Glossary

Number

4-hydroxydiphenylamine (4-HDPA)
A transformation product of 6PPD. Visit USEPA's CompTox Dashboard for more information on this chemical.

6PPD-q
6PPD-quinone

A

Active sampling
The use of a pump to collect water or air for analysis.

Adduct
The chemical product resulting from a chemical or toxicant covalently bonding to a biological molecule, such as a protein or DNA. The adduct produced from this reaction can prevent a molecule from functioning properly.

Aliquots
A portion of a larger sample, often divided equally into smaller portions.

Anadromous
Descriptor for fish that hatch and spawn in fresh water but migrate to feed in marine ecosystems.

Antioxidant
A chemical that prevent or delay a material degradation from reaction with oxygen (oxidation).

Antiozonant
A chemical or material used to protect against degradation from ozone. For example, 6PPD is a chemical additive to tire rubber that functions as an antiozonant.

Apical outcome
An endpoint or effect that is observed in a whole organism. The exact definition of an apical outcome varies by source and discipline but generally includes endpoints or effects directly relating to survival, reproduction, development, growth, and behavior.

Asphalt rubber–asphaltic concrete friction courses (AR-ACFC)
Asphaltic concrete friction courses (ACFCs) are the final riding surface on highways, where superior skid resistance is needed. AR-ACFC is an asphalt-rubber version of ACFC, where crumb rubber is blended with the asphalt cement to form an asphalt-rubber binder.

Autosamplers
Pumping devices that are either programmed or remotely triggered to start sampling at timed or flow-controlled intervals.

B

Best management practices (BMPs)
Structural, vegetative, or managerial practices used to treat, prevent, or reduce water pollution.

Bioaccumulation
The accumulation of substances, such as pesticides, or other chemicals in an organism. Bioaccumulation occurs when an organism absorbs a toxic substance at a rate greater than the rate at which the substance is lost.

Bioavailability
The amount of a chemical that is taken up by an organism from the environment and available to cause a biological response.

Bioconcentration factor (BCF)
The accumulation of a water-borne chemical in an organism that is exposed to the water. BCF is calculated as the ratio of the chemical concentration in the organism to the chemical concentration in the surrounding aquatic environment.

Bioretention
The use of chemical, biological, and physical properties of plants, microbes, and soil to improve water quality by removing pollutants during stormwater detention.

Biosolids
Also known as sewage sludge, biosolids are a semi-solid material that remains following wastewater treatment. Biosolids are often applied to land as nutrient rich fertilizer, with or without chemical and physical treatment prior to land application.

Blood–brain barrier
The properties of blood vessels that tightly regulate the movement of molecules, ions, and cells between circulating blood and the central nervous system. Relative to the permeabilities of capillaries and veins in other parts of the body, the blood–brain barrier is uniquely selective.

C

Carcinogenicity
The ability to cause cancer.

Cleanup level
A parameter-specific concentration or other regulatory limit that is considered protective of human health and the environment.

Coarse particulate matter
Inhalable particles with diameters between 2.5 and 10 micrometers, also referred to as PM_{10}. Coarse particulate matter is typically a mixture of solid particles and liquid droplets found suspended in air.

Co-benefits
Multiple positive outcomes or synergies that arise as the result of an environmental action or policy. For example, reducing particulate emissions of TRWP improves air quality and reduces the source mass of 6PPD to soil and surface water.

Column tests
Laboratory studies that measure contaminant removal from water or air passing through a porous media. For stormwater treatment, the results of these tests can be used to quantify hydraulic parameters (such as hydraulic conductivity) and treatment effectiveness (such as contaminant removal rates and capacity) during the design or evaluation of full-scale systems.

Combined sewer systems
Hydraulic structures and pipe networks that collect and convey both sewage and stormwater to a wastewater treatment plant. Most combined sewer systems allow combined sewage overflow to discharge to a receiving water body with minimal or no treatment during large storm events to protect the treatment works.

Contaminant of emerging concern (CEC)
A substance or microorganism, including physical, chemical, biological, or radiological materials known or anticipated in the environment, that may pose newly identified risks to human health or the environment. For more information, visit the ITRC CEC Team website.

