

**Table 5-A - Soil Investigation Levels (mg/kg)**

Substances	Health Investigation Levels (HILs)						Ecological Investigation Levels (EILs)		Background Ranges <sup>6</sup>
	A <sup>1</sup>	B <sup>2</sup>	C <sup>3</sup>	D	E	F	REIL <sup>4</sup>	Interim Urban <sup>5</sup>	
<b>METALS/METALLOIDS</b>									
Arsenic (total)	100			400	200	500		20	1 - 50
Barium								300	100 - 3000
Beryllium	20			80	40	100			
Cadmium	20			80	40	100		3	1
Chromium (III)	12%			48%	24%	60%		400	
Chromium (VI)	100			400	200	500		1	
Chromium (Total)* <sup>7</sup>									5 - 1000
Cobalt	100			400	200	500			1 - 40
Copper	1000			4000	2000	5000		100	2 - 100
Lead	300			1200	600	1500		600	2 - 200
Manganese	1500			6000	3000	7500		500	850
Methyl mercury	10			40	20	50			
Mercury (inorganic)	15			60	30	75		1	0.03
Nickel	600			2400	600	3000		60	5 - 500
Vanadium								50	20 - 500
Zinc	7000			28000	14000	35000		200	10 - 300
<b>ORGANICS</b>									
Aldrin + Dieldrin	10			40	20	50			
Chlordane	50			200	100	250			
DDT + DDD + DDE	200			800	400	1000			
Heptachlor	10			40	20	50			
Polycyclic aromatic hydrocarbons (PAHs)	20			80	40	100			
Benzo(a)pyrene	1			4	2	5			
Phenol	8500			34000	17000	42500			
PCBs (Total)	10			40	20	50			
Petroleum Hydrocarbon Components (constituents):									
• >C16 - C35 Aromatics <sup>8</sup>	90			360	180	450			
• >C16 - C35 Aliphatics	5600			22400	11200	28000			
• >C35 Aliphatics	56000			224000	112000	280000			
<b>OTHER</b>									
Boron	3000			12000	6000	15000			
Cyanides (Complexed)	500			2000	1000	2500			
Cyanides (free)	250			1000	500	1250			
Phosphorus								2000	
Sulfur								600	
Sulfate <sup>9</sup>								2000	

<sup>1</sup> Human exposure settings based on land use have been established for HILs (see Taylor and Langley 1998). These are:

- 'Standard' residential with garden/accessible soil (home-grown produce contributing less than 10% of vegetable and fruit intake; no poultry): this category includes children's day-care centres, kindergartens, preschools and primary schools.
- Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake) and/or poultry providing any egg or poultry meat dietary intake.
- Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake); poultry excluded.
- Residential with minimal opportunities for soil access: includes dwellings with fully and permanently paved yard space such as high-rise apartments and flats.
- Parks, recreational open space and playing fields: includes secondary schools.
- Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites.

<sup>2</sup> Site and contaminant specific: on site sampling is the preferred approach for estimating poultry and plant uptake. Exposure estimates may then be compared to the relevant ADIs, PTWIs and GDs.

<sup>3</sup> Site and contaminant specific: on site sampling is the preferred approach for estimating plant uptake. Exposure estimates may then be compared to the relevant ADIs, PTWIs and GDs.

<sup>4</sup> These will be developed for regional areas by jurisdictions as required.

<sup>5</sup> Interim EILs for the urban setting are based on considerations of phytotoxicity, ANZECC B levels, and soil survey data from urban residential properties in four Australian capital cities.

<sup>6</sup> Background ranges, where HILs or EILs are set, are taken from the Field Geologist's Manual, compiled by D A Berkman, Third Edition 1989. Publisher - The Australasian Institute of Mining & Metallurgy. This publication contains information on a more extensive list of soil elements than is included in this Table. Another source of information is Contaminated Sites Monograph No. 4: Trace Element Concentrations in Soils from Rural & Urban Areas of Australia, 1995. South Australian Health Commission.

<sup>7</sup> Valence state not distinguished - expected as Cr (III).

<sup>8</sup> The carbon number is an 'equivalent carbon number' based on a method that standardises according to boiling point. It is a method used by some analytical laboratories to report carbon numbers for chemicals evaluated on a boiling point GC column.

<sup>9</sup> For protection of built structures.

