

Glossary of Water Terminology

A

Acid — A substance that dissolves in water with the formation hydrogen ions (H⁺).

Acidic Solution — A solution that contains significant numbers of (H⁺) ions.

Acre-foot — The amount of water required to cover one acre of land to the depth of one foot. This equals 325,851 gallons, or 43,560 cubic feet.

Action Levels — That level of a contaminant in drinking water at which EPA requires the water system to take specified actions such as public education and for treatment process evaluations and modifications.

Acute Effects — The adverse health effects experienced shortly after exposure to a substance or mixture of substances.

Aesthetics — Those qualities of water that deal more with appearance, taste and odor. These qualities may have no bearing on whether the water is safe to drink, but may affect people's desires to drink the water.

Algae — The simplest of all plant forms, having neither root, stem, nor leaves. Most are microscopic consisting of single cells or colonies of cells. They are present in all natural surface waters. Certain types of algae (particularly the Blue-Green Algae) produce objectionable tastes or odors in drinking water supplies.

Alkaline Solution — A basic solution that contains significant numbers of hydroxyl (OH⁻) ions.

Alkalinity — The capacity of water to neutralize acids. A property primarily imparted by the water's content of carbonates, bicarbonates and hydroxides. Alkalinity is expressed in milligrams per liter of equivalent calcium carbonate.

Ammonia — A chemical combination of hydrogen (H) and nitrogen (N) occurring extensively in nature. The combination used in water and wastewater engineering is expressed as NH₃.

Anion — A negative ion (for example, chloride, Cl⁻).

Aquifer — A bed of porous rock or sand that carries or holds water and from which water can be extracted.

Anthrafilt — Brand name of anthracite, specially prepared and used as filter media.

Aquitard — A geologic formation which will not transmit water fast enough to yield an appreciable supply for a well. Aquitards frequently provide barriers to the movement of water between aquifers.

Available Chlorine — A term used for rating hypochlorites as to their total oxidizing power. Dry calcium hypochlorite typically contains 65% available chlorine. Liquid household bleach (sodium hypochlorite) typically contains 5.22 % available chlorine.

B

Backflow — (1) A flow condition, induced by a differential in pressure, that causes the flow of non-potable water or other liquid into the distribution system of a potable water supply. (2) The backing up of water through a pipe in the direction opposite to normal flow.

Bacteria — Simple, one-celled microscopic organisms. Although some bacteria cause diseases (pathogenic bacteria), others are harmless and fill indispensable ecological roles such as decomposers.

Base — Any compound that dissociates in water to yield hydroxylions (OH⁻).

Best Available Technology (BAT) — The best treatment methods that can be achieved based on current technology and economics.

Biochemical Oxygen Demand (BOD) — A measure of the amount of oxygen consumed in biological processes that break down organic matter in water; a measure of the organic pollutant load.

Boosters — Pumps and pumping facilities located throughout the distribution system to insure proper water pressure for delivery to all points.

C

Calcium Carbonate — The primary mineral residue causing particles in ice and white scale build-up in cooking:

- particles found in ice cubes — Often when water taken from the tap is made into ice cubes, the action of freezing the water causes the calcium carbonate in the water to settle out and form what looks like small, heavy snowflakes in the bottom of the ice cube. The whitish substance is not harmful. When the ice cube melts, the whitish substance will settle to the bottom of a glass.
- white build-up in pans — When a pan is used often to heat or boil water, a build-up of grayish white scale will appear on the bottom of the pan. As the water is heated or boiled, it evaporates, leaving behind the minerals dissolved into the water. These minerals precipitate out of solution to form the scale. Calcium and magnesium, which are associated with hardness, leave the most scale. The scale can be removed by soaking and scrubbing the pan in a very mild acid, i.e. vinegar.

Carcinogen — A chemical which causes or induces cancer under specific circumstances.

Cation — A positive ion (for example, sodium, Na⁺).

Chloramine — A compound of organic or inorganic nitrogen and chlorine. Chloramines are formed when both chlorine and ammonia are added in water treatment. Like chlorine, they are useful disinfectants.

