



## Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision

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# Environmental Protection Agency

## AGENCY STATUS

The Environmental Protection Agency (EPA) is an independent public body established in July 1993 under the Environmental Protection Agency Act, 1992. Its sponsor in Government is the Department of the Environment, Heritage and Local Government.

The EPA is managed by a full time Executive Board consisting of a Director General and four Directors. Independence is assured through the selection procedures for the Director General and Directors and the freedom, as provided in the legislation, to act on its own initiative. The assignment, under the legislation, of direct responsibility for a wide range of functions underpins this independence. Under legislation, it is a specific offence to attempt to influence the Agency, or anyone acting on its behalf, in an improper manner.

The Agency is assisted by an Advisory Committee of twelve members, appointed by the Minister for the Environment, Heritage and Local Government.

## RESPONSIBILITIES

The EPA has a wide range of statutory duties and powers under the Environmental Protection Act. In addition, the capacity of the EPA in relation to enforcement has been enhanced by powers contained in the Protection of the Environment Act 2003. The main responsibilities of the EPA include the following:

- licensing large/complex industrial and other processes with significant polluting potential;
- monitoring environmental quality, including the establishment of databases to which the public have access;
- publishing periodic reports on the state of the environment;
- promoting environmentally sound practices;
- promoting and co-ordinating environmental research;
- licensing all significant waste disposal and recovery activities, including landfills, and the preparation of a national hazardous waste management plan;
- implementing a system of permitting for the control of VOC emissions resulting from the storage of significant quantities of petrol at terminals;
- implementing and enforcing the GMO Regulations for the contained and deliberate release of GMOs into the environment;
- preparing and implementing a national hydrometric programme;

- drafting a National Allocation Plan for greenhouse gas emissions allowance trading; the establishment of a National Competent Authority for the issuing of trading permits and allowances to those covered by the scheme; the monitoring, overseeing and verification of emissions from participating companies; and the establishment of a National Emissions Trading Registry;

and, under the Office of Environmental Enforcement, established in 2003 and dedicated to the implementation and enforcement of environmental legislation in Ireland:

- improving overall compliance with environmental protection legislation in Ireland;
- raising awareness about the importance of enforcement of environmental protection legislation in Ireland;
- enforcing IPPC licences and Waste licences issued by the EPA;
- auditing and reporting on the performance of local authorities in the discharge of their environmental protection functions, including:
  - enforcement in respect of breaches of waste permits,
  - taking action in relation to illegal dumping,
  - implementation of waste collection permits, and
  - enforcement of producer responsibility initiatives (for example, in the area of packaging waste);
- taking action against local authorities that are not discharging their environmental protection functions in an adequate manner;
- prosecuting, or assisting local authorities to prosecute, significant breaches of environmental protection legislation, in a timely manner; and
- assisting local authorities to improve their environmental protection performance on a case by case basis, through the establishment of an enforcement network to promote information exchange and best practice, and by the provision of appropriate guidance.



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## **Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision**

Published by the Environmental Protection Agency, Ireland

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**ISBN: 1-84095-195-8**

**05/06/1000**

**Price: €20**

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## ACKNOWLEDGEMENTS

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This project was financed by the Office of Environmental Enforcement (OEE) within the Environmental Protection Agency (EPA). RPS were Project Co-ordinators responsible to the OEE for its preparation and were assisted by Professor Yvonne Scannell, Ms. Deborah Spence, and Mr. Brendan Slattery of Arthur Cox, and Mr. Stephen Sykes, Professor Bob Lee and Ms. Begonia Filguerra of Gaia Law. Ms. Maria Kelleher and Ms. Betty Muise of Kelleher Environmental also provided valuable assistance in the development of the Training Programme. The Project was monitored by a Technical Steering Group established by the OEE and comprising representatives of the OEE, the Department of the Environment, Heritage and Local Government (membership below).

The input to the guidance document from OLG and OEE Licence Enforcement staff, in particular Dr. Jonathan Derham, Ms. Mary Gurrie, Mr. Stephen McCarty, Ms. Derval Devaney and Ms. Becci Cantrell is gratefully acknowledged.

Members of the Technical Steering Group were:

Mr. Dara Lynott, Director OEE, EPA  
Mr. Brendan Foley, Project Manager, OEE, EPA  
Ms. Loraine Fegan, Programme Manager, OEE, EPA  
Mr. Malcom Doak, OLG, EPA  
Dr. Brian Leech, Policy Advisor, Department of the Environment, Heritage and Local Government.

The Agency would also like to acknowledge those persons who took time to offer valuable information, advice and in many cases comments and constructive criticism on the guidance document in its draft form who are acknowledged below.

Dr. Ben Dhonau, Department of Marine Communications and Natural Resources  
Mr. Bob Taylor, Environment Agency  
Office of the DG Environment, European Commission  
Mr. Conor Linehan, William Fry Solicitors (on behalf of Indaver Ireland)  
Mr. Danny Clack, Quanta Europe Ltd  
Mr. David Burke, Shannon Environmental Services  
Mr. Erik O'Donovan, Irish Waste Management Association  
Ms. Paula Neilan, Glanbia Ingredients  
Mr. Rod MacConaill, Schering-Plough (Brinny) Company  
Mr. Vincent Boyton, Novartis Ringaskiddy Limited  
Mr. Josef A. Teppan & Mr. Walter Power, The Grangemockler & Hardbog Environmental Group  
Ms. Kara Flannery, Enviros Consulting  
Mr. Nick Hawthorne, Golder Associates UK Ltd  
Mr. Gerard Kelly, URS Ireland Ltd  
Ms. Dawn Slevin, Environmental Liability Services  
Mr. Shane M. Bennet, S.M. Bennet & Company

The Agency would also like to acknowledge the co-ordination of the preparation and supply of photographs by Mr. John Doheny.

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# 1 INTRODUCTION

## 1.1 GENERAL INTRODUCTION

This Guidance Document presents a systematic approach to the assessment and management of Environmental Liabilities in order to comply with IPPC and Waste Licence conditions for Environmental Liability Risk Assessment (ELRA), Residual Management Planning (RMP) and Financial Provision (FP). Currently, there are variations between the IPPC and Waste Licensing systems in relation to specific conditions and terminology, but these will be gradually addressed during future revisions to existing licences (through the implementation of the IPPC Directive for example) and by the issue of new licences to new facilities.

This Guidance includes a risk assessment methodology in Step 1 (Initial Screening) that reduces the number of IPPC and waste licensed facilities that will be required to complete full ELRA and RMP reports and make Financial Provision. The Guidance also proposes a system whereby higher risk facilities can reduce their risk profile through risk management in order to reduce the costs of making financial provision.

There are several environmental benefits of proper ELRA, CRAMP and FP planning which include:

- The reduction in the potential for environmental damage as the result of accidents
- The minimisation of residual / long term impacts from manufacturing and waste management facilities upon closure
- Forward Financial planning for environmental liabilities
- Reduction in the financial provision required

A Glossary of Terms has been included within Appendix A of this document for reference.

## 1.2 LEGAL FRAMEWORK FOR ELRA/RMP/FP

### 1.2.1 European Union

#### Landfill Directive

Directive 1999/31/EC of 26 April 1999 on the landfill of waste makes direct reference, in particular, to RMP and Financial Provision under Article 7.

The application for a landfill permit must contain certain minimum particulars, including “the proposed plan for the closure and after-care procedures” (i.e., CRAMP) and “the financial security by the applicant, or any other equivalent provision, as required under Article 8(a)(iv) of this Directive” (i.e., FPA).<sup>1</sup>

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<sup>1</sup>Article 7

Furthermore Article 8 stipulates that the competent authority (the EPA) must not issue a landfill permit unless it is satisfied that:

“adequate provisions, by way of financial security or any other equivalent, on the basis of modalities to be decided by Member States, has been or will be made by the applicant prior to commencement of disposal operations to ensure that the obligations (including after-care provisions) arising under the permit issued under the provisions of this Directive are discharged and that closures procedures required by Article 13 are followed. This security or its equivalent shall be kept as long as required by maintenance and after-care operation of the site in accordance with Article 13(d).

### **Waste Incineration Directive**

The stated aim of Directive 2000/76/EC of 4 December 2000 on the incineration of waste is to “prevent or to limit as far as practicable negative effects on the environment...from the incineration and co-incineration of waste”.

A permit for an incineration or co-incineration plant must comply with applicable requirements under various other EU Directives including the Landfill Directive. As a result, the Landfill Directive requirements regarding adequate financial provision would apply with equal force to incineration or co-incineration plants.

### **IPPC Directive**

Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control contains separate references to the necessary measures “to prevent accidents and limit their consequences” and “upon definitive cessation of activities, to avoid any pollution risk and return the site of operation to a satisfactory state” under Article 3.

### **Environmental Liability Directive**

The Directive 2004/35/EC of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage provides a framework of environmental liability based on the “polluter pays” principle. The deadline for transposition into domestic law is 30<sup>th</sup> April 2007.

The Directive applies to certain occupational activities, including the operation of installations under the IPPC Directive, the Waste Framework Directive, the Landfill Directive and the Waste Incineration Directive. The Directive will also apply to activities under the proposed Extractive Industry Waste Directive.

It imposes strict liability on those who cause environmental damage (that is, damage to biodiversity and water resources and land contamination that causes significant risk of harm to human health). It requires such persons to take preventive measure to avoid damage occurring, remedy damage that occurs and bear the remediation costs of damage that is remedied by the competent authority. Liability is principally to the competent authority and the Directive does not provide for compensation to third parties who suffer damage.

### **Proposed Mine Waste Directive**

The EU proposed Directive “provides for measures, procedures and guidance to prevent or reduce as far as possible any adverse effects on the environment, and any resultant risks to human health, brought about as a result of the management of waste from the extractive industries”<sup>2</sup>. Following Conciliation in late 2005 on a number of issues including financial provision, the Directive is expected

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<sup>2</sup> Article 1 of COM(2003)0319-C5-0256/2003

to include the requirement for a Financial Guarantee. The guarantee must be sufficient to cover the cost of rehabilitation of the land affected by the waste facility, including the waste facility itself, and the size of the guarantee must be periodically adjusted in accordance with any necessary rehabilitation work<sup>3</sup>.

## 1.2.2 Ireland

### **Waste Management Acts, 1996 to 2003 (the “WMA”).**

#### ***Mandatory Requirements***

The Agency is prohibited from granting a waste licence until it has been satisfied on certain matters,<sup>4</sup> including that:

- The activity concerned will not cause environmental pollution;
- For landfills, the activity will comply with the Landfill Directive;<sup>5</sup>
- The applicant is a fit and proper person to hold a waste licence;<sup>6</sup>
- The applicant has complied with the requirements for provision of financial security under section 53;<sup>7</sup>
- Necessary measures will be taken to prevent and limit the consequences of accidents in the carrying on of the activity; and,<sup>8</sup>
- Necessary measures will be taken upon the permanent cessation of the activity concerned (including from abandonment) to avoid any risk of environmental pollution and return the site of the activity to a satisfactory state.<sup>9</sup>

#### ***Fit and Proper Person***

A person shall be regarded as a fit and proper person if (among other things):

“in the opinion of the Agency, that person is likely to be in a position to meet any financial commitments or liabilities that the Agency reasonably considers will be entered into or incurred by him or her in carrying on the activity to which the waste licence will relate in accordance with the terms thereof or in consequence of ceasing to carry on that activity”<sup>10</sup>.

It is worth noting that section 53 provides a second and separate basis for the imposition of financial provision requirements. The separate references at section 40(4)(d) and (e) (and section 47(5)(a) and (b)) both support this conclusion. The principal significance would appear to be that, although local authorities are not required to be “fit and proper”, they can be required to make financial provision under section 53.

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<sup>3</sup> Report on the joint text by the Conciliation Committee for a directive of the European Parliament and of the Council on the management of waste from the extractive industries and amending Directive 2004/35/EC, A6-0001/2006

<sup>4</sup> Section 40(4) of the WMA.

<sup>5</sup> Inserted by section 35(d) of the Protection of the Environment Act 2003 (“POEA 2003”).

<sup>6</sup> Note that this requirement does not apply where the applicant is a local authority etc.

<sup>7</sup> The requirements under section 53 apply to both private and public entities.

<sup>8</sup> Inserted by section 35(g) of the POEA 2003.

<sup>9</sup> Inserted by section 35(g) of the POEA 2003.

<sup>10</sup> Section 40(7)(c) of the WMA.

## **Conditions**

The Agency may grant a waste licence subject to, or without, conditions or refuse to grant to the applicant such a licence.<sup>11</sup> Certain matters must be specified as conditions in the licence<sup>12</sup> and other matters may be addressed by way of condition, including:

- the making of a plan setting out the measures to be taken in the event of any accident or incident (including any difficulty of an operational nature) occurring that involves the facility or any plant concerned;<sup>13</sup>
- require the making and maintenance of such financial provision as may be required under section 53(1);<sup>14</sup>
- require the holder of the licence to effect and maintain a policy of insurance insuring him or her as respects any liability on his or her part to pay damages or costs on account of injury to person or property arising from the carrying on of the activity concerned;
- require the making of payments by the holder of the licence to the Agency to defray costs which may be incurred by the Agency in monitoring or otherwise in performing any functions in relation to the activity concerned;
- specify requirements for the closure, restoration and remediation of, or the carrying out of aftercare in relation to, the facility concerned; and,
- require the holder of the licence to comply with such further requirements in relation to the closure, restoration, remediation and aftercare of the facility concerned, or otherwise as may in due course be determined under section 46(5).<sup>15</sup>

The Agency is permitted to recover the amount of any payment due to it arising from a condition attached to a waste licence as a simple contract debt in any court of competent jurisdiction.<sup>16</sup> Financial Provision

Before the Agency (1) decides whether to grant or transfer a waste licence or (2) conducts a review of a waste licence, section 53(1) permits the Agency to require the applicant for, or the holder of, the licence or the proposed transferee to:

“(i) furnish to it such particulars in respect of such matters affecting his or her ability to meet the financial commitments or liabilities that the Agency reasonably considers will be entered into or incurred by him or her in carrying on the activity to which the licence relates or will relate, as the case may be, in accordance with the terms of the licence or in consequence of ceasing to carry on that activity as it may specify, and

(ii) make, and furnish evidence of having so made, such financial provision as it may specify (which may include the entering into a bond or other form of security) as will, in the opinion of the Agency, be adequate to discharge the said financial commitments or liabilities.”

Integrated Pollution Prevention and Control - Environmental Protection Agency Acts, 1992 and 2003 (the “EPA Acts”). Mandatory Requirements

As with the WMA, the Agency is prohibited from granting a licence or revised licence for an activity unless it is satisfied of a number of matters, including that:

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<sup>11</sup> Section 40(1)(a) of the WMA. Note there exists a (theoretical) possibility of the grant of a permit without conditions, which would not appear consistent with EU Directives etc. This is not an issue in practice as the Agency routinely imposes certain standard conditions, at minimum. cf section 41(2)(a), which does provide certain minimum requirements for conditions.

<sup>12</sup> Section 41(2)(a) of the WMA.

<sup>13</sup> Effectively, this would comprise an ELRA for future operations. Note that the question of whether FPA can be required to accompany the ELRA must be addressed under section 40(7)(c) and 53 of the WMA.

<sup>14</sup> Which relates to financial provision.

<sup>15</sup> i.e., upon review of the waste licence.

<sup>16</sup> Section 41(5) of the WMA.

- any emissions from the activity will not cause significant environmental pollution;
- necessary measures will be taken to prevent and to limit the consequences of accidents in the carrying on of the activity and to remedy those consequences;
- necessary measures will be taken upon the permanent cessation of the activity (including from abandonment) to avoid any risk of environmental pollution and return the site of the activity to a satisfactory state;
- and, the applicant or licensee or transferee, as the case may be, is a fit and proper person to hold a licence.

### ***Fit and Proper Person***

A person shall be regarded as a fit and proper person if (among other things):<sup>17</sup>

in the opinion of the Agency, that person is likely to be in a position to meet any financial commitments or liabilities that the Agency reasonably considers have been, or will be entered into or incurred by him in carrying on the activity to which the licence or revised licence relates or will relate, as the case may be, in accordance with the terms thereof or in consequence of ceasing to carry on that activity.”

### ***Conditions***

The Agency may grant a licence subject to such conditions as it considers appropriate or refuse the application.<sup>18</sup>

Certain matter must be specified in the licence, including to specify the measures to be taken, including as appropriate the duration of such measures, on and following the permanent cessation of an activity (including such a cessation resulting from the abandonment of the activity).

### ***Financial Provision***

Before the Agency (1) decides whether to grant or to effect a transfer of a licence or a revised licence or (2) completes a review of a licence or a revised licence, section 83(6) permits the Agency to require the applicant for the licence, the licensee in the case of a review, or the proposed transferee to:

“(i) furnish to it such particulars in respect of such matters affecting his ability to meet the financial commitments or liabilities that the Agency reasonably considers will be entered into or incurred by him in carrying on the activity to which the licence or revised licence relates or will relate, as the case may be, in accordance with the terms of the licence or in consequence of ceasing to carry on that activity as it may specify, and

(ii) make, and furnish evidence of having so made, such financial provision as it may specify (which may include the entering into a bond or other form of security) as will, in the opinion of the Agency, be adequate to discharge the said financial commitments or liabilities.”

