Proposed Regulated Waste Classification Framework

Regulatory Impact Statement Addendum

June 2017

Contents

1.0 Introduction

This paper supplements EHP's waste reform consultation regulatory impact statement (consultation RIS) to provide further detail of the proposed regulated waste classification framework.

The proposed regulated waste classification system is a significant departure from the current method of classifying regulated waste and will inform the way Queenslanders manage regulated waste into the future. Summary information on the proposed regulated waste classification system is provided in the following document with more detailed information available in the consultant's report at the EHP website: https://www.ehp.qld.gov.au/waste/regulated-waste-review.html

2.0 Background

In Queensland, regulated wastes are managed in a different way to other wastes as they are considered to pose a significant risk to human health and the environment. There are currently 71 regulated wastes listed in Schedule 7 Part 1 of the *Environmental Protection Regulation 2008* (the Regulation). This list includes heavy metals, hazardous substances, end-of-life products, and a variety of wastes identified by their material type or hazard properties.

The Schedule 7 list is considered an 'absolute' list and any waste that meets the regulated waste definition and contains a trace of any of the items listed in Part 1 is therefore classified as a regulated waste. This classification is made irrespective of the volume or concentration of the Part 1 items present in the waste. Since the development of this list the management and understanding of regulated wastes has changed dramatically. The proposed regulated waste classification system reflects some of the new thinking around regulated waste, particularly the measurable link between waste and the potential risk to human health and the environment. In doing this, the proposed regulated classification system adopts a risk-based approach to classifying and managing waste.

This summary paper has been developed using the information contained in the consultant's report and feedback received during a preliminary consultation process undertaken in early 2016. To the greatest extent possible the comments received during the preliminary consultation have been reflected in this paper. Outstanding comments have been collated and will be considered further in conjunction with any additional feedback received during this RIS consultation process.

It is important that the scope of the regulated waste classification review does not include:

- influencing national or international waste regulatory processes;
- the definition of waste under s 13 of the *Environmental Protection Act 1994* (EP Act); or
- compliance and enforcement matters under the EP Act.

3.0 Proposed regulated waste classification system

The proposed regulated waste classification system includes four risk-based categories.

1. Category 1 regulated waste (highest risk)
2. Category 2 regulated waste
3. Category 3 regulated waste
4. Not regulated (NR) waste category (lowest risk)

The three regulated waste categories provide a hierarchy of regulated wastes based on their potential threat to the environment and human health. Category 1 is the highest risk category and category 3 is the lowest risk category for regulated waste. The 'not regulated' waste category includes wastes with hazard parameter concentrations that are considered to be of a low enough risk that does not warrant regulated waste classification.

The proposed system encourages waste management that is environmentally and socially responsible and is likely to provide economic benefits to operators who adopt improved waste management practices. This includes the immobilisation and treatment of wastes to reduce their hazard, which is not encouraged under the current regulated waste classification system.

4.0 Methods for classifying regulated waste under the proposed regulated waste classification system

The new regulated waste system offers two ways of classifying regulated waste. Method 1 is the most straightforward and provides a default waste classification category for each waste, whereas method 2 requires that testing of waste material for known hazard parameters must be undertaken to determine a waste category. Both methods are described in the following section.

4.1 Method 1 - 'Default waste category list' method for classifying waste

This method relies on broadly identifying the hazard parameters of a waste material and then finding the corresponding category on a default waste category list (see *Table 2 – Default waste categories)*. This method does not require laboratory testing to ascertain individual hazard parameter concentrations. Under this method, the default categories have a "precautionary factor" applied that may result in the waste being classified into a higher risk category.

Where a waste has multiple hazard parameters the waste category will be determined by the hazard parameter(s) with the highest risk category. Several working examples are provided in sections 7.1 and 7.2 which explain this more clearly.

Advantages	**Disadvantages**
• Potentially faster and more cost effective as it doesn't require laboratory testing. • Ease of classification for all waste types.	• No opportunity to have waste categorised as not regulated (other than those wastes listed in Schedule 7, part 2). • No opportunity to manage waste into lower risk regulated waste categories. • The waste may be classified into a higher risk category.

4.2 Method 2 - 'Waste categories table' method for classifying waste

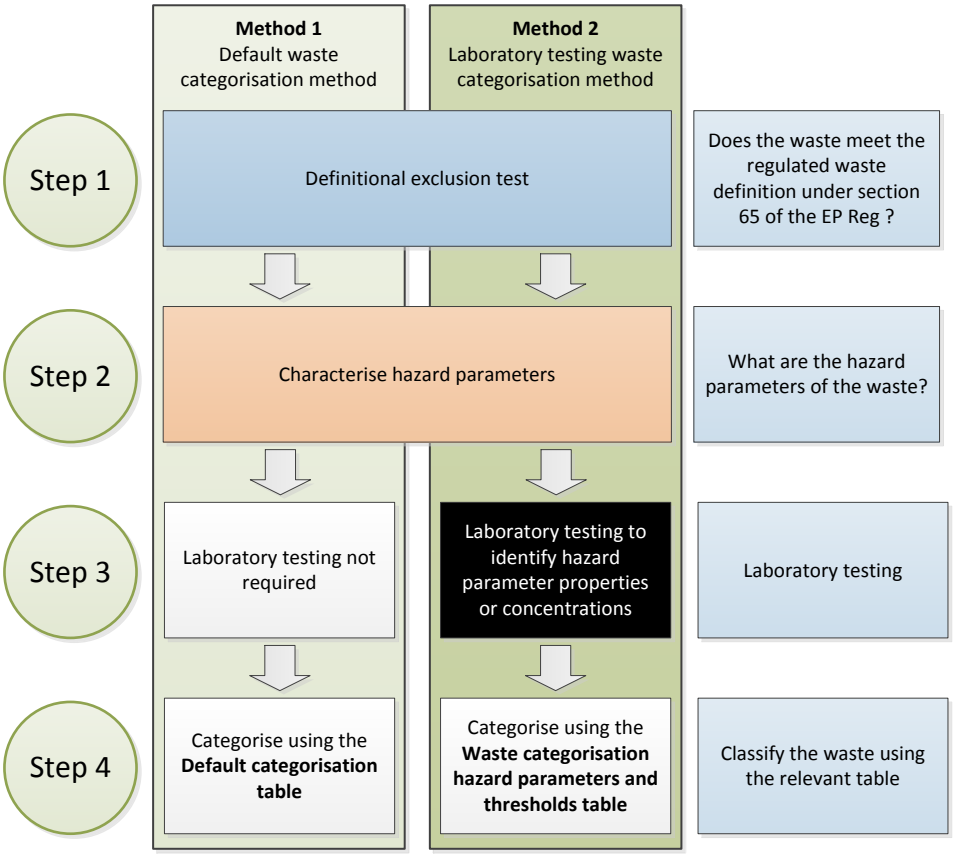
This method requires that laboratory testing of the waste will be undertaken to ascertain what hazard parameters are present and the concentrations or properties of each. Testing results are compared to waste category thresholds (see *Table 1 – Waste categorisation hazard parameters and thresholds*) to determine whether the waste is a regulated waste and if so what category of regulated waste.

