WATER TREATMENT

**Wastewater**, also written as **waste water**, is any [water](http://en.wikipedia.org/wiki/Water) that has been adversely affected in qual ity by [anthropogenic](http://en.wikipedia.org/wiki/Human_impact_on_the_environment) influence.

[Sewage](http://en.wikipedia.org/wiki/Sewage) is the subset of wastewater that is contaminated with [feces](http://en.wikipedia.org/wiki/Feces) or [urine](http://en.wikipedia.org/wiki/Urine), but is often used to mean any wastewater. Sewage includes domestic, municipal, or industrial liquid [waste](http://en.wikipedia.org/wiki/Waste) products disposed of, usually via a [pipe](http://en.wikipedia.org/wiki/Pipeline_transport) or sewer (sanitary or combined)

**Sewage treatment** is the process of removing [contaminants](http://en.wikipedia.org/wiki/Contaminants) from [wastewater](http://en.wikipedia.org/wiki/Wastewater), including household [sewage](http://en.wikipedia.org/wiki/Sewage) and [runoff](http://en.wikipedia.org/wiki/Surface_runoff) ([effluents](http://en.wikipedia.org/wiki/Effluents)). It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce an environmentally safe fluid waste stream (or treated [effluent](http://en.wikipedia.org/wiki/Effluent)) and a solid waste (or treated [sludge](http://en.wikipedia.org/wiki/Sludge)) suitable for disposal or reuse (usually as farm [fertilizer](http://en.wikipedia.org/wiki/Fertilizer)). With suitable technology, it is possible to re-use sewage effluent for drinking water, although this is usually only done in places with limited water supplies, such as [Windhoek](http://en.wikipedia.org/wiki/Windhoek) and [Singapore](http://en.wikipedia.org/wiki/Singapore).[[2]](http://en.wikipedia.org/wiki/Sewage_treatment#cite_note-2)

ORIGINS OF SEWAGE

Sewage is generated by residential, institutional, commercial and industrial establishments. It includes [household waste](http://en.wikipedia.org/wiki/Household_waste) liquid from [toilets](http://en.wikipedia.org/wiki/Toilet), [baths](http://en.wikipedia.org/wiki/Bathing), [showers](http://en.wikipedia.org/wiki/Shower), [kitchens](http://en.wikipedia.org/wiki/Kitchen), [sinks](http://en.wikipedia.org/wiki/Sink) and so forth that is disposed of via [sewers](http://en.wikipedia.org/wiki/Sanitary_sewer). In many areas, sewage also includes liquid waste from industry and commerce. The separation and draining of household waste into [greywater](http://en.wikipedia.org/wiki/Greywater) and [blackwater](http://en.wikipedia.org/wiki/Blackwater_%28waste%29) is becoming more common in the developed world, with greywater being permitted to be used for watering plants or recycled for flushing toilets.

Sewage treatment generally involves three stages, called primary, secondary and tertiary treatment.

 *Primary treatment* consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while oil, grease and lighter solids float to the surface. The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment.

 *Secondary treatment* removes dissolved and suspended biological matter. Secondary treatment is typically performed by [indigenous](http://en.wikipedia.org/wiki/Indigenous_%28ecology%29), water-borne micro-organisms in a managed habitat. Secondary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment.

 *Tertiary treatment* is sometimes defined as anything more than primary and secondary treatment in order to allow rejection into a highly sensitive or fragile ecosystem (estuaries, low-flow rivers, coral reefs,...). Treated water is sometimes disinfected chemically or physically (for example, by lagoons and [microfiltration](http://en.wikipedia.org/wiki/Microfiltration)) prior to discharge into a [stream](http://en.wikipedia.org/wiki/Stream), [river](http://en.wikipedia.org/wiki/River), [bay](http://en.wikipedia.org/wiki/Bay), [lagoon](http://en.wikipedia.org/wiki/Lagoon) or [wetland](http://en.wikipedia.org/wiki/Wetland), or it can be used for the [irrigation](http://en.wikipedia.org/wiki/Irrigation) of a golf course, green way or park. If it is sufficiently clean, it can also be used for [groundwater recharge](http://en.wikipedia.org/wiki/Groundwater_recharge) or agricultural purposes.

### Primary treatment

### In the primary [sedimentation](http://en.wikipedia.org/wiki/Sedimentation_%28water_treatment%29) stage, sewage flows through large tanks, commonly called "pre-settling basins", "primary sedimentation tanks" or "primary [clarifiers](http://en.wikipedia.org/wiki/Clarifier)".[[23]](http://en.wikipedia.org/wiki/Sewage_treatment#cite_note-23) The tanks are used to settle sludge while grease and oils rise to the surface and are skimmed off. Primary settling tanks are usually equipped with mechanically driven scrapers that continually drive the collected sludge towards a hopper in the base of the tank where it is pumped to sludge treatment facilities.[[21]](http://en.wikipedia.org/wiki/Sewage_treatment#cite_note-EPA_Primer-21):9–11 Grease and oil from the floating material can sometimes be recovered for [saponification](http://en.wikipedia.org/wiki/Saponification) (soap making).

### Secondary treatment

**Secondary treatment** is designed to substantially degrade the biological content of the sewage which are derived from human waste, food waste, soaps and detergent. The majority of municipal plants treat the settled sewage liquor using aerobic biological processes. To be effective, the [biota](http://en.wikipedia.org/wiki/Biota_%28ecology%29) require both [oxygen](http://en.wikipedia.org/wiki/Oxygen) and food to live. The [bacteria](http://en.wikipedia.org/wiki/Bacteria) and [protozoa](http://en.wikipedia.org/wiki/Protozoa) consume biodegradable soluble organic contaminants (e.g. [sugars](http://en.wikipedia.org/wiki/Sugar), fats, organic short-chain [carbon](http://en.wikipedia.org/wiki/Carbon) molecules, etc.) and bind much of the less soluble fractions into [flock](http://en.wikipedia.org/wiki/Flocculation). Secondary treatment systems are classified as *fixed-film* or *suspended-growth* systems

**Tertiary treatment**

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