## **1.3 IPPC AND WASTE LICENCE CONDITIONS FOR ELRA / RMP / FP**

### **1.3.1 Existing IPPC Licensing Requirements**

The standard condition for Residual Management Plan (RMP) in a recently granted IPPC Licence is outlined below:

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<sup>17</sup> Section 84(4); inserted, s15 PoEA 2003.

<sup>18</sup> Section 83(1) of the EPA Acts.

#### **Condition 14. Residuals Management**

*14.1 Following termination, or planned cessation for a period greater than six months, of use or involvement of all or part of the site in the licensed activity, the licensee shall, to the satisfaction of the Agency, decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.*

##### *14.2 Residuals Management Plan:*

*14.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for the decommissioning or closure of the site or part thereof. This plan shall be submitted to the Agency for agreement within six months of the date of commencement of the activities at the site.*

*14.2.2 The plan shall be reviewed annually and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.*

##### *14.3 The Residuals Management Plan shall include as a minimum, the following:*

*14.3.1 A scope statement for the plan.*

*14.3.2 The criteria which define the successful decommissioning of the activity or part thereof, which ensures minimum impact to the environment.*

*14.3.3 A programme to achieve the stated criteria.*

*14.3.4 Where relevant, a test programme to demonstrate the successful implementation of the decommissioning plan.*

*14.3.5 Details of costings for the plan and a statement as to how these costs will be underwritten.*

*14.4 A final validation report to include a certificate of completion for the residuals management plan, for all or part of the site as necessary, shall be submitted to the Agency within three months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.*

The standard condition for Environmental Liabilities Risk Assessment (ELRA) is included with the Financial Provision (FP) Condition. A typical example is provided below:

#### **Condition 15. Financial Provisions**

##### *15.3 Environmental Liabilities*

*15.3.1 The licensee shall arrange for the completion, by an independent and appropriately qualified consultant, of a comprehensive and fully costed Environmental Liabilities Risk Assessment for the operation, which will address liabilities from past and present activities. A report on this assessment to be submitted to the Agency for agreement within six months of date of commencement of either or both of the activities at the site.*

*15.3.2 Within nine months of the date of commencement of either or both of the activities at the site, the licensee shall make financial provision in a form acceptable to the Agency to cover any liabilities incurred by the licensee. The amount of indemnity must always be capable of covering the liabilities identified in Condition 15.3.1.*

*15.3.3 The amount of indemnity, held under Condition 15.3.2 shall be reviewed and revised as necessary, but at least annually.*

*15.3.4 The licensee shall within two weeks of purchase, renewal or revision of the financial indemnity required under Condition 15.3.2, forward to the Agency written proof of such indemnity.*

### **1.3.2 Existing Waste Licence Requirements**

As with IPPC licences, the requirements for ELRA / RMP / FP varies between licences. There are no requirements for Residual Management Plans (RMP) in Waste Licences. There are however requirements for Closure and Aftercare Management Plans for Landfill sites in particular which have the same overall objective as an RMP that is to restore the site upon closure to a satisfactory environmental condition.

The EPA incorporates conditions for the provision of ELRAs in new and reviewed Waste Licences. The requirements for the ELRA are typically described as follows:

*Condition 16.3.1: The licensee shall arrange for the completion, by an independent and appropriately qualified consultant, of a comprehensive and fully costed Environmental Liabilities Risk Assessment for the whole site, which will address liabilities from past and present activities. A report on this assessment to be submitted to the Agency for agreement within twelve months of the date of grant of this licence.*

*Condition 16.3.2: Within eighteen months of the date of grant of this licence, the licensee shall make financial provision in a form acceptable to the Agency to cover any environmental liabilities incurred by the licensee. The amount of indemnity must always be capable of covering the liabilities identified in Condition 16.3.1*

### **1.3.3 Forthcoming Changes to IPPC and Waste Licence Requirements**

In line with implementing the recently enacted Environmental Liability Directive (2004/35/EC), which provides a framework of environmental liability based on the “polluter pays” principle, future IPPC and Waste Licences will include a condition under a “Statement of Measures” condition as outlined below:

#### *Statement of Measures*

*The licensee shall as part of the AER provide an annual statement as to the measures taken or adopted at the site in relation to the prevention of environmental damage, and the measures in place in relation to the underwriting of costs for remedial actions following anticipated events (including closure) or accidents/incidents, as may be associated with the carrying on of the activity.*

## 1.4 ENVIRONMENTAL LIABILITY ASSESSMENT

Environmental liabilities can be subdivided into two main types, known and unknown liabilities. The quantification and costing of these liabilities is conducted separately and different financial instruments are appropriate for each type of liability. Table 1.1 outlines how these different liabilities are defined, quantified and should be provided for financially.

**Table 1.1 Outline of Environmental Liability Assessment**

Liability Type	Definition	Quantification Method	Financial Instrument
Known Liability	Planned/anticipated liabilities associated with facility closure, restoration and aftercare management	Closure Restoration Aftercare Management Plan (CRAMP)	Cash based (Cash, Trust, Fund, Escrow, etc)
Unknown Liability	The risk of environmental liabilities occurring due to unexpected events (e.g. leaking chemical storage tank resulting in groundwater contamination)	Environmental Liability Risk Assessment (ELRA)	Risk transfer instruments (insurance, bonds etc) or combinations of these instruments

Depending on the type of facility, the duration and extent of restoration and aftercare management that will be required (if at all) and the potential risk of unknown liabilities occurring, the level of assessment and financial provision that will be required to satisfy EPA requirements will vary.

This guidance sets out an approach and methodology to quantify and make provision financially for environmental liabilities, both known and unknown.

## 1.5 STRUCTURE OF GUIDANCE AND ASSESSMENT TOOLS

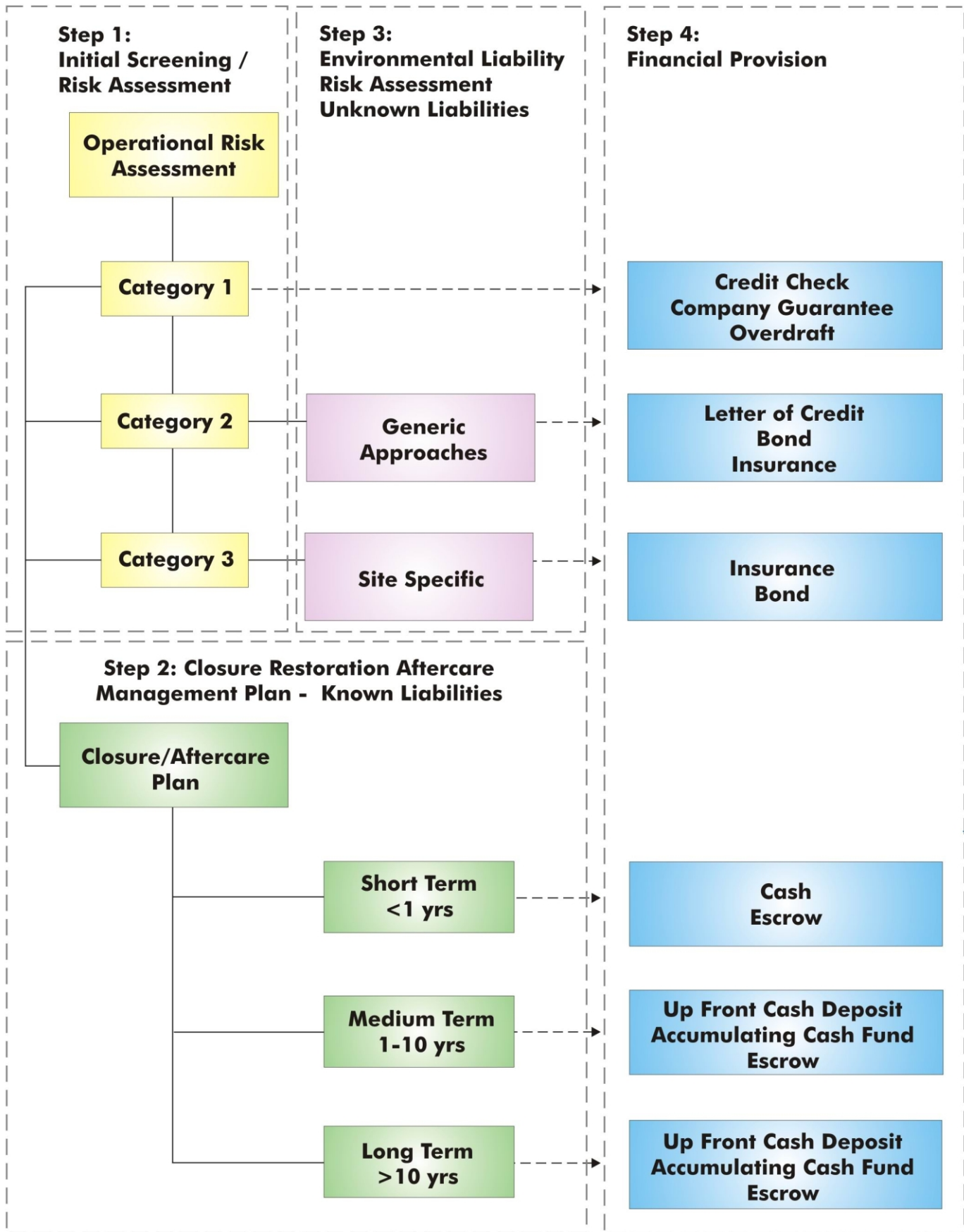
Closure Restoration Management Planning (CRAMP), Environmental Liabilities Risk Assessment (ELRA) and Financial Provision (FP) are mutually dependent. A systematic step-wise approach is outlined in this document:

- Step 1: Initial Screening & Operational Risk Assessment
- Step 2: Preparation of a Closure, Restoration and Aftercare Management Plan (CRAMP) for known Liabilities.
- Step 3: Environmental Liability Risk Assessment (ELRA) for unknown Liabilities.
- Step 4: Identification of Financial Provision (FP) and Instruments

Figure 1.1 illustrates the overall process and the interrelationship between each step. Information on how to undertake and complete each step is included in the chapters 2 to 5 of this document.



# Figure 1.1 ELRA/CRAMP/FPA PROCESS



## 2 STEP 1: INITIAL SCREENING AND OPERATIONAL RISK ASSESSMENT

### 2.1 INTRODUCTION AND DESCRIPTION

As a starting point in the process, a relatively simple risk assessment decision matrix can be used to classify sites into Risk Categories (1-3) and thereby select the specific CRAMP, ELRA and FP requirements that will be needed.

- Complexity – the extent and magnitude of potential hazards present due to the operation of the facility (e.g. a function of the nature of the activity, the volumes of hazardous materials stored on site etc.). A Complexity Band (G1 least complex to G5 most complex) for each class of activity has been assigned and included in a Look-Up Table (Appendix B). For activities with complexity G4 or G5, these facilities are automatically classified as Risk Category 3. For activities with complexity of G1, G2 or G3, these facilities must consider and evaluate their score using the Environmental Sensitivity and compliance record as outlined below.
- Environmental Sensitivity – the sensitivity of the receiving environment in the vicinity of the facility, with more sensitive locations given a higher score (e.g. the presence of aquifers below the site, groundwater vulnerability, the proximity to surface water bodies and their status, the proximity to sensitive human receptors, etc). The Environmental Sensitivity is calculated on a site-specific basis using a sub-matrix (Table 2.2)
- Compliance Record – the compliance history of the facility and whether soil and/or activities carried on are in compliance with licence requirements and emission limits,

Each aspect is multiplied to give the Total Score for the facility, and this can be used to place the facility into an appropriate Risk Category (1-3) as outlined in Table 2.1. Once this has been completed, the licensee proceeds through the relevant steps of CRAMP, ELRA and FP that are considered appropriate for the Risk Category.

Figure 2.1 illustrates the overall Step 1 process.

**Table 2.1 Risk Category**

<b>Risk Category</b>	<b>TOTAL Score</b>
Category 1	< 5
Category 2	5 - 23
Category 3	> 23

## 2.2 COMPLEXITY

Significant work has been done by the Environment Agency (England and Wales) in the development of the Environmental Protection Operator and Pollution Risk Appraisal (EP OPRA)<sup>1</sup> methodology for classifying activities, and a similar but shortened version of this methodology has been developed for this process. Complexity Bands have where available, been derived from similar classification in the EP OPRA Complexity Score. A look up table for Irish activities has been included in Appendix B of this Guidance. The licensee should refer to the look up table to determine the relevant Complexity Band for the licensed site activity.

The Complexity Band is used to determine the value used in the Operational Risk Assessments as follows:

- G1 = 1
- G2 = 2
- G3 = 3
- G4 = 4
- G5 = 5

Where more than one scheduled activity is located at a facility, then the highest Complexity Band is applied.

## 2.3 ENVIRONMENTAL SENSITIVITY

A sub-matrix for environmental sensitivity is outlined in Table 2.2. This considers 6 key potential environmental receptors and assigns individual scores that are added together to arrive at a total environmental attribute score. The total environmental attribute score is used to look up the environmental sensitivity classification in Table 2.3. The environmental sensitivity sub matrix has been developed based on professional judgment and with reference to the system designed in the EP OPRA Scheme by the Environment Agency (UK).

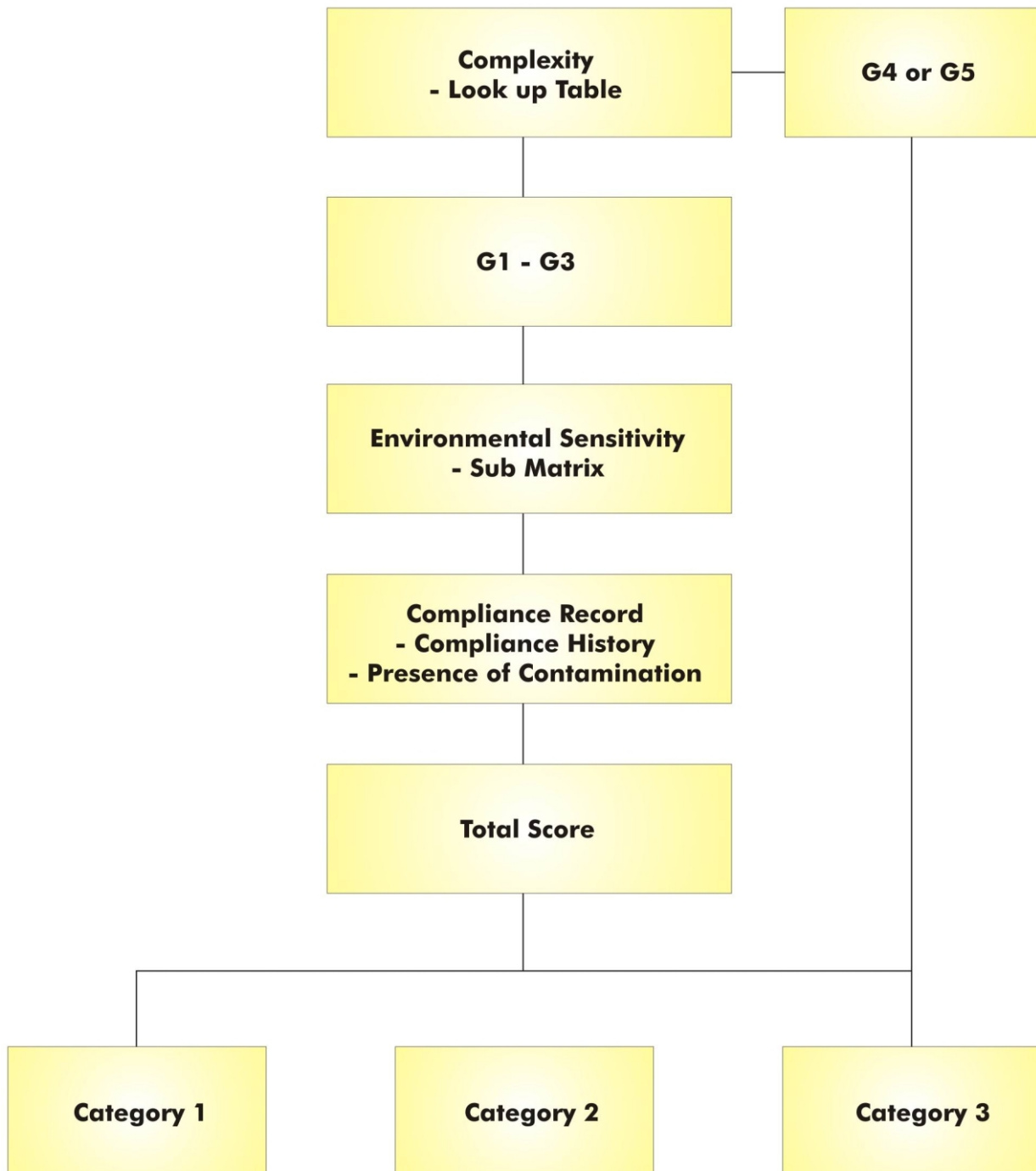
The key receptors include:

- Human Beings
- Groundwater
- Surface Water
- Air Quality
- Protected Ecological Sites
- Sensitive Agricultural Receptors

The environmental sensitivity classification is used in the operational risk assessment as illustrated in Figure 2.1 and by way of the worked example used in Table 2.4 to calculate the total score.