Advantages	**Disadvantages**
• Enables operators to implement practices and processes that can reduce their category of regulated waste. • Allows for wastes with a low enough hazard parameter concentration to be classified as 'not regulated'. • Greater certainty determining the regulated waste category for each hazard parameter.	• Higher cost associated and potential delays in classifying some wastes. • Potentially more complex to use for some wastes.

5.0 The four step classification process

The following section outlines the two methods of classifying regulated waste. It describes both methods in four steps to simplify the process. Steps 1 and 2 are common to both methods. The significant difference between the two methods is the laboratory testing at step 3 and subsequent waste category classification at step 4, as shown in figure 1.

Figure 1 – proposed methods for classifying regulated waste



5.1 Step 1 - definitional exclusion test

The definitional exclusion test is common to both classification methods and tests whether the waste can be classified as a regulated waste against the regulatory definition for 'regulated waste'. If the waste isn't a regulated waste the process stops here and no further action is needed. This includes all wastes listed in Schedule 7, Part 2 (see Table 3) that are not considered to be a regulated waste.

Section 65 of the *Environmental Protection Regulation 2008* (EP Reg) defines 'regulated waste' as:

> (1) Regulated waste is waste that:
>
> a. is commercial or industrial waste, whether or not it has been immobilised or treated; and
> b. is of a type, or contains a constituent of a type, mentioned in Schedule 7, Part 1.
>
> (2) Waste prescribed under subsection (1) includes:
>
> a. for an element—any chemical compound containing the element; and
> b. anything that contains residues of the waste.
>
> (3) However, waste is not regulated waste if it is mentioned in Schedule 7, Part 2.

If the proposed regulated waste classification system is adopted, the existing Schedule 7, Part 1 will be replaced by 'Table 1 - Waste categorisation hazard parameters and thresholds' and 'Table 2 - Default waste categorisation table' as the new list of regulated wastes. A list of wastes that are not regulated wastes will still be maintained under Schedule 7, Part 2 as shown in 'Table 3 - Waste that is not regulated waste under section 65(3)'.

5.2 Step 2 – Characterising the hazard

The second step requires the wastes to be characterised to determine the likely hazard parameters of the waste. This can be done using the following approaches:

- assess the process that generated the waste, including specific input materials and output chemicals/products;
- use literature and published information about the process or waste (including Safety Data Sheet information) relevant to inputs and outputs;
- use specialist company knowledge or expertise from industry associations that may assist in focusing on the hazard parameters likely to be present; or
- test the waste at a laboratory.

A default waste characterisation table (see Table 2) has been prepared to assist waste generators in determining the type of hazard parameters or properties contained in their waste.

> ***Characterising the type of hazard(s) present***
>
> *Under the proposed framework the generator is expected to characterise and classify the waste. This is because the characterisation process relies on knowledge about the source of the waste. If the waste source is unknown, the holder of the waste may need to conduct literature and published information reviews or carry out broad testing to find out further information about the waste. The proposed regulated waste framework focusses on ensuring that the generator of the waste is responsible for characterising and classifying the waste.*

5.3 Step 3 – Test for hazard parameters

Once the waste has been characterised a generator may use either method 1 or method 2 to classify their waste.

5.3.1 Method 1 (no laboratory testing required)

Testing of hazard parameters is not required for generators who choose to adopt a default waste category using method 1. Users of method 1 will proceed directly to Step 4 – Waste categorisation.

5.3.2 Method 2 (undertake laboratory testing)

This method requires that testing of the waste material is undertaken to determine the hazardous parameter concentrations or properties of the waste.

The type of testing carried out will be determined by the nature of the contaminant or its properties. Most hazard parameters require total concentration (T) and leachable concentration (L) testing. A separate test is required when testing for hazard properties (such as pH) and further information may be required prior to testing.

The relevant testing methods for each of the hazard parameters shown in *Table 1 – Waste categorisation hazard parameter and thresholds* are:

1. the total concentration of the hazard parameter;
2. the leachable concentration of the hazard parameter (using the Australian Standard Leaching Procedure (ASLP) test); and
3. the value of the hazardous property.

As with all laboratory testing, specific testing procedures and processes must be followed. This includes standards relating to holding times, sample preservation and the use of quality-assured laboratories.

When testing, total concentrations should be determined first as this may avoid the need to do leachability testing. For example, where the total concentration is less than 20 times the leachable hazard threshold, ASLP testing will not be required.

5.4 Step 4 – Waste categorisation

5.4.1 Method 1 – 'Default waste category' method for classifying waste

The default waste list contains waste types historically encountered in Queensland and has been developed through a quantitative method of scoring the potential hazards posed by the wastes and the addition of a precautionary factor. Applying a precautionary factor is considered necessary for this method as the hazard parameters are not being accurately measured and there may be variances in contaminant concentration levels or hazard parameters.

The characterised waste is identified against the default waste categorisation table (see Table 2) and the corresponding default category assigned. Where there are multiple hazard parameters present in the waste then the

waste classification is determined by the hazard with the highest risk. An excerpt from the default waste categorisation table is provided below in Figure 2.

