

Glossary

Aeration

Incorporation of air into liquid or solid material by exposure (passive), mixing, agitation, chemical means or direct injection with the aim of transferring oxygen to the material.

Aerobe

An organism that can grow in the presence of air.

Anaerobe

An organism that can grow in the absence of oxygen or air.

Anaerobic respiration

Use of inorganic electron acceptors, other than oxygen, as terminal electron acceptors for energy yielding oxidative metabolism. Examples include nitrate respiration.

Asbestos

The fibrous varieties of a number of silicate materials used as fabrics for heat and electrical insulation and fire-proof fabrics, as a binder in asbestos cement building materials, and in filtration. Inhalation of certain asbestos fibres can cause asbestosis, a lung disease, which is frequently fatal.

Assessment endpoint

Explicit expressions of the environmental value that is to be protected. Assessment endpoints should be defined in terms of the valued ecological entity (species, ecological resource or habitat type) and a characteristic of the entity to protect, e.g. reproductive success.

Attenuation

Reduction in contaminant concentration, availability or toxicity through biological, chemical and physical processes.

Bioaccessibility/ Bioavailability

Bioaccessibility is the fraction of a substance that is available for absorption by an organism. Bioavailability is the fraction of a substance that can be absorbed by the body through the gastrointestinal system, the pulmonary system and the skin. By its definition, bioavailability also includes the process of bioaccessibility.

Bioaccumulation

Accumulation of environmental contaminant, such as heavy metals, within the cells of living organisms.

Bioassay

Biological tests using specific organisms to quantify the toxicity of contaminated soil and water samples.

Bioaugmentation

Addition of specifically prepared cultures of organisms to carry out specific functions such as biodegradation, in the environment.

Biodegradation

Decomposition of a compound into smaller chemical sub units through the action of organisms, typically micro-organisms (bacteria, fungi and actinomycetes).

Bioindicators

Multiple measures of organism health to environmental stressors, which include several levels of biological organisation and timescales of response. Because organisms are subjected to a variety of stressors in their environment, multiple measures of health are needed to help identify and separate the effects of man-induced stressors (such as contaminants) from the effects of natural stressors (such as food and habitat availability).

Biological contamination

Contamination of soil or groundwater with bacteria, viruses and fungi as opposed to chemical or radiological contamination.

Bioremediation

The elimination, attenuation or transformation of polluting or contaminating substances by the use of biological processes, to minimise the risk to human health and the environment.

Biological remediation techniques

Remedial techniques that rely on processes carried out by living organisms or occurring due to the activity of organisms, such as degradation, transformation, sorption, accumulation or solubilisation. Established biological remediation methods include landfarming, biopiling, biosparging and bioventing.

Biosensor

Analytical device containing a biological material that acts as a sensing element. When exposed to a contaminant, the sensing element generates an information-linked response, which can be obtained via a suitable transducer.

Bioslurping

Simultaneous withdrawal of non-aqueous phase liquid (NAPL), groundwater and/or soil gas from the groundwater layer using a single pump.

Biosparging

Injecting a gas (usually air) under pressure into the saturated zone to provide oxygen (or an alternate electron acceptor) to facilitate microbial degradation of contaminants in groundwater and saturated soil.

Biostimulation

Addition of nutrients, oxygen and/or water to stimulate micro-organisms in contaminated soils, to enhance biological processes.

Biotransformation

Conversion of a contaminant to a less toxic and/or less mobile form.

Bioventing

The process of supplying oxygen in situ to oxygen deprived soil micro-organisms by forcing air through unsaturated contaminated soil at low flow rates. This stimulates biodegradation and minimises stripping volatiles into the atmosphere.

Brownfield sites

Any land that has been previously developed or requires work to be carried out to it to bring it into use.

Building structures and services

Aspects that could be affected by contamination including concrete and metal structures such as foundations and underground services such as plastic potable water pipes.

Capping/ containment/ cover systems

Engineering based remedial techniques used to block contamination pathways through horizontal or vertical containment of sources.

Chemical analysis

Laboratory analysis of soil and water samples to determine concentrations of contaminants present.

Chemical contamination

Contamination of soil or groundwater with chemical contaminants, including inorganic and organic substances, as opposed to biological or radiological contamination.