<sup>1</sup> Footnote: Environment Agency (2004) *Environmental Protection Operator and Pollution Risk Appraisal (EP OPRA) Version 3 Consultation Paper*.

**Figure 2.1 Initial Screening and Operational Risk Assessment**



**Table 2.2 Environmental Sensitivity Sub-Matrix**

<b>Environmental Attribute</b>	<b>Environmental Attribute Score</b>
<b>Human Occupation</b> <sup>1</sup> < 50m 50m - 250m 250m - 1000m > 1km	<b>5</b> <b>3</b> <b>1</b> <b>0</b>
<b>Groundwater Protection</b> <sup>2,3</sup> Regionally Important Aquifer Locally Important Aquifer Poor Aquifer  Vulnerability Rating - Extreme Vulnerability Rating - High Vulnerability Rating - Moderate Vulnerability Rating - Low	<b>2</b> <b>1</b> <b>0</b>  <b>3</b> <b>2</b> <b>1</b> <b>0</b>
<b>Sensitivity of Receiving Waters</b> <sup>4</sup> Class A Class B Class C Class D  Designated Coastal & Estuarine Waters <sup>5</sup> Potentially Eutrophic Coastal & Estuarine Waters <sup>6</sup>	<b>3</b> <b>2</b> <b>1</b> <b>0</b>  <b>2</b> <b>1</b>
<b>Air Quality &amp; Topography</b> <sup>7</sup> Complex terrain <sup>7</sup> Intermediate terrain <sup>8</sup> Simple terrain <sup>9</sup>	<b>2</b> <b>1</b> <b>0</b>
<b>Protected Ecological Sites and Species</b> <sup>10</sup> Within or directly bordering species protected site < 1km to protected site > 1km from protected site	<b>2</b> <b>1</b> <b>0</b>
<b>Sensitive Agricultural Receptors</b> <sup>11</sup> Fruit, vegetable or dairy farming < 50m from the activity footprint Fruit, vegetable or dairy farming 50m - 150m from the activity footprint Fruit, vegetable or dairy farming > 150m from the activity footprint	<b>2</b> <b>1</b> <b>0</b>

**Notes \***

1. Measured from activity/footprint to public or private occupied building
2. Groundwater Classifications according to DoELG, EPA, GSI Groundwater Protection Schemes (1999)
3. Aquifer Classification Score to be added to Groundwater Vulnerability Score
4. Site located within catchment of EPA Surface Water Classification (1996) or adjacent to transitional water body
5. Designated as Sensitive Areas UWWT Regulations (2001)
6. EPA (2002) Water Quality in Ireland 1998-2000
7. Generally elevated terrain such as a mountain or the side of a valley, where receptors are at elevations above the stack tip elevation, US EPA (2000) Meteorological Monitoring Guidance for Regulatory Modelling Applications
8. Intermediate terrain where the elevations of receptors lie between the stack tip elevation and the plume rise elevation, US EPA (2000) Meteorological Monitoring Guidance for Regulatory Modelling Applications
9. Relatively flat terrain, where receptor elevations are between stack base and the stack tip elevations, US EPA (2000) Meteorological Monitoring Guidance for Regulatory Modelling Applications
10. Distance from activity/footprint to protected areas designated as pNHA (Irish Wildlife Acts 1976, 2000), cSAC (Habitats Directive 1992) and/or SPA (Birds Directive 1979).
11. Distances derived from UK Department for Environment, Food and Rural Affairs (2003), Local Air Quality Management - Technical Guidance LAQM.TG(3)

**\* or more recent equivalent reference material**

**Table 2.3 Environmental Sensitivity Classification**

<b>TOTAL Environmental Attribute Score <sup>12</sup></b>	<b>Environmental Sensitivity Classification</b>
Low < 7	<b>1</b>
Moderate 7 - 12	<b>2</b>
High > 12	<b>3</b>

12. Total Score equal to the addition of Environmental Attribute Scores

## 2.4 COMPLIANCE RECORD

The compliance record score is derived from the compliance history of the facility and whether the activities carried on have resulted in contamination or pollution.

- For newly licensed facilities and those operating without non-compliance of emission limits, then these are classified as **Compliant/New Facility** and have a score of 1.
- Licensed facilities with administrative non-compliances only are classified as administrative non-compliant and have a score of 2.
- Licensed facilities with minor emission non-compliances (< 5 non-compliances in a 12 month period) are classified as being **Minor Non-Compliant** and have a score of 3. Facilities with minor soil and groundwater contamination (i.e. those with concentrations above background but not posing risk to the environment) are also considered in the class.
- Licensed facilities with major emission non-compliance history ( $\geq 5$  non-compliances in a 12 month period) and/or those with significant soil and groundwater contamination (i.e. requiring remediation and/or long-term monitoring requirements) are classified as **Major Non-Compliant/Significant Ground Contamination** and have a score of 4.
- Those facilities with repeated non-compliances (>10 Total) during a 12 month period are classified as **Repeat Non-Compliance** and have a score of 5.

In determining the score, the EPA Inspector assigned to the facility should be consulted in relation to the score to be assigned.

## 2.5 OUTCOMES AND NEXT STEPS

Once the complexity has been looked up from the Look-Up Table (Appendix B), the Environmental Sensitivity Score has been determined using the sub-matrix (Tables 2.2 & 2.3), and the Pollution Record Score has been determined, the product of these scores is used to calculate a total score which is then used to assign the site specific Risk Category (Table 2.1). Once the risk category has been determined (either Category 1, Category 2 or Category 3), the licensee proceeds to Step 2, Closure Restoration Aftercare Management (CRAMP), as illustrated in Figure 1.1 and described in Section 3.

A worked example of the output from the Step 1 Process is included in Table 2.4

**Table 2.4 Worked Example – Step 1 Operational Risk Assessment**

<b>Complexity</b>		<b>Score</b>
Licensed Activity Class		Look-up Table
5.6 The manufacture of pesticides, pharmaceutical or veterinary products and their intermediates, not included in paragraph 5.12 to 5.17 (Production capacity <2,000 tpa)	G3	<b>3</b>
<b>Environmental Sensitivity</b>	<b>Sub Matrix Score</b>	<b>Score</b>
Human Occupation – Located 500m from site	1	
Groundwater Protection - Overlying Locally Important Aquifer (GSI) - Groundwater Vulnerability High (GSI)	1 2	
Sensitivity of Receiving Waters - Adjacent to Designated Protected Estuary	2	
Protected Ecological Sites - Located 400m from pNHA	1	
Air Quality & Topography - Intermediate Terrain	1	
Sensitive Agricultural receptors - Dairy Farming 100m from site	1	
Total Environmental Sensitivity	9	<b>2</b>
<b>Compliance Record</b>		
- Significant groundwater contamination		<b>4</b>
<b>OVERALL RISK SCORE (Complexity x Environmental Sensitivity) x Compliance Record)</b>	<b>3 x 2 x 4 =</b>	<b>24</b>
<b>RISK CATEGORY</b>		<b>Category 3</b>



### **3 STEP 2: CLOSURE, RESTORATION, AFTERCARE MANAGEMENT PLAN (CRAMP) – KNOWN LIABILITIES**

#### **3.1 INTRODUCTION**

To date the EPA have required licensees to compile what has been termed a Residuals Management Plan (RMP) under IPPC Licence conditions and a closure plan under Waste Licences. The standard condition for RMP in recently granted IPPC Licences has a number of requirements including the following:

- A closure plan or Closure, Restoration and Aftercare Management Plan (CRAMP) including costings that deal with site decommissioning and known liabilities for the facility at closure. The plan is normally required to be submitted within 6 months of the date of grant of the licence.
- The plan should be reviewed annually as part of the company's Annual Environmental Report (AER)
- The Plan should include:
  - A scope statement
  - The criteria for successful decommissioning
  - A programme to achieve stated criteria
  - If relevant, a test programme.
  - Details of how costs will be underwritten
  - A final validation report including a certificate of completion within 3 months of plan execution

Within the IPPC/Waste licensing context, the plan is a subset of the overall Environmental Liability Assessment of the site. Liabilities associated with Closure and the related stages of Restoration and Aftercare Planning would be considered the known liabilities.

Both the IPPC Directive, which was transposed into law under the Protection of The Environment Act of 2003, and the Landfill Directive make reference to the requirements to ensure that closure is adequately addressed. The IPPC Directive states that "the necessary measures are taken upon definitive cessation of activities to avoid any pollution risk and return the site of the operation to a satisfactory state." As part of the implementation of the IPPC Directive the terminology Residuals Management (RMP) will be replaced by Closure, Restoration and Aftercare Management Planning (CRAMP).

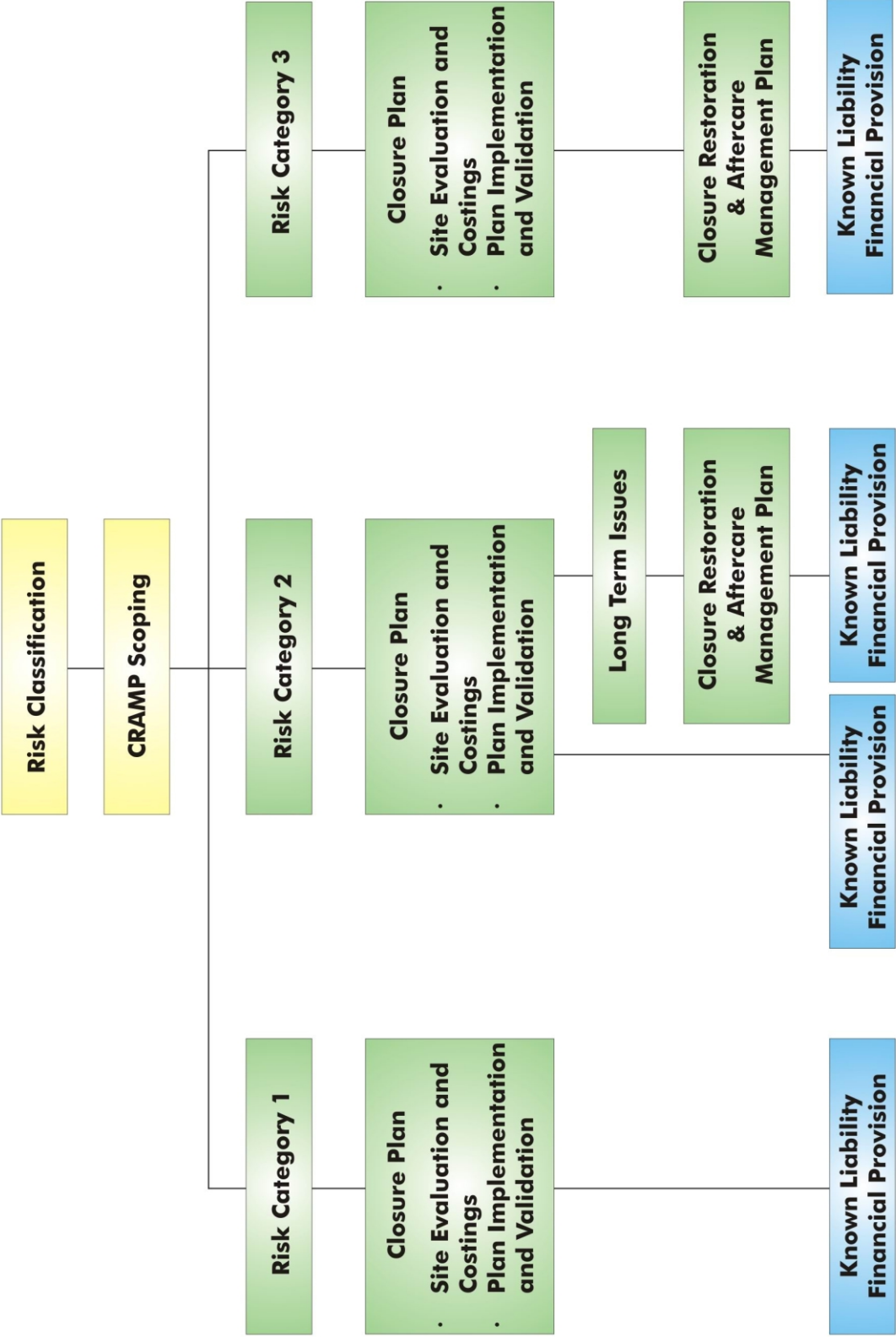
This section of the guidance covers the following:

- Scoping the CRAMP
- Preparation of the Closure Plan
- Preparation of the Restoration and Aftercare Management Plan

Figure 3.1 illustrates the overall CRAMP process.

An example of a CRAMP is contained in Appendix C.

**Figure 3.1 Closure, Restoration and Aftercare Management Plan Process (CRAMP)**



### 3.2 SCOPING THE CLOSURE, RESTORATION AND AFTERCARE MANAGEMENT PLAN (CRAMP)

There will be varying requirements for closure, restoration and aftercare between IPPC and Waste Licensees, and it is necessary to scope the content of the CRAMP for each facility using the Operational Risk Assessment (Step 1) process outlined in Section 2. In summary, the licence requirements for CRAMP for each Risk Category are outlined in Table 3.1.

**Table 3.1 Risk Category and CRAMP Requirements**

<b>Risk Category</b>	<b>Closure Plan</b>	<b>Restoration, Aftercare Management Plan</b>
<b>Category 1</b>	√	
<b>Category 2</b>	√	
<b>Category 2 with long term issues (e.g. contaminated land)</b>	√	√
<b>Category 3</b>	√	√

For all Category 1 facilities and some Category 2 facilities, clean closure would be envisaged such that all plant is safely removed for reuse or recycling and all wastes are removed off site at the time of closure for appropriate recovery or disposal. Monitoring undertaken should demonstrate that there are no outstanding environmental issues. The only CRAMP requirement is therefore the closure plan and clean closure can be achieved.

For the majority of Category 2 facilities a closure plan with clean closure is envisaged, particularly where there are no long-term issues and monitoring demonstrates that there are no outstanding environmental issues.

For some Category 2 and the majority of Category 3 facilities, clean closure may not be achievable due to either the nature of the operation or due to residual contaminated land issues that require restoration or remediation. If a limited aftercare period is necessary, such as monitored natural attenuation (MNA) of groundwater and soil contamination, then passive aftercare can be undertaken. Following its completion and verification, clean closure can be achieved.

In the case of Category 3 facilities, either due to the nature of the operation (e.g. mining and landfill) or due to the presence of significant land contamination, a process of extensive restoration and aftercare may be required. It is expected that during this period there would be on-going restoration/remediation works, contaminated land remediation/management and long term monitoring. Where category 3 facilities (excluding mining and landfill) have demonstrated by way of previous investigations that long term liabilities are not present, the requirements for RAMP will be reduced.

Following determination of the scope of the CRAMP for the facility, the Licensee proceeds to preparing the Closure Plan as outlined in Section 3.3 and Restoration and Aftercare Management Plan (if required) in Section 3.4.

In the case of mine facilities, it should be noted that additional planning requirements may need to be addressed in the CRAMP.

### 3.3 PREPARATION OF THE CLOSURE PLAN

#### 3.3.1 Content of Closure Plan

All facilities (Category 1 – Category 3) are required to prepare a closure plan and this section provides guidance on compiling the Closure Plan. The closure plan should contain all the elements listed in Table 3.2

**Table 3.2 Outline Content of Closure Plan**

Closure Plan Section	Section Contents
1. Introduction	<ul style="list-style-type: none"> <li>• Facility and Licence Details</li> <li>• Facility Closure Scenarios Covered in the Plan</li> </ul>
2 Site Evaluation	<ul style="list-style-type: none"> <li>• Facility Description &amp; History</li> <li>• Facility Compliance Status</li> <li>• Facility Processes and Activities</li> <li>• Inventory of Site Buildings, Plant, Raw Materials and Wastes</li> </ul>
3 Closure Considerations	<ul style="list-style-type: none"> <li>• Clean or Non Clean Closure Declaration</li> <li>• Plant or Equipment Decontamination Requirements</li> <li>• Plant Disposal or Recovery</li> <li>• Waste Disposal or Recovery</li> <li>• Soil or Spoil Removal</li> </ul>
4 Criteria for Successful Closure	<ul style="list-style-type: none"> <li>• Addressing of Site Environmental Liabilities at Closure.</li> </ul>
5 Closure Plan Costing	<ul style="list-style-type: none"> <li>• Decontamination Costs</li> <li>• Plant &amp; Waste Disposal Costs</li> <li>• On going monitoring</li> <li>• Facility Security and Staffing</li> <li>• Other Costs</li> </ul>
6 Closure Plan Update & Review	<ul style="list-style-type: none"> <li>• Proposed Frequency of Review</li> <li>• Proposed Scope of Review</li> </ul>
7 Closure Plan Implementation	<ul style="list-style-type: none"> <li>• EPA Notification</li> <li>• Local or other Statutory Authority notifications</li> <li>• Test Programme (If Applicable)</li> <li>• Full or Partial Closure considerations</li> </ul>
8 Closure Plan Validation	<ul style="list-style-type: none"> <li>• Closure Validation Audit</li> <li>• Closure Validation Audit Report</li> <li>• Closure Validation Certificate</li> </ul>

Specific guidance in gathering the information necessary to prepare the plan is provided in the following sections. It should be noted that much of the preparatory information required for Section 2 (Site Evaluation) will be available from existing information such as the Licence Application, Environmental Impact Statements and records maintained under the facility licence.

