

Henrico County Department of Public Utilities

Industrial and Commercial Strong Waste Charge

Industrial and commercial customers, which include food service establishments, nursing homes, users with discharge greater than 25,000 gallons per day or other manufacturing facilities, generate wastewater streams that are higher in strength than the average residential customer. Indicators of "strength" are Biochemical Oxygen Demand (BOD₅), Total Suspended Solids (SS), Total Phosphorus (TP), and Total Kjeldahl Nitrogen (TKN). Higher strength wastes cost more to treat and are often more troublesome for maintenance of the sanitary sewerage system. To recover costs and to make the difference between industrial/commercial and residential customers more equitable, a strong waste surcharge program was established around 1990. These facilities are monitored by Henrico County to determine if a high strength waste surcharge is warranted. The rate is determined and established by Henrico County Code in the same manner as other water and sewer rates (**Chapter 23, Section 23-362. – Sewer service charges and rates**).

Strong Waste Surcharge Formulas based on rates effective 7/1/17

The formula for calculating a strong waste charge is as follows:

$$\begin{aligned} & \text{[(Volume of wastewater) x (*(BOD}_5\text{ – SBOD}_5\text{) – BOD}_5\text{ Threshold)) x (Rate)]} \\ & \text{and} \\ & \text{[(Volume of wastewater) x (SS – SS Threshold) x (Rate)]} \\ & \text{= \$ amount of surcharge.} \end{aligned}$$

For each customer sampled, the values for BOD₅ and SS are entered into our customer information system on their account and used to calculate strong waste surcharges on their water and sewer bill. These values remain active on the account until new values are reported. Most bills are generated bi-monthly (every 60 days).

Example of charges:

Volume: 220 CCF,
BOD₅: 1,759 mg/L,
SBOD₅: 1,500 mg/L,
SS: 799 mg/L.

$$\text{BOD}_5: (220 \text{ CCF}) \times ((1,759 \text{ mg/L} - 1,500 \text{ mg/L}) - 250 \text{ mg/L}) \times (0.002103) = \underline{\$4.16}$$

$$\text{SS: } (220 \text{ CCF}) \times (799 \text{ mg/L} - 275 \text{ mg/L}) \times (0.001517) = \underline{\$174.88}$$

The dollar amounts represent the strong waste surcharges that would appear on a customer's bill below the water and sewer charges.

Link to Water & Sewer Rates:

<http://henrico.us/utility/water-sewer-rates/>

Useful Definitions

Biochemical Oxygen Demand (BOD₅)

The biochemical oxygen demand, generally referred to as BOD₅, is a measure of the oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedures for five days at 20 degrees Celsius. It is simply an indicator of the organic strength of wastewater. As the strength of wastewater increases greater amounts of energy are required to clean the wastewater. As the strength increases so do the costs to treat it. BOD₅ is expressed in terms of weight and concentration (milligrams per liter).

CCF = 100 cubic feet = 100 X 7.48 gallons per cubic foot = 748 gallons

High Strength

Food service establishments make up a large percentage of facilities that may discharge high strength wastes into the sewerage system. Discharge of food solids, animal and vegetable oils and greases and cleaning chemicals can all increase insoluble BOD₅ and SS concentrations. Improper maintenance of grease control devices or lack of a grease control device may also result in higher strength waste discharges. In addition, the use of garbage grinders may increase wastewater strength by introducing additional solids into the waste stream. The strength is determined by laboratory analysis of samples taken from a customer's wastewater discharge and reported in milligrams per liter (mg/L).

***Insoluble Biochemical Oxygen Demand**

The resultant value in mg/L from subtracting SBOD₅ from total BOD₅.

List of Average Insoluble BOD₅ Percentages by Customer Use Type

- County Offices – 57%
- Convenience Store – 30%
- Hospital – 67%
- Multiple Listings – 48%
- Medical Treatment – 67%
- Nursing Home – 51%
- Service Station – 91%
- Food Service Establishment – 39%
- Motel/Hotel – 56%

- Industrial Manufacturing – 39%
- Schools – 61%

Monitoring

The monitoring for strong waste is accomplished by deploying an automatic sampling device to sample only the isolated wastewater discharged by one customer account. In some instances, a series of grab samples are collected and composited together to make one sample. Whatever the sampling method performed, the account is monitored for a full business day to gather a representative sample. Monitoring is performed by trained Henrico County personnel or can be performed by a supplemental self-monitoring consultant hired by the customer.

Sewerage System

A sewerage system is the network of pipes and pumping stations leading to a treatment facility. Sewerage and sewage are often used interchangeably, however this is not correct. Sewage is what passes through the sewerage system.

Soluble Biochemical Oxygen Demand (SBOD₅)

The result measured by the BOD₅ test procedure specified in 40 CFR 136 after the sample is filtered (vacuum of 25 mmHg) through a 0.45 µm pore size filter. The soluble BOD₅ is a measure of food for microorganisms that is dissolved in the water being treated.

Strong Waste

This is a term applied to the relative strength of an industrial or commercial discharge into the County's sewerage system. If the discharge exceeds 250 mg/L BOD₅ or 275 mg/L SS it is considered to be a strong waste. By definition, if any commercial or industrial customer exceeds the threshold values that customer is automatically a "strong waste customer."

Strong Waste Monitoring

The composite sample testing is accomplished by deploying an automatic sampling device to sample only that waste discharged by the facility. A composite sample consists of a series of individual, proportional grab samples taken every 15 minutes or more apart over a period of one full business day during normal operating conditions.

Supplemental Self-Monitoring

Use of a private environmental consultant to perform strong waste monitoring at a customer location.

Surcharge Thresholds

In Henrico County, the BOD₅ threshold is 250 milligrams per liter (mg/L) and the SS threshold is 275 mg/L. Above these values, a customer is subject to receiving a surcharge on the water/sewer bill. In 2016, Henrico County began the practice of separating the BOD₅ laboratory results into components of soluble vs. insoluble. The value that is used for billing purposes is the insoluble component (higher in strength).

Total Suspended Solids (SS)

All solids that either float on the surface or are in suspension in water, sewage, wastewater or other liquids and which are removable by laboratory filtering. SS is expressed in terms of weight and concentration (milligrams per liter).

List of Average SS Values by Customer Use Type

- County Offices – 1,000 mg/L
- Convenience Store – 1,200 mg/L
- Hospital – 1,071 mg/L
- Multiple Listings – 1,200 mg/L
- Medical Treatment – 1,368 mg/L
- Nursing Home – 1,000 mg/L
- Service Station – 1,050 mg/L
- Food Service Establishment – 1,250 mg/L
- Motel/Hotel – 950 mg/L
- Industrial Manufacturing – 1,200 mg/L
- Schools – 1,000 mg/L

Total Kjeldahl Nitrogen (TKN)

TKN is the total concentration of organic nitrogen and ammonia.

Total Phosphorus (TP)

TP is defined by the National Pollutant Inventory as compounds that give rise to phosphate ions. This is a very broad group including many natural and anthropogenic substances, either containing phosphate or decomposing into it.

Volume

Volume is measured in CCF (hundred cubic feet). The volume of wastewater discharged to the sanitary sewerage system is also an important factor in a strong waste bill. An increase in volume causes an increase in the surcharge.