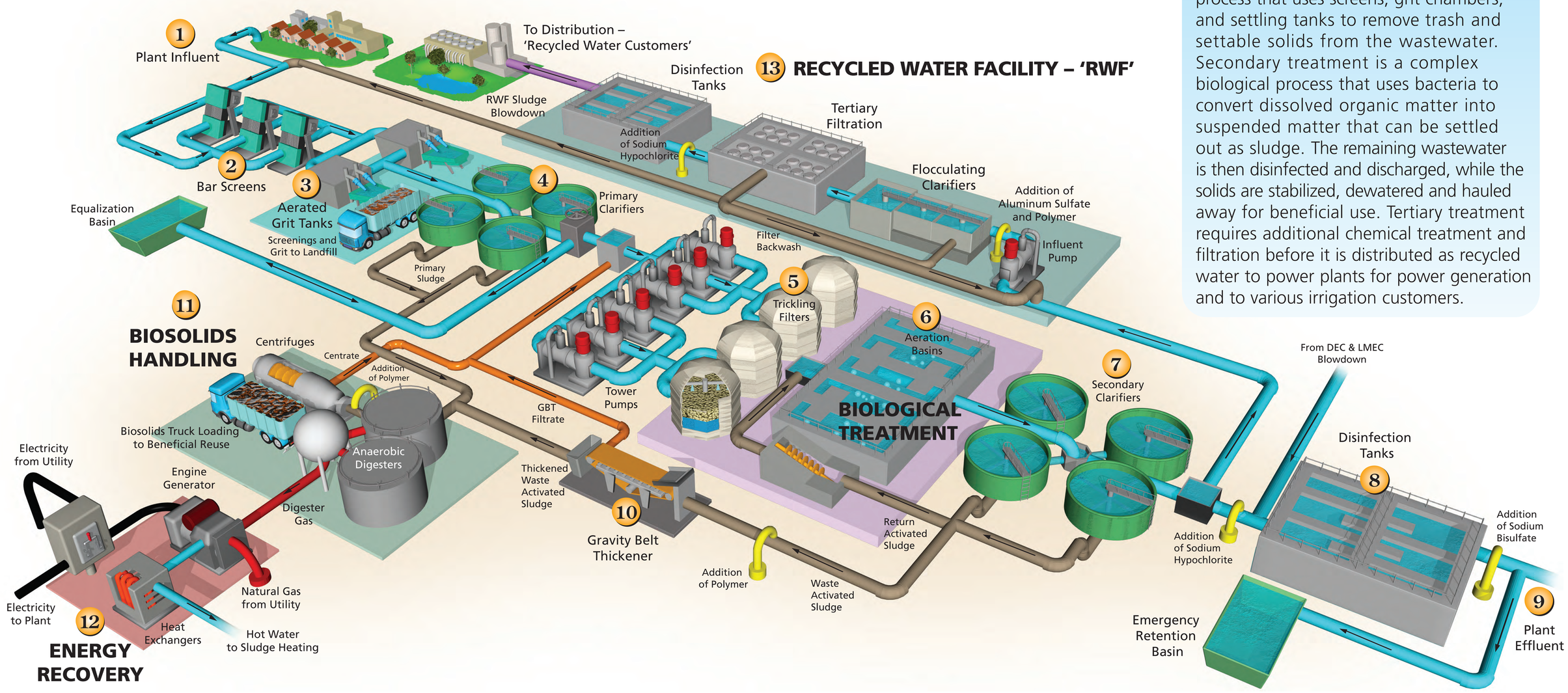
Transforming Wastewater to Resources



THE PROCESS

Delta Diablo treats wastewater from Antioch, Bay Point, and Pittsburg using primary, secondary and tertiary treatment. Primary treatment is a simple mechanical process that uses screens, grit chambers, and settling tanks to remove trash and settable solids from the wastewater. Secondary treatment is a complex biological process that uses bacteria to convert dissolved organic matter into suspended matter that can be settled out as sludge. The remaining wastewater is then disinfected and discharged, while the solids are stabilized, dewatered and hauled away for beneficial use. Tertiary treatment requires additional chemical treatment and filtration before it is distributed as recycled water to power plants for power generation and to various irrigation customers.