Figure 2 – Excerpt from default waste categorisation table

Waste (tracking) code	Current regulated waste description	Primary hazard	Hazard description	Default waste category
D130	Arsenic and arsenic compounds	H11	Toxic (delayed or chronic)	1
D160	Beryllium and beryllium compounds	H11	Toxic (delayed or chronic)	1
D150	Cadmium and cadmium compounds	H11	Toxic (delayed or chronic)	1
T100	Chemical waste arising from research and development or teaching activity, including new or unidentified material and material whose effects on human health or the environment are not known	H6.1	Poisonous (acute)	1
D350	Chlorates	H1	Explosive	1

5.4.2 Method 2 - 'Waste categories table' method for classifying waste

Following the laboratory testing undertaken in step 3 the results are then used to classify the waste against the hazard parameters and thresholds as shown in *Table 1 – Waste categorisation hazard parameters and thresholds* to determine whether the waste is a category 1, 2 or 3 regulated waste or a category NR (not regulated) waste. An excerpt from Table 1 is provided below in Figure 3.

Figure 3 – Excerpt from waste categories table

Hazard parameters	Waste categories											
	Category 1			Category 2			Category 3			Category NR		
	T (mg/kg)		**L** (mg/L)	**T** (mg/kg)		**L** (mg/L)	**T** (mg/kg)		**L** (mg/L)	**T** (mg/kg)		**L** (mg/L)
CONSTITUENTS												
Inorganic species												
Arsenic	> 2,000	or	> 2.8	2,000 - 500	or	2.8 - 0.7	< 500	&	0.7 - 0.35	< 500	&	< 0.35
Barium	> 25,000	or	> 280	25,000 – 6,250	or	280 - 70	< 6,250	&	70 - 35	< 6,250	&	< 35
Beryllium	> 400	or	> 4	400 - 100	or	4 - 1	< 100	&	1 - 0.5	< 100	&	< 0.5
Cadmium	> 400	or	> 0.8	400 - 100	or	0.8 - 0.2	< 100	&	0.2 - 0.1	< 100	&	< 0.1

5.5 What if there are multiple hazard parameters and properties?

Where multiple hazard parameters are present, all hazard parameters should be assessed. The final classification of the waste will be determined by the hazard parameter(s) that has the highest risk category.

For example, where a waste contains a category 2 concentration of Benzene and a category 3 concentration of Toluene the waste will be classified as a category 2 regulated waste. Several working examples and further clarification is provided in section 7.0 of this document.

6.0 Liquid wastes

During preliminary consultation, a number of submissions sought clarification about the classification and management requirements for liquid forms of regulated waste. Liquid wastes typically pose a higher risk to the environment and, human health than solid waste. This is because liquid wastes are more difficult to contain and manage and can be easier to illegally dispose of by improperly discharging to land or waters.

To manage the increased risk, it is proposed that all liquid wastes be classified as either category 1 or 2 regulated waste unless the waste is otherwise exempted in Schedule 7, Part 2 of the *EP Reg*. This means category 1 liquid waste will remain in category 1 and all other liquid wastes will be classified as a category 2 regulated waste, irrespective of the hazard parameters or other properties.

Figure 4 – Classification of (liquid) regulated waste

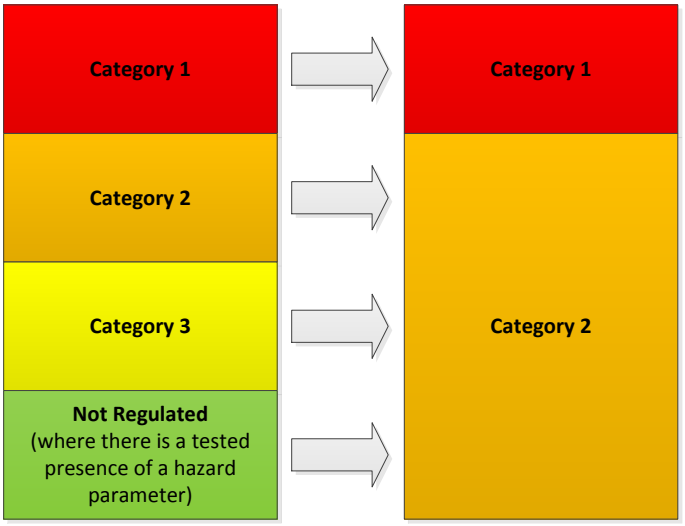


Table 1 – Waste categorisation hazard parameters and thresholds

Hazard parameters	Waste categories											
	Category 1			Category 2			Category 3			Category NR		
	T (mg/kg)		**L** (mg/L)	**T** (mg/kg)		**L** (mg/L)	**T** (mg/kg)		**L** (mg/L)	**T** (mg/kg)		**L** (mg/L)
CONSTITUENTS												
Inorganic species												
Arsenic	> 2,000	or	> 2.8	2,000 - 500	or	2.8 - 0.7	< 500	&	0.7 - 0.35	< 500	&	< 0.35
Barium	> 25,000	or	> 280	25,000 – 6,250	or	280 - 70	< 6,250	&	70 - 35	< 6,250	&	< 35
Beryllium	> 400	or	> 4	400 - 100	or	4 - 1	< 100	&	1 - 0.5	< 100	&	< 0.5
Cadmium	> 400	or	> 0.8	400 - 100	or	0.8 - 0.2	< 100	&	0.2 - 0.1	< 100	&	< 0.1
Chromium (VI)	> 2,000	or	> 20	2,000 - 500	or	20 - 5	< 500	&	5 - 2.5	< 500	&	< 2.5
Copper	> 20,000	or	> 800	20,000 – 5,000	or	800 - 200	< 5,000	&	200 - 100	< 5,000	&	< 100
Lead	> 6,000	or	> 4	6,000 – 1,500	or	4 - 1	< 1,500	&	1 - 0.5	< 1,500	&	< 0.5
Mercury	> 300	or	> 0.4	300 - 75	or	0.4 - 0.1	< 75	&	0.1 - 0.05	< 75	&	< 0.05
Molybdenum	> 4,000	or	> 20	4,000 – 1,000	or	20 - 5	< 1,000	&	5 - 2.5	< 1,000	&	< 2.5
Nickel	> 12,000	or	> 8	12,000 – 3,000	or	8 - 2	< 3,000	&	2 - 1	< 3,000	&	< 1
Selenium	> 200	or	> 4	200 - 50	or	4 - 1	< 50	&	1 - 0.5	< 50	&	< 0.5
Silver	> 10	or	> 0.4	10 - 2.5	or	0.4 - 0.1	< 2.5	or	0.1 - 0.05	< 2.5	&	< 0.05
Zinc	> 140,000	or	> 1,200	140,000 – 35,000	or	1,200 - 300	< 35,000	or	300 - 150	< 35,000	&	< 150
Anions												
Cyanide[2]	> 10,000	or	> 14	10,000 – 2,500	or	14 - 3.5	< 2,500	&	3.5 - 1.75	< 2,500	&	< 1.75
Fluoride	> 40,000	or	> 600	40,000 – 10,000	or	600 - 150	< 10,000	&	150 - 75	< 10,000	&	< 75
Organic species												
Petroleum hydrocarbons												
C6-C9 petroleum hydrocarbons	> 2,600		-	2,600 - 650		-	650 - 325		-	< 325		-
C10-C36 petroleum hydrocarbons	> 40,000		-	40,000 – 10,000		-	10,000 – 5,000		-	< 5,000		-
Polycyclic Aromatic Hydrocarbons												
Benzo(a)pyrene	> 20	or	> 0.004	20 - 5	or	0.004 - 0.001	< 5	&	0.001 - 0.0005	< 5	&	< 0.0005
Polycyclic aromatic hydrocarbons (total)[3]	> 400		-	400 - 100	0	-	100 - 50	0	-	< 50		-

