

Appendix K

Glossary

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Unless otherwise noted, definitions in this glossary were developed from text and figures in the Orange County Sanitation District (Sanitation District) 2017 Wastewater Collection and Treatment Facilities Master Plan.

Activated sludge. The **activated sludge** process, part of **secondary treatment**, is a biochemical method of treating wastewater that uses bacterial microorganisms and aeration to remove organic matter and other pollutants from the waste liquid. The basic components of an activated sludge system are an aeration tank (also referred to as an “**activated sludge basin**” or “**activated sludge reactor**”), where untreated wastewater is mixed with microorganisms to create a biological flocculant; a settling tank (or “**secondary clarifier**”) for separation of solids from treated wastewater; and **return activated sludge (RAS)** equipment that transfers settled sludge from the clarifier back into the influent of the aeration tank to re-seed new sewage.¹ Activated sludge that is not returned to the tanks for further use is referred to as waste activated sludge (WAS), which is pumped away for **solids treatment**. The Sanitation District operates two activated sludge facilities at **Reclamation Plant No. 1 (Plant 1)**, and one activated sludge facility at **Reclamation Plant No. 2 (Plant 2)**.

Activated sludge basin. See **activated sludge**.

Activated sludge reactor. See **activated sludge**.

Air jumper. **Air jumpers** are short pipeline segments that carry foul air from depressed sections of sewer pipes built at lower elevations to avoid an obstacle such as a creek (also known as an **inverted siphon**). Without an air jumper, air must be released upstream of an inverted siphon, which can cause upstream odor emissions and an increase in deterioration of the sewer pipe material. When air jumpers are added to an inverted section of pipe, the foul air is returned to the sewer pipe downstream of the siphon rather than released upstream.

Bleach station. A **bleach station** is used for storage and application of chemical bleach for additional disinfection of wastewater effluent prior to disposal. The Sanitation District operates bleach stations at Plant 1 and Plant 2; the Plant 2 bleach station is also used to disinfect **plant water**.

Blower. A **blower** is a high-pressure mechanical fan used for directional air circulation. In wastewater treatment plants, blowers are typically used to supply air to the activated sludge basin.

Carbon scrubber. A **carbon scrubber** is a carbon-based air-filtration mechanism used to reduce emissions of foul odor from ventilated air by absorbing compounds responsible for the odor.

Chemical dosing station. A **chemical dosing station** is a facility positioned along a wastewater collection system or within a wastewater treatment facility that adds chemicals to wastewater for enhanced odor-control, biological treatment, or settling purposes.

Chemical scrubber. A **chemical scrubber** is an odor-control mechanism that removes contaminants from air by forcing the air through a packed structure with a large wet surface area, enabling contact between the gaseous air and chemically treated liquid.²

¹ International Water Association Publications. “Activated Sludge Process.” Accessed January 2, 2020. <https://www.iwapublishing.com/news/activated-sludge-process>.

² Evoqua Water Technologies. “Chemical Scrubber Odor Control Systems.” Accessed January 2, 2020. https://www.evoqua.com/en/markets/Municipal_Wastewater/Pages/chemical-scrubber-systems.aspx.

Chemically enhanced primary treatment. **Chemically enhanced primary treatment (CEPT)** is the process of adding chemicals, such as ferric chloride, to wastewater influent to aid in coagulation and flocculation (i.e., settlement) of solids for removal from the treated liquid waste during **primary treatment**. At Plant 1, **Primary Clarifiers 6–15** are equipped with ferric chloride and polymer feed facilities for CEPT.

Clarifier. A wastewater treatment **clarifier** is a tank in which solids settle out of suspension in liquid for removal. In the Sanitation District's system, **primary clarifiers** are used at Plant 1 to remove suspended solids in the primary wastewater treatment process, and **secondary clarifiers** are used at Plant 1 and Plant 2 in the **activated sludge** process.

Collection system. The Sanitation District's **collection system** (also referred to as **conveyance system**) is the extensive series of trunk sewer pipelines that transmits wastewater from its member cities and special districts to the treatment plants. A trunk line can either be a gravity main, when the wastewater is carried by gravity, or a force main, when the pipe leads from a pump station (also referred to as a lift station), a facility that mechanically transports the wastewater under pressure because gravity is insufficient to provide liquid flow. The Sanitation District's collection system also features inverted siphons, manholes, and flow diversion structures.

Conveyance system. See **collection system**.

Cured-in-place pipe. **Cured-in-place pipe (CIPP)** is a method of pipeline rehabilitation that involves installing a new pipeline lining inside an existing pipe. A felt liner saturated with thermal-curing resin is inverted into the pipe, which is then filled with hot water or steam to seal the liner against the interior of the pipe while simultaneously curing the resin, creating a sealed structural liner within the pipe.

Digester. See **solids treatment**.

Digester gas. See **solids treatment**.

