

# GLOSSARY

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**above ground storage tanks (ASTs):** any type of container used above the surface to store products. Regulated ASTs include those containing 660 or more gallons (in one container) or 1320 gallons (in more than one container) of oil of any kind and which pose a potential discharge to surface waters.

**absorption field (drainfield):** area where effluent from a septic tank is discharged

**accretion:** the process of growing by being added to

**accuracy:** the closeness of a measurement to the true or accepted value

**acid mine drainage:** acidic waters that are formed in mine areas from water coming into increased contact with sulfate and sulfide minerals. This forms sulfuric acid.

**acidic:** having a pH value of less than 7; acidic liquids are corrosive and sour (**DO NOT TASTE!**)

**acidity:** (1) a characteristic of substances with a pH less than 7; (2) tending to form an acid

**acid rain:** rain with a pH of less than 5.6; results from atmospheric moisture mixing with sulphur and nitrogen oxides emitted from burning fossil fuels or from volcanic activity; may cause damage to buildings, monuments, car finishes, crops, forests, wildlife habitats, and aquatic life

**activated sludge:** sludge particles produced by the growth of microorganisms in aerated tanks as a part of the activated sludge process to treat wastewater

**activated carbon (charcoal):** material made from coal by driving off hydrocarbons under heat without oxygen, leaving a tremendous surface area on which many chemicals can be adsorbed

**acute (toxic) effects:** adverse health effects which are observed rather quickly after exposure to a toxin; illness with rapid onset caused by a toxin

**adage:** an old saying; a phrase passed down through the years

**adhere:** to stick fast; stay attached to another substance

**adhesion:** the act of sticking (surface attraction) or the state of being stuck together

**adsorption:** phenomenon by which molecules in a fluid phase are attracted to a solid surface (e.g., activated carbon) and held there by physical or weak chemical bonds

**advanced treatment:** any level of treatment beyond secondary treatment that includes secondary treatment plus nutrient removal. Advanced treatment generally removes greater than 85% of BOD and TSS; typically required when the waters receiving effluent from a treatment plant do not provide adequate dilution. It is generally very expensive to construct and maintain advanced treatment facilities.

**aeration:** exposing to circulating air; addition of oxygen to wastewater or water, as in first step of both activated sludge wastewater treatment process and drinking water treatment

**aerobic:** with oxygen; needing oxygen for cellular respiration

**aesthetic:** (1) drinking water - refers to water characteristics such as taste, odor, color, and appearance that reduce the quality but do not necessarily result in adverse health effects;  
(2) of or relating to the sense of the beautiful; artistic quality or appearance

**AF:** (acre foot) - volume of any substance required to cover one acre of a surface to the depth of 1 ft (43,560 ft<sup>3</sup>) or (1232.75 m<sup>3</sup>)

**agriculture:** science of cultivating the soil, producing crops, and raising livestock; farming

**air sparging:** injecting air into groundwater to help remove contaminants

**algae:** any various, primitive, chiefly aquatic, one-celled or multicellular plants that lack true stems, roots, and leaves, but usually contain chlorophyll. Algae are divided into three groups: chlorophyta (green), phaeophyta (brown), and rhodophyta (red), typically grow in sunlit waters in proportion to the amount of nutrients available, and serve as food for fish and small aquatic animals.

**algal bloom:** a sudden increase in the amount of algae, usually causing large, floating masses to form. Algal blooms can affect water quality by lowering DO content and decreasing sunlight penetration, are usually caused by excessive nutrient addition, and can be characteristic of a eutrophic lake.

**alkaline:** having a pH greater than 7; alkaline liquids are caustic and bitter (**DO NOT TASTE!**)

**alkalinity:** (1) a characteristic of substances with a pH greater than 7; (2) the capacity of water to

neutralize acids, imparted primarily by the water's content of carbonates, bicarbonates, and hydroxides (expressed in mg/l of  $\text{CaCO}_3$ )

**allegory:** a story in which symbols are used to present moral truths

**alliteration:** repetition of an initial sound, usually of a consonant or cluster, in two or more words of a phrase or line of poetry

**alum:** aluminum salt (typically, aluminum sulfate) used as a flocculant

**anaerobic:** in the absence of oxygen; able to live and grow where there is no air or free oxygen, as certain bacteria

**anhydrite:** a white to grayish or reddish mineral of anhydrous (free from water) calcium sulfate ( $\text{CaSO}_4$ ) occurring as layers in gypsum deposits

**anthropomorphize (personify):** to take something inanimate or subhuman and give it human characteristics

**aqueous:** of, pertaining to, or dissolved in water

**aquiclude:** a low-permeability unit that forms either the upper or lower boundary of a groundwater flow system

**aquifer:** porous, water-bearing layer of sand, gravel, and rock below the Earth's surface; reservoir for groundwater

**aquifer recharge:** the addition of water by any means to an aquifer

**aquitard:** a low-permeability layer of rock or clay that can store water but transmits it very slowly one aquifer to another

**arid:** lacking enough water for adequate growth; dry and barren

**artesian well:** a well that produces water without need for pumping due to pressure exerted by confining layers of soil

**artesian aquifer:** an aquifer that is sandwiched between two layers of impermeable materials and is under great pressure, forcing the water to rise without pumping. Springs often surface from artesian aquifers.

**aseptic:** free or protected from disease-producing or putrefying microorganisms

**assessment:** a fact-based evaluation or judgment

**atmospheric pressure:** the pressure or force per unit area, exerted by the atmosphere on any surface beneath or within it

**atmospheric water:** water found in vapor form in the atmosphere

**atom:** any of the smallest particles of an element that combine with similar atomic particles of other elements to produce molecules; made up of electrons, neutrons, and protons

**attenuation:** dilution or lessening in severity

**bacteria:** typically one-celled, non-photosynthetic microorganisms that multiply by simple division. They occur in three main forms: spherical (cocci), rod-shaped (bacilli), and spiral (spirilla).

**banana wrap:** plastic that is put around bananas during shipping

**bar-built estuary:** type of estuary formed by a series of bars or islands created from offshore depositing sand, washed down by rivers or in from deep water. The sand works up the continental shelf and stabilizes. A bar-built estuary is usually laterally extended along the shore, and is long, narrow, and low.

**barrier island:** a ridge of sand and gravel thrown up parallel to a coastline by the waves and tides with a lagoon behind it

**barrier reef:** a rock or coral reef, aligned roughly parallel to a shore and separated from it by a lagoon

**bathymetry:** the measurement of the depth of the ocean

**bay:** a body of water partly enclosed by land but with a wide outlet to the sea

**bedrock:** the solid rock that underlies all soil, sand, clay, gravel, and loose material on the Earth's surface; the bottom layer

**benefit:** help or reward; positive factors to consider

**benthic:** living on the bottom of a lake or sea; pertaining to the ocean bottom

**benzene:** (1) a clear, inflammable, poisonous, aromatic liquid,  $C_6H_6$ , obtained by scrubbing coal gas with oil and by the fractional distillation of coal tar. It is used as a solvent for fats and in making lacquers, varnishes, many dyes, and other organic compounds; (2) a structural unit in the molecules of organic aromatic compounds.