Hazard parameters	Waste categories											
	Category 1			Category 2			Category 3			Category NR		
	T (mg/kg)		L (mg/L)	T (mg/kg)		L (mg/L)	T (mg/kg)		L (mg/L)	T (mg/kg)		L (mg/L)
Monocyclic Aromatic Hydrocarbons												
Benzene	> 16	or	> 0.4	16 - 4	or	0.4 - 0.1	< 4	&	0.1 - 0.05	< 4	&	< 0.05
Toluene	> 12,800	or	> 320	12,800 – 3,200	or	320 - 80	< 3,200	or	80 - 40	< 3,200	&	< 40
Ethylbenzene	> 4,800	or	> 120	4,800 – 1,200	or	120 - 30	< 1,200	&	30 - 15	< 1,200	&	< 15
Xylenes (total)	> 9,600	or	> 240	9,600 – 2,400	or	240 - 60	< 2,400	or	60 - 30	< 2,400	&	< 30
Styrene (vinyl benzene)	> 480	or	> 12	480 - 120	or	12 - 3	< 120	or	3 - 1.5	< 120	&	< 1.5
Chlorinated hydrocarbons												
Carbon tetrachloride	> 48	or	> 1.2	48 - 12	or	1.2 - 0.3	< 12	&	0.3 - 0.15	< 12	&	< 0.15
Chlorobenzene	> 4,800	or	> 120	4,800 – 1,200	or	120 - 30	< 1,200	&	30 - 15	< 1,200	&	< 15
Chloroform	> 960	or	> 24	960 - 240	or	24 - 6	< 240	&	6 - 3	< 240	&	< 3
1,2- Dichlorobenzene	> 24,000	or	> 600	24,000 – 6,000	or	600 - 150	< 6,000	&	150 - 75	< 6,000	&	< 75
1,4- Dichlorobenzene	> 640	or	> 16	640 - 160	or	16 - 4	< 160	&	4 - 2	< 160	&	< 2
1,2- Dichloroethane	> 48	or	> 1.2	48 - 12	or	1.2 - 0.3	< 12	&	0.3 - 0.15	< 12	&	< 0.15
1,1-Dichloro- ethylene	> 480	or	> 12	480 - 120	or	12 - 3	< 120	&	3 - 1.5	< 120	&	< 1.5
Dichloromethane	> 64	or	> 1.6	64 - 16	or	1.6 - 0.4	< 16	&	0.4 - 0.2	< 16	&	< 0.2
1,1,1,2- Tetrachloro- ethane	> 1,600	or	> 40	1,600 - 400	or	40 - 10	< 400	or	10 - 5	< 400	&	< 5
1,1,2,2- Tetrachloro- ethane	> 210	or	> 5.2	210 - 52.5	or	5.2 - 1.3	< 52.5	or	1.3 - 0.65	< 52.5	&	< 0.65
Tetrachloro- ethylene	> 800	or	> 20	800 - 200	or	20 - 5	< 200	or	5 - 2.5	< 200	&	< 2.5
1,1,1- Trichloroethane	> 4,800	or	> 120	4,800 – 1,200	or	120 - 30	< 1,200	or	30 - 15	< 1,200	&	< 15
1,1,2- Trichloroethane	> 190	or	> 4.8	190 - 47.5	or	4.8 - 1.2	< 47.5	or	1.2 - 0.6	< 47.5	&	< 0.6
Trichloroethylene	> 80	or	> 2	80 - 20	or	2 - 0.5	< 20	or	0.5 - 0.25	< 20	&	< 0.25
Vinyl chloride	> 4.8	or	> 0.12	4.8 - 1.2	or	0.12 - 0.03	< 1.2	or	0.03 - 0.015	< 1.2	&	< 0.015
Phenols												
2,4,5- Trichlorophenol	> 64,000	or	> 1,600	64,000 – 16,000	or	1,600 - 400	< 16,000	or	400 - 200	< 16,000	&	< 200
2,4,6- Trichlorophenol	> 320	or	> 8	320 - 80	or	8 - 2	< 80	or	2 - 1	< 80	&	< 1
Cresol (total)	> 32,000	or	> 800	32,000 – 8,000	or	800 - 200	< 8,000	&	200 - 100	< 8,000	&	< 100
Phenol total, (non- halogenated)[4]	> 2,200	or	> 56	2,200 - 550	or	56 - 14	< 550	&	14 - 7	< 550	&	< 7

