

A

Absorption: a) The penetration of one substance into the inner structure of another. b) The reduction of light intensity in transmission through an absorbing substance or in reflection from a surface.

ACA: Ammoniacal copper arsenate

Accuracy: A measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; the EPA recommends using the terms “precision” and “bias,” rather than “accuracy,” to convey the information usually associated with accuracy.

Acid: In water, ionization or splitting of the molecule occurs, so that some or most of the hydrogen forms H_3O^+ ions (hydronium ions), usually written more simply as H^+ (hydrogen ion). The pH range of acids is from 6.9 to 1.

Acid, strong/weak: Acids are referred to as strong or weak according to the concentration of H^+ ion that results from ionization. Hydrochloric, nitric, and sulfuric are strong or highly ionized acids; acetic acid (CH_3COOH) and carbonic acid (H_2CO_3) are weak acids.

Acid rain: Precipitation which has been rendered (made) acidic by airborne pollutants.

Action level: In Superfund, the existence of a contaminant concentration in the environment high enough to warrant action or trigger a response under SARA and the National Oil and Hazardous Substances Contingency Plan.

ACZA: Ammoniacal copper zinc-arsenate

Addition reaction: A reaction in which chemicals are combined to form a new compound.

Adhesive force: Molecular force that exists in the area of contact between unlike bodies and that act to unite them.

Adsorption: The retention of atoms, ions, or molecules onto the surface of another substance.

Advecton: The process of transfer of fluids (vapors or liquid) through a geologic formation in response to a pressure gradient that may be caused by changes in barometric pressure, water table levels, wind fluctuations, or infiltration.

Aerobic: A condition in which “free” (atmospheric) or dissolved oxygen is present in water.

Aerosol: A suspension of liquid or solid particles in a gas.

Aggregate: A collective term denoting any mixture of such particulates as sand, gravel, crushed stone, or cinders.

Alcohol: Compound in which a hydroxyl group $-OH$, is attached to a saturated carbon atom.

Aldehyde: A broad class of organic compounds having the generic formula $RCHO$, and characterized by an unsaturated carbonyl group ($C=O$).

Aliphatic: One of the major groups of organic compounds, characterized by straight- or branched-chain arrangement of the constituent carbon atoms.

Alkalinity: The capacity of bases to neutralize acids.

Alkanes: A class of aliphatic hydrocarbons characterized by a straight or branched chain; generic formula C_nH_{2n+2} .

Alkenes: The group of unsaturated hydrocarbons having the general formula $C(n)H(2n)$ and characterized by being highly chemically reactive.

Alkynes: The group of unsaturated hydrocarbons with a triple Carbon-Carbon bond having a general formula $C(n)H(2n-2)$.

American Society for Testing and Materials (ASTM): This society, organized in 1898 and chartered in 1902, is a scientific and technical organization formed for “the development of standards on characteristics and performance of materials, products, systems and services, and the promotion of related knowledge.” It is the worlds largest source of voluntary consensus standards.

Amide: Derivatives of oxoacids $R(C=O)(OH)$ in which the hydroxy group has been replaced by an amino or substituted amino group.

Amine: Compound formally derived from ammonia by replacing one, two, or three hydrogen atoms by hydrocarbyl groups, and having the general structures RNH_2 (primary amines), R_2NH (secondary amines), R_3N (tertiary amines).

Ammonium: The univalent radical, NH_4^+ , or group NH_4 , which plays the part of a metal in the salt formed when ammonia reacts with an acid.

Ammonoid: Any cephalopod mollusk of the extinct order Ammonoidea, from the Devonian to the Cretaceous periods, having a coiled, chambered shell.

AMU: Atomic mass unit

Anaerobic: A condition in which “free” (atmospheric) or dissolved oxygen is NOT present in water.

Analyte: The chemical for which a sample is analyzed.

Anion: A negatively charged atomic or molecular particle.

Anisotropic: In hydrology, the conditions under which one or more hydraulic properties of an aquifer vary from a reference point.

Anisotropy: The condition of having different properties in different directions.

Glossary

Annulene: Refers to monocyclic compounds having alternating single and double bonds.

Anode: The positive pole or electrode of an electrolytic system, such as a battery. The anode attracts negatively charged particles or ions (anions).

Anoxic: Total deprivation of oxygen.

Anthropogenic: Caused or produced by humans.

Anthropogenic Background Levels: Concentrations of chemicals that are present in the environment due to human-made, non-site sources (e.g., industry, automobiles).

Aqueous: Something made up of, similar to, or containing water.

Aqueous solubility: The maximum concentration of a chemical that will dissolve in pure water at a reference temperature.

Aquifer: A geologic formation capable of transmitting significant quantities of groundwater under normal hydraulic gradients.

Aquitard: Underground geological formation that is slightly permeable and yields inappreciable amounts of water when compared to an aquifer.

Aromatic (compound): A major group of unsaturated cyclic hydrocarbons containing one or more rings, typified by benzene, which has a 6-carbon ring containing three double bonds.

Artesian: Water held under pressure in porous rock or soil confined by impermeable geologic formations. An artesian well is free flowing.

ASTM: The American Society for Testing and Materials.

Askarel: Any of the class of synthetic nonflammable, liquid dielectrics used chiefly for insulation in transformers.

Atm.: Atmosphere; usually referring to atmospheric pressure.

Atmospheric pressure: The pressure exerted by the air at sea level (14.696 psi), which will support a column of mercury 760 mm HG in height (approximately 30 in.).

Atom: The smallest unit of a chemical element; composed of protons, neutrons and electrons.

Atomic mass: The mass of a nuclide, normally expressed in unified atomic mass units (u).

Atomic mass units (AMU): A unit of mass, equal to 1/12 the mass of the carbon-12 atom and used to express the mass of atomic and subatomic particles.

Atomic number (Z): The number of protons (positively charged mass units) in the nucleus of an atom, upon which its structure and properties depend. This number represents the location of an element in the periodic table.

Atomic weight: The average weight or mass of all the isotopes of an element as determined from the proportions in which they are present in a given element, compared with the mass of the 12 isotope of carbon (taken as precisely 12.000), which is the official standard.

ATSDR: Agency for Toxic Substances and Disease Registry

Avogadro's Number (Avogadro's Constant): The number of atoms (6.023×10^{23}) present in 12 grams of carbon-12 isotope (one mole of carbon-12) and can be applied to any type of chemical entity.

B

Background: *See background level.*

Background level: The concentration of a substance in an environmental media (air, water or soil) that occurs naturally or is not the result of human activities.

Background sample: A sample taken from a location where chemicals present in the ambient medium are assumed due to natural source.

B(a)P: Benzo(a)Pyrene

Base: Historically, a substance that yields an OH⁻ ion when it dissociates in solution, resulting in a pH >7. The more general definition, due to G.N.Lewis, classifies any chemical species capable of donating an electron pair as a base.

Base, strong/weak: A base is strong or weak according to the molecules which break down (ionize) into positive ion and hydroxyl ion in the solution. Common strong bases (alkalies) are sodium and potassium hydroxide and ammonium hydroxide.

Bed: A bed (or beds) is the smallest formal lithostratigraphic unit of sedimentary rocks.

Bedding plane: A planar or nearly planar bedding surface that visibly separates each successive layer of stratified rock (or the same or different lithology) from the preceding or following layer.

Bedding plane parting: A parting or surface of separation between adjacent beds or a bedding plane.