**Bernoulli Principle:** the statement in hydraulics that, under conditions of uniform steady flow of water in a conduit or stream channel, the sum of the velocity head, the pressure head, and the head due to elevation at any given point is equal to the sum of these heads at any other point plus or minus the losses in head between the two points due to friction or other causes

**best management practices (BMPs):** techniques that are determined to be currently effective, practical means of preventing or reducing pollutants from point or nonpoint sources in order to protect water quality. BMPs include, but are not limited to: structural and nonstructural controls, operation and maintenance procedures, and other practices. Usually, BMPs are applied as a system of practices rather than as a single practice.

**bicarbonate:** an acid salt of carbonic acid containing the radical  $HCO_3^-$

**bioaccumulate:** to accumulate larger and larger amounts of a toxin within the tissues of organisms at each successive trophic level

**bioaccumulation:** the process by which a substance is taken up by an (aquatic) organism both from water and through food

**bioassessment:** an evaluation of the biological condition of a waterbody using biological surveys and other direct measurements of resident biota in surface waters

**biochemical oxygen demand (BOD):** a laboratory measurement of wastewater that is one of the main indicators of the quantity of pollutants present; a parameter used to measure the amount of oxygen that will be consumed by microorganisms during the biological reaction of oxygen with organic material

**biodegradable:** capable of being decomposed (broken down) by natural biological processes

**biodegradation:** the breakdown of materials by living things into simpler chemicals

**biodiversity:** the number of different varieties of life forms in a given area, or an index derived from this number

**biological treatment:** treatment of wastewater using microorganisms to decompose undesirable

organic compounds in an aqueous waste stream

**biological magnification (biomagnification):** bioaccumulation occurring through several levels of a food chain; process by which certain substances (such as pesticides or heavy metals) are deposited into a waterway, are eaten by aquatic organisms which are in turn eaten by large birds, animals, or humans, and become concentrated in tissues or internal organs as they move up the food chain.

**biomes:** area or groups of ecosystems with similar climates, soils, and communities

**bioremediation:** a biologically mediated corrective process that occurs naturally over time; humans may speed up this process through technology (see in-situ bioremediation)

**biosolids:** wastewater solids that meet government criteria for beneficial use

**biota:** the plant and animal life of a region

**biotic:** living or derived from living things

**blackwater:** domestic wastewater containing human or animal waste or other sources of pathogens

**“bloom” (algal bloom):** a sudden excessive growth of algae that can affect water quality adversely; large floating masses of algae; characteristic of a eutrophic lake

**blowouts:** when an oil well blows its top and spews crude oil into the air

**“blue baby” syndrome (methemoglobinemia):** pathological condition where the skin of infants (or other sensitive groups) turns blue due to nitrates bonding with red blood cells, which prevent the transport of oxygen throughout the body; can be caused by nitrate contamination in drinking water

**BOD (Biochemical Oxygen Demand):** a laboratory measurement of wastewater that is one of the main indicators of quantity of pollutants present

**bog:** freshwater marsh with build-up of peat and high acidity, that typically supports mosses adapted to acidic soil conditions (particularly, sphagnum); many are located in colder regions

**boiling point (BP):** the temperature at which a liquid starts to bubble up and vaporize by being heated

**bottled water:** water that is sealed in food grade bottles and is intended for human consumption

**bottomlands:** lowlands along streams and rivers that are typically flooded

**brackish water:** water that is a mixture of fresh and salt water

**buffer zone:** an area between the water supply source and the possible contamination sources where no contamination activities are likely to occur

**calcium carbonate:** one of the most stable, common, and widely dispersed materials on Earth; occurs naturally in oyster shells, calcite, limestone, marble, chalk, and other forms; used to express hardness and alkalinity (mg/l of  $\text{CaCO}_3$ )

**capillary action:** the action by which the surface of a liquid where it is in contact with a solid (as in a capillary tube) is elevated or depressed depending on the relative attraction of the molecules of the liquid for each other and for those of the solid

**carbon column:** compressed activated carbon in a tube; used for adsorption processes

**carbonate aquifer:** underground layer of limestone that is saturated with usable amounts of water

**carbon dioxide:** colorless, odorless gas made of carbon and oxygen ( $\text{CO}_2$ ); exhaled by animals, and humans, utilized by plants in photosynthesis and contained in automobile exhaust

**carbonic acid:** substance formed by combining water ( $\text{H}_2\text{O}$ ) and carbon dioxide ( $\text{CO}_2$ ); chemical formula  $\text{H}_2\text{CO}_3$

**carcinogen:** cancer-causing agent

**career:** a chosen pursuit or life's work; a job or profession one is trained to do

**cartographer:** a person whose work is making maps or charts

**channel:** (1) a body of water joining two larger bodies of water; (2) a channel could also be the physical dimensions of a stream or river

**channeling:** to make a channel or channels in

**channelization:** the straightening and sometimes deepening of stream or river channels to speed water flow and reduce flooding. A waterway so treated is said to be channelized. However, channelization can cause unstable situations and may cause adverse environmental impacts.

**chemical oxidation:** a means of destroying dissolved organic contaminants in water using ultraviolet (UV) radiation, hydrogen peroxide, or other processes

**chemical water pollution:** introduction of chemicals into a waterbody

**chlorination:** the addition of chlorine to water to destroy microorganisms especially for disinfection

**chlorine:** a chemical compound used as disinfectant in wastewater treatment and drinking water treatment processes; symbol  $Cl_2$

**chronic (toxic) effects:** adverse health effects that are either the result of long-term (chronic) use or those that are permanent or long-lasting (e.g., cancer)

**cinquain:** a poem of five lines as follows:

First line	One word, giving title
Second line	Two words, describing title
Third line	Three words, expressing an action
Fourth line	Four words, expressing a feeling
Fifth line	One word, a synonym for the title

**clarifier (settling tank or sedimentation tank):** a vessel in which solids settle out of water by gravity during drinking water or wastewater treatment processes

**Clean Water Act (CWA):** water pollution control law passed to restore and maintain the nation's waters; the nation's primary source of federal legislation that specifies the methods to be used in determining how much treatment is required for discharges (effluents) from publicly owned treatment works (POTWs)

**club soda:** same as soda water; water charged under pressure with carbon dioxide gas

**Cnidaria:** phylum name for a group of invertebrates that includes coral animals, jellies, sea anemones and the hydra

**coagulant:** a substance added to a mixture that will cause precipitates (flocs) to form; also called "flocculant"

**coagulation:** the process by which dirt and other small suspended solid particles are chemically bound, forming flocs using a coagulant (flocculant) so they can be removed from the water (the second step in drinking water treatment)



**cohere:** to be united by molecular cohesion; to stick to the same substance

**cohesion:** the force by which the molecules of a substance are held together

**colloid:** a solid, liquid, or gaseous substance made up of very small, insoluble, nondiffusible particles that remain in suspension in a surrounding solid, liquid, or gaseous medium of different matter

**commensal relationship:** a relationship between two organisms in which one is benefited by the relationship and the other is neither benefited nor harmed

**common law:** the law of a country or state based on custom, usage, and the decisions and opinions of law courts

**community:** assemblage of populations of species living together and interacting with each other within a certain area

**compound:** a substance formed by the bonding of two or more atoms or ions that share electrons (covalent compounds) or transfer electrons (ionic compounds)