Dissolved air flotation thickener. A **dissolved air flotation thickener (DAFT)** is a tank used to dewater and thicken sludge as part of the **solids treatment** process. The Sanitation District's Plant 1 features older DAFT facilities that were previously used to process **waste activated sludge (WAS)**, which are now obsolete and may be either demolished or repurposed in coming years.

Ductile iron pipe. **Ductile iron pipe** is a type of metallic pipe material made of graphite-rich cast iron.³

Effluent. **Effluent** is the outgoing liquid in a wastewater treatment process.

Flow diversion structure. A **flow diversion structure** is an underground pipeline junction with a valve that can send wastewater flows in multiple directions to bypass certain facilities.

Force main. See **collection system**.

Headworks. See **preliminary treatment**.

³ "Ductile iron." Accessed January 3, 2020. https://en.wikipedia.org/wiki/Ductile_iron.

Horizontal directional drilling. **Horizontal directional drilling (HDD)** is a trenchless method of installing underground pipe. A drilling rig staged on the ground surface bores a pilot hole that is filled with fluid, then a swiveling reamer is used to enlarge the hole to the size of the sewer pipe and the sewer pipe is pulled through the hole.

Influent. **Influent** is the incoming liquid in a wastewater treatment process.

Interceptor. An **interceptor** sewer is the portion of a collection system that connects main and trunk sewers with the wastewater treatment plant, thereby controlling the flow into the plant.⁴

Inverted siphon. See **air jumper**.

Jack-and-bore. The **jack-and-bore** method of trenchless pipeline installation involves the use of a horizontal boring machine or auger to drill a hole, and a hydraulic jack to push a casing through the hole. As the boring proceeds, a steel-casing pipe is jacked into the hole; the pipeline then is installed in the casing. This method requires a jacking pit and a receiving pit.

Launder. A **launder**, or effluent launder, is a shallow trough that collects processed wastewater effluent from a tank, such as a **clarifier**, for transmittal to the next stage in the treatment process.

Lift station. See **collection system**.

Microtunneling. **Microtunneling** is a trenchless method of pipe installation that may be used on Facilities Master Plan installation projects. Microtunneling features a small boring machine that is controlled remotely from the surface. Pipe is installed immediately behind the boring machine. When using the microtunneling method, no workers are in the tunnel, although workers might need to enter to repair equipment. Microtunneling can be used below the water table in certain soil types.

Mixed liquor. **Mixed liquor** is the mixture of wastewater and microorganisms in an activated sludge basin.

Mixed liquor return. A **mixed liquor return (MLR)** is a pumping system that transmits **mixed liquor** from the end of the **activated sludge basin** to the beginning of the **activated sludge basin**.

Plant water. **Plant water** is water used for various process purposes in the Sanitation District's treatment plants, including cooling, diluting/mixing, and cleaning. Treated effluent from secondary treatment at Plant 1 is carried by the **Plant Water Pump Station**.

Preliminary treatment. **Preliminary treatment** is the initial stage of treating wastewater at a treatment plant, in which solids such as sticks, stones, grit, and sand are removed from the wastewater stream to protect and reduce wear on the downstream process equipment, preparing effluent for **primary treatment**.⁵ The equipment performing this work is called the **headworks**. At the Sanitation District's Plant 1, for instance, Headworks No. 2 (HW2) provides all the preliminary treatment under normal operation, and the older Headworks No. 1 is used only during extreme wet weather events. HW2 includes four mechanically cleaned bar screens and five aerated grit-removal chambers.

⁴ King County. "Protecting Our Waters Glossary of Terms." Accessed January 2, 2020. <https://www.kingcounty.gov/services/environment/wastewater/cso/library/glossary/h-l.aspx>,

⁵ Water and Wastes Digest. "Headworks: Removing Inorganics and Preventing Wear." Accessed January 3, 2020. <https://www.wwdmag.com/grit-removal-equipment/headworks-removing-inorganics-and-preventing-wear>.

Primary clarifier. See **clarifier**.

Primary sedimentation basin. See **primary treatment**.

Primary treatment. **Primary treatment** is the stage in the wastewater treatment process following **preliminary treatment**, where **primary clarifiers** remove settleable and floatable solids from the liquid wastewater. Heavy organic material sinks to the bottom (as **sludge**), and light material (fats, oils, and greases) floats to the top (as **scum**).⁶ Sludge and scum are sent to **digesters** for stabilization and disposal, and treated effluent is pumped into the **secondary treatment** system.

Process control system. The **process control system** is the complex assembly of equipment used to operate the Sanitation District's plants and collection system, housed at both Plant 1 and Plant 2. The Sanitation District operates a **Supervisory Control and Data Acquisition (SCADA)** system for the treatment plants and pump stations. SCADA includes hardware, software, computer servers, and various control equipment located throughout the plant facilities, as well as fiber-optic cable used for communications.

Pump station. See **collection system**.

Reinforced concrete pipe. **Reinforced concrete pipe (RCP)** is a type of pipe material made of pre-cast concrete poured around steel rebar for added strength and support.