Chloride — The (Cl⁻) radical or ion. Sodium chloride (NaCl) is common table salt. Chloride ion (Cl⁻) is found in all natural waters.

Chlorination — The application of chlorine to water generally for the purpose of disinfection, but frequently for accomplishing chemicals such as iron, manganese or taste and odor removal.

Chlorine — An element (Cl) ordinarily existing as a greenish-yellow gas (Cl₂) about 2.5 times as heavy as air. It is commonly used as a disinfectant in water treatment.

Chlorine Residual — When added to the water, chlorine not only kills the harmful bacteria but reacts with other substances in the water. Therefore, adequate chlorine must be added so it can react and still have a small measurable amount of chlorine left in the water. This small amount of measurable chlorine is called a chlorine residual.

Chloroform — The most common trihalomethane. A byproduct of chlorine disinfection of drinking water supplies that is a suspected human carcinogen.

Cholera — Waterborne disease, caused by the bacterium *Vibrio Cholerae*, usually marked by severe gastrointestinal symptoms.

Chronic Effects — The health effects experienced over a long period of time following repeated or continuous exposure to a substance or mixture of substances.

Clarifier — Unit that separates particles of dirt from the water and deposits it in a sludge pile.

Clear wells — Underground reservoirs where water is stored previous to delivery to the customer.

Coagulant — A compound responsible for coagulation; a floc-forming agent.

Coagulation — A step in the water treatment process in which suspended particles combine physically (upon chemical treatment) forming larger particles (floc) which then settle out or are large enough to be filtered.

Coliform Bacteria — A group of bacteria that resemble E.Coli; found in soils, natural water and in the intestines of warm-blooded animals. Although usually harmless themselves, they are used as an indicator of the potential presence of pathogenic (disease-causing) organisms in water.

Color — Water can appear colored, depending on the natural metallic ions (such as iron or manganese), or natural organic materials such as decayed plant matter) which the water has dissolved in it. Where these color-changing assents may not be harmful, drinking water treatment processes are designed to remove them to make the water suitable for general and industrial purposes.

Concentration — A measure of the amount of dissolved substances contained per unit volume of solution. Concentration may be expressed as grains per gallon, pounds per million gallons, or milligrams per liter.

Connate Water — Water which was entrapped in a geologic formation at the time the formation was deposited. If the formation was deposited in the ocean or a saline lake, the connate water is also saline.

Contamination — Any introduction into water of microorganisms, chemicals, wastes or wastewater in a concentration that makes the water unfit for its intended use.

Corrosion Control — Methods used to prevent the dissolution of pipe materials into water. Adjustment of pH or the addition of corrosion-inhibiting chemicals like zinc phosphate is commonly used.

Corrosion — Depending upon the characteristics of the water, it will react with metals and chemicals. This reaction can cause corrosion of the pipes, which contain the water. The most common deterioration is seen as rust.

Cross Connection — (1) A physical piping connection through which a supply of potable (suitable for drinking) water could be contaminated or polluted. (2) A connection of unknown potability, such as a private well.

D

Distribution System — Pipelines, pumps and tank facilities located away from the plant, which delivers water to customers.

DBCP (1,2-Dibromo-3 Chloropropane) — A volatile organic compound used as a soil fumigant for nematode control on crops. It has been detected in some ground water. USEPA has cancelled all uses of this pesticide. Also called dibromochloropropane.

Dechlorination — The partial or complete reduction of residual chlorine in a liquid by any chemical or physical process.

Disinfection — The removal or inactivation of infectious microorganisms in the water treatment process.

Dissolved Oxygen (DO) — The oxygen dissolved in water. It is necessary for respiration by aquatic life and for the oxidation, or breakdown, of organic matter.

Distillation — The removal of dissolved substances from water by first evaporating it to steam and then condensing the steam back to water. Distilled water is usually very pure.

Drinking Water Standards — Allowable levels of contaminants (primary and secondary) established by EPA to protect public health and welfare. These are also called Maximum Contaminant Levels (MCLs).

Dysentery — A disease (sometimes waterborne) characterized by severe diarrhea with passage of mucus and blood.