**Table 5-B**  
**Groundwater Investigation Levels**

SETTING <sup>10</sup>	Aquatic Ecosystems <sup>11</sup>		Drinking Water	Agricultural <sup>9</sup>	
	Marine Waters µg/L	Fresh Waters µg/L	Health <sup>10</sup> / Aesthetic <sup>11</sup> mg/L	Irrigation (mg/L)	Livestock (mg/L)
<b>METALS/METALLOIDS</b>					
Aluminium		<5 (if pH <6.5) <100(if pH >6.5)	(0.2)	5.0	5.0
Antimony		30	0.003		
Arsenic (total)	50.0	50	0.007	0.1	0.5
Barium			0.7		
Beryllium		4		0.1	0.1
Boron			0.3	0.5-6.0	5.0
Cadmium	2.0	0.2-2.0	0.002	0.01	0.01
Chromium (Total)	50.0	10		1.0	
Chromium (VI)			0.05	0.1	1.0
Cobalt				0.05	1.0
Copper	5.0	2.0-5.0	2.0 (1.0)	0.2	0.5
Iron		1000	(0.3)	1.0	
Lead	5.0	1.0-5.0	0.01	0.2	0.1
Lithium				2.5	
Manganese			0.5 (0.1)	2.0	
Mercury (total)	0.1	0.1	0.001	0.002	0.002
Molybdenum			0.05	0.01	0.01
Nickel	15.0	15.0-150.0	0.02	0.02	1.0
Selenium	70.0	5.0	0.01	0.02	0.02
Silver	1.0	0.1	0.1		
Thallium	20.0	4.0			
Tin (tributyltin)	0.002	0.008			
Vanadium				0.1	0.1
Zinc	50.0	5.0-50.0	(3.0)	2.0	20.0
<b>ORGANICS</b>					
1,2-dichloroethane			0.003		
Benzo(a)pyrene			0.00001		
Carbon tetrachloride			0.003		
Chlorobenzene			0.3 (0.01)		
Dichloromethane (methylene chloride)			0.004		
Ethylbenzene			0.3 (0.003)		
Ethylenediamine tetracetic acid (EDTA)			0.25		
Hexachlorobutadiene	0.3	0.1	0.0007		

<sup>10</sup> Levels for recreational and industrial uses have not been set. For guidance on Recreational levels, see NHMRC/ARMCANZ, 1996. For recreational uses, toxic substances should, in general, not exceed the concentrations given for drinking water. For guidance on Industrial levels, see ANZECC, 1992. Industrial settings include: generic processes, hydro-electric power generation, textiles, chemical and allied industries, food and beverage, iron and steel, tanning and leather, pulp and paper, petroleum.

<sup>11</sup> Taken from Australian Water Quality Guidelines for Fresh and Marine Waters (AWQG) (ANZECC 1992)

SETTING <sup>10</sup>	Aquatic Ecosystems <sup>11</sup>		Drinking Water	Agricultural <sup>9</sup>	
	Marine Waters µg/L	Fresh Waters µg/L	Health <sup>10</sup> / Aesthetic <sup>11</sup> mg/L	Irrigation (mg/L)	Livestock (mg/L)
<b>ORGANICS (cont.)</b>					
Monocyclic aromatic compounds					
Benzene	300.0	300.0	0.001		
Chlorinated benzenes		0.007-15.0 <sup>12</sup>			
Chlorinated phenols	0.2-8.0	0.05-18.0 <sup>13</sup>	0.04-1.5		
Phenol	50.0	50.0			
Toluene		300.0	0.8 (0.025)		
Xylene			0.6 (0.02)		
Pesticides	Footnote <sup>14</sup>	Footnote <sup>15</sup>	Footnote <sup>16</sup>		See guidelines for raw water for drinking water supply (AWQG, ANZECC 1992)
Aldrin	10.0 ng/L	10.0 ng/L	0.0003		
Chlordane	4.0 ng/L	4.0 ng/L	0.001		
DDT	1.0 ng/L	1.0 ng/L	0.02		
Dieldrin	2.0 ng/L	2.0 ng/L	0.0003		
Heptachlor	10.0 ng/L	10.0 ng/L	0.0003		
Phthalate esters					
di-n-butylphthalate		4.0			
di(2-ethylhexyl)phthalate		0.6			
other phthalate esters		0.2			
Polyaromatic hydrocarbons					
Polychlorinated biphenyls	0.004	0.001			
Polycyclic aromatic hydrocarbons	3.0	3.0			
Styrene (vinylbenzene)			0.03 (0.004)		
Tetrachloroethene			0.05		
Trichlorobenzenes (total)			0.03 (0.005)		
Vinyl chloride			0.0003		
<b>OTHER</b>					
Calcium					1,000.0
Chloride			(250.0)	30.0 700.0 <sup>17</sup>	
Cyanide	5	0.005	0.08		
Fluoride			1.5	1.0	2.0
Nitrate-N			50.0		30.0
Nitrite-N			3.0		10.0
<b>AESTHETIC PARAMETERS</b>					
Colour and clarity	< 10% change in euphotic depth	< 10% change in euphotic depth			

<sup>12</sup> See table 2.8, p.2-49 AWQG (ANZECC 1992) for further information

<sup>13</sup> see table 2.9, p.2-50 AWQG (ANZECC 1992) for further information

<sup>14</sup> see table 2.10 also, p.2-55 (ANZECC 1992) for further information

<sup>15</sup> see table 2.10 also, p.2-55 (ANZECC 1992) for further information

<sup>16</sup> see table on p.32 (Guidelines for Pesticides), p.32 (NHMRC/ ARMCANZ 1996)

<sup>17</sup> Maximum chloride concentration should be set according to the sensitivity of the crop. For further information. (See Tables 5.1, 5.2, 5.3, 5.4, ANZECC 1992)