Bedrock: A general term for the rock that underlies unconsolidated material.

Belemnite: A fossil pointed like a dart, being the internal shell of a cephalopod mollusc.

Benzyl: The univalent group C₇H₇⁻, derived from toluene.

Bias: The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).

Bicarbonate: A salt containing a metal and the radical HCO₃⁻; also refers to the radical alone.

Bioconcentration: The accumulation of a chemical in tissues of an organism (such as a fish) to levels greater than in the surrounding medium in which the organism lives.

Blank: A clean sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage, or analysis.

Block: Any large, angular mass of solid rock.

Boiling point: The temperature at which a component's vapor pressure equals atmospheric pressure.

Bond, chemical: An attractive force between atoms strong enough to permit the combined aggregate to function as a unit. *Covalent bonding* results most commonly when electrons are shared by two atomic nuclei. Here the bonding electrons are relatively localized in the region of the two nuclei, although frequently a degree of delocalization occurs when the shared electrons have a choice of orbital. The conventional single covalent bond involves the sharing of two electrons. There may also be double bonds with four shared electrons, triple bonds with six shared electrons, and bonds of intermediate multiplicity.

Covalent bonds may range from nonpolar, involving electrons evenly shared by the two atoms, to extremely polar, where the bonding electrons are very unevenly shared. The limit of uneven sharing occurs when the bonding electron(s) spends full time with one of the atoms. This makes this atom into a negative ion and leaves the other atom in the form of a positive ion. Ionic bonding is the electrostatic attraction between oppositely charged ions.

BTEX: Abbreviation for benzene, toluene, ethylbenzene, and xylenes.

Btu: British Thermal Unit; the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit at 39 degrees F.

Buffer: A solution or liquid whose chemical makeup is such that it minimizes changes in pH when acids or bases are added to it.

C

C_A : Chemical concentration in air.

C_S : Chemical concentration in soil.

C_W : Chemical concentration in water.

Capillarity: The action by which a fluid, such as water, is drawn up (or depressed) in small interstices or tubes as a result of surface tension.

Capillary action: The force that causes a liquid in contact with a solid to rise (as in a capillary tube), or to spread (as through blotting paper), caused by surface tension.

Capillary force(s): The molecular forces which cause the movement of water through very small spaces.

Capillary fringe: The zone above the water table within which the porous medium is saturated by water under less than atmospheric pressure.

Capillary water: Water held in, or moving through, small interstices or tubes by capillarity.

Carbonyl: A compound of carbon monoxide with a metal, as in $\text{Co}(\text{CO})_3$.

Carboxyl group: Composed of a carbonyl group and a hydroxyl group bonded to a carbon atom. Shown as COOH or CO_2H .

Carboxylic acid: Any of a broad array of organic acids comprised chiefly of alkyl (hydrocarbon) groups (CH_2 , CH_3), usually in a straight chain (aliphatic), terminating in a carboxyl group (COOH).

Catalyst: A substance that changes the speed or yield of a chemical reaction without being consumed or chemically changed by the chemical reaction.

Cathode: The negative pole or electrode of an electrolytic cell or system. The cathode attracts positively charged particles or ions (cations).

Cation: A positively charged ion in an electrolyte solution, attracted to the cathode under the influence of a difference in electrical potential. Sodium ion (Na^+) is a cation.

Cation exchange capacity: The term cation exchange refers to the exchange of cations balancing the surface charge on the soil surface and dissolved cations. The total amount of cations adsorbed by these negative charges in a mass of soil is defined as cation exchange capacity of the soil.

CCA: Chromated copper arsenate

CEC: Cation exchange capacity

Cellulose: A carbohydrate forming the chief component of cell walls in plants and in wood.

Cephalopod: Any mollusk of the class Cephalopoda, having tentacles attached to the head, including cuttlefish, squid and octopus.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act (1980)

CFR: Code of Federal Regulations. A periodic publication of the regulations established by U.S. law.

Chain-of-custody procedures: Procedures for documenting who has custody of and the condition of samples from the point of collection to the analysis at the laboratory. Chain of custody procedures are used to ensure that the samples are not lost, tampered with, or improperly stored or handled.

Charge (electric charge): One of the basic properties of the elementary particles of matter giving rise to all electric and magnetic forces and interactions.

Glossary

Chemical: See *chemical compound*.

Chemical compound: A distinct and pure substance formed by the union of two or more elements in definite proportion by weight.

Chemical equation: A representation of a chemical reaction using symbols to show the weight relationship between the reacting substances and the products.

Chemical formula: A written representation using symbols of a chemical entity or relationship. There are several kinds of formulas as follows: (1) Empirical: Expresses in simplest form the relative number and the kind of atoms in a molecule of one or more compounds; it indicates composition only, not structure. (2) Molecular: shows the actual number and kind of atoms in a chemical entity. (3) Structural: Indicates the location of the atoms, groups or ions relative to one another in a molecule as well as the number and location of chemical bonds. (4) Generic: Expresses a generalized type of organic compound where the variables stand for the kind of radical in a homologous series (e.g. C_nH_{2n}). (5) Electronic: A structural formula in which the bonds are replaced by dots indicating electron pairs, a single bond being equivalent to one pair of electrons shared by two atoms.

Chemical oxygen demand (COD): A measure of the oxygen required to oxidize all compounds, both organic and inorganic, in water.

Chemical reaction: A chemical change that may occur in several ways, e.g., by combination, by replacement, by decomposition, or by some modification of these. Chemical reactions involve the rupture of bonds which hold the molecules together, and should not be confused with nuclear reactions where the atomic nucleus is involved.

Chemisorption: The formation of bonds between the surface molecules of a metal (or other material of high surface energy) and another substance (gas or liquid) in contact with it.

Chemistry: The science of the composition, structure and properties of substances and the transformations they undergo.

Chlorodiphenyl: PCB, polychlorinated biphenyl

Chromatography (chromatographic): A method of separation of the components of a sample in which the components are distributed between two phases, one of which is stationary while the other moves. In gas chromatography the gas moves over a liquid or solid stationary phase. In liquid chromatography the liquid mixture moves through another liquid, a solid, or a gel.

Clay: One type of soil particle with a diameter of approximately one ten-thousandth of an inch.

Cleanup: Actions taken to deal with a release or threat of release of a hazardous substance that could affect humans and/or the environment. The term "cleanup"

is sometimes used interchangeably with the terms remedial action, removal action, response action and corrective action.

CLP: Contract Laboratory Program

Coagulation: The clumping together of very fine particles into larger particles caused by the use of chemicals.

COD: Chemical oxygen demand

Cohesion: The force that holds adjacent molecules of a single material together.

Cohesive force: Molecular force within a body or substance acting to unite its parts.

Coke: The carbonaceous residue of the destructive distillation (carbonization) of bituminous coal, petroleum, and coal-tar pitch.

Coke Oven: An industrial process which converts coal into coke, one of the basic materials used in blast furnaces for the conversion of iron ore into iron.

Colloids: Very small, finely divided solids (that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.

Comparability: A measure of the confidence with which one data set or method can be compared to another.

Completeness: A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions.

Complexation: Electrostatic association of positively charged metal ions and negatively charged organic matter, usually with two or more points of attachment. Also called chelation.

Complexes (complex compound; coordination compound): A compound formed by the union of a metal ion (usually a transition metal) with a non-metallic ion or molecule called a ligand or complexing agent.