Hazard parameters	Waste categories											
	Category 1			Category 2			Category 3			Category NR		
	T (mg/kg)		L (mg/L)	T (mg/kg)		L (mg/L)	T (mg/kg)		L (mg/L)	T (mg/kg)		L (mg/L)
Nitroaromatics and ketones												
2,4-Dinitrotoluene	> 21	or	> 0.52	21 - 5.25	or	0.52 - 0.13	< 5.25	&	0.13 - 0.065	< 5.25	&	< 0.065
Nitrobenzene	> 320	or	> 8	320 - 80	or	8 - 2	< 80	&	2 - 1	< 80	&	< 1
Methyl ethyl ketone	> 32,000	or	> 800	32,000 – 8,000	or	800 - 200	< 8,000	&	200 - 100	< 8,000	&	< 100
Specific persistent organic pollutants (POP)												
2,4-D	> 480	or	> 12	480 - 120	or	12 - 3	< 120	&	3 - 1.5	< 120	&	< 1.5
Aldrin + Dieldrin	> 4.8	or	> 0.12	4.8 - 1.2	or	0.12 - 0.03	< 1.2	&	0.03 - 0.015	< 1.2	&	< 0.015
Organochlorine pesticides[5]	> 50	0	-	< 50	0	-	< 50	&	2 - 1	< 50	&	< 1
Organophosphate pesticides[6]	> 30	or	> 0.8	30 - 7.5	or	0.8 - 0.4	< 7.5	&	0.4 - 0.2	< 7.5	&	< 0.2
Polychlorinated biphenyls	> 50	or	> 0.002	50 - 20	or	0.002 - 0.001	20 - 2	&	<0.001	< 2	&	< 0.001
Any other ratified Stockholm – POP[7]	> 50		-	-		-	-		-	< 50		-
PROPERTIES												
	Category 1			**Category 2**			**Category 3**			**Category (NR)**		
pH	≤ 2.0 or ≥12.5			2 - 4 or 10.5 - 12.5			4 - 6			6 - 10.5		
Electrical conductivity (µS/cm)	N/A			≥15,000			≥15,000			<15,000		
Biochemical oxygen demand	N/A			≥20			≥20			<20		
Flash point (^{0}C)	≤60.5			N/A			N/A			>60.5		
Peroxides (other than hydrogen peroxide) above 1% (v/v)	Present			N/A			N/A			Not present		
WASTES FOR WHICH TESTING IS NOT RELEVANT												
	Category 1			**Category 2**			**Category 3**			**Category (NR)**		
Chemical waste arising from research and development or teaching activity, including new or unidentified material and material whose effects on human health or the environment are not known	N/A			Present			N/A			Not present		
Clinical and related waste[8]	Present			N/A			N/A			Not present		
Oxidising agents	Present			N/A			N/A			Not present		
Pharmaceuticals, drugs and medicines	Present			N/A			N/A			Not present		
Tyres	N/A			N/A			Present			Not present		

WASTES FOR WHICH TESTING IS NOT RELEVANT				
	Category 1	**Category 2**	**Category 3**	**Category (NR)**
Waste from the production and preparation of pharmaceutical products	Present	N/A	N/A	Not present
Waste of an explosive nature other than explosives within the meaning of the Explosives Act 1999	Present	N/A	N/A	Not present

Notes:

1. mg/kg is expressed on a dry weight basis.
2. Cyanide means:
    a) for total concentration analysis (T, mg/kg), Total Cyanide
    b) for leachable concentration analysis (L, mg/L) Cyanide Amenable to Chlorination. Note that the ASLP/ TCLP method is not appropriate for measuring cyanide.
3. Total sum of naphthalene, acenaphthylene, acenaphthene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluorene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene and pyrene.
4. Total sum of phenol, 2-methylphenol (o-cresol), 3-methylphenol (m-cresol), 4-methylphenol (p-cresol), 2,4-dimethylphenol, 2.4-dinitrophenol, 2- methyl-4,6-dinitrophenol, 2-nitrophenol, 4-nitrophenol, 2-cyclohexyl-4,6-dinitrophenol and dinoseb.
5. Means laboratory analysis suite of organochlorine pesticides that typically include: Total sum of aldrin, hexachlorobenzene, alpha BHC, beta BHC, gamma BHC (lindane), delta BHC, chlordane, DDT, DDD, DDE, dieldrin, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, methoxychlor and endosulfan (includes endosulfan I, endosulfan II and endosulfan sulphate).
6. Means the list of organophosphate chemicals approved for use in Australia as shown in Appendix 2 of: Organophosphate Pesticides – Hazardous Chemicals Requiring Health Monitoring, Safe Work Australia, 2013 (http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/801/Organophosphate-Pesticides.pdf).
7. Persistent Organic Pollutant, as listed in the Stockholm Convention (http://chm.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx) and ratified by the Australian Government (more information at: http://www.environment.gov.au/topics/environment-protection/chemicals-management/pops).
8. Clinical or related waste means wastes arising from medical, nursing, dental, veterinary, laboratory, pharmaceutical, podiatry, tattooing, body piercing, brothels, emergency services, blood banks, mortuary practices and other similar practices, and wastes generated in healthcare facilities or other facilities during the investigation or treatment of patients or research projects, which have the potential to cause disease, injury, or public offence, and includes: sharps, clinical waste, human tissue or body parts, cytotoxic waste, pharmaceutical waste and chemical wastes.

