

Table I-9.1. Major contaminants fate and transport pathways.

PROCESS	DESCRIPTION	PHASE	MECHANISM	EFFECT	EXAMPLE	INFLUENCING FACTORS (samples)
Advection	Turbulent transport	A,G	M	T _P	Simple transport down concentration gradients	porosity, transmissivity, permeability, hydraulic conductivity, tortuosity of flowpaths. concentration gradients
Dispersion	Movement away from the source	A,G	M	T _P		
Diffusion	Migration due to the existence of concentration gradients	A,G,S	M	T _P		
Separation into immiscible phases	Separation into unique liquid phases of different density and viscosity. These phases are not readily mixed	A	C	R	Formation of separate BTEX liquid/gas phases	solubility, polarity, octanol/water partition coefficient, organic carbon partition coefficient, density, dynamic viscosity
Density Stratification	Formation of distinct, vertically defined layers due to differing specific gravities and properties	A	P	R,iM	Formation of LNAPL layer floating on aquifer	density
Migration along preferential flowpaths.	Migration of gas and liquid at increased velocity through large (relatively), interconnected subsurface channels and openings	A,G	M	iM	Flow through fractures or other subsurface conduits (such as utilities)	porosity (secondary), existence of subsurface conduits
Sedimentation	Settling of heavier compounds	S	C,M,P (b)	R	Deposition of heavier petroleum fractions after an oceanic spill	density, mass, dynamic viscosity, carrier fluid velocity, turbulence
Filtration	Physical retention by a solid network	S	C,M,P (b)	DM	Chemical sequestration in soil micropores too small for the molecule to exit from	particle size, surface charge, polarity
Volatilization	Phase transition from the solid or liquid state to vapor	A G	P	iM	Escape of benzene into the free, soil gas phase	vapor pressure, concentration, solubility, temperature
Photolysis/photooxidation	Reaction catalyzed by solar radiation	G	P	Tf,D	Reaction of MTBE with hydroxyl radical after escape through ground surface	concentration of free radicals, insolation
Co-solvation (dissolution)	Attraction of water molecule shell	A	C	iM	Formation of hydrated aluminum	pH, temperature, solubility, solution ionic strength (conductance), catalytic action, water activity
Hydrolysis	Chemical reaction of water molecules with contaminants	A	C	V	Formation of aluminum hydroxide	pH, temperature, solubility, solution ionic strength (conductance), water activity
Ionization	Separation of ionic compounds into separate cationic and anionic constituents as a result of complete co-solvation	A	C	V	Dissolution of halite into cationic sodium and anionic chloride	pH, temperature, solubility, solution ionic strength (conductance), water activity
Adsorption	Retention on the surface of a solid	S	C,P (b)	R	Ion Exchange processes resulting in retention of a charged contaminant on a charged solid surface.	octanol/water partition coefficient, organic carbon partition coefficient, soil organic carbon content, polarity, surface charge solubility, Van der Waals attraction, electrostatic interaction, ion exchange
Absorption	Retention within the interior matrix of a solid	S	C,P (b)	R	Preferential partitioning of hydrocarbons into the interior of the organic soil matrix	soil organic carbon content
Complexation	Reaction with soil compounds that form covalent bonds	S	C (b)	R,Tf	Reaction with humic substances in soil to form "bound residues"	concentration of oxidants/reductants, pH, oxygen concentration, temperature, electrical and chemical interfaces,
Oxidation / Reduction	Process of gaining or losing electrons which can result in destruction of compounds	A,G,S	C,P (b)	D,Tf	The mineralization of glucose to carbon dioxide and water through oxidative respiration in animal cells	concentration of oxidants/reductants, pH, oxygen concentration, temperature, electrical and chemical interfaces,
Biological Reaction/Uptake	Biologically mediated reaction with compounds (enzymatic catalysis) or absorption in to the living cell	A S	C	V	Extracellular or intracellular enzymatic reaction	microbial population, pH, temperature, moisture, acclimation, nutrient
Biodegradation	Biologically mediated transformation of a compound (via enzyme catalysis)	A S	C	D,Tf	Growth and metabolism of <i>Arthrobacter sp.</i> On gasoline	existence of appropriate enzyme systems and electron acceptors

T - KEY

A = aqueous phase (b) = indicates varying degree of biological influence **C** = chemical **D** = destruction **dM** = decreased mobility **G** = gas phase **iM** = increased mobility **M** = mechanical **P** = physical **R** = recalcitrance = solid phase **T_P** = transport **Tr** = transformation **V** = variable effects