Critical habitat

As defined by the Endangered Species Act, critical habitats are areas that contain physical or biological features that are essential to the conservation of the species. These habitats may require special management considerations or protection.

Crumb rubber
Tire rubber that is ground to between particle sizes ranging between 1.5 and 6.5 mm, with the steel and fibers removed. One use of crumb rubber is as a cushioning infill on artificial turf playing fields (NYSDOH 2018).

Cryo-milled tire tread (CMTT)
Particles generated from cutting strips of tire tread into small pieces that are subsequently frozen, hammer-milled (to break the strips into small fragments), and sieved. The Tire Industry Project developed the protocol for consistent production.

D

D5-6PPD-q
Internal standard used in the laboratory for quantification of 6PPD-q concentrations.

Degradants
Chemicals formed during the chemical degradation process.

E

EC_{10}
A statistically derived concentration of a substance at which an effect is expected in 10% of test subjects following exposure.

EC_{50}
The median effect concentration, which is a statistically derived concentration of a substance that is expected to result in an effect in 50% of test organisms following exposure.

Ecosystem services
The direct and indirect benefits that ecosystems provide to humans.

Enantiomer
A chemical that has two configurations, denoted with the prefixes *R*– and *S*-, that are mirror images of one another. Enantiomers have the same chemical formula and sequence of bonded atoms but exist in left- and right-handed orientations that cannot be superimposed over one another.

Enantioselective
A phenomenon or effect that is different between the enantiomer of a given chemical. For example, *R*-6PPD-q and *S*-6PPD-q share similar physicochemical properties but differ in their toxicities (Di et al. 2022).

Endothelial permeability
The ability or extent that blood vessels leak blood contents into surrounding tissues. Endothelial permeability is an essential property that facilitates normal vascularization of organs and tissues, but alterations to this process may indicate or result in disease.

Essential Fish Habitat (EFH)
EFH is defined by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) as habitat necessary for to fish spawn, breed, feed or grow to maturity. These areas are designated for all federally managed fishes, but are distinct from 'critical habitat', which is only for species protected by the Endangered Species Act.

Essential Fish Habitat (EFH) consultation
Collaborative effort between NOAA Fisheries and other federal agencies on best practices to minimize environmental damage to fish habitat during coastal development.

F

Fine particulate matter
Inhalable particles with a diameter of 2.5 micrometers or less, also referred to as $PM_{2.5}$.

Finished drinking water
Water that has been completely treated in a treatment plant and is ready for distribution to and use by consumers but has not entered the water distribution system.

G

Geographic information systems (GIS)
The people, hardware, software, and data necessary to display and manage information about places, analyze spatial relationships and model spatial processes. GIS integrates geospatial data with descriptive information to help users understand patterns, relationships, and geographic context.

Grab sample or grab sampling
Collection of a discrete sample over a short time interval from a single location.

H

Habitat Areas of Particular Concern
A subset of essential fish habitats that are high priority areas for conservation, management, and research.

Half-life
The amount of time for a substance's concentration to decrease by 50%.

Hematocrit
The volume percentage of red blood cells in blood. Hematocrit depends on the number and size of red blood cells.

High-performance bioretention soil mixes (HPBSM)
Engineered soil layer for bioretention BMP designs in Washington State that is designed to achieve specific runoff treatment performance goals.

Hydrologic unit
A hierarchical system to delineate watersheds in the United States based on surface hydrologic features.

K

Keystone species
An organism (plant, animal, bacteria, or fungi) that is critical to the survival or other functions of organisms in an ecosystem.

K-rail barriers
Solid structure adjacent to a roadway. K-rail barriers, also referred to as Jersey barriers, are typically made of precast concrete or molded plastic.

L

LC_{50}
Median lethal concentration, which is a statistically derived concentration of a substance (in air or water) that is expected to result in the death of 50% of test organisms following exposure.

LD_{50}
Median lethal dose, which is a statistically derived dose of a substance that is expected to result in the death of 50% of test organisms following administration of the substance.

Lignin
A plant-based polymer with potential for use as a replacement tire anti-degradant.

M

Media filter
A treatment process that uses one or more layers of sand, peat, shredded tires, foam, crushed glass, geo-textile fabric, anthracite, crushed granite, or other material to remove specific types and sizes of particles from influent water, resulting in effective and efficient contaminant removal.

