# Appendix 2 – Potential land uses and activities that may cause site contamination

**Table A2.1:** Activities that may cause site contamination

|  |  |
| --- | --- |
| Acid and alkali plant and formulation | Iron and steel work |
| Agricultural and horticultural activities | Landfill sites |
| Airports | Metal treatment |
| Asbestos production and disposal | Mining and extractive industries |
| Battery manufacture and recycling | Oil production and storage |
| Breweries and distilleries | Paint formulation and manufacture |
| Chemical manufacture and formulation | Pesticide manufacture, formulation and use |
| *Council depots* | Power stations |
| Defence works | Printing shops |
| Drum reconditioning works | Railway yards |
| Dry-cleaning | *Research institutions (laboratories)* |
| Electrical manufacturing (transformers, capacitors) | Scrap yards |
| Electroplating and heat treatment premises | Service stations and fuel storage facilities (depots) |
| Engine works | Sheep and cattle dips |
| Explosives industry | Smelting and refining |
| *Firefighting training and the use of firefighting foams* | Tanning and associated trades |
| Foundries | *Waste processing, storage and treatment* |
| Fuel storage | Water and sewerage treatment plants |
| Gas works | Wood preservation |
| *Hospitals* |  |

Source: Table 1 in Appendix 1 of the Department of Planning and Environment’s draft *Contaminated Land Planning Guidelines*. The use of *italics* indicates an activity not identified in these guidelines but is known to cause site contamination.