E

E.Coli (Escherichia Coli) — One of the species of bacteria in the chloroform group. Its presence is considered indicative of recent fecal contamination.

EDB (Ethylene Dibromide) — A volatile organic compound used as a pesticide. It has been detected in some ground water. Most uses have been cancelled by the USEPA. Also called 1,2-dibromoethane.

Effluent — The treated or untreated liquid that flows out of a pipe. This term is generally used in the water and wastewater industries to describe finished waters discharged into distribution systems or treated waste waters discharged back to natural waters (rivers and streams).

Electrical Conductivity — A measure of the ability of the water to conduct electrical current. It is used as a measure of the dissolved salts in the water.

Element — Any of more than 100 fundamental substances that consist of atoms of only one kind and that constitute all matter.

Enteric — Having its normal habitat in the intestinal tract of man or animals.

EPA — Stands for the United States Environmental Protection Agency (USEPA or EPA). The Federal Agency created in 1970 that implements major environmental legislation. EPA's Office of Drinking Water is given the responsibility of establishing federal drinking water regulations and standards (levels of contaminants, which could be present in water without being harmful to man, when the water is consumed).

Epidemiology — The study of the incidence, distribution and control of disease in a population.

Eutrophication — An aging process in lakes during which the water becomes overly rich in dissolved nutrients, resulting in excessive development of algae and other microscopic plants, causing a decline in levels of dissolved oxygen.

Filter Media — Layers of porous materials through which water is filtered. Can include sand, hard coal or anthracite, and gravel.

Filtration — The process of removing suspended matter from water as it passes through beds of porous material such as sand or activated carbon.

Floc — Small gelatinous masses formed in a liquid by the reaction of a coagulant added thereto, through biochemical processes, or by agglomeration.

Flume — Essentially, a square, concrete pipe.

Fluoride — When present in drinking water in the proper amounts, fluoride helps harden the enamel on children's teeth during the time the teeth are growing (from the time the children lose their baby teeth until they are about 12-14 years of age) and thus prevents dental caries (cavities or decay). If children drink water that has too much fluoride during the time their teeth are growing, brown spots can appear under the enamel of the teeth. This is called mottling of the enamel and the brown spots will remain as part of the permanent teeth. In some states, drinking water treatment facilities are required to add fluoride to the water to provide the optimum level of dental health.

G

Gastroenteritis — Inflammation of the lining membrane of the stomach and the intestines.

GC/MS (Gas Chromatograph/Mass Spectrometer) — An electric instrument used to detect and quantify organic compounds in the laboratory.

Giardia — A microscopic parasite (a protozoa) found in untreated water that is responsible for an intestinal disorder known as giardiasis.

Grains Per Gallon (gpg) — A measure of the concentration of solutions. It is frequently used when referring to water hardness. 1 gpg = 17.12 mg/L.

Gram — A metric unit of mass defined as one thousandth of a kilogram; one gram is practically equal to the weight of a cubic centimeter of water (1/454 of a pound).

Granular Activated Carbon (GAC) — A treatment technique that relies on the absorbent properties of carbon to remove its contaminants from drinking water. The primary use is organic removal.

Ground Water — Water stored underground in the porous rocks and soils, rather than in lakes, streams or otherwise on the surface of the ground. It is a large portion of the total supply of fresh water.

H

Hardness — A characteristic of water caused primarily by the presence of calcium and magnesium salts. High hardness makes it difficult to obtain soap suds without using a larger amount of soap. Other indications of hardness or hard water are where a scale is built up in boilers, in the pipes close to the boiler, or in pipes near hot water heaters. Waters with a hardness greater than 200 ppm (12 grains per gallon) are usually considered "hard." Consumer acceptance to hardness varies widely. Original term came from the fact that beans cooked in hard water remained hard.

High Lift Pump — Pushes the water into the distribution system and to the customer.

Hypochlorites — Compounds containing the hypochlorite ion (OCI-). Sodium hypochlorite and calcium hypochlorite are often used as drinking water disinfectants.

I

Incrustation — The forming of dense solids as a crust on the inside surface of a pipe as a result of hardness or other characteristics of the water carried.