**con:** against; in opposition; negative consideration

**concentration:** strength or density, as of a solution, as in amount of solute per volume of solution

**condensation:** (1) the process of changing from a vapor to a liquid; (2) a liquid obtained by the coming together of a gas or vapor

**confined aquifer:** an artesian aquifer

**conservation:** act of using the resources only when needed for the purpose of protecting from waste or loss of resources

**contaminant:** an impurity that causes air, soil, or water to be harmful to human health or the environment; something that makes a substance impure, infected, corrupted, or polluted

**continental shelf:** a shallow, submarine plain of varying width, forming a border to a continent and typically ending in a steep slope to the oceanic abyss

**contour:** (1) imaginary line on the surface of the Earth connecting points of the same elevation; (2) a way of shaping the surface of the land in a particular form, commonly used to prevent erosion and control water flow

**conversion:** a physical transformation from one material state to another

**coral reef:** erosion-resistant marine ridge or mound built slowly over thousands of years by coral polyps (tiny animals) bound together with algal material and biochemically deposited carbonates

**corrosion:** a substance formed or an action of wearing away by chemicals; formed by deterioration

**cost:** price; practical factors to consider

**covalent bond:** bond formed between two atoms when they share pairs of electrons

**crude oil:** unrefined petroleum; a mixture of many different hydrocarbons

**cryptosporidiosis:** acute, highly infectious disease caused by the protozoan *Cryptosporidium parvum* that can be transmitted by contaminated food or water

**current:** a flow of water or air, especially when strong or swift, in a definite direction; specifically, such a flow within a larger body of water or mass of air

**cypress domes:** small, depressional swamps, typically with tall cypress trees at center characterized by subsurface hardpan overlain by organic matter

**dam:** man-made or animal-made barrier across a stream that holds and regulates flow of water

**decomposition:** the process of breaking down into constituent parts or elements

**deltaic estuary:** type of estuary formed by a delta

**delta:** a deposit of sand and soil, usually triangular, formed at the mouth of some rivers

**density:** the ratio of mass of an object to its volume

**deposition:** a laying or putting down (settling out suspended materials in a liquid due to a decrease in velocity of the suspension)

**detritus:** decomposed or disintegrated organic matter (found in water and on land) and associated microbial elements

**diatomic molecule:** molecule made of two atoms

**digested solids:** sewage solids that have been broken down by microorganisms

**digestion:** the process of sewage treatment by the decomposition of organic matter; decomposition of organic waste materials by the action of microbes

**dike:** elevated structure alongside of stream or perpendicular that acts as a barrier to floodwaters

**discharge:** (1) the outflow of groundwater from a flowing artesian well, ditch, or spring; (2) the release or emittance of a substance.

**discharge area:** an area where groundwater flowing toward the surface escapes as a spring, seep baseflow, or by evaporation and transpiration

**disinfection:** the use of chemicals and/or other means to kill potentially harmful microorganisms in water; used in both wastewater and drinking water treatment

**dissolved oxygen (DO):** oxygen gas (O<sub>2</sub>) dissolved in water

**distributary:** a branch of a river that flows away from the main stream

**diversions/channeling:** altering the course of a river or stream causing the stream to change its direction

**dolomite:** a mineral [CaMg(CO<sub>3</sub>)<sub>2</sub>] consisting of a calcium magnesium carbonate found in crystals and in extensive beds as a compact rock

**domestic wastewater:** wastewater that comes primarily from individuals and does not generally include industrial or agricultural wastewater

**dowsing:** to search for a source of water or minerals with a divining rod

**drawdown:** the lowering of the water table as water is removed from an aquifer

**drinking water standard:** maximum contaminant level or treatment technique requirement

**drowned river valley:** type of estuary that is wider than deep and triangular in shape

**eddy:** a current (of water or air) running contrary to the main current

**effluent:** treated wastewater, flowing from a lagoon, tank, treatment process, or treatment plant

**electron:** any of the negatively charged particles that form a part of all atoms; exists outside the nucleus; involved in bond formation

**element:** natural substances that cannot be broken into anything simpler by ordinary chemical means

**elevation head:** the elevation of the point at which the hydrostatic pressure is measured, above or below an arbitrary horizontal datum

**emergent:** rising from a surrounding liquid

**Environmental Protection Agency (EPA):** the U.S. agency responsible for efforts to control air, land, and water pollution, radiation, and pesticide hazards, and to promote ecological research, pollution prevention, and proper solid waste disposal

**epidemic diseases:** diseases that spread rapidly by infection among many individuals in an area

**epilimnion:** one of three temperature or thermal zones located at the top of a thermally stratified lake; varies in size and temperature characteristics based on a seasonal cycle

**epitaph:** a short composition in prose or verse, written as a tribute to a dead person

**equator:** a great circle of the Earth that is everywhere equally distant from the two poles and divides the Earth's surface into the northern and southern hemispheres

**equipotential line:** a line in a two-dimensional groundwater flow field such that the total hydraulic head is the same for all points along the line

**erosion:** the process of detachment, transport, and deposition of soil material

**escarpment:** a long cliff or steep slope separating two comparatively level or more gently sloping surfaces

**estuarine:** formed or deposited in an estuary; of or having the characteristics of an estuary

**estuary:** a marine ecosystem where freshwater enters the ocean. The term usually describes regions near the mouths of rivers, and includes bays, lagoons, sounds, and marshes.

**ethics:** the study of the general nature of values and of the specific moral choices to be made by the individual in relationships with others and his/her environment

**eutrophic:** refers to a body of water characterized by nutrient-rich water supporting abundant growth of algae and/or other aquatic plants at the surface

**eutrophic lake:** a lake containing a high concentration of dissolved nutrients; often shallow, with periods of oxygen deficiency

**eutrophication:** the process in which a body of water becomes oxygen deficient, nutrient-rich and supports an abundant growth of surface aquatic plants and algae; natural aging cycle of lakes, normally taking centuries, but it can be rapidly accelerated when outside sources of nutrients are added, such as wastewater, fertilizer, or feed lot runoff

**evaporate:** to pass off in vapor or in invisible minute particles (to cause evaporation)

**evaporation:** the process of changing from a liquid to a vapor

**facultative anaerobic:** describes an organism that can use another electron accepting molecule other than oxygen for cellular respiration, if oxygen is not present

**fault:** a fracture in the Earth's crust accompanied by displacement of one side of the fracture with respect to the other

**fecal coliform bacteria:** a type of coliform bacteria found in the intestines of humans and warm-blooded animals that aids in the digestion process and is used as an indicator of fecal contamination and/or possible presence of pathogens

**feed lots:** confined areas where livestock is kept

**ferment:** to break down sugars only partially, producing a gas (usually CO<sub>2</sub>) and alcohol

**fertilizer:** natural and synthetic materials including manure, nitrogen, phosphorus and treated with sludge that are worked into the soil to provide nutrients and increase its fertility

**filter strip:** area of land that infiltrates surface runoff and traps sediment and associated pollutants

**filtration:** the process of passing a liquid or gas through a porous article or mass (e.g. paper, membrane, sand) to separate out matter in suspension, used in both wastewater and drinking water treatment

**fjord:** narrow, deep valleys carved by glaciers and flooded by the sea

**fjord-drowned glacial valley:** type of estuary usually found in arctic and polar regions, U-shaped, deeper than wide, that has a small river discharge and a large tidal volume; important to

shipping

**flocculant:** a substance added to a mixture that will cause precipitates (flocs) to form; also called “coagulant”

**flocculation:** physical process of growing of flocs from smaller flocs or particles

**flocs:** lumpy or fluffy masses of particles agglomerated by a flocculant or coagulant

**floodplain:** relatively flat area on either side of a river that may be under water during a flood

**flow line:** the line of flow of groundwater

**flow net:** the set of intersecting equipotential lines and flow lines representing two-dimensional steady flow through porous media

**fluid:** a substance, as a liquid or gas, that is capable of flowing and that changes its shape at a steady rate when acted upon by a force

**fluid pressure:** the mechanical energy per unit mass of a fluid, at any given point in space and time, with respect to an arbitrary state and datum (fluid potential)

**fluoride:** a binary compound of fluorine added to drinking water to help prevent tooth decay

**fluvial:** found in, produced by, or relating to a river

**forested wetland:** wetland dominated by trees. “Trees” (for the purpose of this definition) are defined as woody vegetation with diameter greater than 3 inches at breast height (approximately 4 feet from ground level).