Table 2 – Default waste categorisation table

Waste (tracking) code	Current regulated waste description	Primary hazard	Hazard description	Default waste category
D130	Arsenic and arsenic compounds	H11	Toxic (delayed or chronic)	1
D160	Beryllium and beryllium compounds	H11	Toxic (delayed or chronic)	1
D150	Cadmium and cadmium compounds	H11	Toxic (delayed or chronic)	1
T100	Chemical waste arising from research and development or teaching activity, including new or unidentified material and material whose effects on human health or the environment are not known	H6.1	Poisonous (acute)	1
D350	Chlorates	H1	Explosive	1
D140	Chromium compounds (hexavalent and trivalent)	H11	Toxic (delayed or chronic)	1
R100	Clinical and related wastes	H6.2	Infectious substances	1
A130	Cyanides (inorganic)	H6.1	Poisonous (acute)	1
N190	Filter cake, other than filter cake waste generated from the treatment of raw water for the supply of drinking water	H11	Toxic (delayed or chronic)	1
N150	Fly ash	H11	Toxic (delayed or chronic)	1
G150	Halogenated organic solvents	H3	Flammable liquids	1
M100	Material containing polychlorinated biphenyls (PCBs), polychlorinated napthalenes (PCNs), polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs)	H12	Ecotoxic	1
D100	Metal carbonyls	H6.1	Poisonous (acute)	1
H110	Organic phosphorus compounds	H11	Toxic (delayed or chronic)	1
G110	Organic solvents other than halogenated solvents, including, for example, ethanol	H3	Flammable liquids	1
M160	Organohalogen compounds, other than another substance stated in this schedule	H12	Ecotoxic	1
-	Oxidising agents	H5.1	Oxidizing	1
D340	Perchlorates	H1	Explosive	1
R120	Pharmaceuticals, drugs and medicines	H6.1	Poisonous (acute)	1
M170	Polychlorinated dibenzo-furan (any congener)	H11	Toxic (delayed or chronic)	1
M180	Polychlorinated dibenzo-p-dioxin (any congener)	H11	Toxic (delayed or chronic)	1
N205	Residues from industrial waste treatment or disposal operations	H11	Toxic (delayed or chronic)	1
J160	Tarry residues arising from refining, distillation or any pyrolytic treatment	H11	Toxic (delayed or chronic)	1
A110	Waste from a heat treatment or tempering operation that uses cyanides	H11	Toxic (delayed or chronic)	1
H100	Waste from manufacture, formulation and use of the following: a) biocides or phytopharmaceuticals	H11	Toxic (delayed or chronic)	1
G160	Waste from manufacture, formulation and use of the following: c) organic solvents	H3	Flammable liquids	1
F110	Waste from manufacture, formulation and use of the following: e) resins, latex, plasticisers, glues or other adhesives	H11	Toxic (delayed or chronic)	1

Waste (tracking) code	Current regulated waste description	Primary hazard	Hazard description	Default waste category
H170	Waste from manufacture, formulation and use of the following: f) wood-preserving chemicals	H11	Toxic (delayed or chronic)	1
R140	Waste from the production and preparation of pharmaceutical products	H6.1	Poisonous (acute)	1
E120	Waste of an explosive nature other than explosives within the meaning of the Explosives Act 1999	H1	Explosive	1
B100	Acidic solutions and acids in solid form	H8	Corrosives	2
N220	Asbestos	H11	Toxic (delayed or chronic)	2
C100	Basic (alkaline) solutions and bases (alkalis) in solid form	H8	Corrosives	2
D310	Boron compounds	H11	Toxic (delayed or chronic)	2
D190	Copper compounds	H12	Ecotoxic	2
M210	Cyanides (organic)	H6.1	Poisonous (acute)	2
G100	Ethers	H3	Flammable liquids	2
K110	Grease trap waste	Other	Amenity based	2
M260	Highly odorous organic chemicals including mercaptans and acrylates	Other	Strong offensive odours at low substance concentrations	2
D110	Inorganic fluorine compounds, other than calcium fluoride	H12	Ecotoxic	2
D330	Inorganic sulfides	H8	Corrosives	2
M220	Isocyanate compounds	H12	Ecotoxic	2
D220	Lead and lead compounds including lead-acid batteries	H11	Toxic (delayed or chronic)	2
D120	Mercury and mercury compounds	H11	Toxic (delayed or chronic)	2
J100	Mineral oils	H3	Flammable liquids	2
M150	Phenols, phenol compounds including chlorophenols	H6.1	Poisonous (acute)	2
D240	Selenium and selenium compounds	H12	Ecotoxic	2
M250	Surface active agents (surfactants), containing principally organic constituents, whether or not also containing metals and inorganic materials	H12	Ecotoxic	2
K140	Tannery wastes, including leather dust, ash, sludges and flours	H11	Toxic (delayed or chronic)	2
D250	Tellurium and tellurium compounds	H11	Toxic (delayed or chronic)	2
M230	Triethylamine catalysts for setting foundry sands	H11	Toxic (delayed or chronic)	2
D270	Vanadium compounds	H11	Toxic (delayed or chronic)	2
E100	Waste containing peroxides other than hydrogen peroxide	H1	Explosive	2
F100	Waste from manufacture, formulation and use of the following: b) inks, dyes, pigments, paints, lacquers or varnish	H3	Flammable liquids	2
T120	Waste from manufacture, formulation and use of the following: d) photographic chemicals or processing materials	H8	Corrosives	2
K190	Wool scouring wastes	Other	Odour amenity	2

Waste (tracking) code	Current regulated waste description	Primary hazard	Hazard description	Default waste category
D230	Zinc compounds	H12	Ecotoxic	2
K100	Animal effluent and residues, including abattoir effluent and poultry and fish processing wastes)	Other	Amenity based	3
D170	Antimony and antimony compounds	H11	Toxic (delayed or chronic)	3
D290	Barium compounds, other than barium sulfate	H11	Toxic (delayed or chronic)	3
-	Food processing waste	Other	Amenity based	3
D210	Nickel compounds	H11	Toxic (delayed or chronic)	3
D300	Non-toxic salts, for example, saline effluent	H13	Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above	3
D360	Phosphorus compounds, other than mineral phosphates	H11	Toxic (delayed or chronic)	3
K130	Sewage sludge and residues, including nightsoil and septic tank sludge	Other	Odour amenity	3
D180	Thallium and thallium compounds	H11	Toxic (delayed or chronic)	3
T140	Tyres	Other	Fire (with toxic by-products) and mosquito (health) risk	3
-	Vegetable oils	H3	Flammable liquids	3

Table 3 - Waste that is not regulated waste under section 65(3)

Intact or partly disassembled televisions
Intact or partly disassembled electronic equipment designed to be used with a television, including video players, DVD players, games units and set-top boxes
Intact or partly disassembled computers, including desktop computers, notebook computers, laptop computers and tablets
Intact or partly disassembled equipment designed to be used with computers, including keyboards, mouses, hard drives, scanners, printers, multi-function devices, speakers and web cameras
Intact or partly disassembled internal computer components, including network or graphics cards, motherboards and DVD drives
Mobile phones and mobile phone accessories, including chargers
Batteries typically used in small electronic devices or handheld devices such as mobile phones, digital cameras, keyboards, toys and torches
Whitegoods
Used treated timber power poles
Residue produced by the process of recycling treated timber products, for example power poles and bridge timbers, containing amounts of treatment chemicals
Groundwater or treated groundwater necessarily or unavoidably brought to the surface of the earth as part of an industrial process, if the groundwater – • has a pH of at least 6 but not more than 10.5; and has an electrical conductivity of less than 15000 micro-Siemens a centimetre.
Tallow

Source: Environmental Protection Regulation 2008, Schedule 7, part 2.