Composite sample: A sample prepared by physically combining two or more samples having some specific relationship and processed to ensure homogeneity.

Compound: See *chemical compound*.

Concentration: The relative amount of a substance mixed with another substance.

Condensation reaction: A type of chemical reaction in which two or more molecules combine with the separation of water, alcohol, or other simple substance.

Confined aquifer: An aquifer in which ground water is confined under pressure which is significantly greater than atmospheric pressure.

Confining layer: A geologic formation characterized by low permeability that inhibits the flow of water (*see also aquitard*).

Conservation of mass: Any chemical reaction between two or more elements or compounds leaves the total mass unchanged, the reaction products having exactly the same mass as present in the reactants, regardless of the extent to which other properties are changed.

Contaminant: Any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water, or soil.

Contract Laboratory Program (CLP): Analytical program developed for Superfund waste site samples to fill the need for legally defensible analytical results supported by a high level of quality assurance and documentation.

Contract required detection limit (CRDL): For inorganics, the chemical-specific quantitation levels that the CLP requires to be routinely and reliably quantitated in specified sample matrices.

Contract required quantitation limit (CRQL): For organics, the chemical-specific quantitation levels that the CLP requires to be routinely and reliably quantitated in specified sample matrices.

Conversion factor: A factor used to convert one unit of measurement to an equivalent value.

Coulomb: The SI unit of quantity of electricity equal to the quantity of charge transferred in one second across a conductor in which there is a constant current of one ampere.

Coulometric (coulometry): A method used in quantitative analysis, whereby the amount of a substance set free or deposited during electrolysis is determined by measuring the number of coulombs that passed through the electrolyte.

Coulometric titrimetry: Titration method in which electrical current is measured to represent when the analyte is consumed.

Covalent bond: Sharing of electrons by a pair of atoms. (*See bond, chemical.*)

CRDL: Contract required detection limit

Creosote: An oily liquid having a burning taste and a penetrating odor, obtained by the distillation of coal and wood tar, used mainly as a preservative for wood and as an antiseptic.

CRQL: Contract required quantitation limit

Critical pressure: The pressure of a pure element or compound at a critical point.

Critical point: The transition point between the liquid and gaseous states of a substance.

Critical temperature: The temperature above which a gas cannot be liquefied however high the pressure.

Crumb: A small particle or portion of anything; fragment.

Cyclic (compound): An organic compound whose structure is characterized by one or more closed rings.

D

D_r: Dilution factor

Data quality objectives (DQOs): Qualitative and quantitative statements derived from the outputs of each step of the DQO Process which specify the study objectives, domain, limitations, the most appropriate type of data to collect and specify the levels of decision error that will be acceptable for the decision.

Data quality objectives process: A systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use. DQOs are the qualitative and quantitative outputs from the DQO Process.

Data usability: The process of ensuring or determining whether the quality of the data produced meets the intended use of the data.

DCA: Dichloroacetylene; possible decomposition product or trichloroethene or trichloroethane.

DCE: Dichloroethene; dichloroethylene

DCM: Dichloromethane

DDT: Diclolo-Diphenyl-Trichloroethane. The first chlorinated hydrocarbon insecticide.

Decomposition: The conversion of chemically unstable materials to more stable forms by chemical or biological action.

Denitrification: The biochemical conversion of nitrate and nitrite in the soil dissolved in water to gaseous.

Density: The amount of mass per unit volume.

Destructive distillation: An operation in which a highly carbonaceous material, such as coal, oil shale, or tar sands, is subjected to high temperature in the absence of air or oxygen, resulting in decomposition to solids, liquids, and gases.

Detector: A person or thing that detects.

Detection limit (DL): The minimum concentration or weight of an analyte that can be detected by a single measurement above instrumental background noise.

Dielectric: A nonconducting substance; insulator

Diffusion: The migration of atoms, molecules, ions, or other particles as a result of some type of gradient (concentration, temperature, etc.)

Dioxin: Any of a family of compounds known chemically as dibenzo-p-dioxins.

Dipole: A pair of electric point charges or magnetic poles of equal magnitude and opposite signs separated by an infinitesimal distance.

Glossary

Dispersion: The process by which a substance or chemical spreads and dilutes in flowing groundwater or soil gas.

Dissolved oxygen: The oxygen freely available in water, vital to fish and aquatic life and for the prevention of odors.

DL: Detection limit

DNAPL: Dense non-aqueous phase liquid. Non-aqueous phase liquids such as chlorinated hydrocarbon solvents or petroleum fractions with a specific gravity greater than 1.0 that sink through the water column until they reach a confining layer.

DO: Dissolved oxygen

DQOs: Data quality objectives.

Dross: *See slag.*

Duplicate sample: A second aliquot or sample that is treated the same as the original sample in order to determine the precision of the analytical method.

DW: Drinking water

E

Eh (EH): Redox potential. A measure of the electron balance in an environmental sample; the numerical indication of oxidation-reduction conditions, much as hydrogen-ion concentration or pH are measures of acid-base conditions.

Electrochemical reaction: Chemical changes produced by electricity (electrolysis) or the production of electricity by chemical changes (galvanic action).

Electrolyte: A substance which dissociates (separates) into two or more ions when it is dissolved in water.

Electromagnetic radiation: Radiation consisting of electromagnetic waves, including radio waves, infrared, visible light, ultraviolet, x-rays and gamma rays.

Electron: An extremely small, negatively charged particle; the part of an atom that determines its chemical properties.

Electron acceptor: A chemical entity that accepts electrons transferred to it from another compound. It is an oxidizing agent that, by virtue of its accepting electrons, is itself reduced in the process. 2

Electron donor: A chemical entity that donates electrons to another compound. It is a reducing agent that, by virtue of its donating electrons, is itself oxidized in the process.

Electronegativity: All atoms (except those of helium) that have fewer than eight electrons in their highest principal quantum level have low-energy orbital vacancies capable of accommodating electrons from outside the atom. The existence of these vacancies is evidence that within these regions the nuclear charge

can exert a significant attraction for such electrons, even though as a whole the atom is electrically neutral. This attraction is called "electronegativity."

Electronegativity difference: The difference in electronegativity values for two bonding elements. *See electronegativity.*

Element: A substance which cannot be separated into its constituent parts and still retain its chemical identity. For example, sodium (Na) is an element.

Elimination reaction: A reaction in which a small molecule, such as water, is eliminated from a chemical, forming a multiple bond.

EM: Electromagnetic radiation

Enol: An organic compound containing a hydroxyl group attached to a doubly linked carbon atom, as in $>C=C(OH)$.

Environmental chemistry: The study of sources, reactions, transport, effects and fates of chemical species in water, soil and air environments.

Environmental Protection Agency: A federal agency established in 1970.

EPA: United States Environmental Protection Agency

Equation: *See chemical equation.*

Equilibrium: 1) Chemical equilibrium is a condition in which a reaction and its opposite or reverse reaction occur at the same rate, resulting in a constant concentration of reactants. 2) Physical equilibrium is exhibited when two or more phases of a system are changing at the same rate so that the net change in the system is zero.

Ester: A compound formed by the reaction between an acid and an alcohol with the elimination of a molecule of water.

Ether: A class of organic compounds in which an oxygen atom is interposed between two carbon atoms in the molecular structure, giving the generic formula ROR.