**Table A2.2:** Industries and associated chemicals that may cause contamination

| **Industry or activity** | **Main chemical group** | **Associated chemicals** |
| --- | --- | --- |
| Agricultural and horticultural activities |  | *See* – ‘chemical manufacture and use’ (‘fertiliser’, ‘fungicides’, ‘herbicides’ and ‘pesticides’). |
| Airports | Hydrocarbons | Aviation fuels (total petroleum hydrocarbons, kerosene), *PFAS* |
| Metals | Particularly lead, aluminium, magnesium, chromium, chlorinated solvents |
| Asbestos production and disposal | Asbestos | Asbestos (bonded and fibrous). Be aware of assessments in areas of naturally occurring asbestos.1 |
| Battery manufacture and recycling | Acids | Sulfuric acid |
| Metals | Lead, manganese, zinc, cadmium, nickel, cobalt, mercury, silver, antimony |
| Breweries and distilleries | Alcohol | Ethanol, methanol, esters |
| Chemical manufacture and use | Acid and alkali | Mercury; chlorine (chloralkali process); sulfuric, hydrochloric and nitric acids; sodium and calcium hydroxides |
| Adhesives and resins | Polyvinyl acetate, phenols, formaldehyde, acrylates, phthalates |
| Drum reconditioning works | Chemicals, paints, resins, tars, adhesives, oils, fuels, solvents, drum residues |
| Dyes | Chromium, titanium, cobalt, sulfur organic compounds, nitrogen organic compounds, sulfates, solvents |
| Explosives | Acetone, nitric acid, ammonium nitrate, pentachlorophenol, ammonia, sulfuric acid, nitroglycerine, calcium cyanamide, lead, ethylene glycol, methanol, copper, aluminium, bis(2-ethylhexyl) adipate, dibutyl phthalate, sodium hydroxide, mercury, silver |
| Fertiliser | Calcium phosphate, calcium sulfate, nitrates, ammonium sulfate, carbonates, potassium, copper, magnesium, molybdenum, boron, cadmium, arsenic |
| Flocculants | Aluminium |
| Foam production | Urethane, formaldehyde, styrene |
| Fungicides | Carbamates, copper sulfate, copper chloride, sulfur, chromium, zinc |
| Herbicides | Ammonium thiocyanate, carbamates, organochlorines, organophosphates, arsenic, mercury, triazines |
| Paints | Heavy metals – arsenic, barium, cadmium, chromium, cobalt, lead, manganese, mercury, selenium, zinc, titanium  Solvents – toluene oils, either natural (for example, pine oil) or synthetic, hydrocarbon |
| Pesticides | Active ingredients – arsenic, lead, organochlorines, organophosphates, sodium tetraborate, carbamates, sulfur, synthetic pyrethroids  Solvents – xylenes, kerosene, methyl isobutyl ketone, amyl acetate, a wide range of chlorinated solvents |
| Pharmaceutical | Solvents – acetone, cyclohexane, methylene chloride, ethyl acetate, butyl acetate, methanol, ethanol, isopropanol, butanol, pyridine methyl ethyl ketone, methyl isobutyl ketone, tetrahydrofuran |
| Photography | Hydroquinone, sodium carbonate, sodium sulfite, potassium bromide, monomethyl para-aminophenol sulfate, ferricyanide, chromium, silver, thiocyanate, ammonium compounds, sulfur compounds, phosphate, phenylene diamine, ethyl alcohol, thiosulfates, formaldehyde |
| Plastics | Sulfates, carbonates, cadmium, solvents, acrylates, phthalates, styrene |
| Rubber | Carbon black |
| Soaps, detergents | General – potassium compounds, phosphates, ammonia, alcohols, esters, sodium hydroxide, surfactants (sodium lauryl sulfate), silicate compounds  Acids – sulfuric acid and stearic acid  Oils – palm, coconut, pine, tea tree |
| Solvents | General – ammonia  Hydrocarbons – for example, BTEX  Chlorinated organics – for example, tetrachloroethene (perchloroethylene) trichloroethene, trichloroethane, dichloroethane, carbon tetrachloride, methylene chloride |
| *Council depots* |  | Hydrocarbons, PAH, asbestos, heavy metals, pesticides, herbicides, *PFAS* |
| Defence works |  | Hydrocarbons, *PFAS*, asbestos  *See also* – ‘chemical manufacture and use’ (‘explosives’), ‘foundries’, ‘engine works’, ‘service stations and fuel storage facilities (depots)’ |
| Dry-cleaning | Chlorinated solvents | Tetrachloroethene (perchloroethylene), trichloroethylene, 1,1,1–trichloroethane, carbon tetrachloride, white spirit (mixed hydrocarbons) |
| Electrical manufacturing | Solvents, metals | PCBs (transformers and capacitors), solvents, tin, lead, copper, mercury |
| Engine works | Hydrocarbons, metals, solvents, acids, alkalis, refrigerants | Refrigerants – chlorofluorocarbons, hydro chlorofluorocarbons, hydrofluorocarbons |
| Antifreeze | Particularly aluminium, manganese, iron, copper, nickel, chromium, zinc, cadmium, lead, and oxides, chlorides, fluorides and sulfates of these metals |
| Foundries | Metals | Particularly aluminium, manganese, iron, copper, nickel, chromium zinc, cadmium, lead, and oxides, chlorides, fluorides and sulfates of these metals |
| *Firefighting training and the use of firefighting foam* | *PFAS* | Hydrocarbons, solvents, chlorinated solvents, inorganics |
| Gas works | Inorganics | Asbestos, ammonia, cyanide, nitrate, sulfide, thiocyanate, aluminium, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, zinc |
| Organics | BTEX, phenolics, PAHs and coke |
| *Hospitals* | Waste | Asbestos, various |
| Radioactive material | Diagnostic and therapeutic isotopes |
| Iron and steel work | Organics, metals | BTEX; phenolics; PAHs; metals and oxides of iron, nickel, copper, chromium, magnesium, manganese and graphite |
| Landfill sites | Gases, metals, organics | Methane, carbon dioxide, ammonia, sulfides, heavy metals, organic acids, hydrocarbons, asbestos |
| Marinas | Antifouling paints | Copper, tributyltin  *See also* – ‘engine works’, ‘metal treatments’ (‘electroplating’ metals) |
| Metal treatment | Electroplating | Metals – nickel, chromium, zinc, aluminium, copper, lead, cadmium, tin  Acids – sulfuric, hydrochloric, nitric and phosphoric acids  General – sodium hydroxide, 1,1,1–trichloroethane, tetrachloroethylene, toluene, ethylene glycol, cyanide compounds |
| Liquid carburising baths | Sodium, cyanide, barium, chloride, potassium chloride, sodium chloride, sodium carbonate, sodium cyanate |
| Mining and extractive industries |  | Arsenic, mercury and cyanides. *See* *also* – ‘chemical manufacture and use’ (‘explosives’).  Aluminium, arsenic, copper, chromium, cobalt, lead, manganese, nickel, selenium, zinc and radio radionuclides.  The list of heavy metals should be decided according to the composition of the deposit and known impurities. Consideration should be given to chemicals associated with any mineral processing that also occurred on the mine site.  PFAS chemicals associated with firefighting equipment to protect mining infrastructure |
| Oil production and storage |  | *See* – ‘service stations and fuel storage facilities (depots)’ |
| Paint formulation and manufacture |  | *See* – ‘chemical manufacture and use’ (‘paints’) |
| Pesticide manufacture, formulation and use |  | *See* – ‘chemical manufacture and use’ (‘pesticides’) |
| Power stations |  | Asbestos, PCBs, fly ash metals, water treatment chemicals |
| Printing shops |  | Acids, alkalis, solvents, chromium, trichloroethene, methyl ethyl ketone  *See also* – ‘chemical manufacture and use’ (‘photography’) |
| Railway yards |  | Hydrocarbons, asbestos, arsenic, phenolics (creosote), heavy metals, nitrates, ammonia |
| *Research Institutions (laboratories)* |  | Various, depending on the nature of work being carried out. A case-specific evaluation is required. |
| Scrap yards |  | Hydrocarbons, metals, solvents, asbestos |
| Service stations and fuel storage facilities (depots) | Petroleum hydrocarbons, PAHs and lead | Aromatic hydrocarbons, BTEX, naphthalene, PAHs, phenols, lead |
| Sheep and cattle dips |  | Arsenic, organochlorines, organophosphates, carbamates, synthetic pyrethroids |
| Smelting and refining |  | Metals, fluorides, chlorides and oxides of copper, tin, silver, selenium lead, and aluminium |
| Tanning and associated trades | Various | Metals – chromium, manganese, aluminium  General – ammonium sulfate, ammonia, ammonium nitrate, arsenic phenolics, formaldehyde, sulfide, tannic acid |
| Water and sewerage treatment plants | Metals and chemicals used in water treatment and wastewater and biosolids treatment | Aluminium, arsenic, cadmium, chromium, cobalt, lead, nickel, fluoride, lime, zinc |
| *Waste processing, storage and treatment* | Fire retardants, plastics | Polybrominated diphenyl ethers, PFAS, plasticisers |
| Wood preservation | Metals | Chromium, copper, arsenic, naphthalene, ammonia, pentachlorophenol, dibenzofuran, anthracene, biphenyl, ammonium sulfate, quinoline, boron, creosote, organochlorine pesticides |

Note: PFAS = per- and polyfluoroalkyl substances; BTEX = benzene, toluene, ethylbenzene, xylene; PAH = polycyclic aromatic hydrocarbons; PCB = polychlorinated biphenyl.

Source: Table 2 in Appendix 1 of the Department of Planning and Environment’s draft *Contaminated Land Planning Guidelines*. The use of *italics* indicates an activity not identified in these guidelines but is known to cause site contamination.

1 [https://trade.maps.arcgis.com/apps/PublicInformation/index.html?appid=87434b6ec7dd4aba8cb664d8e646fb06](about:blank)