Contaminated Sites
Management Series

POTENTIALLY CONTAMINATING ACTIVITIES, INDUSTRIES AND LANDUSES

July 2000

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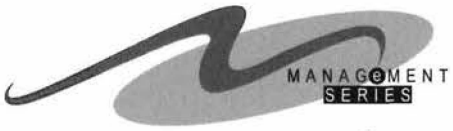

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PREFACE

This guidance document has been prepared by the Contaminated Sites Branch of the Department of Environmental Protection (DEP) to assist local government authorities, planners, consultants, industry and the general public in identifying potential contaminants associated with specific activities/industries, as part of the assessment of contaminated land and groundwater in Western Australia.

The principal causes of environmental contamination are poor or inadequate operational practices associated with the manufacture, use and disposal of chemicals by past or current industrial, agricultural or commercial activities. Other activities such as accidental spills or discharges can also result in contamination. Often, the extent and degree of contamination at a site is dependent upon its physical characteristics such as soil type, depth to groundwater, or proximity to sensitive environments such as wetlands and rivers. Each contaminated site is therefore unique. The purpose of this guidance document is to provide an indication of the type of activities which can contaminate the environment, and identify some of the potential contaminants for those specific industries, activities and landuses.

It is intended that this list will assist Local Government and Planning Authorities in considering site contamination prior to making planning decisions. It should also provide assistance to landowners in determining the potential for their site to be contaminated and whether further investigations are warranted for disclosure statements.

The list can be used as a quick reference to identify the potential for land and groundwater contamination prior to any preliminary site investigation.

If you wish to comment on this document please forward written comments to:

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LIMITATIONS

The list is by no means exhaustive and is provided as a guide only. The publication of this list does not mean that other activities should not be considered when determining the potential for a site to be contaminated.

This document should be used as a quick reference for the identification of potential contaminants associated with specific activities/landuses. However, a preliminary site investigation is necessary to determine which contaminants may be present at a site, through the consideration a number of factors such as current and historical site activities, physical characteristics of the site, and characteristics of any chemicals which are or have been utilised at the site such as, toxicological characteristics, persistence in the environment, environmental mobility, and chemical reactivity and degradation.

The management series discussed below should be referenced when undertaking any assessment of potentially contaminated land and groundwater in Western Australia.

ACKNOWLEDGMENTS

The DEP acknowledges the Water and Rivers Commission and the Health Department of Western Australia for their assistance in the preparation of these guidelines.

DISCLAIMER

CONTAMINATED SITES MANAGEMENT SERIES

This document forms part of a management series being developed by the Contaminated Sites Branch of the DEP to assist in the assessment and management of contaminated sites in Western Australia. The document provides a list of potentially contaminating industries, landuses and activities and the contaminants commonly associated with each, to assist local government authorities, planners, consultants, industry and the general public in identifying the potential for land and groundwater contamination.

The management series has been developed to address certain key aspects of contaminated site assessment and management in Western Australia. The series will comprise of the following guidelines:

- Certificate of Contamination Audit Scheme
- Contaminated Site Assessment – A General Guideline for Reporting
- Contaminated Site Assessment Criteria
- Contaminated Site Assessment - Guidelines for the Development of Sampling and Analysis Programs
- Contaminated Sites Guide for Planners
- Disclosure Statements
- Guidelines for the Assessment of Sites Incorporating Underground Storage Tanks
- Guidelines for the Proposed Contaminated Sites Auditor Accreditation Scheme
- Potentially Contaminating Activities, Industries, and Landuses

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
Abattoirs *	Nutrients	Nitrogen, Phosphorus
	Total Suspended Solids (TSS)	Biological Oxygen Demand,
	Oil and Grease	
Abrasive Blasting *	Dependent on material being removed	Lead from lead based paints Tributyltin (TBT) from boat maintenance
Airports	Total Petroleum Hydrocarbons	Aviation fuels, various fractions
	Aromatic Hydrocarbons	BTEX
	Metals	Aluminium, Magnesium Chromium, Lead
	Solvents	
Asbestos Production or Disposal	Inorganic Non-Metals	Asbestos
Asphalt Manufacturing	Total Petroleum Hydrocarbons	Various fractions
	Polycyclic Aromatic Hydrocarbons	Creosote, Naphthalene
	Aromatic Hydrocarbons	BTEX
	Heavy Metals	Chromium, Lead
Automotive Repair, Engine Works and Spray Painting	Solvents	Dichloromethane, Cresylic Acids, Ortho-dichlorobenzene
	Corrosion Inhibitors	Chromate
	Total Petroleum Hydrocarbons	Various Fractions
	Aromatic Hydrocarbons	Toluene, Xylene, White Spirit
	Metals	Copper, Chromium, Zinc, Lead
	Acids/Alkalis	
	Refrigerants	Chlorofluorocarbons (CFCs), Hydrochlorofluorocarbons, Carbons, Hydrofluorocarbons, Dichloromethane
	Antifreeze	Ethylene Glycol, Nitrates, Phosphates, Silicates
	Acids	Sulphuric and Phosphoric
	General	Phenolics compounds and Amines, Coke/Graphite Dust