**fossil fuels:** hydrocarbon fuels, such as petroleum, derived from living things of a previous geologic time

**fracture:** a break in rock that may be caused by compressional or tensional forces

**freezing point (FP):** the temperature at which a liquid begins to precipitate crystals

**freshwater marsh:** a wetland frequently or continually inundated by freshwater, characterized by herbaceous vegetation

**gastrointestinal tract:** the hollow tube that runs from the mouth to the anus in animals

**geologic map:** a map of the Earth's surface with surface geologic formations superimposed over existing features such as roads, streams, lakes, and other features

**geological formation:** a body of rock identified by lithic characteristics and stratigraphic position; the fundamental unit in lithostratigraphic classification

**geology:** a science that deals with the structure and history of the Earth and its life, especially as recorded in rocks

**glacier:** a large mass of ice formed on land by compacted snow

**gradient:** change of elevation, velocity, pressure, or other characteristics per unit length; slope

**gram negative:** the result of a certain laboratory test done on microorganisms to divided into two groups (either gram negative or gram positive). Gram negative bacteria have a cell membrane composed of lipopolysaccharide and protein.

**graywater:** wastewater from households which does not come into contact with sewage

**grit chamber:** a chamber or tank used in primary treatment where wastewater slows down and heavy, large solids (grit) settle out and are removed

**groundwater:** water that infiltrates into the Earth and is stored in usable amounts in the soil and rock below the Earth's surface; water within the zone of saturation

**groundwater divide:** a crest of the water table with flow going in opposite directions on either side

**gulf:** a large area of a sea or ocean partially enclosed by land

**gulf stream:** the oceanic current that brings warm Gulf of Mexico water up along the east coast of the U.S. and across the Atlantic to the British Isles

**habitat:** the place or type of site where a plant or animal naturally or normally lives and grows

**haiku:** 3-line poem. First line has 5 syllables, second line has 7 syllables, and third line has 5 syllables

**harbor:** a waterbody where wave action is reduced or dampened

**hard water:** water high in mineral content; water containing an abundance of  $\text{Ca}^{+2}$  and  $\text{Mg}^{+2}$  ions

**hardness:** a measure of all the multivalent (primarily calcium and magnesium) ions expressed as mg/l of calcium carbonate ( $\text{CaCO}_3$ )

**hazardous waste:** waste materials that are dangerous to human health and/or the environment

**headwaters:** the streams that are the sources of a river

**homogeneous:** (1) uniform throughout in structure or make-up (for a substance or material); (2) of the same or similar nature or kind (for a group)

**hot spot:** region where an unusually high number of deaths are due to cancer that might be linked to environmental contamination

**hydraulic head:** the height of the free surface of a body of water above a given subsurface point; the sum of elevation, pressure, and velocity components at a given point in an aquifer

**hydrocarbons:** a very large group of chemical compounds consisting primarily of carbon and hydrogen. The largest source of hydrocarbons is petroleum (crude oil).

**hydrogen sulfide:** gas emitted during organic decomposition by anaerobic bacteria which smells like rotten eggs and can cause illness in heavy concentrations (chemical formula,  $\text{H}_2\text{S}$ )

**hydrologic cycle:** the cyclical process of water's movement from the atmosphere, its inflow and temporary storage on and in land, and its outflow to the oceans; cycle of water from the atmosphere, by condensation and precipitation, then its return to the atmosphere by rain and transpiration.

**hydrology:** the study of water, its properties, distribution on Earth, and effects on the Earth's environment.

**hydroxide precipitation:** using the hydroxide ion ( $\text{OH}^-$ ) to cause a material to come out of solution

**hypolimnion:** one of three temperature or thermal zones located at the bottom of a thermally stratified lake; varies in size and other characteristics based on a seasonal cycle

**hypoxic:** containing very little or decreased oxygen

**igneous rock:** rock that solidified from a hot, liquid state

**impermeable (substance):** a substance through which other substances are unable to pass



**in-situ bioremediation:** a means of degrading hydrocarbon-based contaminants at the site of contamination

**incubation:** the phase of development of a disease between the infection and the first appearance of symptoms

**indicator organism:** an organism whose presence or absence typically indicates or provides information on the certain conditions within its environment

**infiltration:** the flow of water downward from the land surface into and through the upper soil layers

**influent:** wastewater flowing into a treatment plant

**ingestion:** the process of taking into the body, as by swallowing

**injection well:** a well in which fluids, such as wastewater, saltwater, natural gas, or used chemicals, are injected in the ground for the purpose of disposal or to force adjacent fluids like oil into the vicinity of oil-producing wells

**inspect:** to examine in detail, especially for flaws

**interstitial:** of, forming, or occurring in a small or narrow space between things or parts

**intertidal:** of, or pertaining to a shore zone bounded by the levels of low and high tide

**inventory:** a detailed list of items in one's view or possession, especially a periodic survey of goods and materials

**ion:** an atom or molecule that has lost or gained one or more electrons

**ionization constant:** a comparison of the strengths of acids or bases in a given solvent, such as water, expressed by the amount of  $H^+$  ions compared to the  $OH^-$  ions

**isotropic:** having physical properties, such as conductivity and elasticity, the same regardless of the direction of measurement

**kinetic energy:** the energy of a body resulting from its motion

**kinetic movement:** movement of electrons, atoms, and molecules as a result of their energy state

**lactose:** a type of simple sugar that can be digested by fecal coliform bacteria

**lagoon:** a shallow body of water, especially one separated from the sea by sandbars or corals

**lagoons (oxidation ponds or stabilization ponds):** a wastewater treatment method that uses ponds to treat wastewater. Algae grow within the lagoons and utilize sunlight to produce oxygen, which is in turn used by microorganisms in the lagoon to break down organic material in the wastewater. Wastewater solids settle in the lagoon, resulting in effluent that is relatively well treated, although it does contain algae.