Chemical remediation techniques

Remedial techniques that breakdown or stabilise toxic compounds by using one or more types of chemical reaction.

Chlorinated solvents

Chlorinated hydrocarbons used in applications such as metal degreasing and dry-cleaning.

Chronic effect

An adverse effect on a human or animal in which symptoms recur frequently or develop slowly over a long period.

Combustible materials

Materials present in the ground capable of igniting and burning easily, such as coal residues, with a high calorific value.

Co-metabolism

A process in which a compound is fortuitously degraded by an enzyme or co-factor produced during microbial metabolism of another compound.

Conceptual model

A textual or graphical representation of the relationship(s) between contaminant source(s), pathway(s) and receptor(s) developed on the basis of hazard identification, and refined during subsequent phases of assessment.

Contaminant

See Source.

Contaminated land

Any land that appears to the local authority in whose area it is situated to be of in such a condition, by reason of substances in, on or under the land, that:

- a) Significant harm is being caused, or there is a significant possibility of such harm being caused or
- b) Pollution of controlled waters is being, or is likely to be, caused (EPA 1990; Section 78[2]).

Contaminated site

Any site that, as a result of activities either previously or currently carried out on it, contains concentrations of substances or pathogens high enough to be a hazard to health or the environment either in the current use of the site or if it is used for a different purpose (Royal Commission on Environmental Pollution, 1996, Sustainable use of soil, 19th report).

Controlled waters

All fresh and saline natural waters up to the UK offshore territorial limit, including rivers, streams, lochs, estuaries, coastal waters and groundwater. The statutory definition of controlled waters is given in the Water Resources Act 1991, s 104(1) and the Control of Pollution Act 1974, s 30A(d).

Derelict land

Land so damaged by industrial or other development that it is incapable of beneficial use without treatment.

Desk study

Interpretation of historical, archival and current information to establish where previous activities of the land were located, and where areas or zones containing distinct and different types of soil contamination can be expected to occur, and to understand the environmental setting of the site in terms of pathways and receptors.

Detailed investigation

Main on-site investigation involving sampling and analysis to characterise ground conditions for a specified purpose; may be undertaken as a single stage or as several successive stages.

Discharge consent

Authorisation issues by the regulatory authorities (Environment Agency, Scottish Environment Protection Agency, Environment and Heritage Service Northern Ireland) permitting discharge or effluent into controlled waters to prevent pollution.

Ecological risk assessment

Qualitative and/or quantitative analysis of the actual or potential effects of contamination on ecological receptors other than humans and domesticated species.

Ecosystem

A living entity of populations co-existing as a unit, with the capacity to interact with one another and their physical and chemical environments.

Ecotoxicity

Aspects relating to substances which are dangerous to the environment, being toxic or harmful to organisms or with the potential to cause long term effects in the environment.

Ecotoxicology

The study of the toxic effects of agents on living organisms.

Effect endpoint

Measurable biological response to a stressor that can be related qualitatively or quantitatively to the characteristic chosen as the assessment endpoint.

Electron acceptor

Compound that is reduced in a metabolic redox reaction.

Endpoint

See assessment or effect endpoints.

Exploratory investigation

Preliminary limited intrusive investigation/analytical work of a site, to provide preliminary information on the condition of the land.

Explosive ordnance

Munitions, weapons delivery systems or other items containing explosives or propellants.

Exposure

Concentration or amount of an agent that reaches a specified receptor or component of the receptor (e.g. organ, tissue or cell).

Ex situ

Approaches are applied to excavated soil and/or extracted groundwater.

Fate and transport

Study of the properties of contaminants affecting mobility and stability in the environment.

Field testing

Sampling and testing methods used during site investigations as opposed to the laboratory.

Financial risk

Combination of the likelihood of a financial loss or gain occurring and its magnitude. Risk may have positive or negative outcomes and reflects a deviation from a company's expected costs, income or asset value.

Flora and fauna

Plants and animals including livestock (agricultural and game species), crops and plants used for landscape and amenity.

Free product

A petroleum hydrocarbon in the liquid, free or non-aqueous phase

Fuel stations

Retail sites used for the sale of petroleum products such as petrol, diesel or LPG.