### **3.3.2 Site Evaluation**

A desk study and site walkover should be carried out in order to compile the information that should be contained in this section of the report, such as:

- Site location and general context
- Site environmental sensitivity evaluation
- Site history and operational history including full details of site processes
- Site investigations and information available regarding the environmental performance of the site.
- Details of the layout and contents/construction of all site buildings
- Site assets register and details of the type and value of process equipment and tanks
- Stock inventory, raw materials information and details of all hazardous materials.
- Details of storage arrangements and that bunds and underground services have been tested as required
- Details of waste shipments and waste contractors
- Drawings of the facility (at appropriate scales).

### **3.3.3 Closure Considerations**

At the outset it should be outlined what type of closure is expected:

- Clean Closure - upon cessation of operations and subsequent decommissioning at the facility, there are no remaining environmental liabilities.
- Non-Clean Closure – upon cessation of operations and subsequent decommissioning - there are remaining liabilities, which require a restoration and aftercare management plan.

Having established the type of site closure, this section of the report should detail the environmental aspects of decommissioning and closure process at the facility. The level of detail and scope of information to be provided in this section will be site and sector specific. In general however it is expected that this section will include the following type of information:

- Details of plant items which require decontamination
- The proposed method of decontamination
- Details of types of wastes that will require recovery / disposal and how this will be conducted
- Details of any contaminated ground or spoil at the site which may require specialist recovery / disposal.

A project programme with a logical sequence of tasks and timeframes should be developed and included in the report.

### **3.3.4 Criteria for Successful Closure**

For clean closure, a benchmark set of criteria should be established in order to evaluate the success of closure. This section should provide details of the facility and sector specific criteria used. An example of criteria for clean closure is provided below.

*Successful clean closure will be expected to be achieved when it can be demonstrated that there are no remaining environmental liabilities at the site. In practice this will require demonstration that the following criteria have been met:*

- *All plant safely decontaminated using standard procedures and authorised contractors.*
- *All Wastes handled, packaged, temporarily stored and disposed or recovered in a manner which complies with regulatory requirements.*
- *All relevant records relating to waste and materials movement and transfer or disposal were managed and retained throughout the closure process.*
- *There was no soil or groundwater contamination at the site. This was verified using monitoring data and a soil /groundwater assessment at the time of closure (if required).*
- *The Environmental Management System remained in place and was actively implemented during the closure period.*

For non clean closure, a Restoration and Aftercare Management Plan (RAMP) will be required in order to address this aspect. The content of this RAMP is outlined in Section 3.4

### **3.3.5 Closure Plan Costing**

Estimates should be prepared for all closure items and included in tabular format within this section of the report. The costings should be obtained directly from the relevant suppliers and contractors (where possible) or from recognised experts who are familiar with such costs and would include the following main headings:

- Plant Removal
- Decontamination
- Waste disposal / recovery
- Decommissioning supervision
- Demolition
- Test programme
- Environmental Monitoring
- Verification audit/certification
- Report to EPA
- Other relevant items specific to the licensee's site.

Where there have not been significant changes on site from previous cost estimates, these can be updated allowing for inflation.

### **3.3.6 Closure Plan Update and Review**

The closure plan should be updated and reviewed in accordance with the facility's licence conditions.

### **3.3.7 Closure Plan Implementation**

This section of the report should detail the licensee's provision for implementing the closure plan. In all cases, there should be details of the notice period to be provided to the EPA and the form that this notice will take. Partial closure should also be considered in this section and some licensees (e.g. landfill operators) should address more sector specific aspects of closure implementation in this section (e.g. phasing of landfill capping etc.)

Where it is necessary for a licensee to conduct a test programme as part of the closure process (e.g. mining tailings pond rehabilitation) then full details of proposed test programmes should be provided in this section.

### 3.3.8 Closure Plan Validation

This section should detail the validation auditing provisions that will be in place, the scope and criteria for the audit, the qualifications and independence of the auditor and the nature of the report and closure certification resulting from the audit. It should be borne in mind that the validation process, and certification resulting from it, relate solely to the physical closure of the facility and that the formal acceptance of closure and ultimate surrender or transfer of a licence is a separate process that must be formally agreed with the EPA.

For an IPPC/Waste licence to be transferred or surrendered there must be a consultation process with the EPA. Normally the EPA conducts a post closure audit of the site and thereafter the EPA must be satisfied that the facility is fully compliant with its licence conditions at the time of closure in order to facilitate the formal surrender or transfer of a licence.

## 3.4 PREPARATION OF RESTORATION AND AFTERCARE MANAGEMENT PLAN

### 3.4.1 Content of the Restoration and Aftercare Management Plan

Some Risk Category 2 and the majority of Category 3 facilities will require a restoration and aftercare management plan. The Restoration Aftercare Management Plans should include all the elements contained in Table 3.3

**Table 3.3 Outline Content of Restoration and Aftercare Management Plan**

<b>Restoration &amp; Aftercare Management Plan Sections</b>	<b>Section Contents</b>
1. Restoration and Remediation Proposals	<ul style="list-style-type: none"> <li>• Site Investigation Findings</li> <li>• Qualitative and/or Quantitative Risk Assessment</li> <li>• Remediation and/or Restoration Proposals</li> </ul>
2. Aftercare Management	<ul style="list-style-type: none"> <li>• Proposed Short Term Aftercare Monitoring and Maintenance</li> <li>• Proposed Long Term Aftercare Monitoring and Maintenance</li> </ul>
3. Site Restoration and Aftercare Management Costs	<ul style="list-style-type: none"> <li>• Restoration and/or Remediation Costing</li> <li>• Aftercare Costings</li> </ul>

### 3.4.2 Restoration and Remediation Proposals

There are two main circumstances in which site restoration and aftercare management plans will be required. Each of these circumstances will require a different approach in developing the site restoration and remediation proposals as follows:

- Significant Soil and Groundwater Contamination including Brownfield redevelopment
- Landform Changes – landfill, and mine sites
- Where there is evidence of soil and groundwater contamination or there have been spills in the past, facilities will be required to undertake some level of soil and groundwater investigation and risk assessment. When contamination is detected, there will be site remediation requirements. The purpose of remediation is to restore the soil and groundwater to a state that does not pose a risk to the environment. This process will include a suitable contaminated land risk assessment, which will provide recommendations and a programme of measures. The general process for the development of a site restoration and/or remediation proposal is likely to involve the following steps:
  - Audit of the site to identify potential sources of contamination and likelihood of occurrence
  - Soil and groundwater investigation
  - Qualitative contaminated land risk assessment and conceptual site model.
  - Quantitative contaminated land risk assessment
  - Proposals for the restoration of the site through remediation
  - Agreement of the proposal with the EPA
- Secondly, some IPPC and waste sector operations can cause significant land changes, which will need to be restored to a suitable condition following closure and cessation of activities. Typical examples of such operations can be found in the mining, quarry and the landfill sectors. A proposal to deal with the restoration of the site to acceptable land uses should be developed in order to carry out any necessary reinstatement, rehabilitation and restoration. Such measures are facility specific and should be incorporated into the facility's operation (e.g. mine backfilling.) The process for the development of a site restoration proposal will involve the following main steps:
  - Proposals for the phased restoration of the facility over a defined period of time
  - Proposals for a system of "close as you go" within the site development proposals
  - Proposals for environmental monitoring in order to monitor environmental impact during facility development
  - Details of the engineering methods and technologies, including justifications, to be employed as part of the facility restoration process
  - Details of proposed measures, land end uses and the considerations required to achieve them
  - Other relevant site specific measures.

### **3.4.3 Aftercare Management Plan**

Aftercare management is an integral part of the site restoration process and follows logically from the site restoration plan. The length of the aftercare period is one of the most critical components in the aftercare management plan and will be related to the type of restoration required at the site. The majority of the aftercare management plan will deal with restoration maintenance and environmental monitoring.

The main purpose of the aftercare management plan will be to ensure that the restoration measures in operation at the site will continue to be effective and achieve the overall restoration goals. Examples of maintenance measures include:

- Maintenance of plant and equipment (e.g. groundwater pump and treat systems, leachate collection systems)
- Servicing and calibration of monitoring equipment (e.g. continuous water quality monitors)



- Maintenance of access to the monitoring locations
- Maintenance of landfill groundwater wells, drainage ditches and gas vents
- Landscape maintenance of grass cover and planting

The aftercare management plan should provide a logical order of tasks and timeframes. It should be based on good engineering practice and suited to the nature and scale of the particular restoration activities proposed at the facility.

The objectives of the monitoring programme should be to ensure that the facility does not cause environmental pollution following closure and restoration. The scope of the programme should include details of the environmental monitoring proposed and provide contingency in the event that monitoring indicates a deterioration following closure.

#### **3.4.4 Costing of the Restoration and Aftercare Management Plan**

There are two main items that need to be costed, the restoration and remediation proposals and the aftercare management. The costing of each will vary on a facility and sectoral basis. Two main areas should be covered:

For sites where significant ground contamination is present the following cost items should be included within this section of the plan:

- Site investigation works (e.g. drilling and groundwater well installation) in order to delineate the extent and magnitude of contamination
- Environmental risk assessment in order to determine whether risk is posed to environmental receptors and to devise an appropriate remediation strategy
- Implementation of remediation programme such as excavation, treatment, environmental verification testing and/or design and installation of in-situ treatment systems
- Maintenance and monitoring costs associated with the site remediation e.g. costs of maintenance of the treatment plant associated with a pump and treat system or the costs of groundwater monitoring associated with a monitored natural attenuation (MNA) programme.

For restoration plans which address landform changes (e.g. mines and quarry facilities) the following cost items should be included within this section:

- Decommissioning of aboveground and underground plant
- Backfilling, reinstating and restoring excavated ground
- Reseeding and landscaping of restored ground
- Environmental monitoring e.g. surfacewaters and/or groundwaters

## **4 STEP 3: ENVIRONMENTAL LIABILITY RISK ASSESSMENT (ELRA) - UNKNOWN LIABILITIES**

### **4.1 INTRODUCTION AND DESCRIPTION**

Environmental liability risk assessment (ELRA) considers the risk of unplanned events occurring during the operation of a facility that could result in unknown liabilities materialising. Based on the initial risk categorisation of the activity outlined in Step 1 into Risk Category 1 – Category 3 risk, different approaches are recommended according to the risk category. Simple approaches are proposed for Category 1 facilities to more detailed site-specific approaches involving detailed environmental liability risk assessment for Category 3 facilities. The procedures for each of these risk categories are outlined in subsections 4.2 to 4.4.

An example ELRA is included in Appendix D.

### **4.2 CATEGORY 1 FACILITIES**

For Category 1 facilities, there is no requirement for detailed environmental liability risk assessment. The main requirement is to ensure that there is financial provision through the company's ability to financially operate. Company credit checks, overdrafts or guarantees can be used to ensure that any liabilities that may arise during the operational phase of the site can be adequately addressed.

### **4.3 CATEGORY 2 FACILITIES – GENERIC APPROACH**

For Category 2 facilities, the potential for unplanned events to occur that could result in an unknown liability need to be considered and financial provision must be in place to cover such eventualities. However, there is no need to conduct a detailed ELRA for the majority of medium risk facilities.

The potential for unknown liabilities to arise should be considered and financially provided for by way of ensuring that the following potential risks are covered by the financial provision instruments (environmental liability insurance, bond etc).

The following risks (where applicable to the facility) must be included at a minimum. This list should not be considered as exhaustive.

- Leaks from above ground and underground storage tanks
- Spillages from bund
- Leaks from process and effluent drains
- Leaks from pipes
- Fire and failure/overspill from fire water storage at the facility
- Failures in landfill liner
- Escapes of landfill gas
- Tank overflows
- Mobile tanker spills on site
- Leaks from underground sumps

## **4.4 CATEGORY 3 FACILITIES – SITE SPECIFIC ELRA**

### **4.4.1 Introduction**

For Category 3 facilities, a detailed site specific ELRA should be conducted. The objectives of the proposed ELRA are:

- To identify and quantify environmental liabilities at the facility focusing on: unplanned, but possible and plausible events occurring during the operational phase.
- To calculate the value of financial provisions required to cover unknown liabilities
- To identify suitable financial instruments to cover each of the financial provisions; and

To provide a mechanism to encourage continuous environmental improvement through the management of potential environmental risks. The proposed methodology is based on commonly used risk management approaches (e.g. UK Risk Management Standard BS-6079-3:2000, Australian/New Zealand Risk Management Standard AS/NZS 4360:2004). This methodology has been amended to include for the quantification of the financial provision and the identification of the most appropriate financial instruments.

The proposed methodology is provided below. It includes a Risk Management Programme for the mitigation and management of environmental liabilities at the facility. This programme is not required for the calculation or implementation of a financial provision at a facility. However, such a programme would encourage continuous environmental improvement and the reduction of environmental liabilities.

Risk assessments conducted for Seveso Directive purposes may be used in preparation of the ELRA provided the relevant sections are submitted to the EPA in accordance with this guidance.

The detailed ELRA process is illustrated in Figure 4.1

### **4.4.2 Scope of ELRA**

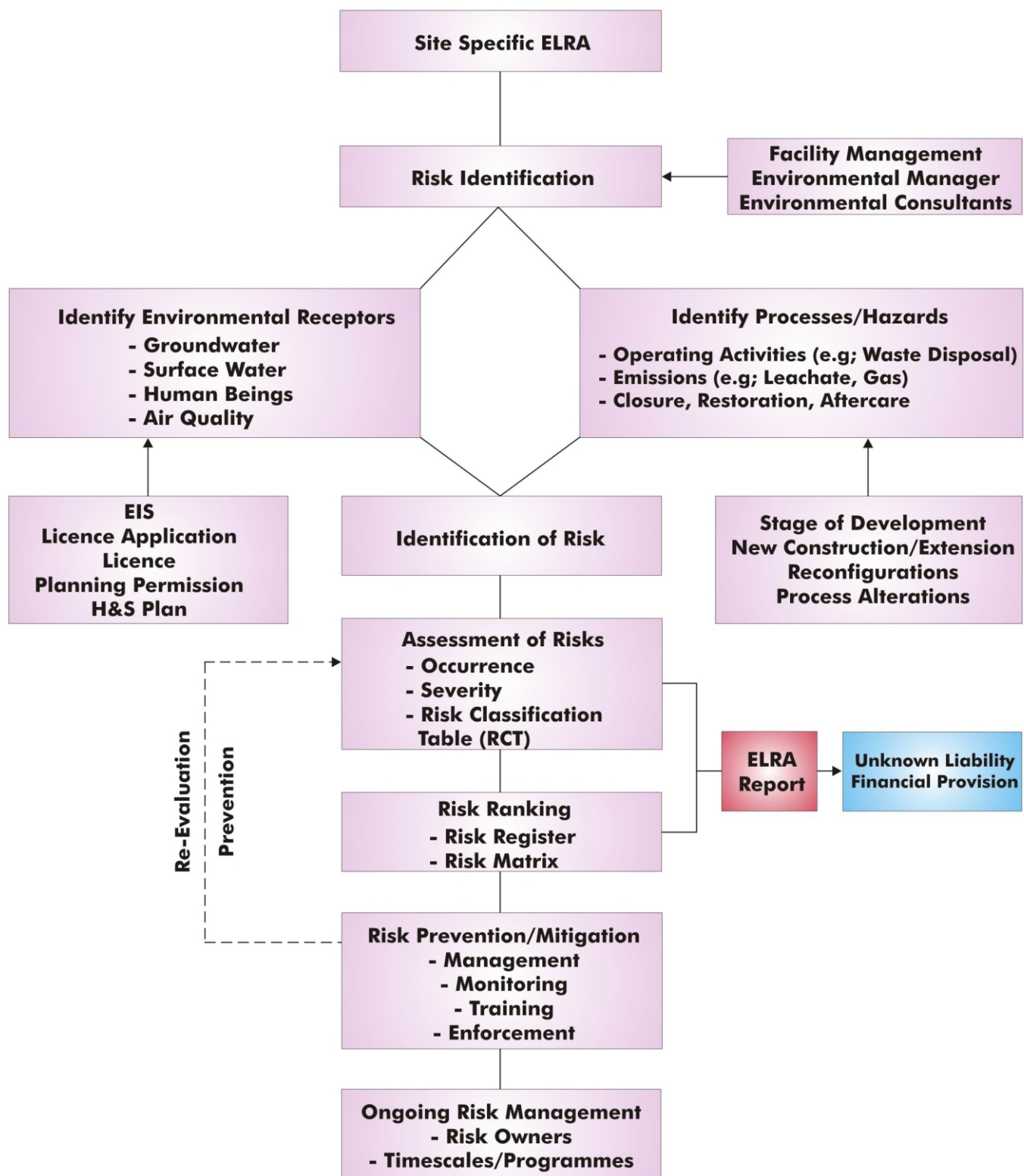
The ELRA should cover environmental risks leading to a potential or anticipated liability. Environmental risks will be deemed to cover all risks to: surface water, groundwater, atmosphere, land and human health.