Metabolites
Byproducts (either intermediates or end products) formed by biological processes.

Migration rate
The speed at which a chemical travels through a specific substance.

Mucociliary action
A bodily function that protects the lungs from harmful substances by capturing airborne particulate matter and microorganisms in mucus and other fluids prior to removal from airways.

Municipal separate stormwater system (MS4)
A conveyance or system of conveyances that is owned by a state, city, town, village, or other public entity and is designed or used to collect or convey stormwater for discharge to waters of the United States. The conveyances in an MS4 system typically include features such as storm drains, pipes, and ditches. MS4s do not include combined sewers, sewage treatment

plants, or publicly owned treatment works.

N

Nominal
The assumed amount or concentration of a substance that is expected to be in an exposure medium. It is often based on a calculated dilution of a stock solution.

Nonpneumatic tires
Tires that are manufactured with a flexible, spoke-like structure on the inside of a rubber tread to fulfill the role of pressurized air in conventional tires.

No-observed-effect concentration (NOEC)
The highest concentration at which no effect was observed in test subjects.

O

Octanol-water coefficient (K_{ow})
The unitless ratio of a chemical concentration in 1-octanol (C_O) and water (C_W) in an octanol-water system at chemical equilibrium. Mathematically, $K_{ow} = C_O/C_W$.

Overburdened communities
As defined by Washington State in Provisional Community Engagement Plan for HEAL Act Implementation (2023), overburdened communities are “a geographic area where vulnerable populations face combined, multiple environmental harms and health impacts”.

Oxidative stress
A process that damages critical molecules such as deoxyribonucleic acid (DNA), proteins, and lipids, with the potential for other adverse molecular effects.

P

Particulate matter (PM)
A mixture of solid particles and liquid droplets found in the air.

Passive sampler or passive sampling
A device or technique that uses a non-powered device or biological organism to allow measurement of chemical concentrations in environmental media. Passive sampling allows chemical molecules to freely flow over time from the sampled medium to a receiving phase until equilibrium is achieved. For more information, visit the ITRC Passive Sampling Team Website.

Permeable pavement
Hard surfacing that allows rain, snow melt, or surface runoff to pass through and infiltrate into the ground below. Some types of permeable pavement temporarily retain infiltrating water in a reservoir that slowly drains into underlying layers and soil. Permeable pavement is a type of green infrastructure that is an alternative to traditional (low permeability) concrete and asphalt.

Phylogenetic
Relating to the evolutionary development and diversification of a species or group of organisms, or a particular feature of a single organism.

Physicochemical characteristics
Physical and chemical properties of a substance, which include molecular properties (such as molecular weight, and chemical structure) and bulk properties (such as solubility, partitioning coefficients, and volatility).

$PM_{0.1}$
Inhalable particles with a diameter less than 0.1 micrometers, also referred to as ultrafine particulate matter.

PM_{10}
Inhalable particles with a diameter between 2.5 and 10 micrometers, also referred to as coarse particulate matter. PM_{10} is

typically a mixture of solid particles and liquid droplets found suspended in air.

$PM_{2.5}$
Inhalable particles with a diameter of 2.5 micrometers or less, also referred to as fine particulate matter.

Point of entry
Location where a water supply line enters a building or other extraction point on a consumer's property, but before water is conveyed within the consumer's water supply pipes, tanks, or on-site treatment/conditioning systems.

Point of use
Location of water consumption and use, such as a tap, spigot, or faucet.

Pollution prevention
Actions taken to stop a pollutant from entering the environment or from reaching sensitive receptors.

Q

Quinones
Organic compounds that contain two carbonyl groups either in ortho (adjacent) or para (opposite) positions on a six-membered unsaturated ring or, in some cases, on different rings.

R

Racemate
A chemical mixture containing equal amounts of two enantiomers.

Read-across
A technique that uses data from a similar substance to predict toxicity for chemical that is not well investigated or understood.

Receptors
A person, plant, animal, habitat, or ecosystem potentially impacted by exposure to a chemical or other contaminant.

Remediation
The act or process of abating, cleaning up, containing, or removing a substance (usually hazardous or infectious) from the environment.