Return activated sludge (RAS). See **activated sludge**.

Scum. See **primary treatment** and **secondary treatment**.

Secondary clarifier. See **clarifier**.

Secondary treatment. **Secondary treatment** is the stage in the treatment process following **primary treatment** in which organic matter is removed from the waste stream by biochemical processes. The principal techniques used in secondary treatment are the **trickling filter** and **activated sludge**, both of which are employed at the Sanitation District's treatment plants. A trickling filter is a process in which liquid waste is slowly trickled over a bed of media that enables the formation of biomass composed of organisms that feed upon and remove waste from the water being treated. Activated sludge is a method of treating wastewater that uses bacterial microorganisms and aeration to remove organic matter and other pollutants from the waste liquid. The basic components of an activated sludge system are an aeration tank (also referred to as an "**activated sludge basin**" or "**activated sludge reactor**"), where untreated wastewater is mixed with the microorganisms to create a biological flocculant; a settling tank (or "**clarifier**") for separation of solids (e.g., **scum** and **sludge**) from treated wastewater; and **return activated sludge (RAS)** equipment that transfers settled sludge from the clarifier back into the influent of the aeration tank to re-seed new sewage.⁷ Activated sludge that is not returned to the tanks for further use is referred to as **waste activated sludge (WAS)**, which is pumped away for **solids treatment**.

Sludge. See **primary treatment** and **secondary treatment**.

Sludge thickening centrifuge. See **solids treatment**.

⁶ King County Wastewater Treatment Division. "Wastewater Treatment Process." Accessed January 3, 2020. https://your.kingcounty.gov/dnrp/library/wastewater/wtd/about/WestPoint/0909WP_BrochureWebProcess.pdf,

⁷ International Water Association Publications. "Activated Sludge Process." Accessed January 2, 2020. <https://www.iwapublishing.com/news/activated-sludge-process>.

Sodium bisulfite station. A **sodium bisulfate station** is used to dose effluent wastewater with sodium bisulfate for additional dechlorination of effluent prior to discharge. The Sanitation District operates a sodium bisulfate station at Plant 2.

Solids treatment. **Solids treatment** is the process of stabilizing solid byproducts of wastewater treatment and preparing them for reuse or disposal. The main component of solids treatment is a **digester**, a tank that receives and treats **sludge** and **scum**. The Sanitation District's digesters at Plant 1 and Plant 2 use single-stage mesophilic anaerobic sludge digestion, which is a process whereby microorganisms break down biodegradable material in the absence of oxygen.⁸ After processing in the digesters, sludge is sent through **sludge thickening centrifuges** that spin the material at high speeds to produce sludge that is the consistency of tar. This substance is then transferred to sludge dewatering centrifuges that remove liquid waste before disposal. Dewatered sludge cake is stored on site in silos before being transferred off site for reuse. Gas byproducts of the digestion process, referred to as **digester gas**, are stored in tanks and then compressed and dried by running chilled **plant water** through a heat exchanger. This gas can then be used as fuel for electricity production at the plants, while excess heat produced in the process is used for digester heating and other needs. Excess gas that has been compressed can be disposed of by high-pressure flares. A 5-mile-long Interplant Gas Line connects the high-pressure gas systems of Plant 1 with those of Plant 2. This provides temporary storage of digester gas; allows the gas production to be split between the plants' electrical generation facilities; and buffers spikes in gas production, reducing the need for flaring.

Supervisory control and data acquisition (SCADA). See **process control system**.

Trickling filter. A **trickling filter** is part of the **secondary treatment** process in which liquid waste is slowly trickled over media, such as stones, corrugated plastic, or synthetic materials, that enable the formation of biomass composed of organisms that feed upon and remove wastes from the water being treated.⁹

Trunk sewer. See **collection system**.

Vitrified clay pipe. **Vitrified clay pipe (VCP)** is a pipe material composed of a blend of clay and shale and hardened by exposure to high temperature, similar to ceramic.¹⁰

Waste activated sludge (WAS). See **activated sludge**.

Waste side-stream. In the wastewater treatment context, a **waste side-stream** is any other type of water flow that is not part of the **waste stream** collected and processed in the enclosed treatment process. This includes plant process water, building drains, and surface storm water. The Sanitation District captures waste side-stream water at both its plants, and pumps the water into its system for treatment, minimizing off-site runoff.

Wet well. A **wet well** is a basin in a pumping system that collects the liquids that will be pumped out.

⁸ "Anaerobic digestion." Accessed January 3, 2020. https://en.wikipedia.org/wiki/Anaerobic_digestion_

⁹ Sacramento State University Office of Water Programs. "Glossary of Water and Wastewater Terms." Accessed January 2, 2020. <https://www.owp.csus.edu/glossary/>.

¹⁰ "Vitrified clay pipe." Accessed January 3, 2020. https://en.wikipedia.org/wiki/Vitrified_clay_pipe_

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