Infectious Hepatitis — An acute virus inflammation of the liver that may be waterborne, characterized by jaundice, fever, nausea, vomiting, and abdominal discomfort.

Inorganic Chemicals — Chemical substances of mineral origin not having carbon in their molecular structure.

Ion — An atom which is electrically unstable because it has more or less electrons than protons. A positive ion is called a cation. A negative ion is called an anion. Most inorganic substances dissociate into ions when dissolved in water.

L

Langelier Index — A method for reporting the tendency of water to either scale or corrode pipes, based on the pH and alkalinity of the water. Full name is "Langelier's calcium carbonate saturation index." A positive value indicates a tendency for the water to deposit a protective mineral scale on the inside pipe surface.

Low Lift Pump — Pulls water out of the river and into the treatment plant.

M

MCLG (Maximum Contaminant Level Goal) — The highest permissible concentration of a substance allowed in drinking water, established by the EPA, at which no known or anticipated health effects will occur. They are health goals and are not enforceable.

MCL (Maximum Contaminant Level) — The highest permissible concentration of a substance allowed in drinking water, as established by the USEPA. These are enforceable standards (laws) designed to be protective of human health and to take into account available monitoring and treatment technologies.

Milligram Per Liter (ug/L) — One part per billion (ppb).

Microorganism — Organisms so small that a single unit cannot be seen by the unaided eye. Microorganisms include bacteria, viruses, protozoa, unicellular fungi and algae.

MGD — Million gallons per day (not thousands as M might indicate).

Million Per Liter (mg/L) — One part per million (ppm). The term milligrams per liter is used to express, by weight, the amount of chemical dissolved into one liter of water. One part per million is the equivalent to one milligram per liter.

Mutagen — A substance or mixture of substances capable of causing genetic change.

N

National Primary Drinking Water Regulations (NPDWRs) — The standards and monitoring and notification regulations, which EPA must establish, authorized under the Safe Drinking Water Act Amendments of 1986.

Nitrate (NO⁻ and NO⁻²) — When water, which contains large amounts of the mineral nitrate or nitrite (exceeding drinking water standards) is consumed by a woman who is pregnant or by an infant, the nitrates and nitrites have an effect on the baby's blood in that the blood will not have the ability to properly supply oxygen to the cells of its body. This condition is called "blue baby syndrome." Babies up to the age of six months should not drink water with high nitrates or nitrites.

Non-Point Source Discharge — Any non-confirmed area (generally not a pipe) from which pollutants are discharged into a body of water (agricultural run-off, urban run-off, sedimentation from construction sites).

NTU (Nephelometric Turbidity Unit) — The unit of measure for turbidity in water.

O

Organic Chemicals — Natural and synthetic compounds containing carbon.

Ozone — Oxygen in molecular form with three atoms of oxygen forming each molecule (O₃). Used as an oxidizing agent in drinking water treatment for disinfection and taste, color, or odor removal.

P

PAC (Powdered Activated Carbon) — A finely ground form of activated carbon that is added directly to water, typically in the coagulation-sedimentation process (prior to filtration) for removal of organic compounds.

Pathogens — Pathogenic or disease-producing organisms. They have historically been the primary impetus to treat water. Until the 20th century, waterborne protozoa, bacteria and viruses have caused disease outbreaks, resulting in widespread illness and death. With the advent of disinfection, such outbreaks have been virtually eliminated.

PCBs (Polychlorinated Biphenyls) — A group of synthetic organic chemicals used for numerous purposes. Manufacture of PCBs was discontinued in 1976. PCBs are still present in many electrical capacitors and transformers and have been detected in some drinking water sources.

pH — Water has the ability to dissolve both alkaline and acid substances. When these substances are dissolved equally, it is said that the water is neutral and has a pH of 7. When the pH of the water is above 7, it means that more alkaline substances have been dissolved. When the pH of the water is below 7, it means that more acid substances have been dissolved. The pH scale runs from 0 (most acid) to 14 (most basic).

Picocuries per Liter (pCi/L) — The usual unit of measurement for the amount of radioactivity in water. One pCi is equivalent to 2.22 disintegrants per minute (dpm).