Greenfield site

An area previously undeveloped and therefore undisturbed with a predominantly consistent subsurface.

Ground improvement/ piling

Ground improvement techniques are used to improve the geotechnical properties of strata. Piling is used in foundation engineering to transfer loads from soft strata to competent strata or rock.

Groundwater/ hydrogeology

Water associated with soil or rock layers below ground level in the saturated zone. Hydrogeology is the study of water in underground strata.

Guideline Values/ SGVs

Generic criteria for concentrations of contaminants designed to be protective of specified receptors in a range of conditions. Soil Guideline Values (SGVs) relate to chronic risks to human health and are derived from the CLEA model for various land use scenarios.

Harm

Adverse effects on the health of living organisms or other interference with the ecological systems of which they form a part. In the case of humans the definition includes harm to property.

Hazard

A substance, feature or situation that has the potential to cause harm, either directly or indirectly, to the environment, including humans (construction workers and site users and occupiers), soil, water, air, flora and fauna, buildings and commercial assets. They may be chemical, biological or physical.

Hazard assessment

A conceptual stage of risk assessment concerned with assessing the degree of hazard associated with a particular site or group of sites.

Hazard identification

An initial conceptual stage of risk assessment concerned with identifying and characterising the hazards that may be associated with a particular site or group of sites.

Headspace

The vapour mixture trapped above a solid or liquid in a sealed vessel.

Human health

Aspects relating to toxic or harmful effects of contaminants on humans.

Hyperaccumulation

For some plants accumulation of metals appears to be an active process possibly related to a tolerance mechanism for their survival on contaminated sites. For such plants leaf concentrations of heavy metals can reach high levels (for example around 1% for zinc or manganese, and 0.1% for cadmium, on a dry matter basis). In Europe these plants tend to be members of the Brassicaceae and are generally found on "naturally" contaminated soils, such as serpentine soils. These plants are referred to as "hyperaccumulators" to distinguish the

nature of their metal accumulation from passive accumulation processes taking place in say SRC.

Indicator species

Species that can be used as an early indicator of environmental degradation to a community or an ecosystem (see bioindicator).

In situ

Unexcavated, remaining in the subsurface.

Inspection strategies

Strategic approach to be taken by local authorities for inspection of their areas for potentially contaminated land as required under Part IIA.

Intrusive investigation

Investigations involving below ground works to obtain data on the nature (physical and chemical) of soil, groundwater and soil gas conditions through monitoring and sampling.

Integrated Pollution Prevention & Control (IPPC)/ Integrated Pollution Control (IPC)

Pollution prevention regime relating to permitting of process industries, mobile plant and waste management sites. Includes requirement for no deterioration in land quality.

Landfill gas/ soil gas

Elevated concentrations of methane, carbon dioxide or trace constituents in gas derived from degradation of putrescible matter or fill materials.

Leachate

Liquid that has percolated through solid waste and has extracted, dissolved or suspended materials from it.

Made ground

Material artificially in place comprising a wide range of materials, such as concrete, tarmacadam, brick materials.

Metabolic by-product

A product of the biologically mediated reaction between an electron donor and an electron acceptor. Metabolic by-products include volatile fatty acids, daughter products of chlorinated aliphatic hydrocarbons, methane and chloride.

Micro-organisms

Includes bacteria, fungi, protozoa and viruses.

Mineralisation

The breakdown of organic matter to inorganic materials (such as carbon dioxide and water) by micro-organisms.

Military sites

Sites used currently or historically by the armed forces principally associated with the Ministry of Defence (MoD).

Mining sites

Sites used for the extraction of coal, ore or superficial deposits through open cast methods, shafts or quarrying activities.

Mobile plant licence

Waste management licence issued under Section 35(1) of the Environmental Protection Act 1990 authorising the treatment or disposal of specified waste by specified plant.

Monitored natural attenuation (MNA)

Monitoring of soils or groundwater to confirm whether natural attenuation processes (see natural attenuation) are acting at a sufficient rate to ensure that the wider environment is unaffected and that remedial objectives will be achieved within a reasonable timescale.