### **4.4.3 Risk Classification and Identification**

A Risk Management Workshop should be held with the facility management, environmental manager and independent environmental consultant to identify and quantify the risks inherent in the operation, closure, restoration and aftercare of the facility. Two main outputs from this workshop are required:

- The establishment of Risk Classification Tables
- The identification of risks using risk identification tools and brainstorming exercises.

**Figure 4.1 Step 2: Environmental Liability Risk Assessment  
- Risk Category 3 Facilities**



#### 4.4.3.1 Risk Classification Tables

Risk Classification tables are required in order to evaluate and rank the risks compared with each other. They form the basis for assigning a rate of 'occurrence' (the probability of an event occurring) and 'severity' (the magnitude of impact if the event occurs) to every risk. There are two required Risk Classification Tables. The first is for 'Occurrence' (Table 4.1) and the second is for 'Severity' (Table 4.2), which are provided for illustration in this Guidance.. In order to associate 'site-specific' liabilities with the risk classifications, a range of perceived costs to remediate should be inserted into the last column of the severity table.

**Table 4.1 Risk Classification Table – Occurrence**

Rating	Occurrence		
	Category	Description	Likelihood of Occurrence (%)
1	Very Low	Very low chance (0-5%) of hazard occurring in 30 yr period *	0 – 5
2	Low	Low chance (5-10%) of hazard occurring in 30 yr period	5 - 10
3	Medium	Medium chance (10-20%) of hazard occurring in 30 yr period	10 - 20
4	High	High chance (20-50%) of hazard occurring in 30 yr period	20 - 50
5	Very High	Greater than 50% chance of hazard occurring in 30 yr period	>50

\* The assessment of the environmental liabilities has been limited to a 30-year period in accordance with Article 10 of the *Council Directive 1999/31/EC of 26 April 1999 on the Landfill of Waste*.

**Table 4.2 Risk Classification Table – Severity**

Rating	Severity		
	Category	Description	Cost of Remediation*
1	Trivial	No damage or negligible change to the environment.	€ A
2	Minor	Minor impact/localised or nuisance	€ B
3	Moderate	Moderate damage to environment	€ C
4	Major	Severe damage to local environment	€ D
5	Massive	Massive damage to a large area, irreversible in medium term	€ E

\* Facility specific cost estimates to be provided. Independent professional advice may be required.

#### 4.4.3.2 Risk Identification

Once the Risk Classification Tables are established and the costs associated with each severity rating are determined, the process of identifying risks is commenced. A suggested method of carrying out this process is to initially identify all the 'processes' on site, list the hazards associated with each process, identify potential causes of failure of the processes and analyse the effect impacts on the environment.

The risks should be tabulated in tailored risk assessment forms, and assessed in terms of severity and likelihood of occurrence using the Risk Classification Tables. A sample Risk Assessment Form is provided in Table 4.3 by way of example.

**Table 4.3 Risk Assessment Form - Sample**

<b>Risk ID</b>	<b>Process*</b>	<b>Potential Hazards</b>	<b>Environmental effect</b>	<b>Severity Rating**</b>	<b>Basis of Severity</b>	<b>Occurrence Rating***</b>	<b>Basis of Occurrence</b>	<b>Risk Score (Severity x Occurrence)</b>
1	Construction	Poor installation of landfill cap resulting in gas venting and leachate discharging to surface water	Odour, greenhouse gas release, risk of explosion.  Surface water contamination, fish kills	3	Cost of repair to capping system, restocking of river system, installation of gas extraction system	2	Landfill closed for 5 years	6
2	Construction	Cracking of landfill liner due to sunlight exposure resulting in discharge to Groundwater	Groundwater contamination	4	Cost of abstracting and cleaning groundwater in the vicinity of the landfill. Supplying public water scheme to all local residents	1	Landfill liner has been protected from sunlight since placement. Waste has degraded for 5 years.	4
								4
3	Chemical Storage	Leakage from storage tank and containment bund	Direct discharge to groundwater	4	Cost of soil and groundwater remediation	3	20 year old storage tank and bund	12
4	Placement of Waste in cells	Damage to liner on initial filling of new cells	Direct discharge of leachate to groundwater	4	Cost of abstracting and cleaning groundwater in the vicinity of the landfill. Supplying public water scheme to all local residents, excavating waste in place, repairing liner.	1	Site supervised by experience staff, instruction on which waste to be placed at the base of the cells, avoidance of sharp objects etc.	4

\* = Each Process may have numerous Hazards associated with it. Each hazard should be evaluated separately.

\*\* = Rating for Severity based on Risk Classification Table – Severity (costs are site specific)

\*\*\* = Rating for Chance of Occurrence based on Risk Classification Table - Occurrence

A sample Risk Mitigation Form is provided in Table 4.6

The risks will focus on unplanned, but possible and plausible events occurring during the operational phase that could result in unknown liabilities. Known liabilities occurring during the closure (including unanticipated remediation costs identified on closure) and aftercare phases are covered in the CRAMP (Section 3).

#### 4.4.4 Assessment of Risks

Once the risks have been identified, a Risk Register should be prepared listing the risks to be assessed during the study. Minor risks (risk score  $\leq 2$ ) may be excluded at this stage. Each risk is allocated an initial Risk Score based on the severity and occurrence ratings (as illustrated in Table 4.4). The risks are ranked based on the Risk Scores and can be tabulated in a Risk Matrix. The Risk Matrix provides a pictorial illustration of the level of each risk and the required actions as illustrated in Table 4.5

The environmental risks can be ranked to assist in the prioritisation of mitigation and management measures.

**Table 4.4 Risk Register Ranked by Risk Scores – Sample**

<b>Risk ID</b>	<b>Description</b>	<b>Severity Rating</b>	<b>Occurrence Rating</b>	<b>Risk Score</b>
<b>3</b>	Leakage from storage tank and containment bund	4	3	12
<b>1</b>	Poor installation of landfill cap resulting in gas venting and leachate discharging to surface water	3	2	6
<b>2</b>	Cracking of landfill liner due to sunlight exposure resulting in discharge to Groundwater	4	1	4
<b>4</b>	Damage to liner on initial filling of new cells	4	1	4

A Risk Matrix can be developed to allow the risks to be easily displayed and prioritised. The severity and occurrence ratings are used in the matrix; with the level of severity forming the x-axis and the likelihood of occurrence forming the y-axis. This matrix provides a visual tool for regular risk reviews since the success of mitigation can be easily identified. An example risk matrix is displayed in Table 4.5

The risks have been colour coded in the matrix to provide a broad indication of the critical nature of each risk. The colour code is as follows:

- Red – These are considered to be high-level risks requiring priority attention. These risks have the potential to be catastrophic and as such should be addressed quickly.
- Amber / Yellow – These are medium-level risks requiring action, but are not as critical as a red coded risk.
- Green (light and dark green) – These are lowest-level risks and indicate a need for continuing awareness and monitoring on a regular basis. Whilst they are currently low or minor risks, some have the potential to increase to medium or even high-level risks and must therefore be regularly monitored and if cost effective mitigation can be carried out to reduce the risk even further this should be pursued.

**Table 4.5 Risk Matrix – Sample**

<b>Occurrence</b>	<b>V. High</b>	<b>5</b>					
	<b>High</b>	<b>4</b>					
	<b>Medium</b>	<b>3</b>				<b>3</b>	
	<b>Low</b>	<b>2</b>			<b>1</b>		
	<b>V. Low</b>	<b>1</b>				<b>2</b> <b>3</b>	
			<b>Trivial</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Massive</b>
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
			<b>Severity</b>				

In the example supplied the risk matrix (Table 4.5) indicates that there are no risks in the red zone requiring priority attention. There are no risks in the yellow/amber zone either and these would indicate



that these risks require mitigation or management action. All risks are located in the green zone indicating a need for continuing awareness and monitoring on a regular basis. However, assessment of the green zone risks has indicated that many of these risks can be reduced through the implementation of mitigation measures. These measures should be adopted where considered cost-effective to further reduce the risks.

#### **4.4.5 Risk Prevention / Mitigation**

The cost-effectiveness of each risk mitigation measure is assessed in terms of the ability of the measure to provide significant risk reduction. Each Risk Score is revised using post-mitigation severity and occurrence rankings through the use of the Risk Mitigation Form. The risks are then re-ranked and tabulated in the risk matrix to illustrate the overall degree of risk reduction resulting from the risk mitigation measures. Where appropriate, the mitigation measures are accepted for implementation. The mitigation actions should as a minimum address all risks requiring priority actions as identified in the risk matrix as illustrated in Table 4.5

Potential mitigation measures can also be identified for each risk at this stage and a management plan for the risks established.

**Table 4.6 Risk Mitigation Form - Sample**

<b>Risk ID</b>	<b>Process*</b>	<b>Potential Hazards</b>	<b>Risk Score Before Mitigation</b>	<b>Possible Mitigation Measures</b>	<b>Risk Manager</b>	<b>Time to Complete Mitigation Measures</b>	<b>Revised Severity Rating</b>	<b>Revised Occurrence Rating</b>	<b>Revised Risk Score (Severity x Occurrence)</b>
1	Construction	Poor installation of landfill cap resulting in gas venting and leachate discharging to surface water	6	CQA of landfill capping, proper site supervision and administration of contract	Consultant/ CQA Manager	Report to be issued by CQA manager on completion of capping contract.	3	1	3
2	Construction	Cracking of landfill liner due to sunlight exposure resulting in discharge to Groundwater	4	Site staff fully briefed on requirement to protect liners from sunlight. Should be observed during daily site walkovers. Install drainage layer/protective geotextile.	Site Manager	On-going	4	1	4
3	Chemical Storage	Leakage from storage tank and containment bund	12	Short-term - Conduct tank and bund integrity assessment and implement regular checks.  Medium term - Upgrade storage facilities.	Site Manager	Within 3 months	4	2	8
4	Placement of Waste in cells	Damage to liner on initial filling of new cells	4	Prepare filling plan and guidance on initial lifts of waste, train those working near tipping face.	Site Manager/ Foreman	Before filling starts in next cell – October '05	4	1	4

#### 4.4.6 Risk Management Programme

A Risk Management Programme should be prepared to allocate a risk owner (such as the engineering manager, environmental manager etc) to each risk. Risk owners are responsible for the ongoing management of risks and the implementation of risk mitigation measures. Timeframes should be allocated for the implementation of each risk mitigation measure. This information can be stored on the Risk Mitigation Form (Table 4.6)

The Risk Management Programme will provide a mechanism for continuous and ongoing environmental risk management and mitigation such that the unknown environmental risks will reduce at the facility.

#### 4.4.7 Quantification of Unknown Environmental Liabilities

The known environmental liabilities (e.g. closure and aftercare costs) for the facility will be calculated through the preparation and costing of a CRAMP (refer to Section 3)

For the unknown liabilities a financial model is necessary to estimate the environmental liability associated with these risks.

Each Risk has two characteristics that are derived from the Risk Classification Tables (Table 4.1 and 4.2) that are used in the financial models:

- The range in probability (X-Y%) of the risk occurring
- The range in cost implications (€A-B) if the risk occurs

The requirements of the financial model must first be defined in terms of worst, most likely or best case scenarios. If the model is for the worst case scenario, then the higher end of each range is used in the calculations, if the model is for the most likely case then the median of each range is used and similarly if the best case scenario is required then the lower end of each range is used resulting in the lowest cost.

The simplest form of financial model can be based on simply multiplying the minimum, median or maximum value of each range for each Risk (depending on the scenario considered) and totalling the values for each Risk in the Register. The worked example in Table 4.7 illustrates how the financial output for the most likely scenario is calculated using the median probability and median severity scenarios. More sophisticated statistical modelling can be used to quantify cost scenarios with higher probabilities.

**Table 4.7 Example Most Likely Scenario Financial Model**

<b>Risk</b>	<b>Occurrence Rating</b>	<b>Likelihood of Occurrence Range</b>	<b>Severity Rating</b>	<b>Cost Range</b>	<b>Median Probability</b>	<b>Median Severity</b>	<b>Most Likely Scenario Cost</b>
1	3	10-20%	4	€10,000-100,000	15%	€55,000	€ 8,250
2	2	5-10%	2	€1,000-5,000	7.5%	€3,000	€ 225
3	2	5-10%	5	€100,000-1M	7.5%	€550,000	€ 41,250
						<b>Total</b>	<b>€ 49,725</b>

Other methods of calculation, such as probabilistic techniques, of the financial model can be used depending on the outputs required.

It should be noted that the amount of unknown environmental liability, which is calculated from the financial model, is completely dependant on the accuracy of the risk evaluation and the assumed costs of remediation.

#### **4.4.8 Review of Risk Assessment**

Reviews of the Risk Assessment, the Risk Management Plan, and Financial Provision should be undertaken on annual or biennial basis, to reflect changes in the environmental risks. In particular, these reviews should:

- Update the risk register through the addition of new risks or the omission of redundant risks;
- Verify the implementation of the Risk Management Plan;
- Ensure that the financial provision continues to cover the environmental liabilities at the facility
- Verify that the financial instruments continue to effectively provide the financial provision.

#### **4.5 OUTCOMES AND NEXT STEPS**

Following completion of the environmental liability risk assessment, financial instruments for unknown liabilities should be selected as outlined in Section 5.

## 5 FINANCIAL PROVISION

### 5.1 INTRODUCTION

Guidance for the assessment and establishment of a financial provision is provided in this section and should be applied to both IPPC and Waste Licensed facilities. The main objective of Financial Provision is to ensure that sufficient financial resources are available to cover:

- Known environmental liabilities that will arise at the time of facility closure;
- Known environmental liabilities that are associated with the aftercare and maintenance of the facility until such time as the facility is considered to no longer pose a risk to the environment.
- Unknown environmental liabilities that may occur during the operating life of the facility.

Unknown environmental liabilities, which could occur during the aftercare phase, and post-surrender of the licence, have not been specifically addressed. It is considered that the likelihood of occurrence of such liabilities should be extremely low provided that all significant environmental issues are identified and addressed during the closure, restoration and aftercare phases.

Financial provision encompasses two aspects:

- Quantifying the financial amount of the environmental liabilities (known and unknown)
- Selecting appropriate financial instrument(s) to underwrite the liabilities.

Figure 1.1 illustrates the appropriate types of financial instruments for different types of environmental liability and how financial provisions are calculated through the Closure Restoration Aftercare management Plan (CRAMP) and Environmental Liability Risk Assessment (ELRA) processes.

Figure 5.1 illustrates the Site Specific Financial Provision.