Point Source Discharge — A discrete, readily definable source of pollution such as a pipe, discharging pollutants to natural waters.

Pollution — A condition representing the presence of harmful or objectionable materials in the water.

Polynuclear Aromatic Hydrocarbons (PAHs) — A group of synthetic organic compounds used in coal-tar products. These products are often used to line storage tanks and distribution mains and have been detected in some drinking water.

Potable Water — Water which does not contain objectionable or harmful substances and is considered satisfactory for domestic consumption.

ppb — One part per billion; equal to one gram of solute per billion grams of solution; ppb and ug/L (microgram per liter) represent the same concentration.

ppm — One part per million; equal to one gram of solute per million grams of solution; ppm and mg/L (milligram per liter) represent the same concentration.

Primary Drinking Water Standards — Standards (MCLs) established for the protection of public health. **Priority Pollutants** — A list of 129 industrial pollutants regulated by the Clean Water Act.

Protozoa — Small one-celled animals including amoebae, ciliates and flagellates.

R

Radionuclides — The general term for natural or man-made substances that are radioactive in nature. EPA has determined that radionuclides can be harmful to one's health if consumed in large quantities over a long period of time. People are subjected to radioactivity in many forms; therefore, the limits allowed in water are very low.

Radon — A natural radioactive gas. Surface water does not normally contain radon, but some ground waters can contain high levels.

Raw Water — River water, untreated.

Reverse Osmosis (RO) — A method used to remove dissolved substances from water. Water is forced through a semi-permeable membrane under high pressure. The membrane only allows water and small molecules to pass through.

S

Safe Drinking Water Act — The Safe Drinking Water Act of 1974 and its 1986 Amendments are the laws enacted by Congress authorizing the EPA to establish national drinking water regulations.

Salinity — Concentration of salts dissolved in water; salt level.

Saturation Index (S.I.) — See Langelier Index.

Secondary Drinking Water Standards — Standards (SMCLs) specifying limits for substances that may affect aesthetics or consumer acceptance of drinking water, such as taste, odor or color. These are non-enforceable standards, but only serve as guidelines for aesthetic quality of water.

Sedimentation — One of the first steps in the water treatment process, when suspended material in water is settled out.

Sludge — Solid waste taken from raw water during treatment. It can be pumped into a city's sewer system or placed in a lagoon for drying, then moved later to a landfill.

SOCs (Synthetic Organic Chemicals) — Man-made chemicals, many of which have been detected in drinking water. This group includes the EPA-regulated VOCs.

Sodium — Is an essential element in the human diet; however, evidence from epidemiologic, clinical, and animal studies suggest that chronic excessive sodium intake is associated with hypertension, defined as an increase in blood pressure. The American Heart Association (AHA) has advocated a sodium-restricted diet for the long-term management of hypertension and has suggested a maximum level of sodium in drinking water of 20 milligram per liter (mg/L). However, sodium in drinking water is usually a very small percentage of the normal dietary intake. For example, one large dill pickle may contain more than 2,000 mg sodium, and the average person consumes 5,000 mg per day. Persons on low sodium diets should check with their physician to determine what levels of sodium in drinking water are acceptable for their needs.

Soft Water — Water which has very little calcium and magnesium dissolved into it, allows soap to form suds easily, does not build up scale in boilers or hot water heaters, is considered soft water. When tested, water with a hardness of 0 to 3 grains per gallon or 0 to 50 milligrams per liter is considered "soft water." One gram per gallon equals approximately 17 milligrams per liter of water hardness.

Solute — The substance is dissolved in a solution.

Solution — A liquid containing a dissolved substance. The liquid alone is called the solvent, the dissolved substance is called the solute. Together they are called a solution. In an aqueous solution of sodium chloride (table salt) the solvent is water and the solute is table salt.

Solvent — Liquid used to dissolve a substance.

Surface Water — Water that rests or moves on the surface of the earth, such as streams, ponds, lakes and reservoirs.

Suspended Solids (SS) — Small particles of matter, such as fine soils or clays, suspended in the water. SS is a measure of the materials that can be filtered out of a water sample.