7.0 Working examples

This section uses several examples to clarify the waste classification process under the proposed framework.

The example uses the hazard parameter list, thresholds and waste categories in Table 1.

The example follows the four decision steps:

1. Employing the definitional exclusion test.
2. Characterising the type of hazard(s) present.
3. Testing for hazard parameters.
4. Assessing and classifying the waste.

7.1 Example 1: Spent catalyst waste using method 2 (testing required)

Petroleum refining company X produces spent catalyst waste, which is suspected to contain a range of heavy metals and other organic contaminants.

Step 1 – Apply the definitional exclusion test

The relevant part of the existing regulated waste definition is:

> *"(1) Regulated waste is waste that –*
>
> - *is commercial or industrial waste, whether or not it has been immobilised or treated…"*

Applying this part of the definition, the fact that Company X is in the petroleum refining industry and that this particular waste emanates from an industrial process, identifies the waste as *industrial waste*. This means that the spent catalyst waste is not immediately excluded from being regulated waste and the categorisation process continues to step 2.

Step 2 – Characterise the type of hazard present

A sampling and testing program for this waste is established. In this case the waste material is granular, like pellets, and held on-site in three storage bins. A combination of process knowledge and previous testing indicates the likely contaminants of concern are heavy metals (most likely zinc and lead), BTEX (benzene, toluene, ethyl benzene and xylene) and PAHs (polycyclic aromatic hydrocarbons). As a result of this in-house knowledge, the company decides to target these analytes using a sample from one of the storage bins. A separate composite sample (taken from all bins) for a slightly broader analysis suite, due to the potential presence of a broader range of organic chemicals, is also undertaken.

Step 3 – Test for hazard parameters

- Seven samples (one sampling duplicate from each bin plus the composite) are taken by subsampling each bin several times and combining them for each sample.
- These seven samples are sent to a NATA registered laboratory – one of them for a broad screen and the remaining six for analysis of likely contaminants – determined to be heavy metals, BTEX and PAHs.
- Sampling results averaged for the three samples are shown in Table 4.

Table 4 - Total concentration results from seven samples of spent catalyst waste

Test parameter	Sample A1 (mg/kg)	Sample A2 (mg/kg)	Sample B1 (mg/kg)	Sample B2 (mg/kg)	Sample C1 (mg/kg)	Sample C2 (mg/kg)	Sample D Composite (mg/kg)
Arsenic	410	472	267	306	349	401	367
Barium	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Beryllium	12	14	8	9	10	12	11
Cadmium	127	146	83	95	108	124	114
Chromium (VI)	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Copper	4,520	5,198	2,938	3,379	3,842	4,418	4,049
Lead	1,690	1,944	1,099	1,263	1,437	1,652	1,514
Mercury	105	121	68	78	89	103	94
Molybdenum	200	230	130	150	170	196	179
Nickel	280	322	182	209	238	274	251
Selenium	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Silver	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Zinc	8,550	9,833	5,558	6,391	7,268	8,358	7,659
C6-C9 petroleum hydrocarbons							67
C10-C36 petroleum hydrocarbons							108
Benzene	10	12	7	7	9	10	9.0
Toluene	21	24	14	16	18	21	19
Ethylbenzene	13	15	8	10	11	13	12
Xylenes (total)	28	32	18	21	24	27	25
Styrene (vinyl benzene)	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Total PAHs	36	41	23	27	31	35	32
Total phenols							<LOR
Carbon tetrachloride							<LOR
Chlorobenzene							<LOR
Chloroform							<LOR
1,2- Dichlorobenzene							<LOR
1,4- Dichlorobenzene							<LOR
1,2- Dichloroethane							<LOR
1,1-Dichloro- ethylene							<LOR
Dichloromethane							<LOR
1,1,1,2- Tetrachloro-ethane							<LOR
1,1,2,2- Tetrachloro-ethane							<LOR
Tetrachloro-ethylene							<LOR
1,1,1- Trichloroethane							<LOR
1,1,2- Trichloroethane							<LOR
Trichloroethylene							<LOR

All results reported on a dry weight basis
LOR = limit of reporting

Step 4 - Assess and classify the waste

After characterising, testing and comparing these results against the levels in **Table 1,** each individual result was classified as Category 1, 2, 3 or NR. For ease of reading, each of the classified hazard parameters are colour coded to be either red (category 1), orange (category 2), yellow (category 3) or green (not-regulated). This is consistent with the colour coded classifications shown in **Table 1**.

The assessment of total concentration results against the system are shown in **Table 5**. From this we can deduce the following:

- For all samples, no leachability testing is required for barium, chromium VI, selenium, silver, toluene, ethyl benzene, xylene, styrene and PAHs, as these are all below the lowest threshold and exhibit properties of **Category NR**.

- For the composite sample, all additional analyses (total phenols, total petroleum hydrocarbons and a range of chlorinated aliphatic hydrocarbons) are below the lowest threshold and exhibit properties of **Category NR**, meaning that no further testing for these additional parameters is necessary.
- All samples are definitively categorised as **Category 2** for benzene and most samples fall into **Category 2** for cadmium, lead and mercury.
- Overall this waste is at least **Category 2** waste after the total concentrations test stage, but leachability testing is required to definitively assess the following hazard parameters: **arsenic, beryllium, molybdenum, nickel** and **zinc**.

After the above review of total concentration results, the laboratory was instructed to undertake a second level of analyses on all samples as follows:

- Leachability testing using the ASLP method for arsenic, beryllium, cadmium, copper, lead, mercury, molybdenum, nickel, zinc and BTEX (benzene, toluene, ethyl benzene and xylene, often plus styrene, are an inclusive suite).

This second round of results is shown in **Table 6**.

Using the same approach as described above, the remaining ASLP results are assessed against the thresholds in **Table 1.** The resulting classification for each hazard parameter is shown in **Table 7** and from this we can determine that the waste is a **Category 1 Regulated Waste.**

This is because the leachability results for both lead and mercury (for all samples) fall within the Category 1 threshold limits and the overall classification of the waste is determined by the hazard parameter/s with the highest risk category.