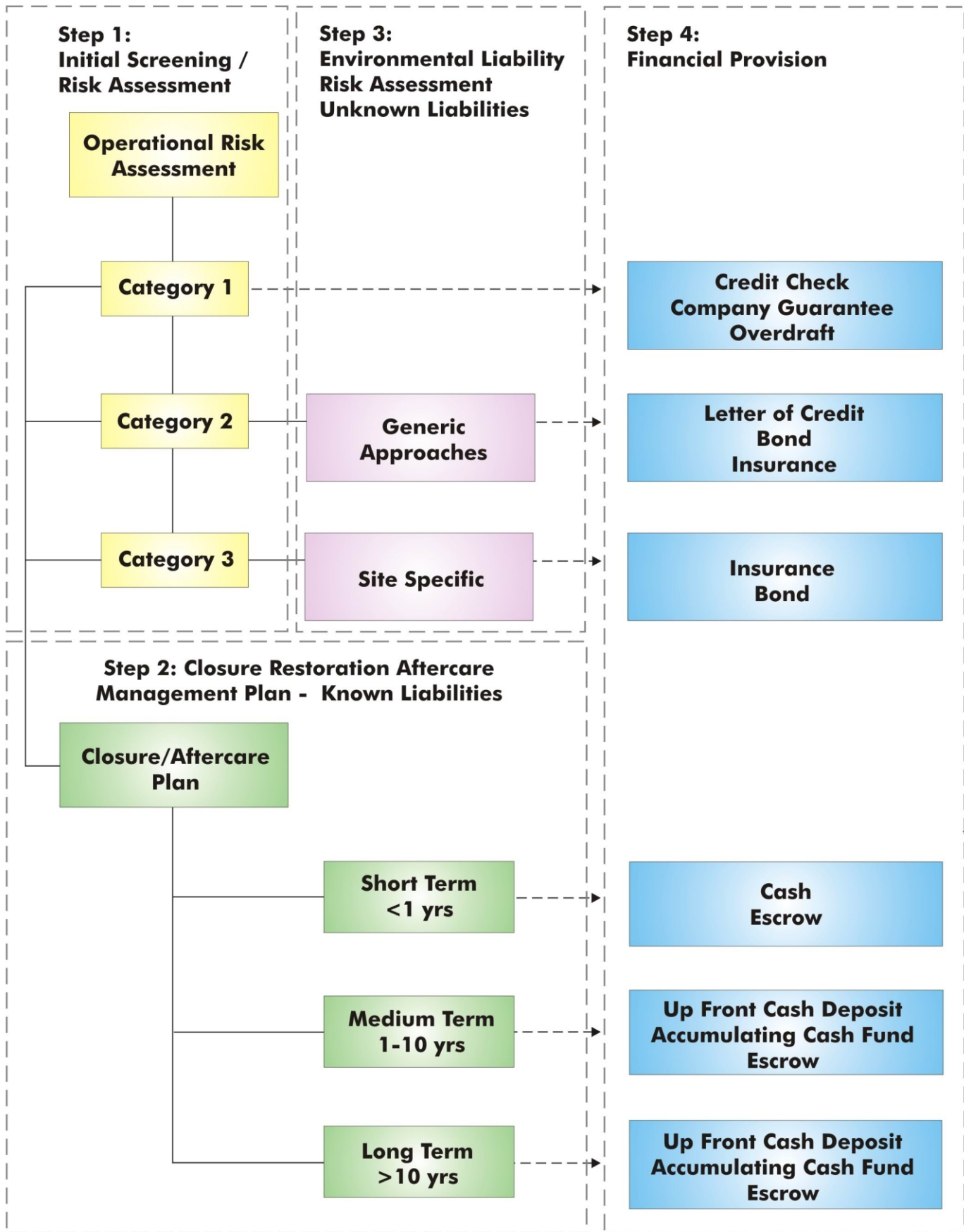
### 5.2 CALCULATION OF FINANCIAL PROVISION

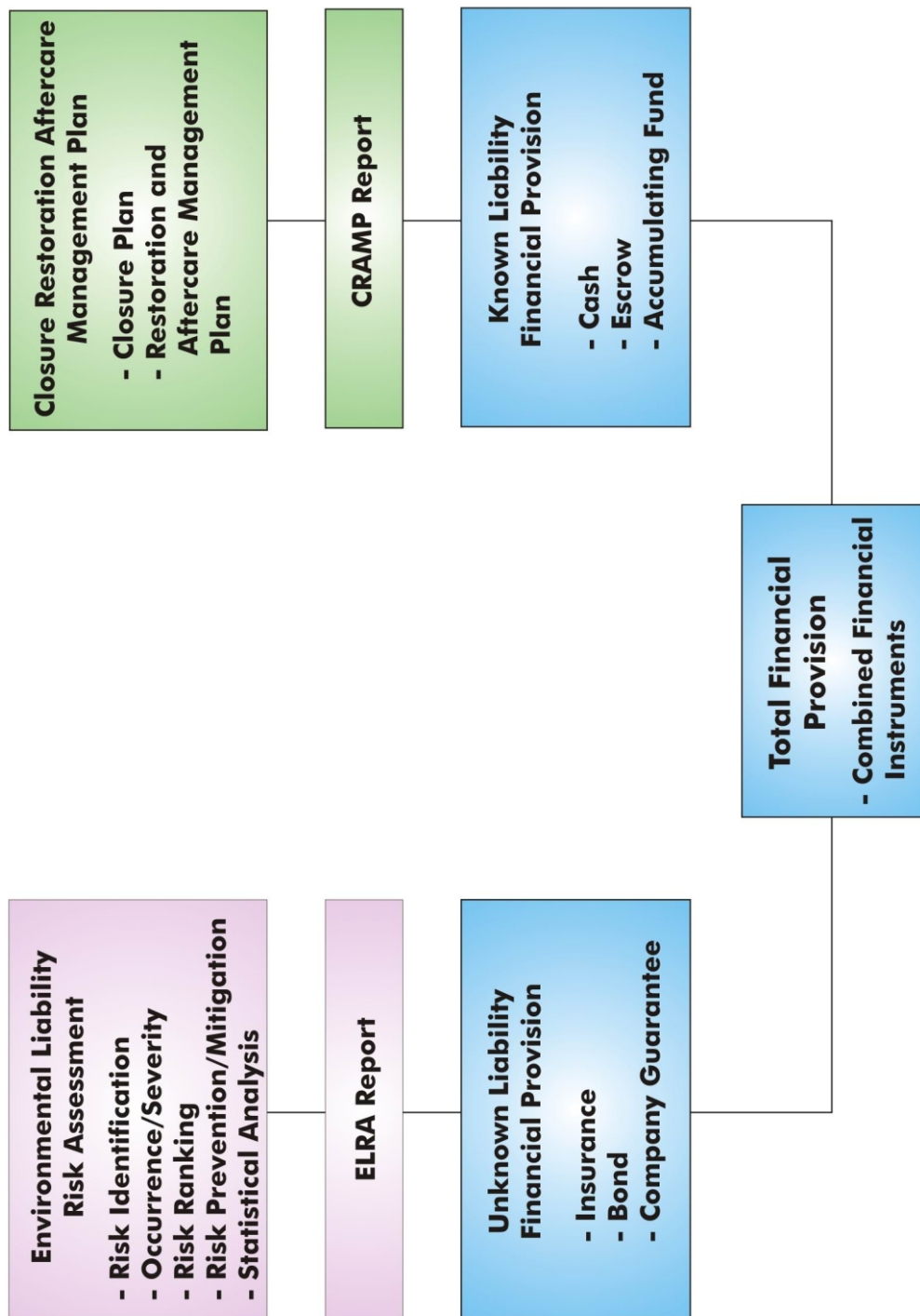
The amount of financial provision required for a facility should be determined using the CRAMP (Step 2) and ELRA (Step 3) as outlined in this Guidance.

Table 5.1 summarises how financial provisions should be calculated for known and unknown liabilities.

Financial provision should be clearly set out with a description of the liability, how it has been quantified, the amount of provision and the financial instrument used to underwrite the liability. An example template is included in Table 5.2

# Figure 1.1 ELRA/CRAMP/FPA PROCESS





**Figure 5.1 Site Specific Financial Provision**

**Table 5.1 Outline Financial Provision**

<b>Liability Type</b>	<b>Description</b>	<b>Method of Quantification</b>	<b>Amount of Provision</b>	<b>Appropriate Financial Instrument</b>	<b>Accessibility</b>	<b>Revision *</b>
Known Liability - Closure	Planned liabilities that will arise upon closure, of the facility (e.g. site decommissioning, residual waste disposal, landfill capping, soil and groundwater remediation programme).	Preparation of site specific Closure Plan as part of overall Closure Restoration Aftercare Management Plan (CRAMP).	Financial provision to cover all known environmental liabilities that are expected to be incurred upon closure.	Cash based solutions depending on the type of activity: Cash deposits Accumulating trust funds Escrows	Financial provision to be accessible by the regulatory authority and the operator with the approval of the regulatory authority. Provision to be maintained through the life of the activity and drawn down as liabilities fall due.	CRAMP and cost estimate to be revised on a yearly basis and the financial provision updated to reflect the current level of known environmental liabilities.
Known Liability – Restoration and Aftercare Management	Planned liabilities that will arise upon restoration and aftercare management of the facility (e.g. landfill from restoration, long term soil and groundwater remediation programme, long term environmental monitoring)	Preparation of detailed site specific Closure Restoration Aftercare Management Plan (CRAMP).	Financial provision to cover all known environmental liabilities.	Cash based solutions: Cash deposits Accumulating trust funds Escrows	Financial provision to be accessible by the regulatory authority and the operator with the approval of the regulatory authority. Provision to be maintained through the life of the activity and drawn down as liabilities fall due.	CRAMP and cost estimate to be revised on a yearly basis and the financial provision updated to reflect the current level of known environmental liabilities.
Unknown Liability	Unplanned liabilities that have the potential to arise during the operational life of the facility (e.g. failure in chemical storage tank resulting in soil and groundwater contamination)	Undertake detailed site specific risk assessment (ELRA). Statistical (probabilistic) analysis of cost scenarios to calculate 90 <sup>th</sup> percentile expected.	Financial provision to cover the expected cost of potential environmental liabilities. Based on statistical assessment of cost scenarios.	Risk-transfer instruments to reflect the uncertainty of the risk occurrence and availability of funds: Bonds Insurance Letters of Credit	Financial provision to be accessible by the regulatory authority and the operator with the approval of the regulatory authority. Financial provision to be maintained for the life of the potential environmental liability.	Risk assessment and cost estimate to be revised on a yearly basis and the financial provision updated to reflect the current level of unknown environmental liabilities.

**\* Where there have not been any significant changes on site, updated cost estimates can be revised based on inflation.**

**Table 5.2 Example Financial Provisions**



Liability Type	Description	Method of Quantification	Amount of Provision	TOTAL AMOUNT (€)	Financial Instrument
Known Liability - Closure	Site closure and decommissioning: <ul style="list-style-type: none"> <li>Decommissioning of plant and buildings</li> <li>Residual waste disposal</li> </ul>	Cost estimates provided in detailed Closure Plan for the facility (based on independent quotation)	€250,000		
Known Liability – Restoration and Aftercare Management	Continuation of contaminated groundwater Monitored Natural Attenuation (MNA) programme for 5 year period	Cost estimates provided in Restoration and Aftercare management Plan (and based on independent quotation)	€30,000 per annum €150,000 Total	<b>Known = €400,000</b>	Cash Reserve – On Deposit
Unknown Liability	Risk of unplanned events occurring on site: <ul style="list-style-type: none"> <li>Failure of chemical storage containment</li> <li>Leak in bund wall</li> </ul>	Environmental Liability Risk Assessment report and analysis of likely cost scenario	€1,000,000	<b>Unknown = €1,000,000</b>	Environmental Liability Insurance Policy

### **5.3 FINANCIAL INSTRUMENTS AND OPTIONS**

There are a number of financial instruments available to underwrite environmental liabilities. The main instruments are summarised in Table 5.3 based on the type of liability to be underwritten, along with a description of their advantages and disadvantages. Precautionary notes are also included in Table 5.3 in order to protect the financial provision against the effects of liquidation, receivership and examinership. Further information in relation to the definitions of liquidation, receivership and examinership are contained in Table 5.4. Supplementary information in relation to insurance as financial provision is contained in Table 5.5.

**Table 5.3 Summary of Financial Provision Instruments**

<b>Liability Type</b>	<b>Instrument</b>	<b>Description</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>Known Closure, Restoration and Aftercare Liabilities</b>	<b>Cash Deposits</b>	<p>Cash deposited in a bank account in the sole name of the regulator, not joint names.</p> <p>Can be paid in as lump sum or set up as accumulating fund.</p>	<ul style="list-style-type: none"> <li>Ensures that some monies are available in the event of the operator's insolvency.</li> <li>Provides long term security.</li> <li>Payment into account are invested rather than consumed in the form of premiums.</li> <li>Annual cost likely to be equivalent to that of bond or insurance premiums.</li> </ul>	<ul style="list-style-type: none"> <li>Monies may not be enough to cover the operator's obligations as capital is not pooled.</li> <li>Start up costs can close the market to small operators.</li> <li>Can tie up valuable working capital.</li> <li>Problems arise if a loss occurs at an early stage when the fund is not yet big enough to pay for it.</li> <li>Operator may be liable to pay tax on the money paid in.</li> </ul>
	<b>Escrow accounts</b>	<p>A property (cash or other assets, such as gilts) held by a third party (e.g. a lender) on behalf of two people (e.g. the licensee and the regulator) for a specified period of time until one or both parties meets the conditions set out in the escrow agreement (e.g. in the case of the licensee a successful surrender of its licence with no liability having arisen). Escrow can accumulate.</p>	<ul style="list-style-type: none"> <li>Cannot be unilaterally released by operator.</li> <li>Secures a definite amount of money to cover environmental liabilities.</li> <li>Suited to cover liabilities, which are quantifiable before operations commence, e.g. closure costs.</li> </ul>	<ul style="list-style-type: none"> <li>Ties up valuable working capital.</li> <li>Potentially high enforcement costs.</li> <li>Potentially high transactional costs for all parties.</li> <li>Monies may not be released to cover obligations it is meant to guarantee.</li> <li>Not suitable for unexpected liabilities such as damage to third parties</li> </ul>

Liability Type	Instrument	Description	Advantages	Disadvantages
Short – Medium Term Unknown Liabilities	Insurance	<p>Risk spreading mechanism for securing environmental liability. Through premiums, the overall cost for the operator of securing risks is reduced. By pooling together resources the insurer is more likely to be able to respond to significant liabilities.</p> <p>Refer to Table 5.5 for additional information.</p>	<ul style="list-style-type: none"> <li>Established and growing market.</li> <li>Products are available on the market.</li> <li>Current willingness by insurers and reinsurers to insure.</li> <li>Pools resources resulting in a greater ability to pay out for claims.</li> <li>Spreads the risk amongst insurers and reinsurers</li> <li>Induces better environmental management.</li> <li>Releases valuable working capital.</li> <li>Regulated industry.</li> <li>Cover is flexible and can be structured to include site closure costs.</li> </ul>	<ul style="list-style-type: none"> <li>Policies contain exclusions and other restrictions. E.g. liability caps and deductible may be difficult for operators to fund.</li> <li>Larger operators may be able to negotiate better policies to the detriment of the smaller operator.</li> <li>Cost can be high for small and medium size enterprises.</li> <li>Claims based insurance restricts cover to claims made during the policy, but cover can apply to prior acts.</li> <li>Risk of insolvency of the insurer</li> <li>Attracts Insurance Premium Tax, although not VAT</li> <li>Administrative costs (policy scrutiny) will have to be borne by the prospective insured.</li> <li>It is possible that some sites will be uninsurable owing to site features of poor site management.</li> </ul>
Short Term Unknown Liabilities	Bonds	<p>Undertakings by banks to pay a third party beneficiary a certain sum of money on a certain event, including in the event of environmental liabilities materialising.</p>	<ul style="list-style-type: none"> <li>Releases valuable working capital.</li> <li>Backed by a regulated industry unlikely to default on obligations.</li> <li>Cannot be cancelled unilaterally by the buyer.</li> <li>Flexibility; e.g. can be made to pay out if the bond is not renewed</li> <li>Relatively simple contractual device</li> <li>Generally not subject to numerous / onerous limitations and restrictions</li> </ul>	<ul style="list-style-type: none"> <li>Renewable yearly and as no obligation to renew does not prove to be a good long term guarantee.</li> <li>Costs can be high and are not recoverable.</li> </ul>

Liability Type	Instrument	Description	Advantages	Disadvantages
Short Term Unknown Liabilities	Letters of Credit	Bought from banks and require that a third party beneficiary be paid the amount represented by the letter of credit if and when the buyer fails to perform certain obligations.	<ul style="list-style-type: none"> <li>Releases valuable working</li> <li>Backed by a regulated industry unlikely to default on obligations.</li> <li>Cannot be cancelled unilaterally by the buyer.</li> <li>Useful for short-term risks.</li> </ul>	<ul style="list-style-type: none"> <li>Renewable yearly and as no obligation to renew does not prove to be a good long term guarantee.</li> <li>May not be available for smaller operators.</li> <li>Can have a negative impact on the operator's credit rating.</li> <li>Costly.</li> </ul>
Short Term Unknown Liabilities  Subsidiary operations of large reputable parent organisation	Parent company guarantee	Parent company acts as guarantor of the potential future environmental liabilities of a subsidiary company, normally the operating company.	<ul style="list-style-type: none"> <li>Releases valuable working capital.</li> <li>Parent company will normally have deeper pockets</li> <li>Parent company acts as an interested third party overseeing environmental management.</li> </ul>	<ul style="list-style-type: none"> <li>Parent company may go into liquidation.</li> <li>Transactional cost, both set up and monitoring costs can be high.</li> <li>Only available to operators with parent companies of substance.</li> <li>Parent company may not be in existence when the liability materialises.</li> </ul>
Short Term Unknown Liabilities  Low risk facilities only	Self insurance through charges on the company's assets	A company may allow charges over its assets, including land, to be earmarked to cover possible future environmental liabilities.	<ul style="list-style-type: none"> <li>This form of guarantee is a safer form of security given that in the event of bankruptcy or liquidation of the company, the realised value of the asset would be reserved specifically to cover environmental liabilities.</li> <li>The company would benefit from not having to pay out insurance or other premiums or levies and the transaction costs or the company are low.</li> </ul>	<ul style="list-style-type: none"> <li>Some assets depreciate and reduce in value over time and thus the value of the charge would reduce over time whilst environmental liabilities may increase with time. Thus the asset, when realised, may not be sufficient to cover the actual liability.</li> <li>Regulator who ends up owning contaminated land may become liable for clean up costs.</li> <li>The regulator will incur transaction costs in registering the charge and carrying out searches in order to ensure that the asset is free from other charges.</li> <li>The regulator would also have to invest in continual monitoring and verification of the company's financial performance and its asset value.</li> </ul>