T

Taste/Odor — It is difficult to separate taste from odor. Due to the fact that we rely simultaneously on a combination taste and odor sensory organs to come up with our individual perceptions of flavor, feels and smells of substances ingested and/or inhaled. Because water can dissolve chemicals and minerals, it takes on the taste of the chemicals or minerals. Depending on what the water comes in contact with, each different source of supply has its own distinctive taste/odor. When someone first drinks the water, they may find it unpleasant because the taste is different from what they are accustomed to. As one continues to drink the water over a period of time, they become accustomed to the taste and no longer find it unpleasant.

Teratogen — A chemical or mixture of chemicals that can cause birth defects.

THMs (Trihalomethanes) — A group of volatile organic compounds formed when chlorine reacts with naturally occurring humic (organic) substances in water. (See Trihalomethanes.)

Total Dissolved Solids (TDS) — The total of the dissolved salts, minerals and other matter (by weight) in a measured quantity of water; usually stated in parts per million (ppm) or milligrams per liter (mg/L). Dissolved solids generally are not removed from water by filtration.

Total Organic Halogen (FOX) — Is a measure of the organic compounds associated with chlorine, bromine and iodine (halogens), including trihalomethanes. Since most halogenated organics are suspected of being toxic or carcinogenic, the TOX in water is a useful indicator of toxic contaminants.

Toxic — Of, relating to, or caused by a poison.

Toxicity — The quality or degree of being poisonous or harmful to plant, animal or human life.

Toxicology — The study of the harmful effects of substances on living systems.

Treated Water — Water that had been treated chemically and/or physically to make it suitable for its intended use.

Trihalomethanes (THMs) — A class of compounds forming upon the reaction of chlorine and natural organic matter (such as humic and fulvic acids). Chloroform, a suspected human carcinogen, is the most common THM. All-organic materials contain carbon atoms or what are called carbon chains. When these organics are present in the water and chlorine is added, the chlorine reacts with the carbon and forms trihalomethanes. It has been determined that trihalomethanes could cause cancer if sufficient amounts of them are consumed by an individual over a long period of time.

Trihalomethane Formation Potential (THMFP) — Is a measure and is generally related to the amount of natural organics (or THM-precursors) of the potential that a water source has for producing THMs. Studies have shown that the use of a water supply source lower in THMFP can be expected to result in lower THMs after chlorine treatment.

Turbidity — A measure of water clarity. Turbidity indicates the presence of suspended solids. High turbidity water is not only visually unacceptable to the consumer; it can shield microorganisms from the action of disinfectants.

Typhoid — A communicable disease that may be waterborne, marked especially by fever, diarrhea, prostration, headache and intestinal inflammation. Caused by Salmonella typhosa bacterium.

U

Unregulated Contaminants — Contaminants for which drinking water standards have not been established by EPA. The EPA has at times required public water systems to monitor for a list of contaminants which are being considered for resolution. EPA refers to such monitoring requirements as monitoring for "unregulated contaminants."

V

Variance — A temporary waiver which may be issued to a public water supply if characteristics in the raw water source make it impractical to meet the MCLs and with the approval of appropriate regulatory agencies once it has been determined that granting such variances will not result in unreasonable risk to human health.

Viruses — The smallest life form capable of producing infection and diseases in man or other large species. The true viruses are insensitive to antibiotics. They multiply only in living cells. They do not multiply by division as do bacteria.

VOCs (Volatile Organic Compounds) — Lightweight organic compounds that vaporize or evaporate easily. Many industrial solvents like TCE and TCA belong to this class of compound.

W

Water Quality — The chemical, physical and biological properties of water which affect its suitability for use.

Water Softener — A water softener is a mechanical unit designed to remove hardness. When the hard water comes in contact with special resins or minerals in the softener, a chemical reaction takes place. The calcium and magnesium (which cause the hardness) become bound to the resin and sodium ions form the resin take their place. Softeners are periodically regenerated by passing a strong brine solution (sodium chloride or salt) over the resin.

Water Table — The geographic level where ground water is encountered in a well in an unconfined aquifer.

Watershed — The land area from which water drains to a given point, such as a reservoir, stream, river, or storm water catchment area.