Evaporation: The process by which a liquid enters the vapor (gas) phase.

Exfoliation: The action of separating into layers; coming off in flakes.

F

F_{om}: Fraction of organic matter.

False negative (type II or beta error): A statement that a condition *does not* exist when it actually *does*.

False positive (type I or alpha error): A statement that a condition *does* exist when it actually *does not*.

Faults: A break in the continuity of a body of rock or of a vein, with dislocation along the plane of the fracture.

Feasibility study: Analysis of the practicability of a proposal; e.g., a description and analysis of potential cleanup alternatives for a site such as one on the National Priorities List. The feasibility study usually recommends selection of a cost-effective alternate. It usually starts as soon as the remedial investigation is underway, together, they are commonly referred to the “RI/FS”.

Fick’s Law: The statement that the flux J of a diffusing substance is proportional to the concentration gradient, i.e., $J = -D(dc/dx)$, where D is called the diffusion coefficient.

Fick’s First Law: An equation describing the rate at which a gas transfers into solution. The change in concentration of gas in solution is proportional to the product of an overall mass transfer coefficient and the concentration gradient.

Fick’s Second Law: An equation relating the change in concentration with time due to diffusion to the change in concentration gradient with distance from the source of concentration.

Field capacity: The maximum amount of water that a soil can retain after excess water from saturated conditions has been drained by the force of gravity.

Flammable (material): Any material that ignites easily and will burn rapidly.

Flocculation: The gathering together of fine particles in water by gentle mixing after the addition of coagulant chemicals to form larger particles.

Fluid: Any material or substance that changes shape or direction uniformly in response to an external force imposed on it.

Fluorescence: The emission of radiation (i.e., visible light) by a substance during exposure to external radiation (i.e., light or x-ray).

Flux: A substance used to help metals fuse together.

Fracture: A break in a rock formation due to structural stresses; e.g., faults, shears, joints, and planes of fracture cleavage.

Free water: Water in the soil in excess of field capacity that is free to move in response to the pull of gravity.

Freezing point: *See melting point.*

Fulvic acid: The organic matter of indefinite composition that remains in solution when an aqueous alkaline extract of soil is acidified.

Functional group: A group of atoms responsible for the characteristic behavior of the class of compounds in which the group occurs, as the hydroxyl group in alcohols.

Furan: A heterocyclic compound with the basic structure HC:CHCH:CHO

G

Gas: One of the states of matter, having neither independent shape nor volume and tending to expand indefinitely.

Gas chromatography: The process in which the components of a mix are separated from one another by volatilizing the sample into a carrier gas stream which is passing through or over a bed of packing.

Gas chromatography/mass spectrometer: A tandem instrumental method for separating, identifying, and quantifying organic compounds. The GC separates the compounds. Compound identification is based on the compound retention time in the GC and on the mass spectral pattern. Compound quantification is normally done by measuring peak heights in the mass spectra.

GC: Gas chromatography. Gas chromatograph.

GC/MS: Gas chromatography/mass spectrograph

Glaciofluvial gravel: Pertaining to the meltwater streams flowing from wasting glacier ice and especially to the deposits and land forms produced by such streams, as kame terraces and outwash plains.

GLC: Gas liquid chromatography

Glycol: Dihydric alcohol in which two hydroxy groups are on different carbon atoms, usually but not necessarily adjacent.

Grab sample: A single sample collected at a particular time and place that represents the composition of the water, air, or soil only at that time and place.

Gravimetric: A means of measuring unknown concentrations of water quality indicators in a sample by *weighing* a precipitate or residue of the sample.

Gravimetric analysis: A type of quantitative analysis involving precipitation of a compound which can be weighed and analyzed after drying.

Gravimetric titrimetry: Measuring the mass of a reagent needed to react with an analyte.

Gray region: An area that is adjacent to or contains the action level, and where the consequences of making a decision error are relatively small.

Groundwater: Water found below the surface of the land, usually in porous formation. Groundwater is the source of water found in wells and springs and is used frequently for drinking.

GW: Groundwater

Gypson: Gypsum

H

Halogen : One of the chemical elements chlorine, bromine, or iodine.

Halogenated: Having one of the halogens as part of the chemical compound.

Hardness (water): Characteristic of water caused by presence of various salts.

Hardness, water: A characteristic of water caused mainly by the salts of calcium and magnesium, such as bicarbonate, carbonate, sulfate, chloride and nitrate.

Head: The elevation to which water rises at a given point as a result of reservoir pressure.

Henry's Law: The relationship between the partial pressure of a compound and the equilibrium concentration in the liquid through a proportionality constant known as the Henry's law constant.

Henry's Law Constant: The ratio of the concentration of a compound in air (or vapor) to the concentration of the compound in water under equilibrium conditions.

Heterogeneous: Varying in structure or composition at different locations in space.

Homogeneous: Uniform in structure or composition at all locations in space.

Humic acid: Black acidic organic matter extracted from soils, low-rank coals and other decayed plant substances by alkalis. It is insoluble in acids and organic solvents.

Humic: Vegetable-degradation material occurring in coal as an amorphous brown to black substance or gel and that is insoluble in alkaline solution. GEO

Humus: Organic portion of the soil remaining after prolonged microbial decomposition.

Hydraulic conductivity: The rate at which water can move through a permeable medium.

Hydraulic gradient: In general, the direction of groundwater flow due to changes in the depth of the water table.

Hydrocarbon: Chemical compounds composed only of carbon and hydrogen.

Hydronium ion: An ion (H_3O^+) formed by the transfer of a proton (hydrogen nucleus) from molecule of water to another: a companion ion (OH^-) is also formed.

Hydrophilic: Having a strong affinity for water.

Hydrophobic: Having little or no affinity for water.

Hydrostatic pressure: In the case of ground water, the pressure at a specific elevation due to the weight of water at higher levels in the same zone of saturation.

Hydroxide: A chemical compound which contains one or more hydroxyl groups.

Hydroxyl (hydroxy): A compound radical consisting of one atom of oxygen and one atom of hydrogen.

Hygroscopic water: Moisture held in the soil that is in equilibrium with that in the atmosphere to which the soil is exposed.

I

IDL: Instrument detection limit.

Infiltration: The penetration of water through the ground subsurface into subsurface soil.

Inorganic chemical: Chemical without organic carbon, including metals and other ions such as chloride, sulfate, and nitrate.

Insoluble: Incapable of being dissolved.

Instrument detection limit: The lowest amount of a substance that can be detected by an instrument without correction for the effects of sample matrix, handling and preparation.

Instrument reading/response: Signal or display of signal from detector used in an instrument.

International Union of Pure and Applied Chemistry (IUPAC): A voluntary nonprofit association of national organizations representing chemists in 45 member countries. It was formed in 1919 with the object of facilitating international agreement and uniform practice in both academic and industrial aspects of chemistry.

Ion: An electrically charged atom or group of atoms.

Ionic bond: Refers to the formation of ions by transfer of one or more electrons from one atom to another. *See bond, chemical.*

Ionization potential: The ionization potential of a compound is defined as the energy required to remove a given electron from the molecule's atomic orbit (outermost shell) and is expressed in electron volts (eV).

IR: Instrument response, instrument reading

Isotope: A variation of an element that has the same atomic number of protons but a different weight because of the number of neutrons.

Isotropic: The condition in which hydraulic properties of an aquifer are equal when measured in any direction.