Liability Type	Instrument	Description	Advantages	Disadvantages
<b>Short Term Unknown Liabilities</b>  <b>Low risk activities</b>	<b>Self insurance through accounting</b>	<p>Larger operators will have the capacity to make a provision in their accounts for future environmental liabilities. This accounting provision can be made over retained profits or the company's assets.</p>	<ul style="list-style-type: none"> <li>Releases valuable working capital.</li> <li>Low transactional costs for operator.</li> <li>Corporate social responsibility duties increase transparency in valuating risks.</li> <li>If audited present and independent record of value of environmental liabilities.</li> </ul>	<ul style="list-style-type: none"> <li>No assurance that monies will be set aside to pay for environmental liabilities.</li> <li>No creditor rating in case of insolvency.</li> <li>Company may not be in existence when the liability materialises.</li> <li>The regulator will incur financial monitoring costs.</li> </ul>
<b>Short Term Unknown Liabilities</b>  <b>Small low risk activities</b>	<b>Overdrafts</b>	<p>Operators use an overdraft facility as a way of guaranteeing their environmental liabilities.</p>	<ul style="list-style-type: none"> <li>Banks are good guarantors.</li> <li>Low transactional costs as the facility does not have to be drawn down.</li> </ul>	<ul style="list-style-type: none"> <li>Ties up financial resources.</li> <li>Likely to guarantee only small amounts.</li> <li>Overdrafts are payable on demand and may put the operator in an unexpected financial difficulties.</li> <li>Overdraft facility may not be available when the liability materialises.</li> </ul>

**Table 5.4 Factors to be Considered when Evaluating Insurance Provision**

<b>Limits of Liability</b>	<p>Regulators need to be aware of the various financial caps, each of which may apply to the policy in question:</p> <ol style="list-style-type: none"> <li>1. Aggregate Liability limit is the maximum sum, which the insurer will pay out for all claims arising under the Policy.</li> <li>2. There will also be a maximum limit of liability for each and every claim or loss: this is generally the same as the aggregate limit, but can occasionally be lower.</li> <li>3. Sub-limits may be set for particular types of claim –e.g. for bodily injury or business interruption losses (such as increased costs of working or loss of gross profit arising from a pollution liability).</li> </ol> <p>Each of these financial caps needs to be set at a realistic level in order for insurance to provide worthwhile cover.</p> <p>By way of example, the Policy may state that “the aggregate limit of liability is 10 million euros, subject to a sub-limit of liability of 2 million euros for each and every claim and a further sub-limit of 500,000 euros for any claim relating to bodily injury”. The aggregate limit may be acceptable to the regulator on the basis of the latest financial modelling techniques (e.g. there may be a 99% probability that any losses arising from the relevant facility will not cost more than 10 million euros). However, the regulator’s level of confidence could be much lower (e.g. 90%) that losses will exceed the 2 million euro per claim sub-limit.</p> <p>It would be prudent for the regulator to develop financial modelling tools that enable it to check that the policy limits, sub-limits and co-insured layers (if any) are set at levels which are reasonably sufficient (e.g. 95% + likely) to cover foreseeable / insured losses. Such tools would also be of value to operators to determine the adequacy of the level of insurance purchased in the first place.</p>
<b>Deductible</b>	<p>This is the amount of any financial loss which the policyholder assumes before it receives indemnity from the insurer.</p> <p>Deductibles can apply for each and every claim/loss or event. A single pollution event e.g. the escape of pollution beyond the boundaries of the facility) could give rise to multiple claims.</p> <p>The policy might also contain an aggregate deductible. By way of example, the Policy may make the Insured liable for the first 100,000 euros of any loss, subject to an aggregate deductible for all losses of 500,000. This would mean that when a sixth loss arises (in excess of the per claim deductible) the insurer is liable to pay the loss from the first euro upwards (also known as “ground up”). Aggregate deductibles can therefore be attractive to insureds and regulators.</p> <p>In some cases insureds may, in addition to the deductible, accept liability for a percentage of any insured loss (e.g. paying 25% of any insured loss). This is sometimes known as a “co-insured layer”. It is fair to say that this is not usual within environmental insurance.</p> <p>Deductibles or a co-insured layer may be set at a high level either as demanded by the insurer or at the request of the insured so that the cost of the cover is reduced. By way of example, the policy might make the insured liable for the first 500,000 euros of any loss, above which the insured is liable for 25%. If a 2 million euro loss is incurred, the Insured would have to pay 1 million euros (the sum of the deductible and the co-insured layer).</p> <p>Regulators may be concerned about the credit risk that the Insured cannot meet afford to pay for the uninsured element of the loss. However, it is fair to say that the per loss deductible is often set at or around the 50,000 – 75,000 euro level.</p> <p>It would be prudent for the regulator to carry out a credit check on operators to determine whether the deductible is set at an affordable level. The lower the credit rating, the lower the deductible should be set.</p>
<b>Triggers</b>	<p>These are events, which can trigger a claim under the policy, such as the service of a statutory notice by a regulator following a breach of a permit.</p> <p>They need to be relevant to the insured’s operation and the underlying environmental law that can give rise to liability.</p> <p>It is in the Insured’s best interests to have a broadly defined trigger (e.g. a notice which can encompass the full suite of statutory notices together with statements of claim, letters, summons, claim forms etc which can give rise to civil / tortious liability).</p> <p>One related point to note is that the Insured will be under a duty to notify the insurer of any and all claims arising. The Insured should exercise prudence, erring on the side of caution by notifying the insurer of any claim and any potential claim.</p>
<b>Exclusions</b>	<p>These are circumstances, which exclude the insurer’s liability under the policy. They can reduce the value of a policy and thus need to be negotiated, understood and studied carefully.</p> <p>Some exclusions are non-negotiable – the insurers own insurers (its reinsurers) may have imposed the exclusion and the insurer may have no room for manoeuvre.</p> <p>However, the Insured should be prepared to negotiate with the insurer with regard to any exclusion, which significantly restricts coverage. The Insured should find out the rationale for the exclusion: why has the insurer used it? The Insured should consider whether the reason for it can be justified. If it can, the Insured should then consider whether the wording of the exclusion is or is not wider than necessary to achieve the desired end.</p> <p>By way of example, insurance is concerned with fortuity, not inevitability. Insurers will not give coverage for known liabilities and it is reasonable for insurers to exclude such liabilities from the coverage. However, the insurer may also seek to exclude coverage for “known contamination” being contamination, which the Insured knows about or ought to have known about had it carried out prudent investigations. Just because contamination is known to be present at the facility it does not necessarily follow that an insured loss is inevitable. The Insured could contest the exclusion or seek to restrict its ambit to specific</p>

	known pollution linkages.
<b>Conditions Precedent</b>	<p>This is a policy condition that has to be satisfied before a successful claim can be made by the Insured under the policy. If the condition is not satisfied, the insurer is not liable.</p> <p>The insured should take care when entering into contracts of insurance that contain conditions precedent. If the condition precedent is in relation to matters that are outside the Insured's control (e.g. that a process is modified which would require the consent of a regulator), then the Insured should think twice before proceeding.</p>

## 5.4 COMBINED SOLUTIONS

The list of financial instruments referred to in Table 5.3 should not be regarded by regulators and operators as mutually exclusive alternatives. It is possible, and in some cases even desirable to design a financial provision mechanism, which brings together more than one of the different types of financial provision, specifically where both known and unknown liabilities require different financial instruments. In this way the shortcomings of one mechanism can be offset by the strengths of another. Such combination approaches have been used in the past, both in Ireland and the UK. Examples of the combinations that can be used are outlined in Table 5.5



**Table 5.5 Examples of Combined Financial Instruments**

<b>Combined Financial Instrument</b>	<b>Description and Advantages</b>
<b>Insurance backed by Surety Bond</b>	<p>To satisfy the financial provision requirements of UK waste management law, a mechanism was developed which combined an environmental liability policy and a surety bond (an unsecured bond, in this case issued by an insurance company in return for a fee). The environmental liability policy indemnified the landfill operator against specified losses relating to bodily injury and property damage. In the event of the operator's insolvency, the environmental liability policy also indemnified the regulator for the full (i.e. no deductible applying) remediation expenses which it incurred to avoid an environmental emergency.</p> <p>In addition, the environmental liability policy was backed by a surety bond. This covered the supervision or revocation of the waste management licence by the regulator. The combined policy and surety bond was available for up to a 5 year period, with a renewal facility.</p>
<b>Cash and Insurance</b>	<p>The attractions to regulators of cash-based (or equivalent liquid assets, e.g. gilts) have been noted above; in particular, this form of financial provision is readily available to operators and can be "ring-fenced" for the sole purpose of enabling the licence obligations to be met.</p> <p>However, there are some shortcomings with cash. It takes time to build up a sum of money sufficient to pay for any major costs that might arise. If these materialise before the fund is adequate to pay for them, the risk is obvious. To address this shortcoming, operators and regulators could, for instance, use environmental liability insurance to provide cover for catastrophic losses. The policy can provide protection when the cash deposit is depleted in whole or in part.</p> <p>Further refinements to this combination could include:</p> <ul style="list-style-type: none"> <li>• First, the policy can be modified to allow the regulator to take what is known in the USA as "direct action" (i.e. to recover specified costs regardless of the insured' operator's bankruptcy, fraud or misrepresentations);</li> <li>• Secondly, the policy could take the form of a standardised wording, which has been pre-agreed with the regulator (e.g. which cuts back on the number and scope of the exclusions and reduces the insurer's ability to cancel cover).</li> </ul>
<b>Multiple Insurance Policies</b>	<p>More than one environmental insurance policy, for instance, can be used to achieve a high limit of indemnity (where a second insurer provides cover on an "excess of loss" basis, following the terms of the underlying policy provided by the first insurer). Operators with their own captive insurance company could also use an environmental insurance policy either to sit in excess of the captive or vice versa.</p>

## 5.5 FINANCIAL CREDIT RATING

Financial Credit Rating of Private Sector organisations can be undertaken by professional service providers that are available in the marketplace.

In addition, relatively simple financial analysis of company accounts with ratio analysis can be undertaken to provide an indication of a company's financial health. Historical analysis of financial ratios can indicate trends in a business. Table 5.6 provides information on ratio analysis that are commonly used in financial assessment. It should be stressed however, that these ratios are normally calculated based on historic financial information and do not provide an indication on a firm's current financial health. They should also not replace independent checking by professional advisors.

**Table 5.6 Financial Ratio Analysis**

<b>FINANCIAL RATIO</b>	<b>DEFINITION</b>	<b>INDICATION</b>	<b>TYPICAL RANGE</b>
Current Ratio	Current Assets/Current Liabilities	Company's ability to pay it's debts as they fall due	Ideally 2:1 although can vary
Acid Test Ratio	Current Assets – Stock / Current Liabilities	Stricter test of company's ability to pay it's debts as they fall due	Ideally 1:1 although can vary. Can be lower for engineering companies.
Debtors Ratio	(Average Debtors / Credit Sales) x 365	A measure of the company's cash flow and ability to collect from debtors	
Creditors Ratio	(Average Creditors / Credit Purchases) x 365	A measure of the company's cash flow and ability to pay creditors	
Gearing Ratio	Long Term Liabilities / Shareholders Equity	A measure of the company's capital structure	Should be < 1
Debt Ratio	Total Assets / Total Debt	A measure of the company's ability to cover total debt	
Interest Cover	Profit before Interest & Tax / Interest	A measure of the company's ability to meet it's interest repayment obligations	
Net Debt / EBITDA	Net Debt / Earnings before interest, tax, depreciation and amortisation	A measure of how many times the net debt is over the operating profit of the business.	

## 5.6 VERIFICATION AND VALIDATION

In order to verify costed liabilities submitted to the EPA by Licensees, a series of cost estimate tables are provided in Appendix E. These include:

Table D1 – Example Unit Costs for Soil and groundwater Investigation, Monitoring and Remediation

Table D2 – Example Unit Costs for Waste Management Facilities

Table D3 – Example Unit Costs for Demolition of Building Structures

In using these estimates it should be noted that:

- Unit costs provided are indicative estimates based on 2005 rates.
- Site specific circumstances can significantly affect costs.
- Plant decommissioning and recycling of plant and materials can in some circumstances represent assets rather than liabilities.
- There may be no need to demolish building structures if these are not posing environmental, health or safety risks and which could be used by a future occupier.

## **APPENDIX A**

### **Glossary of Terms**

### Glossary of Terms

<b>AER</b>	Annual Environmental Report
<b>Aftercare Management</b>	The maintenance and environmental management of a closed facility.
<b>Bonds</b>	Undertakings by banks to pay a third party beneficiary a specified sum of money on a certain event, including in the event of environmental liabilities materialising.
<b>Cash Deposits</b>	Cash deposited in a bank account.
<b>Charges on the Company's Assets</b>	A company may allow charges over its assets, including land, to be earmarked to cover possible future environmental liabilities.
<b>Closure Plan</b>	A systematic procedure to wind up an operating facility that addresses all of its environmental obligations and liabilities upon closure.
<b>Conditions Precedent</b>	An insurance policy condition that has to be satisfied before a successful claim can be made by the Insured under the policy. If the condition is not satisfied, the insurer is not liable.
<b>CRAMP</b>	Closure, Restoration and Aftercare Management Plan
<b>Deductible</b>	The amount of any financial loss which an insurance policyholder assumes before it receives indemnity from the insurer.
<b>ELRA</b>	Environmental Liability Risk Assessment
<b>Environmental Sensitivity</b>	The sensitivity of the receiving environment in the vicinity of a facility.
<b>Escrow Accounts</b>	A property (cash or other assets such as gilts) held by a third party (such as a lender) on behalf of two people (the licensee and the regulator) for a specified period of time until one or both parties meet the conditions set out in the escrow agreement.
<b>Examinership</b>	The re-structuring of a bankrupt company to enable it to trade successfully into the future.
<b>Exclusions</b>	Insurance circumstances, which exclude the insurer's liability under the policy.
<b>FP</b>	Financial Provision
<b>FPA</b>	Financial Provision Assessment
<b>Insurance</b>	Risk transfer mechanism for securing environmental liability. Through premiums, the overall cost for the operator of securing risks is reduced.
<b>IPPC</b>	Integrated Pollution Prevention Control
<b>Known Liabilities</b>	Planned/anticipated liabilities associated with a facility such as the costs of closure, restoration and aftercare management.
<b>Letters of Credit</b>	Bought from banks and require that a third party beneficiary be paid the amount represented by the letter of credit if and when the buyer fails to perform certain obligations.

<b>Liquidation</b>	The voluntary or involuntary winding up of a company by ascertaining liabilities and apportioning assets.
<b>Overdrafts</b>	A short term credit facility offered by a bank.
<b>Parent Company Guarantee</b>	A financial guarantee by a parent company/organisation to underwrite a liability.
<b>Pollution Record</b>	The operating compliance history of a facility with its IPPC or Waste Licence or environmental legislation.
<b>Receivership</b>	The financial management of a bankrupt business by a receiver appointed by the Courts.
<b>Restoration Plan</b>	A documented plan to rehabilitate a facility to a suitable end use that addresses all of the facility's long term environmental obligations and liabilities.
<b>Restoration &amp; Aftercare Management Plan</b>	A documented plan to rehabilitate and manage for an extended period a facility that addresses all of the facility's long term environmental obligations and liabilities.
<b>Occurrence</b>	The probability of an unplanned event/accident occurring.
<b>Severity</b>	The magnitude of impact if the unplanned event/accident occurs.
<b>RMP</b>	Residual Management Plan.
<b>Triggers</b>	Events which can trigger a policy claim.
<b>Unknown Liabilities</b>	The risk and cost potential of Environmental Liabilities occurring due to unexpected events.