**lake:** a standing body of water which undergoes thermal stratification and turnover by mixing

**leachate:** a liquid that results from water collecting contaminants as it trickles through wastes, or soil containing agricultural pesticides or fertilizers

**leaching:** the removal of chemical constituents from rocks and soil by water (Leach = to leak)

**leaking underground storage tank:** underground storage tank which has spilled, leaked, emitted, discharged, leached, disposed, or otherwise allowed an escape of its contents into groundwater, surface water, or subsurface soils

**leeward:** in the direction toward which the wind blows; of the side of anything away from the wind

**lentic system:** surface water that is standing such as a lake or a pond

**levee:** an embankment, natural or artificial, built alongside a river to limit high water events from flooding bordering land

**limestone:** a rock that formed chiefly by accumulation of organic remains; consists mainly of calcium carbonate

**limnetic zone:** a zone in a lake extending over open water from the edge of one littoral zone to the other and above the profundal zone; characterized by floating vegetation and moderate to high sunlight penetration

**limnology:** the science that deals with the physical, chemical, and biological properties and features of fresh waters, especially lakes and ponds

**liquid:** fluid composed of molecules that move freely among themselves but do not tend to separate like those of gases; state of matter that has a definite volume but not a definite shape

**lithic:** of stone

**lithostratigraphy:** the arrangement of rocks in layers or strata; the branch of geology dealing with the study of the nature, distribution, and relations of the stratified rocks of the Earth's crust

**littoral drift:** movement of materials along the shore

**littoral zone:** a zone along the shore of a lake that is characterized by very shallow water, rooted vegetation, high sunlight penetration

**log landing:** site where logs are sorted and loaded onto trucks for hauling

**longshore current:** a flow of water that runs along the shoreline that is usually strong or swift

**loop current:** oceanic current that enters the Gulf of Mexico through the Yucatan Channel and/or exits through the Straits of Florida (Parent of the Gulf Stream)

**lotic system:** surface water that is flowing such as a river or stream

**man-made:** made by humans; artificial or synthetic

**management:** to effect a plan of action; to solve a problem by direction, guidance, administration, or control

**mangrove swamps:** tropical, wet, coastal areas dominated by mangroves (trees). Mangroves have extensive root systems which form a dense thicket, providing cover for aquatic life.

**MARPOL Treaty:** international treaty that regulates the disposal of solid waste, including plastics

**marsh:** wetland dominated by grasses

**maximum contaminant level (MCL):** maximum permissible level of a contaminant in water is delivered to any user of a public water system; drinking water standard

**mechanical treatment plant:** uses blowers and surface aerators to transfer oxygen into the water

**metallurgy:** the science of separating metals from their ores and preparing them for use by smelting, refining

**metamorphic rock:** rock made by heating and pressurizing preexisting rocks

**metaphor:** a figure of speech containing an implied comparison in which a word or phrase ordinarily and primarily used for one thing is applied to another

**Method Detection Limit (MDL):** the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero

**microalgae:** plant-like microorganisms that use chlorophyll for photosynthesis

**microbe:** microorganism (microbiological organism)

**microbiological:** referring to microscopic or ultramicroscopic organisms such as algae, bacteria, or protozoa

**microbiology:** study of microorganisms, a large and diverse group of organisms that exists as single cells or cell clusters

**microorganisms:** microscopic or ultramicroscopic organisms (e.g., bacteria, protozoa, viruses)

**mineral waters:** sparkling (carbonated) waters generally used as an alternative to soft drinks or cocktails

**model:** using simple or familiar objects to explain or demonstrate a new, unfamiliar, or complicated concept

**molecule:** the smallest particle of a compound that can exist in the free state and still retain the characteristics of the compound

**mud flats:** large estuarine expanses composed of rich muds exposed at low tides

**multimedia filters:** filters that contain more than one type of filtering material

**multivalent (ion):** ion that has lost or gained more than one electron (also called “polyvalent ion”)

**municipal:** of or relating to municipality (city, town, etc.). Municipal wastewater is primarily used as wastewater

**natural:** produced or existing in nature; not artificial or manufactured

**natural water:** water that comes from springs or streams and does not have any chemicals added to it

**negotiations:** a conferring, discussing, or bargaining to reach an agreement

**NIMBY: NOT IN MY BACK YARD**

**nitrates:** compounds containing nitrogen as nitrates ( $\text{NO}_3^-$ ). In the environment, these compounds are found in animal wastes, fertilizers, and in septic tanks and untreated municipal sewage. Their primary public health hazard is the cause of methemoglobinemia or “blue baby” syndrome.

**non-degradable:** not capable of chemical or biological decomposition

**nonendospore-forming:** does not form an encapsulated nucleus resistant to most harsh environmental conditions

**nonpoint source:** general or collective source of contamination

**nonpoint source pollution (NPS):** pollution that cannot be traced to a single point (e.g., outlet or pipe) because it comes from many individual sources or a widespread area (typically, urban, rural, and agricultural runoff)

**nonpolar molecule:** covalent molecule that does not exhibit any partial (+) or (-) charges or fields

**nonrenewable resource:** a resource in a fixed amount; all minerals, coal, crude oil, and natural gas

**NPDES (National Pollutant Discharge Elimination System):** a program created by the Clean Water Act to ensure that water quality is maintained by dischargers of wastewater. NPDES permits require the operator of wastewater treatment plants to test and report the quality of the effluent discharged to streams. The NPDES permit specifies pollutant limitations on the effluent that prevent damage to receiving waters.

**nutrients:** compounds, minerals, or elements needed by living organisms to carry on their functions. Nitrogen, phosphorus, potassium, and other elements are examples of nutrients required for plant growth.

**ocean:** the entire body of salt water that covers about 71 percent of the Earth’s surface

**oceanography:** a science that deals with the oceans and includes the delineation of their extent and depth, the physics and chemistry of their waters, marine biology, and the exploration of their natural resources

**oligotrophic:** refers to any ecosystem that has nutrient-poor water

**optimum pH:** the pH condition that will produce the best results for a given purpose

**organic:** of, pertaining to, or derived from living organisms

**organic molecule:** any molecule that contains carbon and hydrogen

**osmotic pressure:** the force per unit area exerted by a solvent passing through a semipermeable membrane in osmosis, equal to the pressure that must be applied to the solution in order to prevent passage of the solvent into it

**outcrop:** the exposure of bedrock or strata projecting through the overlying cover of detritus and soil

**overturning (turnover):** process by which water and nutrients are circulated in a lake due to thermal processes which can occur on a seasonal basis

**parts per million (ppm):** a measurement of concentration of 1 unit of material dispersed in 1 million units of another (for water, same as mg/l)

**pathogenic:** producing disease

**pathogens:** disease-causing agents, especially disease-producing microorganisms

**perception:** one's belief, comprehension, or knowledge; may not be based on facts

**percolate:** to drain or seep through a porous and permeable substance; to filter such as a liquid passing through a porous body (water through soil to the aquifer)

**percolation:** the downward movement through the subsurface soil layers to groundwater

**percometer:** an instrument to measure the rate of percolation

**permeability:** the capacity of a porous material to transmit fluids. Permeability is a function of the sizes, shapes, and degree of connection among pore spaces, the viscosity of the fluid, and the pressure driving the fluid.

**pH:** a measure of the concentration of hydrogen ions ( $H^+$ ) in a solution; the pH scale ranges from 0 - 14, where 7 is neutral, values less than 7 are acidic, and values greater than 7 are basic or alkaline. It is measured by an inverted logarithmic scale so every unit decrease in pH means a 10-fold increase in hydrogen ion concentration. Thus, a pH of 3 is 10 times as acidic as a pH of 4 and 100 times as acidic as a pH of 5.