Monitoring

Regular field measurements of parameters such as soil gas concentrations, groundwater characteristics, noise, air quality or the progress of remedial works.

Natural attenuation

Used to describe naturally occurring processes, such as dilution, dispersion or degradation, that may reduce the risks associated with contamination.

Non-intrusive investigation

An investigation that uses field-based methods such as geophysics to obtain data relating to a site rather than excavations (e.g. trial pits, boreholes).

On-site techniques

These take place on the contaminated site, and may be ex situ or in situ.

Part IIA

Part IIA of the Environmental Protection Act 1990, which relates to the identification and remediation of contaminated land.

Pathway

The means by which a hazardous substance or agent comes into contact with a receptor (e.g. river or soil pipe).

Permeable reactive barrier (PRB)

A PRB is an engineered treatment zone of reactive material(s) that is placed in the subsurface to remediate contaminated fluids as they flow through it.

Petroleum hydrocarbons

Organic contaminants derived from crude oil containing carbon and hydrogen only, including aliphatic (straight chain or saturated cyclic compounds) and aromatic compounds (containing one or more benzene rings).

Physical remediation techniques

Remedial techniques that separate contaminants from the soil matrix by exploiting physical differences between the soil and contaminant (e.g. volatility, behaviour in electric fields) or between contaminated and uncontaminated soil particles (e.g. density).

Phytodegradation

A process in which plants are able to degrade organic pollutants through metabolic processes.

Phytoextraction

Use of plants to remove contaminants, such as metals, that they have accumulated from the environment, especially soil.

Phytoremediation

The use of plants for in situ risk reduction for contaminated soil, sludges, sediments and groundwater, through contaminant removal, degradation, or containment.

Phytostabilisation

Use of soil amendments and plants to reduce bioavailability and offsite migration of contaminants.

Phytostimulation

Stimulation of microbial biodegradation of contaminants (organics) in the root zone, e.g.: via protecting and supporting microbial communities; by soil aeration as a result of root growth; and by transport of water to the area.

Planning Policy Guidance Notes (PPG)

Documents embodying government guidance on general and specific aspects of planning policy to be taken into account in formulating development plan policies and in making planning decisions.

Plant

Equipment or machinery used in an industrial process, factory or other industrial premise (Environment Agency Guidance on the application of WML to remediation, V2.0, 2001).

Pollutant linkage

The relationship between a contaminant (source), a pathway and a receptor.

Potentially contaminated land sites

Sites identified (while undertaking desk studies/site investigations) as being, or having been, subject to a land use that may give rise to contamination.

Qualitative Risk Assessment

The evaluation of risk associated with potential source-pathway-receptor linkages by consideration of the hazard severity combined with the probability of occurrence expressed using non-numerical terminology (e.g. high, medium, low).

Quantitative Risk Assessment

The estimation of risk based on modelling of contaminant fate and transport and exposure assessment using site-specific criteria and expressed using numerical terminology (e.g. increased risk of 1 in 105).

Radiological contamination

Contamination of soil or groundwater with radionuclides as opposed to chemical or biological contaminants.

Radionuclide

Radioactive particle, man-made (anthropogenic) or natural, with a distinct atomic number.

Ramsar site

Wetland of international importance, especially as a waterfowl habitat. Designated under the Ramsar Convention on Wetlands of Importance 1971 (Ramsar Convention), which places general and special obligations on contracting parties relating to the conservation of wetlands throughout their territory.

Receptor

The entity (for example, humans, animals, water, vegetation, buildings) that is vulnerable to the adverse effects of a hazardous substance or agent.

Redevelopment

New construction or conversion, usually by the private sector but often with public sector support or participation, of previously developed land and/or buildings.

Remedial action

Action taken to mitigate or reduce defined unacceptable risks. Remedial treatment and remedial works are specific examples of remedial action.

Remedial options

Options for mitigating or reducing defined unacceptable risks.

Residual contamination

Amount or concentration of contaminants remaining in specific media following remediation.

Risk

The probability that an adverse effect will occur under defined conditions.

Risk assessment

The process of assessing the hazards and risks associated with a particular site or group of sites.

Risk estimation

A conceptual stage of risk assessment, concerned with estimating the likelihood that an adverse effect will result from exposure (of the receptor) to the hazardous substance or agent.