Road component
The non-tire debris portion of TRWP, which can include asphalt or concrete particles, brake-wear particles, and other debris released from cars.

Rubber modified asphalt (RMA)
A mixture of ground rubber from scrap tires and asphalt.

S

Salmonids
A family of ray finned fish that includes salmon, trout, char, grayling, and freshwater whitefish (in North America) and taimen and lenoks (in Eurasia).

Sediment
A solid material that is moved and deposited in the bottom of a waterbody.

Sensitization
A chemical or agent that causes or elicits an allergic response in animals or humans. There are two types of sensitization: skin or respiratory. A skin sensitizer will elicit an allergic response following skin or dermal contact. A respiratory sensitizer will induce hypersensitivity of the airways following inhalation of the chemical or agent.

Source control
Reducing or removing the pollutant from its origin rather than treating or removing it after release.

Source water

One or more bodies of water (e.g., rivers, streams, lakes, reservoirs, springs, and ground water) that provide water for consumption or use.

Specific surface area
Total surface area per unit mass.

Stormwater
Water originating from rain or snow melt that is routed to surface water by storm sewers, combined sewers, channels, or other engineered structures.

Stormwater control measures (SCMs)
Structural devices or techniques that slow the flow of runoff and remove pollutants. Some entities refer to SCMs as BMPs.

Surface runoff
Unconfined water flowing over land.

Surface water
Any aboveground water body, such as streams, rivers, lakes, wetlands, reservoirs, creeks, estuaries, and oceans.

T

Tire- and road-wear particle (TRWP)
TRWP are heterogeneous particles generated at the interface of the tire and road surface during driving.

Tire particles
Within this document, tire particles is used as an all-encompassing, generic term for particles generated from vehicle tires on both roads and in laboratory settings. The terminology surrounding tire particles continues to evolve, which leads to inconsistency in published literature on this topic.

Tire rubber
The polymer matrix of rubber in a tire that contains both natural rubber and synthetic polymers (butadiene rubber and styrene butadiene rubber). Tire rubber may also contain halobutyl rubber to help keep tires inflated.

Tire wear particles (TWP)
Within this document, TWP refers to the tire component of the tire and road wear particles (TRWP). These are generated from friction between the tire and a road during driving, braking, and turning. TWP are very unlikely to be found in the environment without the road-component.

Toxicokinetic
The absorption, distribution, metabolism, and excretion (ADME) of toxic substances.

Transformation products
A chemical created from metabolic, chemical, or environmental processes acting on a different (parent) compound.

Treatment facility
A series of devices and structures that treat wastewater, industrial wastes, and sludge. Treatment means any process that alters water quality to make it appropriate for a specific end use.

Trophic levels
The position of a species (or in some cases, types of species with similar feeding habitats) within a food chain or food web.

U

Ultrafine particulate matter
Inhalable particles with a diameter less than 0.1 micrometers, also referred to $PM_{0.1}$.

Urban runoff
Water from rain, melting snow, or outdoor-water-use that drains from impervious surfaces (roads, parking lots, roofs, etc.) and does not soak into the ground. Urban runoff may flow directly into water bodies or can be captured by stormwater infrastructure that may or may not include treatment prior to discharge. Urban runoff contains mixture of chemicals and contaminants.

Urban runoff mortality syndrome (URMS)
A phenomenon observed in lowland streams in the Puget Sound region of the Pacific Northwest where adult coho salmon die after returning to freshwater streams and before spawning.

Urban stream syndrome
The degradation of water quality and associated aquatic ecosystems in streams that receive urban runoff.

V

Vehicle miles traveled
The total distance of travel for all vehicles over a given time period (typically one year) in a specific geographic area.

Vulcanization
A chemical process used to harden rubbers via polymer cross-linking. Most commonly, vulcanization refers to the process of heating natural rubber in the presence of sulfur or other agents, but this term can also include processes for hardening synthetic rubbers.

Vulnerable populations
Groups of people that are more likely to be at higher risk for poor health outcomes in response to environmental harms, which can include, but are not limited to, racial or ethnic minorities, low-income populations, populations disproportionately impacted by environmental harms, and populations of workers experiencing environmental harms. (Source: Provisional Community Engagement Plan for HEAL Act Implementation, 2023).