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
Battery Manufacturing and Recycling	Metals	Lead, Manganese, Zinc, Cadmium, Nickel, Cobalt, Mercury, Silver, Antimony
	Acids	Sulphuric, Hydrochloric
Bitumen Manufacturing *	refer to Asphalt Manufacturing	
Boat Building and Maintenance *	Metals	Copper, Zinc, Lead, Mercury, Chromium
	Antifouling Paints	Organotin, Tributyltin (TBT)
Breweries/Distilleries	Alcohol	Ethanol, Methanol, Esters
	Nutrients	Biological Oxygen Demand, Nitrogen, Phosphorus
Chemical Manufacturing, Blending or Mixing *:		
- Acid/Alkali		Mercury (chlor/alkali), Sulphuric, Hydrochloric & Nitric Acids, Sodium & Calcium Hydroxides
- Adhesive/Resins		Polyvinyl Acetate, Phenol, Formaldehyde, Acrylates, Phthalates
- Dyes		Chromium, Titanium, Cobalt, Sulphur and Nitrogen Organic Compounds, Sulphates, Solvents
- Fertilisers		Calcium Phosphate, Calcium Sulphate, Nitrates, Ammonium Sulphate, Carbonates, Potassium, Copper, Magnesium, Molybdenum, Boron, Cadmium
- Flocculants		Aluminium
- Foam Production		Urethane, Formaldehyde, Styrene
- Fungicides		Carbamates, Copper Sulphate, Copper Chloride, Sulphur, Chromium, Zinc
- Herbicides		Ammonium Thiocyanate, Carbamates, Organochlorines,

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
		Organophosphates, Triazines Arsenic, Mercury,
- Paints	Metals	Arsenic, Barium, Cadmium, Chromium, Cobalt, Lead, Manganese, Mercury, Selenium, Zinc, Titanium
	Solvents	Toluene Oils, Natural (eg. Pine Oil) or Synthetic, Toluol, Xylol, Methylene Chloride
	Fillers, Extenders	Talc, Silica, Titanium Dioxide
- Pesticides	Active Ingredients	Arsenic, Lead, Organochlorines, Organophosphates, Sodium Tetraborate, Carbamates, Sulphur, Synthetic Pyrethroids
	Solvents	Xylene, Kerosene, Methyl Isobutyl Ketone, Amyl Acetate, 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 Sulphite, Potassium Bromide, Monomethyl Para-aminophenol Sulphates, Ferricyanide, Chromium, Silver, Thiocyanate, Ammonium Compounds, Sulphur Compounds, Phosphate, Phenylene, Diamine, Ethyl Alcohol, Thiosulphates, Formaldehyde
- Plastics		Sulphates, Carbonates, Cadmium, Solvents, Acrylates, Phthalates, Styrene

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
- Rubber Processing	Metals	Zinc, Lead
	Sulphur Compounds	Sulphur, Thiocarbonate
	Reactive Monomers	Isoprene, Isobutylene
	Acids	Sulphuric, Hydrochloric
	Aromatic Hydrocarbons	Xylene, Toluene
	General	Carbon Black, solvents
- Soap/Detergents	General	Potassium Compounds, Phosphates, Ammonia Alcohols, Esters, Sodium Hydroxide, Surfactants, (Sodium Lauryl Sulphate), Silicate Compounds
	Acids	Sulphuric Acid, Stearic Acid
	Oils	Palm, Coconut, Pine, Tea-Tree
- Solvents	General	Ammonia
	Aromatic Hydrocarbons	BTEX
	Chlorinated Organics	Trichloroethane, Carbon Tetrachloride, Methylene Chloride
Compost Manufacturing *	Nutrients	Phosphorus, Potassium, Nitrogen
	Metals	Aluminium, Iron, Zinc
Concrete Batching or Cement Product Manufacturing *	Inorganic Non-Metals	Asbestos
Defence Works	Metals	Lead, Copper, Aluminium, Mercury, Silver
	Explosives	TNT, 2,4 DNT, 2,6 DNT, RDX
Drum Re-Conditioning Facility (dependent upon contents of drums)	Solvents	Methylene Chloride, Cresylic Acids, Ortho-Dichlorobenzene
	Total Petroleum Hydrocarbons	Various fractions
	Metals	Zinc, Lead, Cadmium, Chromium
Dry Cleaning Establishment	Chlorinated Hydrocarbons	Trichlorethylene, Ethane, 1,1,1 - Trichloroethane, Carbon Tetrachloride, Perchlorethylene