IUPAC: International Union of Pure and Applied Chemistry.

J

Joints: A fracture plane in rocks, generally at right angles to the bedding of sedimentary rocks and variously oriented in igneous and metamorphic rocks, commonly arranged in two or more sets of parallel intersecting systems.

Joule: A measure of energy, work or quantity of heat. One joule is the work done when a force of one newton is displaced a distance of one meter in the direction of force.

K

K: Hydraulic conductivity

K_d : Absorption or distribution coefficient

K_{oc} : Provides a measure of the extent of chemical partitioning between organic carbon and water at equilibrium. The higher the K_{oc} , the more likely a chemical is to bind to soil or sediment than to remain in water.

K_{om} : Organic-matter sorption partition coefficient

K_{ow} : Octanol/water partition coefficient

Karst: A geologic formation of irregular limestone deposits with sinks, underground streams, and caverns.

Ketone: A class of liquid organic compounds in which the carbonyl group, C=O, is attached to two alkyl groups.

KOH: Potassium hydroxide

KPEG: Potassium polyethylene glycol

L

Lagoon: A shallow pond where sunlight, bacterial action, and oxygen work to purify wastewater; also used for storage of wastewater or spent nuclear fuel rods.

Landfill: A method for final disposal of solid waste on land. The refuse is spread and compacted and a cover of soil is applied so that effects on the environment (including public health and safety) are minimized. An industrial landfill disposes of non-hazardous industrial wastes. A municipal landfill disposes of domestic wastes including garbage, paper, etc.

LC: Liquid chromatography

Leachate: Liquids that have percolated through solid waste or other mediums and has extracted dissolved or suspended material from it. Leachate can be compared to coffee: water that has percolated down through the ground coffee.

Ligand: A molecule, ion, or atom that is attached to the central atom of a coordination compound, a chelate, or other complex.

Light non-aqueous phase liquid: A non-aqueous phase liquid with a specific gravity less than 1.0.

Lignin: A phenylpropane polymer of amorphous structure comprising 17–30% of wood.

Lignite: Brown coal. A low rank of coal between peat and sub-bituminous, it contains 35–40% water.

Limit of detection (LOD): The concentration of a chemical that has a 99% probability of producing an analytical result above background “noise” using a specific method.

Limit of quantitation (LOQ): The concentration of a chemical that has a 99% probability of producing an

analytical result above the LOD. Results below the LOQ are not quantitative.

Liquid: In a state between solid and gas, in which the molecules move freely about one another but do not fly apart

LNAPL: Light non-aqueous phase liquid

LOD: Limit of detection.

Lower detection limit: The smallest signal above background noise an instrument can reliably detect.

M

Mass: The quantity of matter contained in a particle or body regardless of its location in the universe.

Mass number (A): The number of neutrons and protons in the nucleus of an atom.

Mass spectrometer: An instrument for producing and measuring, usually by electrical means, a mass spectrum. *See mass spectrometry.*

Mass spectrometry: A method of chemical analysis in which the substance to be analyzed is heated and placed in a vacuum. The resulting vapor is exposed to a beam of electrons, which causes ionization to occur, either of the molecules or their fragments. The ions thus produced are accelerated by an electric impulse and then passed through a magnetic field, where they describe curved paths whose directions depend on the speed and mass-to-charge ratio of the ions. This has the effect of separating the ions according to their mass (electromagnetic separation). Because of their greater kinetic energy, the heavier ions describe a wider arc than the lighter one and can be identified on this basis. The ions are collected in appropriate devices as they emerge from the magnetic field.

Mass spectroscopy: *See mass spectrometry.*

Mass spectrum: A characteristic pattern of ion fragments of different masses resulting from analysis that can be compared with a mass spectral library for analyte identification.

Matric potential: That component of the water potential of plants and soils that is due to the interaction of the water with colloids and to capillary forces.

Matrix/medium: The predominant material comprising the sample to be analyzed (e.g., drinking water, sludge, air).

Matrix spike sample: A sample prepared by adding a known mass of a target analyte to a specified amount of matrix sample for which an independent estimate of the target analyte concentration is available. Spiked samples are used, for example, to determine the effect of the matrix on a method’s recovery efficiency.

Maximum contaminant level: The maximum level of certain contaminants permitted in drinking water

Glossary

supplied by a public water system as set by EPA under the federal Safe Drinking Water Act.

MCL: Maximum contaminant level.

MDL: Method detection limit.

Melting point: The melting point or freezing point of a pure substance is the temperature at which its crystals are in equilibrium with the liquid phase at atmospheric pressure. The terms “melting point” and “freezing point” are often used interchangeably, depending on whether the substance is being heated or cooled.

meq (mEq): Milliequivalent. A unit of measure, applied to electrolytes, that expresses the combining power of a substance.

Metal: Any of numerous opaque elementary substances, possessing a peculiar lustre, fusibility, conductivity for heat and electricity, readiness to form positive ions.

Metalloid (non-metal, semiconductor): Element having moderate electrical conductivity. Called metalloids since they more nearly resemble metals.

Method: A body of procedures and techniques for performing a task (e.g., sampling, characterization, quantification) systematically presented in the order in which they are to be executed.

Method blank: A clean sample processed simultaneously with and under the same conditions as samples containing an analyte of interest through all steps of the analytical procedures.

Method detection limit (MDL): The detection limit that takes into account the reagents, sample matrix, and preparation steps applied to a sample in specific analytical methods.

Mineral: A widely used general term referring to the nonliving constituents of the earth’s crust, which include naturally occurring elements, compounds, and mixtures that have a definite range of chemical composition and properties.

Mineralogy: The science or study of minerals.

Miscibility: The ability of a liquid or gas to dissolve uniformly in another liquid or gas.

Miscible: Capable of being mixed.

Miscible liquid: Two or more liquids that can be mixed and will remain mixed under normal conditions.

Mole: The amount of pure substance containing the same number of chemical units as there are atoms in exactly 12 grams of carbon-12 (i.e., 6.023×10^{23}).

Molecular mass: Sum of all the atomic masses.

Molecular weight: The sum of the atomic weights of the atoms in a molecule.

Molecule: The smallest division of a compound that still retains or exhibits all the properties of the substance.

MW: Molecular weight; also monitoring well

N

NAAQS: National Ambient Air Quality Standards

NAICS: North American Industry Classification System. Replaces the U.S. Standard Industrial Classification (SIC) system.

NAPL: Non-aqueous phase liquid. Contaminants that remain undiluted as the original bulk liquid in the subsurface.

National Ambient Air Quality Standards: Maximum air pollutant standard that EPA set under the Clean Air Act for attainment by each state.

National Institute for Occupational Safety and Health (NIOSH): An organization that tests and approves safety equipment for particular applications. NIOSH is the primary Federal agency engaged in research in the national effort to eliminate on-the-job hazards to the health and safety of working people.

National Oil and Hazardous Substances Contingency Plan (NCP): The federal regulation that guides determination of the sites to be corrected under both the Superfund program and the program to prevent or control spills into surface waters or elsewhere.

National Priorities List (NPL): EPA’s list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund.

NCP: National Contingency Plan or National Oil and Hazardous Substances Contingency Plan.

Neutron: A fundamental particle of matter having a mass of 1.009 but no electric charge.

NIOSH: National Institute for Occupational Safety and Health.

Nitrate (NO₃): A salt or ester of nitric acid, or any compound containing the univalent group - ONO₂, or NO₃.