**phosphate:** an ion composed of a phosphorus atom with 4 oxygen atoms attached ( $\text{PO}_4^{-3}$ ) It is an important plant nutrient.

**phosphorus:** an element considered the key nutrient in controlling eutrophication in lakes and ponds

**phylum:** the principal division of kingdoms. The classification system is the characterization of an organism by its Kingdom, Phylum, Class, Order, Family, Genus, and Species.

**phytoplankton:** any of the many species of plants (such as algae) that consist of single cells or small groups of cells that live and grow freely suspended in the water near the surface

**picrocuries per liter (pCi/L):** units for measurement of radioactive element concentration and in air

**plane of turbulence:** the flat, level, or even surface in which there is violent, irregular motion or swirling agitation of water

**plankton:** microscopic plants and animals in water which are influenced in mobility by the movement of water (i.e., as opposed to nekton (fish) which can swim)

**plume:** an area where a contaminant has spread out

**point source:** known source of contamination

**point source pollution:** pollution that can be traced to a single point source such as a pipe or culvert (e.g., industrial, wastewater treatment plant, and certain storm water discharges)

**polar molecule:** covalent molecule that has a partial (+) and partial (-) end

**pollutant (water):** any substance suspended or dissolved in water that builds up in sufficient quantity to impair water quality

**pollution:** an unwanted change in air, water, or soil (usually through the introduction of pollutants or contaminants) that can affect the health and survival of humans and other organisms

**pollution prevention:** preventing the creation of pollutants or reducing the amount created at the source of generation, as well as protecting natural resources through conservation or increased efficiency in the use of energy, water, or other materials

**pond:** a still body of water smaller than a lake where mixing of nutrients and water occurs primarily through the action of wind (as opposed to turnover)

**population:** group of organisms of a single species living in a certain area and interbreeding (or interacting)

**pore:** a passage; channel; a tiny opening, usually microscopic

**pore space:** the volume of the open spaces in rock or soil

**porosity:** a description of the total volume of rock or soil not occupied by solid matter

**potable water:** water suitable for drinking without harmful effects

**potentiometric surface:** a surface that represents the level where water will rise in a tightly cased well. The water table is the potentiometric surface for an unconfined aquifer.

**prairie potholes:** shallow marsh-like ponds which serve as primary breeding grounds for ducks and migratory birds found in North Dakota, South Dakota, Minnesota, and Canada

**precipitation:** water droplets or ice particles condensed from atmospheric water vapor and sufficiently massive to fall to the Earth's surface, such as rain or snow

**precision:** the agreement among the numerical values of a set of measurements of the same quality made in the same way

**pressure head:** the height of a column of liquid supported, or capable of being supported by pressure  $p$  at a point in the liquid

**pressurize:** to put (gas or liquid) under a greater than normal pressure

**primary productivity (producers):** in an ecosystem, those organisms, mostly green plants that use light energy to construct their organic constituents from inorganic compounds

**primary treatment:** the first stage of wastewater treatment that removes settleable or floating solids only; generally removes 40% of the suspended solids and 30-40% of the BOD in the wastewater

**Prior Appropriations Water Rights:** doctrine of western states that says that "one who is first in time is first in right," or whoever occupies a location first receives the water that he/she wants or needs

**privy:** an outhouse; a latrine



**pro:** for; in support of; affirmative consideration

**profundal zone:** a zone in a lake extending from the bottom of the limnetic zone to the bottom of the lake; characterized by deep waters, decomposing vegetation, and little to no sunlight penetration

**protozoa:** mostly microscopic animals made up of a single cell or a group of more or less identical cells. Protozoa live chiefly in water, but many are parasitic.

**radionuclides:** types of atoms which spontaneously undergo radioactive decay; usually naturally occurring, and can contaminate water or indoor air (e.g., radon)

**radon:** colorless, odorless, tasteless, naturally occurring radioactive gas formed from natural deposits of uranium that can cause lung cancer. It can enter the home around plumbing pipes and/or through cracks and openings in the foundation. It can also be brought in with the home's water supply.

**radon decay products:** the radioactive elements that immediately follow radon-222 in the decay chain. They are ultrafine solids that tend to adhere to other solids, such as dust particles in the air, or lung tissue if inhaled.

**raw/untreated solids:** settleable solids, grit, and other solid material removed by the primary clarifier (not treated by microorganisms)

**recharge:** (1) to replenish a waterbody or an aquifer with water; (2) the replacement of any water that may have flowed out or been pumped out of the aquifer

**recharge area:** an area where infiltration moves downward into an aquifer

**reclamation:** bringing land that has been disturbed by some process back to its original condition

**record:** an account, as of information, set down in writing as a way of preserving data collected on a specific subject

**red tide:** a reddish discoloration of coastal surface waters due to concentrations of certain toxin-producing dinoflagellates. Can cause pulmonary irritations in man and can cause death of marine mammals.

**reef:** a strip or ridge of rocks, sand, or coral that rises to or is near the surface of a body of water

**reforestation:** restocking of a forest stand through natural regeneration or artificially planted or by seedlings

**refractory wastewater:** wastewater containing an organic or nutrient content that will not oxidize in normal treatment processes

**regeneration:** the process of being renewed or reconstituted

**renewable resource:** a resource that can be used, then grown or replenished in some manner from year to year; plants and some animals

**residual:** the quantity left over at the end of a process; remainder

**residue:** something that remains after a part is taken away

**resource:** natural assets: air, water, soil, oil, gas, coal, trees, minerals, land, wildlife, people; the materials needed for the satisfaction of wants and needs

**respiration:** the sum total of the process of oxygen being conveyed to the cells and tissue of living organisms and the process by which the products of this oxidation process, CO<sub>2</sub> and H<sub>2</sub>O, are given off

**riffle:** fast moving area in a stream. Usually the surface is broken by small waves or rocks.; the slope of a stream bed is steeper in riffles than it is in open pools, where the water surface tends to be smoother.

**riparian:** of, adjacent to, or living on the bank of a river, stream, or sometimes, of a lake or pond

**riparian communities:** living organisms adjacent to or living on the bank of a river, lake or pond

**riparian rights:** water rights enjoyed by owners of land adjacent to a body of water

**risk:** exposure to danger; negative factors to consider

**river:** a large body of flowing water that receives water from other streams and/or rivers

**river mouth:** where the river empties into a larger body of water

**river source:** where the river begins

**road cut:** a hill, ridge, or mountain side excavated for a road right-of-way. Road cuts leave exposed strata, rock, and soil that can be viewed in their natural state if not covered or vegetated.

**rod-shaped bacteria:** a physical form of bacteria. These are longer than they are wide; cylindrical.

**runoff:** water (originating as precipitation) that flows across surfaces rather than soaking in ; eventually enters a waterbody; may pick up and carry a variety of pollutants

**Safe Drinking Water Act:** a law passed by the U.S. Congress in 1974 and amended in 1986 and 1996 to help ensure safe drinking water in the United States. The Act requires that regulations be enacted to set maximum contaminant levels (MCLs) or treatment technique requirements for a variety of chemicals, metals, and pathogens in public water supplies; also requires protection of surface source waters and underground sources of drinking water.