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
Electrical	Metals Polychlorinated Biphenyls (transformers and capacitors) Solvents	Tin, Lead, Copper
Electricity Generation/Power Stations *	Fly ash	Sulphates, Heavy Metals, Total Dissolved Solids, Selenium, Germanium
	Tars	Petroleum Hydrocarbons, Poly Aromatic Hydrocarbons
	Asbestos Polychlorinated Biphenyls Water Treatment Chemicals	
Explosives Industry	Acid	Acetone, Nitric Acid, Ammonium Nitrate, Sulphuric Acid, Ammonia, Nitroglycerine, Calcium Cyanamide, Ethylene Glycol, Methanol, Bis(2-Ethylhexyl) Adipate, Dibutyl Phthalate, Sodium Hydroxide
	Chlorinated Hydrocarbons	
	Metals	Lead, Copper, Aluminium, Mercury, Silver
	Explosives	Pentachlorophenol TNT, 2,4 DNT, 2,6 DNT, RDX
Fibreglass Reinforced Plastic Manufacturing *	Solvents Resins	Epoxy or Styrene
Gasworks	Inorganics	Ammonia, Cyanide (free/complex), Nitrate, Sulphide/Sulphate, Thiocyanate, Aluminium, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Vanadium, Zinc Petroleum Hydrocarbons, BTEX, Phenolics, Poly Aromatic Hydrocarbons, Coke, Creosote
	Organics	
	Total Dissolved Solids	

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
Iron and Steel Works	Metals	Nickel, Copper, Lead, Zinc, Selenium, Chromium, Magnesium, Manganese, Graphite
	Oxides of Iron	
	Acids	Sulphuric, Hydrochloric
	Mineral Oils	
	Coking Works Residues	(as for gasworks)
	Hydrocarbons	
Intensive Agriculture	Pesticides and Herbicides	Organochlorines, Organophosphates
	Nitrates	
	Salinity	
	Metals	Arsenic, Lead, Magnesium, Aluminium, Iron, Copper, Potassium, Cadmium
	Nutrients	Nitrogen, Phosphorus
Landfill Sites * (dependent on landfill type)	Polychlorinated Biphenyls	
	Alkanes	
	Sulphides	
	Heavy Metals	
	Organic acids	
	Nutrients	Nitrogen, Phosphorus, Ammonia
	Total Petroleum Hydrocarbons	Various fractions
Metal coating *	Solvents	Phenolic, Methylene Chloride
	Metals	Chromium, Lead, Cadmium, Aluminium, Selenium
	Paint Residue	
Metal Finishing & Treatments *		
Electroplating	Metals	Nickel, Chromium, Zinc, Aluminium, Copper, Lead,
	Acids	Cadmium, Tin
	Alkalis	Sulphuric, Hydrochloric, Nitric,
	Plating Salts	Phosphoric
	Aromatic Hydrocarbons	Sodium Hydroxide
	Chlorinated Hydrocarbons	Cyanide

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
	General	Benzene 1,1,1 - Trichloroethane Tetrachloroethylene, Toluene,
	Liquid Carburizing Baths	Ethylene Glycol, Cyanide Compounds Sodium Cyanide, Barium, Chloride, Potassium Chloride, Sodium Chloride, Sodium Carbonate, Sodium Cyanate
Metal Smelting or Refining *	Metals	Copper, Tin, Silver, Gold, Selenium, Lead, Aluminium
	Fluorides and Oxides Chlorides Oxides of Copper	
Mining and Extractive Industries	Acids, Alkalis Total Dissolved Solids Organic Flocculants	
	Metals	Sulphate, Cyanide, Mercury, Iron, Copper
	Total Petroleum Hydrocarbons	Various fractions
	Aromatic Hydrocarbons	BTEX
Oil or Gas Production, Refining and Storage *	Total Petroleum Hydrocarbons	Various fractions
	Aromatic Hydrocarbons	BTEX
	Acids, Alkalis	Sulphuric, Caustic Soda
	Lagging, Insulation	Asbestos
	Spent Catalysts	Lead, Zinc, Copper, Nickel,
	Heavy Metals	Chromium, Cadmium, Barium, Arsenic, Mercury, Cyanides Heavy metals should be decided according to the composition of the deposit and known impurities
Orchard and Market Gardens	Metals	Cadmium, Arsenic, Copper, Lead, Mercury, Magnesium, Aluminium, Iron
	Organochlorines	DDT, BHC, Dieldrin, Fenthion
	Organophosphates	Azinphos Ethyl, Diazinon