Nitrification: The process whereby ammonia in wastewater is oxidized to nitrite and then to nitrate by bacterial or chemical reactions.

Nitrite (NO₂): A salt or ester of nitrous acid.

Noble gas: Inert gas as helium, argon or neon.

Noise: The sum of random errors in the response of a measuring instrument.

NOM: Natural organic material

Nonmetal: Any of a number of elements whose electronic structure, bonding characteristics, and consequent physical and chemical properties differ markedly from those of metals, particularly in respect to electronegativity and thermal and electrical conductivity.

Nonorganic: *See inorganic.*

Nonpolar: A substance whose molecules possess no permanent electric moments.

Nonpolar covalent bond: *See bond, chemical.*

Nonpolar molecule: A molecule with polar bonds that does not have an overall dipole. The vector sum of its dipoles is zero.

Nonpolar organic compounds: *See organic and nonpolar.*

Nonvolatile organic chemical: An organic compound with a saturation vapor pressure less than 10–8 kPa (kiloPascal) at 25°C.

NPL: National Priorities List.

Nucleus: The positively charged central mass of an atom, it contains essentially the total mass in the form of protons and neutrons.

Nuclide: A species of atoms in which each atom has identical atomic number *Z* and identical mass number *A*.

Q

Occupational Safety and Health Administration (OSHA): A Federal agency responsible for establishing and enforcing standards for exposure to workers to harmful materials in industrial atmospheres, and other matters affecting the health and well-being of industrial personnel.

Octanol/water partition coefficient (*P*): A coefficient representing the ratio of the solubility of a compound in octanol (a non-polar solvent) to its solubility in water (a polar solvent). The higher the *K_{ow}*, the more non-polar the compound.

Octet rule: Atoms are most stable when there are eight valence electrons.

ORD: Office of Research and Development

Organic compound: Any compound containing carbon.

OSHA: Occupational Safety and Health Administration.

Oxidant: *See oxidizing agent.*

Oxidation: Originally meant a reaction in which oxygen combines chemically with another substance, but its usage has long been broadened to include any reaction in which electrons are transferred.

Oxidation-reduction potential: The electric potential required to transfer electrons from one compound (the oxidant) or element to another compound (the reductant); used as a qualitative measure of the state of oxidation in water treatment systems.

Oxidizer: *See oxidizing agent.*

Oxidizing agent: Any substance, such as oxygen (O₂) or chlorine (Cl₂), that will readily add (take on) electrons.

Oxidized: To have lost electrons.

P

PAH: Polynuclear aromatic hydrocarbons

PARCC: Precision, accuracy, representativeness, completeness and comparability

Partial pressure: The portion of total vapor pressure in a system due to one or more constituents in the vapor mixture.

Particles: Any discrete unit of material structure.

Particulates: 1. Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog found in air or emissions. 2. Very small solids suspended in water.

Partition coefficient: Measure of the extent to which a pesticide is divided between the soil and water phases.

Pathway: The physical course a chemical or pollutant takes from its source to the exposed organism.

PCB: Polychlorinated biphenyl

PCDD: Polychlorinated dibenzo-p-dioxins

PCDF: Polychlorinated dibenzofurans

PCE: Perchloroethylene (Tetrachloroethene)

PCP: Pentachlorophenol

pE: Electron activity

PE sample: Performance evaluation sample. A sample of known composition provided for laboratory analysis to monitor laboratory and method performance.

Peat: A highly organic material found in marshy or damp regions, composed of partially decayed vegetable matter.

Ped: A naturally-formed unit or mass of soil, such as a crumb, block or aggregate.

PEG: Polyethylene glycol

PEL: Permissible Exposure Limit

Percolation: The movement of water downward and radially through subsurface soil layers, usually continuing downward to ground water. Can also involve upward movement of water.

Periodic table: A table illustrating the periodic system, in which the chemical elements, formerly arranged in their order of atomic weights and now according to their atomic numbers, are shown in related groups.

Permeability: The rate at which liquids pass through soil or other materials in a specified direction.

pH: A measure of the acidity of a solution. pH is equal to the negative logarithm of the concentration of hydrogen ions in a solution. A pH of 7 is neutral. Values less than 7 are acidic, and values greater than 7 are basic.

Glossary

Phase: One of the three states or conditions in which substances can exist, i.e., solid, liquid, or gas (vapor).

Phenols: A class of aromatic organic compounds in which one or more hydroxyl groups are attached directly to the benzene ring.

Phenyl: The univalent $C_6H_5^+$ group derived from benzene and characteristic of phenol and other derivatives.

Photochemical reaction: Any chemical reaction that is initiated as a result of absorption of light.

Photochemical smog: Air pollution associated with oxidants rather than with sulfur oxides, particulates, etc.

Photon: The unit (quantum) of electromagnetic radiation.

Plume: A visible or measurable discharge of a contaminant from a given point of origin.

Polar: Descriptive of a molecule in which the positive and negative electrical charges are permanently separated, as opposed to nonpolar molecules in which the charges coincide.

Polar covalent bond: *See bond, chemical.*

Polar molecule: A molecule with a positive charge on one end and a negative charge on its other end.

Polar organic compounds: *See polar and organic compound.*

Polarity: The positive or negative state in which a body reacts to a magnetic, electric, or other field.

Pollutant: Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals or ecosystems.

Polymer: A natural or synthetic chemical structure where two or more like molecules are joined to form a more complex molecular structure (e.g., polyethylene in plastic).

Porosity: Degree to which soil, gravel, sediment, or rock is permeated with pores or cavities through which water or air can move.

Potentiometric line: *See potentiometric surface.*

Potentiometric surface: The level to which water will rise in cased wells or other cased excavations into aquifers.

ppb: Parts per billion. One ppb equals one unit measurement per billion units of the same measurement.

ppm: Parts per million. One ppm equals one unit measurement per million units of the same measurement.

PQL: Practical Quantitation Limit

Practical quantitation limit (PQL): The lowest quantitation level of a given analyte that can be reliably achieved among laboratories within the specified limits

of precision and accuracy of a given analytical method during routine operating conditions.

Precipitate: A substance separated from a solution or suspension by chemical or physical change.

Precipitation: Separation of a new phase from solid, liquid, or gaseous solutions.

Precision: The measure of the agreement among individual measurements of the same property, under prescribed similar conditions.

Pressure: The force or load per unit area.

Preservation of mass: *See conservation of mass.*

Primary: In reference to monohydric alcohols, amines, and a few related compounds, this term, together with secondary and tertiary, describes, the molecular structure of isomeric or chemically similar individuals. Monohydric alcohols are based on the methanol group in which three of the bonds of the methanol carbon may be attached either to hydrogen atoms or to alkyl groups.

A primary alcohol has one alkyl group and two hydrogens, except methanol, in which all three bonds are to hydrogen atoms. A secondary alcohol has two alkyl groups and one hydrogen. A tertiary alcohol has three alkyl groups, e.g. The three types can be readily identified by the number of hydrogen atoms attached to the central (methanol) carbon atom; if it is two or more, the alcohol is primary; if one, it is secondary; and if zero, it is tertiary.

Proton: A fundamental unit of matter having a positive charge and a mass number of 1.

psi: Abbreviation for pounds per square inch.

Purging: Removing stagnant air or water from a sampling zone or equipment prior to sample collection.

