separate a large portion of the suspended solids from the waste stream. This is achieved by maintaining quiescent flow throughout detention, allowing for the heavier solids (*sludge*) to sink to the bottom of the tank and the lighter solids (*scum*) to rise to the surface.

The sludge which accumulates on the bottom of the tank is raked continuously towards the center column by a steel raking mechanism. This raking mechanism forces the sludge out of the clarifier through a sludge pocket near the center of the tank. The scum is removed from the clarifier by means of a skimmer assembly attached to one of the arms of the raking mechanism. As the skimmer arm revolves around the tank, scum is guided into a trough attached to the inside of the launder wall. The scum trough removes the scum from the tank and combines it with the sludge removed by the rakes. The removed sludge and scum are pumped to the plant digesters for treatment. The clarified wastewater eventually discharges over the effluent weirs and flows to the fixed film reactor to receive secondary treatment.

Secondary treatment is achieved at the plant by means of a single, fixed film reactor (FFR), constructed as part of the 1986 improvement project. The FFR utilizes a bio-filtration process which removes the dissolved organic matter from the wastewater. The FFR is 117 feet in diameter with a plastic media depth of 12 feet. Wastewater is distributed over microorganisms which grow on the plastic media substrate. The microorganisms absorb the organic matter from the wastewater as their food supply, utilizing much of the suspended colloidal and dissolved organic substrate matter for bioassimilation. As organic matter and nutrients are absorbed from the wastewater, the film of microorganisms grows and thickens, periodically sloughing off the plastic media surface. Partially decomposed organic matter, excess sloughed film, and dead film is carried off with the FFR effluent for further clarification in the secondary clarifier unit.

The secondary clarifier unit, constructed as part of the 1986 improvement project, performs much the same operation as the primary clarifier. The unit is 97 feet in diameter and has a side wall depth of 12 feet. These dimensions allow for a total volume of 665,000 gallons. Under average daily flow, the overflow rate of the clarifier is approximately 393gpd/sf and the detention time is 5.5 hours.

The final step in the treatment process at South San Luis Obispo Sanitation County District's Wastewater Treatment Plant is the disinfection of the treated effluent prior to release through the ocean outfall. This process occurs within the chlorine contact chamber and is achieved by the injection of sodium hypochlorite into the waste stream to kill the majority of all remaining bacteria. Once the wastewaters disinfected, it is discharged from the plant through the ocean outfall line.

For additional information on the ocean outfall line or the biosolids (sludge) handling and treatment at the District's Wastewater treatment plant, please click on the respective tabs.

## Outfall

Treated municipal wastewater is discharged to the Pacific Ocean through a 4,400 foot outfall/diffuser system as regulated by the California Regional Water Quality Control Board - NPDES Permit No. CA 0048003. The outfall terminates in approximately 55 feet of water. The design of the outfall is intended to diffuse the treated municipal waste prior to discharge, creating a minimum initial dilution of 165 parts seawater to 1 part treated municipal waste at the point of release.

This line also serves to convey treated wastewater from the City of Pismo Beach which shares this line by means of a connection at the District's treatment plant site. Discharge of treated municipal waste from Pismo Beach is regulated under California Regional Water Quality Control Board - NPDES Permit No. CA0048151.

The outfall pipe/diffuser system is inspected tri-annually to ensure proper operation and structural integrity of the system. The inspection is conducted from the shoreline to its ocean terminus and includes general observations and photographic records of the outfall/diffuser as well as that of the ocean bottom in the vicinity of the system.

## Biosolids

### Description

Biosolids is a term used by the water treatment industry that refers to treated sludge. Sludge, or "biosolids," is the byproduct of the treatment of domestic and commercial wastewater or sewage in a wastewater treatment plant. During waste water treatment, bacteria and other microorganisms break down components in wastewater into simpler and more stable forms of organic matter. Non-organic matter also settles into sludge. Biosolids in their liquid form look like muddy water and contain 1-10% solids. Biosolids may be dewatered in a second step of the treatment process, which turns it into a "cake" with the texture of a wet sponge. In this stage it contains 11-40% solids.
According to US EPA, biosolids that meet treatment and pollutant content criteria "can be safely recycled and applied as fertilizer to sustainably improve and maintain productive soils and stimulate plant growth." The US EPA's promulgated regulation is 40 CFR Part 503.

### Plant Process

At the South San Luis Obispo County Sanitation District the solids are collected at the Primary Clarifier and are either pumped to the Gravity Sludge Thickener, or directly to the Primary Digester. In the Primary Digester, the solids are heated to approximetly 96 degrees and mixed using the pumped vortex method. Detention time in the Primary Digester is approximetly 26 days.
The solids are then transferred to the Secondary Digester which is unheated and unmixed. This allows the sludge to cool and stratify. The supernatant is recycled through the plant for further treatment and the digested solids are drawn off for further processing.
Sludge drying takes place in one of two ways depending on the weather. During the winter months the District uses the centrifuge for the purpose of dewatering the sludge. The material is then stored in the sludge lagoon. Once the weather warms up, operations Staff begins the use of the drying beds with supplemental processing by the centrifuge. Polymer addition is required for proper operation of the centrifuge, however Staff has made several modifications to the feed system allowing for a dryer cake then usually obtained from similar machines (approx. 25%). The solids generated by the centrifuge and drying beds are then stockpiled onsite until transportation to a composting facility is scheduled.
Over the years, the South San Luis Obispo County Sanitation District has maintained an excellent record with the local Regional Board with respect to biosolids. In light of recent and pending regulations, for the last few years the South San Luis Obispo County Sanitation District has processed all biosolids through commercial composting facilities.