**salinity:** the amount of salt dissolved in water

**salt marsh:** estuarine habitat submerged at high tide, but protected from direct wave action, and overgrown by salt-tolerant herbaceous vegetation; aquatic grasslands (coastal “prairies”) affected by changing tides, temperatures, and salinity

**sand bar:** a ridge or narrow shoal of sand formed in a river or along a shore by the action of currents, tides, and waves

**sand dune:** a pile of sand on the shore that is created by wind or water movement of the sand. Most are affected by wind and water.

**saturated zone:** a portion of the soil profile where all pores are filled with water. Aquifers are located in this zone. There may be multiple saturation zones at different soil depths separated by layers of clay or rock.

**saturation:** being filled to capacity; having absorbed all that can be taken up

**seasonal:** happening based on the yearly seasons of spring, summer, fall, and winter

**Secchi disc:** a black and white circular plate that is used to determine water clarity

**secondary containment for above-ground fuel storage tanks:** spill containment facility that will sufficiently contain 110 percent of the capacity of the largest tank located within the area of management

**secondary treatment:** a type of wastewater treatment used to convert dissolved and suspended

pollutants into a form that can be removed, producing a relatively highly treated effluent.

Secondary treatment normally utilizes biological treatment processes (activated sludge, trickling filters, etc.) followed by settling tanks and will remove approximately 85% of the BOD and TSS in wastewater. Secondary treatment for municipal wastewater is the minimum level of treatment required by the Clean Water Act.

**sediment:** eroded soil material, containing primarily inorganic constituents

**sedimentary rock:** a rock that consists chiefly either of small pieces of rock cemented together (sandstone) or of crystals that grew from water (rock salt, limestone)

**sedimentation:** (1) the process of depositing sediment, or the addition of soils to lakes that is part of the natural aging process; (2) the drinking water treatment process of letting heavy particles in raw water settle out into holding ponds or basins before filtration (also called “settling”); (3) the process used in both primary and secondary wastewater treatment that takes place when gravity pulls particles to the bottom of a tank (also called “settling”)

**seltzer water:** natural mineral water that is effervescent

**septic system:** on-site equipment or system to treat wastewater, consisting of a septic tank and an absorption field

**septic tank:** a tank, commonly buried, to which all of the wastewaters from the home should flow and in which, primary digestion of the organic matter occurs by anaerobic bacteria; the main part of a septic system where scum and solids accumulate; derived from “sepsis”-- meaning “putrid decay” or “decay without oxygen”

**settling tank (sedimentation tank or clarifier):** a vessel in which solids settle out of water by gravity during wastewater or drinking water treatment process.

**settling pond:** usually a human-made pond that is designed to remove many of the particulates from runoff water

**sewage:** waste and wastewater produced by residential, commercial, and light industrial establishment; typically discharged into sewers and sometimes, into septic tanks

**sewage contamination:** the introduction of untreated or improperly treated sewage into a water body

**silviculture:** care and cultivation of forest trees; forestry

**simile:** a figure of speech in which one thing is likened to another dissimilar thing by the use of

words such as *like* or *as*

**sinkhole:** a hole caused by collapse of the land surface, commonly because underlying limestone rock has dissolved away

**site preparation:** the use of machines, herbicides, fire, or combinations thereof to dispose of (unmerchantable debris), improve planting conditions, and provide initial control of competing vegetation

**skid:** to drag logs with specialized equipment to a landing

**slope:** degree of deviation of a surface from the horizontal, measured in degrees

**sludge:** any solid, semisolid, or liquid waste that settles to the bottom of sedimentation tanks (in wastewater treatment plants or drinking water treatment plants) or septic tanks

**soda water:** water charged under pressure with carbon dioxide gas

**soft water:** water that is low in mineral content because it has flowed through soils and rocks containing minerals that react poorly. Soaps are very “sudsy” in soft waters.

**soil venting:** vacuum extraction or soil vapor extraction; a means of reducing concentrations of volatile chemicals in petroleum products absorbed into soils in the unsaturated zone. A vacuum is applied to the soil to create a negative pressure gradient that causes movement of vapors toward extraction wells. The volatile chemicals are then removed through the wells, treated, and discharged into the atmosphere or reinjected to the subsurface.

**solubility:** ability or tendency of one substance to blend uniformly with another

**solution:** a homogenous mixture of two substances, usually a gas or solid in a liquid

**solution mining:** a type of mining wherein water is injected into a well to remove a desired mineral

**solvent:** a substance that dissolves another to form a solution

**sound:** long, broad inlet of the ocean larger than a strait or channel, connecting larger bodies of water

**Source Water Protection:** process that involves delineating areas contributing water to a water well or surface water intake; identifying potential contaminant sources that may threaten the water supply; and using management strategies to protect the source water from contamination.

Source water protection is applied to both surface water and groundwater supply sources.

**sparkling water:** carbonated drinking water

**specific heat:** the number of calories needed to raise the temperature of one gram of a given substance 1°C, relative to the number of calories (one calorie) needed to raise the temperature of 1 gram of water 1°C

**spring:** a surface flow of water originating from subsurface sources (groundwater); often a source of a stream or pond

**stagnation:** inactivity or without change

**standard deviation:** a statistical value that is equal to the square root of the arithmetic average of the squares of the deviations from the mean in a frequency distribution

**strait:** a narrow passage of water that connects two larger bodies of water

**stream gauging:** the measurement of velocity of streams (stream velocity)

**stream velocity:** the volume of water in a stream flowing past a certain point per unit time typically measured in cubic per second (cfs)

**streamside management zone (SMZ):** area left along streams to protect streams from sediment and other pollutants, protect streambeds, and provide shade and woody debris for aquatic organisms

**succession (lake):** gradual, orderly process of changes in a lake ecosystem brought about by changes in species types and populations; occurs over long periods of (geologic) time and ultimately results in the lake reverting back to land (a terrestrial ecosystem)

**suction:** a force causing a fluid or solid to be drawn into interior space or to adhere to a surface due to the difference between external and internal pressures

**sulfuric acid:** (chemical formula,  $H_2SO_4$ ) the most widely used industrial chemical; a major part of acid rain that is formed by sulfur oxides combining with atmospheric moisture

**supertanker:** a very large ship used to carry crude oil

**surface tension:** a property of liquids in which the exposed surface tends to contract to the smallest possible area, as in the formation of a meniscus. It is caused by unequal molecular cohesive forces near the surface.

**surface water:** precipitation that does not soak into the ground or return to the atmosphere by evaporation or transpiration. It is stored in streams, lakes, rivers, ponds, wetlands, oceans, and reservoirs.

**suspended solids:** small particles of solid materials in water that cause cloudiness or turbidity

**suspension:** a mixture whose particles are temporarily dispersed through a fluid but not dissolved in it

**swamp:** wetland dominated by shrubs and trees

**synergistic:** more than one agent working together to produce enhanced combined effects (i.e., a greater total effect than the sum of the individual effects)

**tectonic estuary:** type of estuary formed when the Earth's crust shifts suddenly as in an earthquake, volcanic eruption, or a tsunami; has no definite shape

**temperature zones:** regions characterized by different temperature characteristics

**tertiary treatment:** any level of treatment beyond secondary treatment, which could include filtration nutrient removal (removal of nitrogen and phosphorus), and removal of toxic chemicals or metals; also called "advanced treatment" when nutrient removal is included

**thermocline:** one of the three temperature or thermal zones located between the upper and lower thermally stratified zones of a lake; also called the metalimnion. The thermocline is a thin boundary layer between two layers of distinctly different temperatures. The thermocline is a place characterized by dramatic vertical temperature change.