Pyrite: Iron pyrite. Fool's gold. FeS_2 .

Q

QA: Quality assurance

QAM: Quality assurance manager

QAPP or QAPjP: Quality assurance program (or project) plan

QA/QC: Quality assurance/quality control

QC: Quality control

QMP: Quality management plan

QMS: Quality management system

Qualified data: Any data that have been modified or adjusted as part of statistical or mathematical evaluation, data validation, or data verification operations.

Quality: The totality of features and characteristics of a product or service that bears on its ability to meet the stated or implied needs and expectations of the user.

Quality assurance: An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.

Quality assurance program (or project) plan: A formal technical document containing the detailed procedures for assuring the quality of environmental data prepared for each EPA environmental data collection activity and approved prior to collecting the data.

Quality control (QC): The overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users. The aim is to provide quality that is satisfactory, adequate, dependable, and economical.

Quality management plan (QMP): A formal document describing the management policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation protocols of an agency, organization, or laboratory for ensuring quality in its products and utility to its users.

Quality management system: A management system for ensuring that quality goals are attained.

Quantitation limit: The lowest level at which a chemical can be accurately and reproducibly quantitated. Usually equal to the instrument detection limit multiplied by a factor of three to five, but varies for different chemicals and different samples.

Quantum number: The quantum is the basic unit of electromagnetic energy; it characterizes the wave properties of electrons, as distinct from their particulate properties. An electron has four quantum numbers that define its properties. These are as follows: 1) The principal quantum number is a constant that can be any positive integer ($n = 1, 2, 3, \dots$). It determines the principal energy level, or shell, of the electron, sometimes designated by letters such as K, L, or M, depending on the value of the principal quantum number. 2) The angular momentum constant l , also an integer, is related to n as: $l = 0, 1, \dots, n - 1$. Here again, letter designations are often used in s electrons $l = 0$, in p electrons $l = 1$, in d electrons $l = 2$, and in f electrons $l = 3$. 3) The magnetic quantum number m is an integer related to l as $m = -1, \dots, -1, 0, +1, \dots, +1$. 4) The spin quantum number is independent of the other three and has a value of either $+1/2$ or $-1/2$, depending on the direction of rotation of the electron on its axis in the atomic frame of reference.

Quantum Theory: Any theory predating quantum mechanics that encompassed Planck's radiation formula and a scheme for obtaining discrete energy states for atoms, as Bohr theory.

R

Rd or Rd: Retardation factor

Radiation: Transmission of energy through space or any medium. Also known as radiant energy.

Radicals: An ionic group having one or more charges, either positive or negative, e.g., OH^- , NH_4^+ , SO_4^- .

Random error: The deviation of an observed value from a true value, which behaves like a variable in that any particular value occurs as though chosen at random from a probability distribution of such errors. The distribution of random error is generally assumed to be normal.

RCRA: Resource Conservation and Recovery Act.

Reaction: *See chemical reaction.*

Reagent: A substance or solution used in a chemical reaction, especially those used in laboratory work to detect, measure, or produce other substances.

Receptor: In exposure assessment: an organism that receives, may receive, or has received environmental exposure to a chemical.

Record of decision: A public document that explains which cleanup alternative was selected for a Superfund site.

Redox: Short for oxidation-reduction.

Redox potential: *See oxidation-reduction potential.*

Reduced: In a state of reduction.

Reducer: Reducing agent.

Reducing agent: Any substance, such as base metal (iron) or the sulfide ion (S^{2-}), that will readily donate (give up) electrons.

Reduction: The addition of hydrogen, removal of oxygen, or addition of electrons to an element or compound.

Remedial action: The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

Remedial design: A phase of remedial action that follows the remedial investigation/feasibility study and includes development of engineering drawings and specifications for a site cleanup.

Remedial investigation (RI): A process of collecting data to characterize site and waste and for conducting treatability testing as necessary to evaluate the performance and cost of the treatment technologies and support the design of selected remedies.

Remedial response: *See remediation.*

Remediation: Cleanup or other methods used to remove or contain a toxic spill or hazardous materials from a Superfund site.

Removal: *See removal action.*

Glossary

Removal action: Short-term immediate actions taken to address releases of hazardous substances that require expedited response. *See cleanup.*

Representative sample: A portion of material or water that is as nearly identical in content and consistency as possible to that in the larger body of material or water being sampled.

Representativeness: The degree to which the data collected accurately reflect the actual concentration or distribution.

Retardation: Preferential retention of contaminant movement in the subsurface resulting from absorptive processes or solubility differences.

RgasD: Relative density of gases referenced to air = 1 (indicates how many times a gas is heavier than air at the same temperature).

RI/FS: Remedial Investigation/Feasibility Study

S

Salt: The compound formed when the hydrogen of an acid is replaced by a metal or its equivalent. Example: $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$.

Sample quantitation limit (SQL): The detection limit that accounts for sample characteristics, sample preparation and analytical adjustments, such as dilution.

Sampling and analysis plan (SAP): A document consisting of a quality assurance project plan, and the field sampling plan, which provides guidance for all field sampling and analytical activities that will be performed.

Sand: Soil particles between 0.05 and 2.0 mm in diameter.

SAP: Sampling and analysis plan

SARA: Superfund Amendments and Reauthorization Act of 1986

Saturated hydrocarbon: A hydrocarbon in which all available valence bonds of the atoms (especially carbon) are attached to other atoms.

Saturated solution: The state of a solution when it holds the maximum equilibrium quantity of dissolved matter at a given temperature.

Saturated zone: The area below the water table where all open spaces are filled with water under pressure equal or greater than that of the atmosphere.

Saturation point: The point at which a substance will receive no more of another substance or solution, chemical combination, etc.

SC: Specific conductance

SD: Standard deviation

Secondary: *See primary.*

Semivolatile organic compound: An organic compound with a saturation vapor pressure between 10^{-2} and 10^{-8} kPa at 25°C.

SFC: Supercritical-fluid chromatography

SI: Systeme Internationale

SIC: Standard Industrial Classification

Significant digits: All the nonzero digits of a number and the zeros that are included between them, or that are final zeros and signify accuracy.

Silt: Soil particles between 0.05 and 0.002 mm in diameter.

Site: An area or place within the jurisdiction of EPA and/or a state.

SITE: Superfund Innovative Technology Evaluation Program.

Slag: Fused agglomerate (usually high in silicates) that separates in melt smelting and floats on the surface of molten metal. Formed by combination of flux with gangue of ore, ash of fuel, and perhaps furnace lining. Slag is often the medium by means of which impurities may be separated from metal.

Smelter: A facility that melts or fuses ore, often with an accompanying chemical change, to separate its metal content. "Smelting" is the process involved.

Smelting: Heat treatment of an ore to separate the metallic portion with subsequent reduction.

Smog: Air pollution typically associated with oxidants. (*See: photochemical smog.*)

Smoke: Particles suspended in air after incomplete combustion.

SMOW: Standard mean ocean water. Used as a chemical and isotopic reference standard, for example in oxygen-isotope analysis.

Soil gas: Gaseous elements and compounds in the small spaces between particles of the earth and soil.

Solid: Matter in its most highly concentrated form, i.e., the atoms or molecules are much more closely packed than in gases or liquids and thus more resistant to deformation.

Solubility: Ability of a material (solute) to dissolve in a solvent at a specified temperature.