Risk evaluation

A conceptual stage of risk assessment (generally following risk estimation) concerned with evaluating the acceptability of estimated risks, taking into account:

The nature and scale of risk estimates,

Any uncertainties associated with the assessment and

The broad costs and benefits of taking action to mitigate the risks.

Risk management

The process whereby decisions are made to accept a known or assessed risk and/or the implementation of mitigating action to reduce the risk (the consequences and/ or probability of occurrence) to an acceptably low level.

Sampling strategies

The sampling plan for an intrusive investigation covering aspects such as the sampling methods to be used, number of sampling points, sampling locations, and the depth and type of samples to be taken.

Site licence

Waste management licence issued under Section 35(1) of the Environmental Protection Act 1990 authorising the deposit, disposal, treatment, or keeping of specified waste on specified land.

Site reconnaissance/ walkover survey

A site walkover survey to inspect the land, its use, layout and condition.

Soil contamination

Contamination of soils rather than contamination relating to waters or gas.

Solidification/ stabilisation

Remedial techniques that reduce the mobility of contaminants in soils. Solidification reduces the physical accessibility of contaminants by encapsulating them in a monolithic solid of high structural integrity; stabilisation reduces the chemical availability of contaminants.

Source

A hazardous substance or agent that is capable of causing harm. For pollutant linkages, the source is termed a contaminant.

Special Sites

A site where the contamination is such that the Environment Agency has become the enforcing authority for the purposes of Part IIA of the Environmental Protection Act 1990.

Stakeholder

Any individual, group or organisation that may affect, or be affected by, or perceive itself to be affected by risk.

Statutory consultee

National public organisations/bodies that need to be consulted on planning applications, depending on the nature of the development and its location.

Surface waters/ hydrology

Water present above ground associated with freshwater resources, i.e. rivers, streams and lakes. Hydrology is the study of the distribution, conservation and use of water.

Supplementary investigation

Investigation carried out subsequent to a detailed investigation for the purpose of refining risk estimation, to assist in the selection of an appropriate remedial strategy, or for detailed (remedial) design purposes.

Thermal remediation techniques

Remedial techniques that use elevated temperatures to reduce or remove contaminants.

Toxicity

The adverse effects to a living organism an agent has an inherent capacity or potential to cause. The result may be death, damage to structure or loss of function. See also acute toxicity.

Toxic metals/ semi-metals

Metals and semi-metals likely to be present on many contaminated sites and likely to be pose a risk to human health above certain concentrations as defined in the Environment Agency's R&D publication CLR8. Examples include cadmium, chromium, lead, mercury, arsenic and selenium.

Toxicology

The study of the toxic effects of substances on human health and ecosystems.

Trade effluent discharge

Permit/authorisation issued by the sewerage undertaker (England & Wales) or water authority (Scotland) allowing discharge of trade effluent to public sewer.

Vacant land

Land that was previously developed and is now vacant that could be developed without treatment.

Vadose zone

Unsaturated zone of soil above the groundwater, extending from the bottom of the capillary fringe to the soil surface.

Validation/ Verification

Validation is confirmation of the likely performance of a particular remedial approach, for example supporting evidence of verified performance on other sites. Verification is confirmation that predicted levels of performance have been achieved, for example that a particular level of risk management for a site has taken place.

Volatilisation

The conversion of a chemical substance from a liquid or solid state to a gaseous or vapour state by the application of heat, by reducing pressure, or by a combination of these processes.

Warranty

An express or implied statement forming part of a contract that a particular state of affairs exists.

Waste

Any substance or object which the producer or the person in possession of it discards or intends or is required to discard. (A producer is anyone whose activities produce waste or who carries out pre-processing, mixing or other operations resulting in a change in its nature or composition).

Taken from CIRIA publications and other documents referenced on this web-site:

C545 Land contamination – management of financial risk

C552 Contaminated land risk assessment – a guide to risk assessment

C575 Biological methods for assessment and remediation of contaminated land

C578 Brownfields – managing the development of previously developed land – a clients' guide

C588 Non-biological methods for assessment and remediation of contaminated land – case studies