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
Pest Control Depots	Pesticides	Atrazine, Fenamiphos, Diazinon
	Herbicides	Organochlorides, Organophosphates
	Fungicides	
Petrol Stations and Fuel Storage Facilities	Metals	Lead, Zinc, Copper, Nickel, Cadmium, Barium, Lead
	Total Petroleum Hydrocarbons	Various fractions
	Aromatic Hydrocarbons	BTEX
	Aliphatic Hydrocarbons	
	Octane Boosters	
	Mineral Oil	
	Chlorinated Hydrocarbons	
	Paint, Plastic Residues	Trichloroethylene
	Phenols	
	Oil and Grease	
Printing Shops (see also Photography)	Acids, Alkalis, Solvents, Chromium	
Railway Yards	Petroleum Hydrocarbons	Various fractions
	Aromatic Hydrocarbons	BTEX
	Phenolics	Creosote
	Metals	Arsenic, Lead, Zinc, Cadmium, Chromium, Iron
	Nutrients	Nitrates, Ammonia
	Pesticides/Herbicides	
Rifle Range	Explosives	TNT, 2,4 DNT, 2,6 DNT, RDX
	Metals	
Scrap Metal Recovery *	Metals	Lead, Cadmium, Magnesium
	Metal fluxes	Sodium or Potassium Fluoride
	Hydrocarbons	Various fractions, Oil and Grease
	Solvents	
	Polychlorinated Biphenyls	
Sewage Treatment Plant *	High organics - Nutrients	Phosphorus, Potassium, Nitrogen

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
	Heavy metals	Aluminium, Arsenic, Cadmium, Chromium, Cobalt, Lead, Nickel, Zinc
	Phenolic compounds	
	General	Fluoride, Lime
Sheep and Cattle Dips	Metals	Arsenic
	Pesticides and Herbicides	Organochlorines
		Organophosphates
	Carbamates	
	Synthetic Pyrethoids	
Tannery (and associated trades)*	Acids	Hydrochloric
	Metals	Chromium, Manganese
	Phenols	Aluminium
	Salts	Formaldehyde
	Solvents	Chlorides, Sulphides
	Hydrocarbons	Kerosene, White Spirit
	General	Oil & Grease
		Ammonium Sulphate, Ammonia, Ammonium Nitrate, Phenolics, Tannic Acid, Cyanide
Textile Operations *	Metals	Chromium, Titanium, Carbon, Zinc, Aluminium, Tin
	Acids, Alkalis	Sulphuric, Caustic Soda
	Salts	Sodium Hypochlorite
	Chlorinated Hydrocarbons	Perchloroethylene
	Aromatic Hydrocarbon (MAH)	Phenol
	Pesticides	Organochlorines
		Dieldrin, Aldrin
	Dyestuff Residues	Endrine, Cadmium, Benzidine
Timber Preserving *	Coal tar	Creosote
	Chlorinated hydrocarbons	Pentachlorophenol
	Aromatic Hydrocarbon (PAH)	Naphthalene
	Organochlorine pesticides	
	Metals	Arsenic, Copper, Chromium
	Pesticides	

INDUSTRY, ACTIVITY & LANDUSE	COMMON CONTAMINANT TYPES	EXAMPLE
	General	Ammonia, Dibenzofuran, Anthracene, Biphenyl, Ammonium Sulfate, Quinoline, Boron
Woolscouring *	Nutrients	Phosphorus, Nitrogen, Potassium
	TDS	Sulphate
	Oil & Grease	
	Detergents & Pesticides	
	Bleaching Agents	Hydrogen Peroxide

* - prescribed activities under the Environmental Protection Regulations 1987

REFERENCES

Australian and New Zealand Environment and Conservation Council National Health and Medical Research Council (ANZECC & NHMRC), 1992. Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites.

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