Table 5 - Overlay of category assessment – total concentrations only

Test parameter	Sample A1 (mg/kg)	Sample A2 (mg/kg)	Sample B1 (mg/kg)	Sample B2 (mg/kg)	Sample C1 (mg/kg)	Sample C2 (mg/kg)	Sample D Composite (mg/kg)
Arsenic	L	L	L	L	L	L	L
Barium	NR	NR	NR	NR	NR	NR	NR
Beryllium	L	L	L	L	L	L	L
Cadmium	2	2	L	L	2	2	2
Chromium (VI)	NR	NR	NR	NR	NR	NR	NR
Copper	L	2	L	L	L	L	L
Lead	2	2	L	L	2	2	2
Mercury	2	2	L	2	2	2	2
Molybdenum	L	L	L	L	L	L	L
Nickel	L	L	L	L	L	L	L
Selenium	NR	NR	NR	NR	NR	NR	NR
Silver	NR	NR	NR	NR	NR	NR	NR
Zinc	L	L	L	L	L	L	L
C6-C9 petroleum hydrocarbons							NR
C10-C36 petroleum hydrocarbons							NR
Benzene	2	2	2	2	2	2	2
Toluene	NR	NR	NR	NR	NR	NR	NR
Ethylbenzene	NR	NR	NR	NR	NR	NR	NR
Xylenes (total)	NR	NR	NR	NR	NR	NR	NR
Styrene (vinyl benzene)	NR	NR	NR	NR	NR	NR	NR
Total PAHs	NR	NR	NR	NR	NR	NR	NR
Total phenols							NR
Carbon tetrachloride							NR
Chlorobenzene							NR
Chloroform							NR
1,2- Dichlorobenzene							NR
1,4- Dichlorobenzene							NR
1,2- Dichloroethane							NR
1,1-Dichloro- ethylene							NR
Dichloromethane							NR
1,1,1,2- Tetrachloro-ethane							NR
1,1,2,2- Tetrachloro ethane							NR
Tetrachloro-ethylene							NR
1,1,1- Trichloroethane							NR
1,1,2- Trichloroethane							NR
Trichloroethylene							NR

1, 2, 3, NR = Category names per parameter per sample, with matching colour coding as per Table 3.
L = requires further determination through leachability testing.

Table 6 - Leachable concentration results from 7 samples of spent catalyst waste

Test parameter	Sample A1 (mg/L)	Sample A2 (mg/L)	Sample B1 (mg/L)	Sample B2 (mg/L)	Sample C1 (mg/L)	Sample C2 (mg/L)	Sample D Composite (mg/L)
Arsenic	0.50	0.58	0.33	0.37	0.43	0.49	0.45
Beryllium	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Cadmium	0.42	0.48	0.27	0.31	0.36	0.41	0.38
Copper	181	208	118	135	154	177	162
Lead	19	22	12	14	16	18	17
Mercury	1.1	1.2	0.7	0.8	0.9	1.1	1.0
Molybdenum	2.1	2.4	1.4	1.6	1.8	2.1	1.9
Nickel	6	7	4	5	5	6	6
Zinc	190	219	124	142	162	186	170
Benzene	0.13	0.14	0.08	0.09	0.11	0.12	0.11
Toluene	0.26	0.30	0.17	0.20	0.22	0.26	0.24
Ethylbenzene	0.16	0.19	0.11	0.12	0.14	0.16	0.15
Xylenes (total)	0.35	0.40	0.23	0.26	0.30	0.34	0.31
Styrene (vinyl benzene)	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR

All results as mg/L in extracted leachate
LOR = limit of reporting

Table 7 - Overlay of category assessment – leachable concentrations

Test parameter	Sample A1 (mg/L)	Sample A2 (mg/L)	Sample B1 (mg/L)	Sample B2 (mg/L)	Sample C1 (mg/L)	Sample C2 (mg/L)	Sample D Composite (mg/L)
Arsenic	3	3	NR	3	3	3	3
Beryllium	NR	NR	NR	NR	NR	NR	NR
Cadmium	2	2	2	2	2	2	2
Copper	3	2	3	3	3	3	3
Lead	1	1	1	1	1	1	1
Mercury	1	1	1	1	1	1	1
Molybdenum	NR	NR	NR	NR	NR	NR	NR
Nickel	2	2	2	2	2	2	2
Zinc	3	3	NR	3	3	3	3
Benzene	2	2	2	2	2	2	2
Toluene	NR	NR	NR	NR	NR	NR	NR
Ethylbenzene	NR	NR	NR	NR	NR	NR	NR
Xylenes (total)	NR	NR	NR	NR	NR	NR	NR
Styrene (vinyl benzene)	NR	NR	NR	NR	NR	NR	NR

1, 2, 3, NR = Category names per parameter per sample, with matching colour coding as per Table 3.

7.2 Example 2: Boat building waste using method 1 (no testing required)

A maritime building company produces waste from its boat manufacturing operations that is likely to contain resin-like materials and adhesive gums. This company chooses not to test its waste.

Step 1 – Apply the definitional exclusion test

The relevant part of the existing definition which may be retained is:

> *"(1) Regulated waste is waste that –*
>
> *a) is commercial or industrial waste, whether or not it has been immobilised or treated…"*

Applying this test, because the company is in the business of building marine craft using a range of chemicals and raw materials that could pose a hazard, its resinous waste is suitable to be classified as *industrial waste*. This means that its resinous waste is not immediately excluded from being regulated waste and the process must be followed further.

Steps 2 & 3 – Characterise the hazard and test for hazard parameters

The company knows the hazard parameters of the waste and chooses not to test.

Step 4 – Assess and classify the waste's hazard using the default waste list

This company's waste is automatically regulated waste and the default waste list is consulted to categorise the waste. Since the company had previously filled out waste transport certificates using the waste code *F110*, waste description *Waste from manufacture, formulation and use of the following: resins, latex, plasticisers, glues or other adhesives*, this will be the appropriate waste description to refer to in deciding the waste category.

Using the default category for this waste in **Table 3**, this waste would be classified as **Category 1 Regulated Waste**.

Note: To account for the risk of variability in types of wastes, concentrations of contaminants and constituents and different industrial processes, the default categorisations in table 3 may be higher than what might eventuate from actual testing and assessment. This approach balances workability of the framework with protection of environmental and human health values.