1 **Plant Influent** Wastewater from the District's service area – the plant's *influent* – is collected from homes and businesses and pumped to the treatment plant through a network of sewer pipes.

2 **Bar Screens** Bar screens act as course filters to remove rags, sticks, leaves and other debris that might clog pumps and pipes.

3 **Aerated Grit Tanks** After passing through the bar screens, the wastewater enters the aerated grit tanks, where heavy material like sand and gravel settle out by gravity and are trucked to a landfill. Lighter organic material is kept in suspension by air pumped into the tanks.

4 **Primary Clarifiers** The wastewater then flows to the primary clarifiers where suspended solids gradually settle to the bottom as raw sludge. The sludge, about 50% of the total solids, is mechanically collected and pumped to the digesters. Skimming blades remove scum and grease from the surface. The remaining liquid, called *primary effluent*, is pumped to the top of the tower trickling filters for biological treatment.

5 **Tower Trickling Filters** The tower trickling filters are the first stage of a two-stage biological treatment process. Primary effluent, the wastewater leftover from the sludge removal process, trickles down over plastic grates stacked 25 feet high within the towers. These grates become coated with millions of bacteria, which feed upon the dissolved organic matter in the wastewater and convert it into a new generation of bacteria. When the bacteria becomes too heavy, it breaks off and flows with the partially treated wastewater to the aeration basins for the next stage of biological treatment.

6 **Aeration Basins** The next stage of the biological treatment process are the aeration basins where air is introduced to the wastewater by the use of high efficiency blowers. The water must be aerated so that aerobic microorganisms will get enough oxygen to remain active, healthy, and stimulate the growth of more microorganisms to break down the remaining organic matter. These microorganisms and the biodegradable matter they consume are together called activated sludge.

7 **Secondary Clarifiers** From the aeration basins, the treated wastewater flows to the secondary clarifiers. Here the activated sludge settles out, where it is either sent back to the aeration basins to maintain the microorganism population or thickened and sent to the digesters. The remaining clarified water, called *secondary effluent*, is sent to a diversion structure where it is distributed between the Recycled Water Facility and the final stage in the Treatment Plant process in the disinfection tanks.

8 **Disinfection Tanks** Chlorination and dechlorination are the final treatment steps before the wastewater is discharged in to the Delta. Treated effluent from the secondary clarifiers flows into disinfection tanks, where sodium hypochlorite is added to kill pathogenic organisms. Finally sodium bisulfite is added to protect plants and fish in the receiving water.

9 **Final Effluent** The final effluent, which exceeds all requirements set by the Regional Water Quality Control Board, is discharged to the New York Slough through the District's deep water outfall.

10 **Gravity Belt Thickener** Settled activated sludge from the Secondary Clarifiers that is not returned to the Aeration Basins is thickened with a gravity belt thickener to be wasted. Mixed with polymer, the sludge becomes concentrated as it releases the water, which drains by gravity through a porous horizontal belt.

11 **Biosolids Handling** The thickened waste activated sludge is combined with primary sludge and pumped to anaerobic digesters where the bacteria decompose the solids in the absence of oxygen. The digested biosolids now biologically stabilized and reduced in volume, is dewatered by centrifuges, and then hauled away for beneficial use.

12 **Energy Recovery** A byproduct of the anaerobic digestion process is methane gas, which is similar to commercial natural gas with about half the heating value. The District uses the methane to generate electricity, thereby reducing the cost of operating the treatment plant. The District also uses heat exchangers to recover heat from the engine generators to provide hot water for the anaerobic digestion.

13 **Recycled Water Facility** Secondary effluent is pumped from the diversion structure to the flocculating clarifier process units. The flocculation clarifier is a sand-ballasted total flocculation and sedimentation process used to reduce suspended solids and turbidity. The effluent from the flocculating clarifier flows into the tertiary filtration units where it is split among the operating filter cells. Within each cell, the effluent water travels to the bottom of the bed through internal piping and is driven upward through the bed by the influent head. The tertiary filter effluent is disinfected by injecting sodium hypochlorite and providing detention time in the chlorine contact tanks. The recycled water is then delivered to the distribution system which serves the Los Medanos Energy Center, the Delta Energy Center and various irrigation customers, such as public parks, landscaping and golf courses

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