**thixotropy:** the property of certain gels and emulsions to become fluid when agitated and then settle again when left at rest

**tidal creeks:** meandering, creek-like channels within salt marshes and mud flats, through which seawater enters and leaves as the tide rises and falls

**tidal flats:** flat-topped banks of sand and silt that comprise the most elevated portion of the salt marsh

**tide:** the alternate rise and fall of the surface of oceans, seas, and the bays, rivers, etc. connected with them, caused by the attraction of the moon and sun. The tide occurs once or twice in each period of 24 hours and 50 minutes.

**time-of-travel:** the time required for groundwater to move from a specific point beneath the surface to a well

**tolerance:** the natural or developed ability to endure or resist the harmful effects of a substance

**toluene:** a colorless, liquid, flammable, poisonous hydrocarbon,  $C_7H_8$ , obtained originally from balsam of Tolu but now generally from coal tar or petroleum; used in making dyes, explosives, and as a solvent; structurally consisting of a methyl radical attached to a benzene ring

**topographical map:** a contour map designed to show elevation; commonly referred to a "topo" map; scale 7.5" or 1:24,000

**total suspended solids (TSS):** a laboratory measurement of the quantity of solids present in water that is one of the main indicators of the quantity of pollutants present; amount of solid in suspension in water or wastewater

**toxic chemical:** a chemical with the potential of causing death or damage to humans, animals, plants, protists; poison

**toxic:** harmful to living organisms

**transpiration:** process in which water absorbed by the root systems of plants moves up through the plants, passes through pores (stomata) in their leaves or other parts, and then evaporates into the atmosphere as water vapor; the passage of water vapor from a living body through a membrane or pores

**treatment technique:** drinking water treatment requirement in lieu of a maximum contaminant level (MCL); typically used when establishing an MCL is too difficult or when compliance with an MCL would be too costly; drinking water standard.

**tributary:** a stream that flows into a larger stream, river, or another waterbody

**trickling filter process:** a biological treatment process that uses coarse media (usually rock or plastic) contained in tank that serves as a surface on which microbiological growth occurs. Wastewater trickles over the media and the microorganisms remove the pollutants (BOD and TSS). Trickling filters are followed by settling tanks to remove microorganisms that wash off or pass through the trickling filter media.



**TSS (Total Suspended Solids):** a laboratory measurement of the quantity of wastewater that is one of the main indicators of the quantity of pollutants present

**tsunami:** a huge sea wave caused by a submarine disturbance such as an earthquake or volcanic eruption

**turbidity:** the cloudy or muddy appearance of a naturally clear liquid caused by the suspension of particulate matter

**Tyndall effect:** the scattering and polarization of a light beam caused when light is reflected from colloidal particles in a system

**typhoid fever:** acute, highly infectious disease caused by *Salmonella typhosa* bacteria that can be transmitted by contaminated food or water

**uncertainty:** lack of certainty; doubt

**unconfined aquifer:** an aquifer containing unpressurized groundwater, having an impermeable layer below but not above it

**underground injection well:** a type of well used for wastewater disposal, aquifer recharge and solution mining of minerals

**underground storage tank (UST):** any tank, including underground piping connected to the tank, that has at least 10 % of its volume underground and contains petroleum products or hazardous substances (except heating oil tanks and some motor fuel tanks used for farming or residential purposes)

**universal solvent:** water; a material that can dissolve almost any other substance

**unsaturated zone:** a portion of the soil profile that contains both water and air; the zone between the land surface and the water table. The soil formations do not yield usable amounts of free-flowing water. It is also called zone of aeration and vadose zone

**USGS:** United States Geological Survey

**vadose zone:** the zone of aeration between the Earth's surface and the water table; area of the soil that contains both air and water; same as unsaturated zone--zones between land surface and the water table

**valence:** a number representing the capacity of an atom or radical to combine with other atoms or radicals, as measured by the number of hydrogen or chlorine atoms which one radical or one atom of an element will combine with or replace (oxygen has a valence of two: one atom of oxygen combines with two hydrogen atoms to form the water molecule H<sub>2</sub>O); the electric charge of an element or radical resulting from a change in oxidation state (that is, in the transfer or sharing of electrons)

**vapor:** a substance in gaseous form

**variable wastewater:** wastewater that comes from different sources (regular sewage, stormwater, or industrial wastewater)

**variance or random error:** degree of change or difference; divergence; discrepancy

**velocity (linear):** distance per unit time

**virus:** any of a group of ultramicroscopic or submicroscopic infectious agents that cause various diseases in animals, such as measles and mumps, or in plants, such as mosaic disease. Viruses are capable of multiplying only in connection with living cells.

**viscosity:** the state or quality of having a cohesive and sticky fluid consistency; a measure of resistance to flow upon applying a force

**wants and needs:** those things people desire for sustenance and quality of life

**wastewater:** water that has been used for domestic or industrial purposes

**water analysis:** series of tests to determine various chemical or physical characteristics of a sample of water

**water bar:** a long mound of dirt constructed across the slope to prevent soil erosion and water pollution by diverting drainage from a road or skid trail into a filter strip

**waterborne diseases:** diseases spread by contaminated water

**waterfall:** a cascade of water, as over a dam

**waterlogging:** condition that occurs when the water table rises too near the surface causing plants to die as a result of water filling air spaces in the soil

**water quality:** the condition of water with respect to its content of contaminants, natural or anthropogenic

**water quality criteria:** levels of water quality needed to support a designated use for a body of water, usually expressed as concentration values for specific chemicals

**water rights:** rights, sometimes limited, to use water from a stream, canal, etc., for general or specific purposes, such as irrigation

**watershed:** land area from which water drains to a particular surface waterbody

**waters of the state:** includes every natural or artificial watercourse, stream, river, wetland, pond, lake, coastal, ground or surface water wholly or partially in the state that is not entirely confined and retained on the property of a single landowner

**water table:** upper surface of the zone of saturation of groundwater

**water-table aquifer:** an unconfined aquifer

**water treatment:** a method of cleaning water for a specific purpose such as drinking

**water vapor:** water in a gaseous (vapor) form and diffused as in the atmosphere

**wave:** a ridge or swell moving along the surface of a fluid or body of water as a result of disturbance, as by wind

**well:** a bored, drilled, or driven shaft or dug hole. Wells range from a few feet to more than 6 miles in depth, but most water wells are between 100 and 2,000 feet in depth.

**wellhead:** the physical structure or device at the land surface from or through which groundwater flows or is pumped

**Wellhead Protection Area:** the surface and subsurface area surrounding a public water supply well through which contaminants are reasonably likely to move toward and reach such well

**Wellhead Protection Program (WHPP):** a groundwater-based source water protection program

**wetland:** areas that periodically have waterlogged soils or are covered with a shallow layer of resulting in reduced soil conditions. Wetland areas typically support plant life adapted to life wet environments.

**zone of influence:** area surrounding a pumping well within which the potentiometric surface has been changed due to groundwater withdrawal

**zone of saturation:** that region below the surface in which all voids are filled with liquid

**zoning:** to divide into areas determined by specific restrictions; any section or district in a city restricted by law for a particular use