Solute: One or more substances dissolved in another substance, called the solvent; the solute is uniformly dispersed in the solvent in the form of either molecules (sugar) or ions (salt), the resulting mixture comprising a solution.

Solution: A liquid mixture of dissolved substances. In a solution it is impossible to see all the separate parts.

Solvent: A substance capable of dissolving another substance (solute) to form a uniformly dispersed mixture (solution) at the molecular- or ionic-size level.

SOP(s): Standard operating procedure(s)

Sorption: A general term used to encompass the processes of absorption, adsorption, ion exchange, and chemisorption.

Source: Any thing or place from which something comes, arises, or is obtained.

Specific conductance: Rapid method of estimating the dissolved solid content of a water supply by testing its capacity to carry an electrical current.

Specific gravity: The ratio of density of a substance to the density of a reference substance; it is an abstract number that is unrelated to any units.

Spectroscopic: Using or obtained by spectroscopy.

Spectroscopy: A branch of analytical chemistry devoted to identification of elements and elucidation of atomic and molecular structure by measurement of the radiant energy absorbed or emitted by a substance in any of the wavelengths of the electromagnetic spectrum in response to excitation by an external source.

Spectrum: The radiant energy emitted by a substance as a characteristic band of wavelengths by which it can be identified.

Sp.gr.: Specific gravity

Spring: Groundwater seeping out of the earth where the water table intersects the ground surface.

Spiked sample: *See matrix spike sample.*

SQL: Sample quantitation limit

Standard deviation: The measure of dispersion of a set of data. Specifically, given a set of measurements, x_1, x_2, \dots, x_n , the standard deviation is defined to be the sum of $1/(n-1) * (x_i - \bar{x})^2$ from 1 to n .

Standard operating procedures (SOPs): A written document which details an operation, analysis, or action whose mechanisms are thoroughly prescribed.

Standard pressure: 1 atm.

Standard temperature: 0°C.

STP: Standard temperature and pressure

Stressors: Physical, chemical, or biological entities that can induce adverse effects on ecosystems or humans.

Strong acid/base: *See acid, strong/weak; and base, strong/weak.*

Structural formula: *See chemical formula.*

s.u.: Standard units

Sublimation: The direct passage of a substance from solid to vapor without appearing in the intermediate (liquid) state.

Substance: Any chemical element or compound. All substances are characterized by a unique and identical constitution and are thus homogenous.

Substitution reaction: A chemical reaction in which one element or radical is replaced by another.

Sulfate: The salt of sulfuric acid, as in sodium sulfate.

Sulfide: A compound of an element or radical with sulfur.

Supercritical fluid: A dense gas that is maintained above its critical temperature (the temperature above which it cannot be liquefied by pressure).

Superfund: The program operated under the legislative authority of CERCLA and SARA that funds and carries out EPA solid waste emergency and long-term removal and remedial activities. These activities include establishing the National Priorities List, investigating sites for inclusion on the list, determining their priority, and conducting and/or supervising cleanup and other remedial actions.

Superfund Innovative Technology Evaluation Program: EPA program to promote development and use of innovative treatment and site characterization technologies in Superfund site cleanups.

Surface water: All water naturally open to the atmosphere (rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.)

SW-846: SW-846, also known as Solid Waste Test Methods, is provided by the U.S. Environmental Protection Agency (EPA) via the Office of Solid Waste. SW-846 contains the test methods for solid waste evaluation, physical and chemical.

Systematic error: A consistent deviation in the results of sampling and/or analytical processes from the expected or known value. Such error is caused by humans and methodological bias.

T

TCA: Trichloroethane

TCE: Trichloroethylene (trichloroethene)

TDS: Total dissolved solids.

Titrant: The reagent added in a titration.

Titrate: To *titrate* a sample, a chemical solution of known strength is added on a drop-by-drop basis until a certain color change, precipitate, or pH change in the sample is observed (end point). Titration is the process of adding the chemical reagent in increments until completion of the reaction, as signaled by the end point.

Titration: Any of a number of methods for determining volumetrically the concentration of a desired substance in solution by adding a standard solution of known volume and strength until the reaction is completed, usually as indicated by a change in color due to an indicator.

Titrimetric: Using or obtained by titration.

Glossary

Titrimetry: Technique which uses the amount of an analyte consumed by a reagent to quantify chemicals.

Total dissolved solids: The quantity of dissolved material in a given volume of water.

Total head: Sum of elevation head, pressure head, and velocity head of a liquid.

Total petroleum hydrocarbons (TPH): Measure of the concentration or mass of petroleum hydrocarbon constituent present in a given amount of soil or water.

TPH: Total petroleum hydrocarbons

Trip blank: A clean sample of matrix that is carried to the sampling site and transported to the laboratory for analysis without having been exposed to sampling procedures.

Troilite: A mineral, iron sulfide, FeS, occurring in meteorites.

U

Unconfined aquifer: An aquifer containing water that is not under pressure; the water level in a well is the same as the water table outside the well.

Unsaturated: The state in which not all the available valence bonds along the alkyl chain are satisfied; in such compounds the extra bonds usually form double or triple bonds (chiefly with carbon).

Unsaturated hydrocarbon: *See unsaturated.*

Unsaturated zone: The area above the water table where soil pores are not fully saturated, although some water may be present.

Upper detection limit: The largest concentration that an instrument can reliably detect.

USGS: United States Geological Service

UST: Underground storage tank

UV: Ultraviolet

V

Vadose zone: The zone between land surface and the water table within which moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. Soil pore space also typically contains air or other gases. The capillary fringe is included in the vadose zone.

Valence: A whole number that represents or denotes the combining power of one element with another.

Valence electrons: The electrons in the outermost shell of an atom determining chemical properties.

Van der Waals forces: Weak attractive forces acting between molecules.

Vapor: The gas given off by substances that are solids or liquids at ordinary atmospheric pressure and

temperatures.

Vapor density: Weight of a vapor per unit volume at any given temperature and pressure.

Vapor pressure (v.p.): The force per unit area exerted by a vapor in an equilibrium state with its pure solid, liquid, or solution at a given temperature. Vapor pressure is a measure of a substance's propensity to evaporate.

Variance: A measure of dispersion. It is the sum of the squares of the differences between the individual values and the arithmetic mean of the set, divided by one less than the number of values.

VC: Vinyl chloride

VOC: Volatile organic compound.

Volatile: Any substance that evaporates readily.

Volatile liquid: Liquids which easily vaporize or evaporate at room temperature.

Volatile organic compound (VOC): Any hydrocarbon, except methane and ethane, with vapor pressure equal to or greater than 0.1 mm Hg.

Volumetric titrimetry (titration): A means of measuring unknown concentrations of water quality indicators in a sample by determining the volume of titrant or liquid reagent needed to complete particular reactions.

VP: Vapor pressure

W

Waste piles: Non-containerized, lined or unlined accumulations of solid, nonflowing waste.

Water table (watertable): The level of groundwater.

Weak acid/base: *See acid, strong/weak; base, strong/weak.*

Weight: The force that gravitation exerts upon a body, equal to the mass of the body times the local acceleration of gravity.

Well: A bored, drilled, or driven shaft, or a dug hole whose depth is greater than the largest surface dimension and whose purpose is to reach underground water supplies or oil.

Wilting point: The point at which the water content of the soil becomes so low to prevent the permanent wilting of plants.

Wood treatment facility: An industrial facility that treats lumber and other wood products for outdoor use.