## **APPENDIX B**

### **IPPC and Waste Activities Complexity Look-Up Tables**

## OEE PROPOSED BANDING (G1 LEAST COMPLEX TO G5 MOST COMPLEX)

Ref.	Activities	Band
<b>Protection of the Environment Act, 2003</b>		
<b>1 Minerals and Other Materials</b>		
1.1.1	The production of asbestos.	G1
1.1.2	The extraction, production and processing of raw asbestos, not included in paragraph 1.1.1.	G3
1.2	The extraction of aluminium oxide from an ore, not included in paragraph 5.13.	G4
1.3	The extraction and processing (including size reduction, grading and heating) of minerals within the meaning of the Minerals Development Acts 1940 to 1999, where an activity involves—(a) a metalliferous operation, or (b) any other operation where either the level of extracted or processed minerals is greater than 200,000 tonnes per annum or the total operational yield is greater than 1,000,000 tonnes, and storage of related mineral waste.	Non-metallic Quarries G3 Metal Mines G5
1.4	The extraction of peat in the course of business which involves an area exceeding 50 hectares.	G1
<b>2 Energy</b>		
2.1	The operation of combustion installations with a rated thermal input equal to or greater than 50 megawatts (MW). <ul style="list-style-type: none"> <li>• 50 megawatts or more</li> <li>• 300 megawatts or more</li> </ul>	G3 G4
<b>3 Metals</b>		
3.1.1	The production of pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2.5 tonnes per hour.	G4
3.1.2	The initial melting or production of iron or steel, not included in paragraph 3.1.1.	G3
3.2.1	The processing of ferrous metals:(a) hot-rolling mills with a capacity exceeding 20 tonnes of crude steel per hour, (b) smitheries with hammers the energy of which exceeds 50 kilojoules per hammer, where the calorific power used exceeds 20 MW, (c) application of protective fused metal coars with an input exceeding 2 tonnes of crude steel per hour.	G3
3.2.2	The processing of iron and steel in forges, drawing plants and rolling mills where the production area exceeds 500 square metres, not included in paragraph 3.2.1	G4
3.3.1	The operation of ferrous metal foundries with a production capacity exceeding 20 tonnes per day.	G3
3.3.2	The production, recovery, processing or use of ferrous metals in foundries having melting installations with a total capacity exceeding 5 tonnes, not included in paragraph 3.3.1	G2



Ref.	Activities	Band
3.4.1	The—(a) production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes, (b) smelting, including the alloyage, of non-ferrous metals, including recovered products, (refining, foundry casting, etc.) with a melting capacity exceeding 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals.	G3
3.4.2	The production, recovery or processing of non-ferrous metals, their compounds or other alloys including antimony, arsenic, beryllium, chromium, lead, magnesium, manganese, phosphorus, selenium, cadmium or mercury, by thermal, chemical or electrolytic means in installations with a batch capacity exceeding 0.5 tonnes, not included in paragraph 3.4.1.	G3
3.5	The reaction of aluminium or its alloys with chlorine or its compounds, not included in paragraph 5.13.	G4
3.6.1	The roasting or sintering of metal ore (including sulphide ore).	G3
3.6.2	The calcining of metallic ores in plants with a capacity exceeding 1,000 tonnes per annum	G2
3.7	Swaging by explosives where the production area exceeds 100 square metres.	G4
3.8	The pressing, drawing and stamping of large castings where the production area exceeds 500 square metres.	G2
3.9	Boiler making and the manufacture of reservoirs, tanks and other sheet metal containers where production area exceeds 500 square metres.	G2
<b>4 Mineral Fibres and Glass</b>		
4.1	The processing of asbestos, and the manufacture and processing of asbestos-based products.	G1
4.2.1	The melting of mineral substances including the production of mineral fibres with a melting capacity exceeding 20 tonnes per day.	G2
4.2.2	The manufacture of glass fibre or mineral fibre, not included in paragraph 4.2.1 or 4.3.	G1
4.3	The manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day or 5,000 tonnes per annum.	G4
4.4	The production of industrial diamonds.	G3
<b>5 Chemicals</b>		
5.1	The manufacture of chemicals in an integrated chemical installation, not included in paragraphs 5.12 to 5.17. <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4

Ref.	Activities	Band
5.2	The manufacture of olefins and their derivatives or of monomers and polymers including styrene and vinyl chloride not included in paragraphs 5.12 to 5.17. <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
5.3	The manufacture, by way of chemical reaction processes, of organic or organo-metallic chemical products other than those specified in paragraph 5.2 and not included in paragraphs 5.12 to 5.17. <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
5.4	The manufacture of inorganic chemicals, not included in paragraphs 5.12 to 5.17. <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4
5.5	The manufacture of artificial fertilisers, not included in paragraphs 5.12 to 5.17.	G4
5.6	The manufacture of pesticides, pharmaceutical or veterinary products and their intermediates, not included in paragraphs 5.12 to 5.17. <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4
5.7	The manufacture of paints, varnishes, resins, inks, dyes, pigments or elastomers where the production capacity exceeds 1,000 litres per week, not included in paragraphs 5.12 to 5.17. <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
5.8	The formulation of pesticides, not included in paragraphs 5.12 to 5.17. <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4
5.9	The chemical manufacture of glues, bonding agents and adhesives, not included in paragraphs 5.12 to 5.17. <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4
5.10	The manufacture of vitamins involving the use of heavy metals, not included in paragraphs 5.12 to 5.17. <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4

Ref.	Activities	Band
5.11	The storage, in quantities exceeding the values shown, of any one or more of the following chemicals (other than as part of any other activity) and not included in paragraphs 5.12 to 5.17—methyl acrylate (20 tonnes); acrylonitrile (20 tonnes); toluene di-isocyanate (20 tonnes); anhydrous ammonia (100 tonnes); anhydrous hydrogen fluoride (1 tonne).	G3
5.12	The production of basic organic chemicals, such as:	
	(a) simple hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic); where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
	(b) oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides, epoxy resins; where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
	(c) sulphurous hydrocarbons; where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
	(d) nitrogenous hydrocarbons such as amines, amides, nitrous compounds, nitro compounds or nitrate compounds, nitriles, cyanates, isocyanates; where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
	(e) phosphorus-containing hydrocarbons; where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
	(f) halogenic hydrocarbons; where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
	(g) organometallic compounds; where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4

Ref.	Activities	Band
	(h) basic plastic materials (polymers, synthetic fibres and cellulose-based fibres); where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
	(i) synthetic rubbers; where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
	(j) dyes and pigments; where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
	(k) surface-active agents and surfactants; where <ul style="list-style-type: none"> <li>• annual production &lt; 100 tonnes</li> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G2 G3 G4
5.13	The production of basic inorganic chemicals, such as:	
	(a) gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen, sulphur dioxide, carbonyl chloride; where <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4
	(b) acids, such as chromic acid, hydrofluoric acid, phosphoric acid, nitric acid, hydrochloric acid, sulphuric acid, oleum, sulphurous acids; where <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4
	(c) bases, such as ammonium hydroxide, potassium hydroxide, sodium hydroxide; where <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4
	(d) salts, such as ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate; where <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4
	(e) non-metals, metal oxides or other inorganic compounds such as calcium carbide, silicon, silicon carbide; where <ul style="list-style-type: none"> <li>• annual production &lt; 2000 tonnes</li> <li>• annual production &gt; 2000 tonnes</li> </ul>	G3 G4

Ref.	Activities	Band
5.14	The production of phosphorous-based, nitrogen-based or potassium-based fertilisers (simple or compound fertilisers); where <ul style="list-style-type: none"> <li>annual production &lt; 2000 tonnes</li> <li>annual production &gt; 2000 tonnes</li> </ul>	G3 G4
5.15	The production of basic plant health products and of biocides; where <ul style="list-style-type: none"> <li>annual production &lt; 2000 tonnes</li> <li>annual production &gt; 2000 tonnes</li> </ul>	G3 G4
5.16	The use of a chemical or biological process for the production of basic pharmaceutical products; where <ul style="list-style-type: none"> <li>annual production &lt; 2000 tonnes</li> <li>annual production &gt; 2000 tonnes</li> </ul>	G3 G4
5.17	The production of explosives; where <ul style="list-style-type: none"> <li>annual production &lt; 2000 tonnes</li> <li>annual production &gt; 2000 tonnes</li> </ul>	G3 G4
<b>6 Intensive Agriculture</b>		
6.1	The rearing of poultry in installations, whether within the same complex or within 100 metres of the same complex, where the capacity exceeds 40,000 places.	G1
6.2	The rearing of pigs in an installation, whether within the same complex or within 100 metres of the same complex, where the capacity exceeds— 750 places for sows in a breeding unit, or 285 places for sows in an integrated unit, or 2,000 places for production pigs.	G1
<b>7 Food and Drink</b>		
7.1	The manufacture of vegetable and animal oils and fats where the capacity for processing raw materials exceeds 40 tonnes per day, not included in paragraph 7.8.	G2
7.2.1	The treatment and processing of milk, the quantity of milk received being greater than 200 tonnes per day (average value on a yearly basis).	G3
7.2.2	The manufacture of dairy products where the processing capacity exceeds 50 million gallons of milk equivalent per year, not included in paragraph 7.2.1.	G3
7.3.1	Brewing (including cider and perry production) in installations where the production capacity exceeds 25 million litres per year, not included in paragraph 7.8.	G3
7.3.2	Distilling in installations where the production capacity exceeds the equivalent of 1,500 tonnes per year measured as pure alcohol, not included in paragraph 7.8.	G3
7.3.3	Malting in installations where the production capacity exceeds 100,000 tonnes per year, not included in paragraph 7.8.	G3
7.4.1	The operation of slaughterhouses with a carcass production capacity greater than 50 tonnes per day; where <ul style="list-style-type: none"> <li>discharge to local authority sewer</li> <li>discharge to surface water</li> </ul>	G3 G4

Ref.	Activities	Band
7.4.2	The slaughter of animals in installations where the daily capacity exceeds 1,500 units and where units have the following equivalents— Sch. 1 1 sheep = 1 unit, 1 pig = 2 units, 1 head of cattle = 5 units, and not included in paragraph 7.4.1; where <ul style="list-style-type: none"> <li>discharge to local authority sewer</li> <li>discharge to surface water</li> </ul>	G3 G4
7.5	The manufacture of fish-meal and fish-oil, not included in paragraph 7.8.	G3
7.6	The manufacture of sugar, not included in paragraph 7.8.	G4
7.7.1	The disposal or recycling of animal carcasses and animal waste with a treatment capacity exceeding 10 tonnes per day.	G4
7.7.2	The processing (including rendering) of animal carcasses and by-products, not included in paragraph 7.7.1.	G4
7.8	Treatments or processes for the purposes of the production of food products from:	
	(a) animal raw materials (other than milk) with a finished product production capacity greater than 75 tonnes per day,	G2
	(b) vegetable raw materials with a finished product production capacity greater than 300 tonnes per day (average value on a quarterly basis).	G2
<b>8 Wood, Paper, Textiles and Leather</b>		
8.1	The production of paper pulp, paper or board (including fibre-board, particle-board and plywood) with a production capacity exceeding 20 tonnes per day.	G4
8.2	The production of pulp from timber or other fibrous materials; where <ul style="list-style-type: none"> <li>annual production &lt; 50,000 tonnes</li> <li>annual production &gt; 50,000 tonnes</li> </ul>	G1 G2
8.3	The treatment or protection of wood, involving the use of preservatives, with a capacity exceeding 10 tonnes of wood per day; where <ul style="list-style-type: none"> <li>high pressure treatment with groundwater contamination</li> <li>other high pressure treatment</li> <li>low pressure treatment</li> </ul>	G4 G3 G2
8.4	The manufacture of synthetic fibres, not included in paragraph 5.12; where <ul style="list-style-type: none"> <li>annual production &lt; 2000 tonnes</li> <li>annual production &gt; 2000 tonnes</li> </ul>	G2 G3
8.5.1	The pre-treatment (operations such as washing, bleaching, mercerization) or dyeing of fibres or textiles where the treatment capacity exceeds 10 tonnes per day.	G2
8.5.2	The dyeing, treatment or finishing (including moth-proofing and fireproofing) of fibres or textiles (including carpet) where the capacity exceeds 1 tonne per day of fibre, yarn or textile material, not included in paragraph 8.5.1.	G2
8.6.1	The tanning of hides and skins where the treatment capacity exceeds 12 tonnes of finished products per day.	G3

Ref.	Activities	Band
8.6.2	The fell-mongering of hides and tanning of leather in installations where the capacity exceeds 100 skins per day, not included in paragraph 8.6.1.	G3
<b>9 Fossil Fuels</b>		
9.1	The extraction, other than offshore extraction, of petroleum, natural gas, coal or bituminous shale.	G4
9.2	The handling or storage of crude petroleum, not included in paragraph 9.3.1 or 9.3.2.	G3
9.3.1	The operation of mineral oil and gas refineries.	G5
9.3.2	The refining of petroleum or gas, not included in paragraph 9.3.1.	G5
9.4.1	The operation of coke ovens; where <ul style="list-style-type: none"> <li>• annual production &lt; 250 tonnes</li> <li>• annual production &gt; 250 tonnes</li> </ul>	G2 G4
9.4.2	The operation of coal gasification and liquefaction plants.	G5
9.4.3	The production of carbon (hard-burnt coal) or electrographite by means of incineration or graphitization.	G5
9.4.4	The pyrolysis, carbonisation, gasification, liquefaction, dry distillation, partial oxidation or heat treatment of coal, lignite, oil or bituminous shale, other carbonaceous materials or mixtures of any of these in installations with a processing capacity exceeding 500 tonnes per day, not included in paragraph 9.4.1, 9.4.2 or 9.4.3.	G5
<b>10 Cement</b>		
10.1	The production of cement: where <ul style="list-style-type: none"> <li>• waste used as fuel</li> <li>• other</li> </ul>	G4 G3
<b>11 Waste</b>		
11.1	The recovery or disposal of waste in a facility, within the meaning of the Act of 1996, which facility is connected or associated with another activity specified in this Schedule in respect of which a licence or revised licence under Part IV is in force or in respect of which a licence under the said Part is or will be required: <ul style="list-style-type: none"> <li>• incineration of waste</li> <li>• thermal oxidisers for odour control at chemical, surface coating facilities and food and drink facilities</li> </ul>	G5 G4
<b>12 Surface Coatings</b>		
12.1	Operations involving coating with organo-tin compounds, not included in paragraph 12.2.1 or 12.2.2.	G2
12.2.1	The surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year.	G4

Ref.	Activities	Band
12.2.2	The manufacture or use of coating materials in processes with a capacity to make or use at least 10 tonnes per year of organic solvents, and powder coating manufacture with a capacity to produce at least 50 tonnes per year, not included in paragraph 12.2; where <ul style="list-style-type: none"> <li>&lt; 20 tonnes solvent per annum or powder coating activities;</li> <li>20 – 100 tonnes solvent per annum</li> <li>&gt; 100 tonnes solvent per annum</li> </ul>	G2 G3 G4
12.3	The surface treatment of metals and plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m <sup>3</sup> .	G3
<b>13 Other Activities</b>		
13.1	The testing of engines, turbines or reactors where the floor area exceeds 500 square metres.	G2
13.2	The manufacture of integrated circuits and printed circuit boards.	G2
13.3	The production of lime in a kiln.	G3
13.4.1	The manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, or with a kiln capacity exceeding 4 m <sup>3</sup> and a setting density per kiln exceeding 300 kg/m <sup>3</sup> .	G4
13.4.2	The manufacture of coarse ceramics including refractory bricks, stoneware pipes, facing and floor bricks and roof tiles, not included in paragraph 13.4.1.	G4
<b>Waste Management Act, 1996</b>		
<b>Waste Disposal Activities</b>		
D1	Deposit on, in or under land; where <ul style="list-style-type: none"> <li>unlined landfill accepting &gt; 25,000 tonnes per annum non-hazardous waste or facilities without landfill gas flares</li> <li>unlined landfill accepting &lt; 25,000 tonnes per annum non-hazardous waste</li> <li>closed unlined landfills</li> </ul>	G5 G4 G4
D2	Land treatment, including biodegradation of liquid or sludge discards in soils.	G3
D3	Deep injection of the soil, including injection of pumpable discards into wells, salt domes or naturally occurring repositories.	G3
D4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.	G3



Ref.	Activities	Band
D5	<p>Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment; where</p> <ul style="list-style-type: none"> <li>engineered landfill accepting &gt; 100,000 tonnes per annum non-hazardous waste or hazardous waste landfill</li> <li>engineered landfill accepting &lt; 100,000 tonnes per annum non-hazardous waste</li> <li>closed lined landfills</li> <li>inert landfills</li> </ul>	<p>G5</p> <p>G4</p> <p>G3</p> <p>G2</p>
D6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in this Schedule.	G3
D7	<p>Physico-chemical treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in this Schedule; where</p> <ul style="list-style-type: none"> <li><i>Hazardous</i> – &lt; 10,000 tonnes per annum</li> <li><i>Hazardous</i> – &gt; 10,000 tonnes per annum</li> <li><i>Non-Hazardous</i> - &lt; 20 tonnes per day</li> <li><i>Non-Hazardous</i> - &gt; 20 tonnes per day</li> </ul>	<p>G3</p> <p>G4</p> <p>G2</p> <p>G3</p>
D8	Incineration on land or at sea.	G5
D9	Permanent storage, including emplacement of containers in a mine.	G3
D10	Release of waste into a water body (including a seabed insertion).	G3
D11	Blending or mixture prior to submission to any activity referred to in this Schedule.	G3
D12	Repackaging prior to submission to any activity referred to in this Schedule.	G3
D13	<p>Storage prior to submission to any activity referred to in this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced; where</p> <ul style="list-style-type: none"> <li><i>Non-Hazardous</i> - &lt; 25,000 tonnes per annum</li> <li><i>Non-Hazardous</i> - 25,000 – 100,000 tonnes per annum</li> <li><i>Non-Hazardous</i> - &gt; 100,000 tonnes per annum</li> <li><i>Hazardous</i> - &lt; 10,000 tonnes per annum</li> <li><i>Hazardous</i> - &gt; 10,000 tonnes per annum</li> </ul>	<p>G3</p> <p>G4</p> <p>G5</p> <p>G4</p> <p>G5</p>
<b>Waste Recovery Activities</b>		
R1	<p>Solvent reclamation or regeneration; where</p> <ul style="list-style-type: none"> <li>&lt; 20 tonnes per annum</li> <li>&gt; 20 tonnes per annum</li> </ul>	<p>G2</p> <p>G3</p>

Ref.	Activities	Band
R2	Recycling or reclamation of organic substances which are not used as solvents; where <ul style="list-style-type: none"> <li>• &lt; 5,000 tonnes per annum</li> <li>• 5,000 – 25,000 tonnes per annum</li> <li>• &gt; 25,000 tonnes per annum</li> <li>• mushroom composting</li> </ul>	G2 G3 G4 G4
R3	Recycling or reclamation of metals and metal compounds: <ul style="list-style-type: none"> <li>• collection and sorting only;</li> <li>• processing</li> </ul>	G1 G3
R4	Recycling or reclamation of other inorganic materials.	G2
R5	Regeneration of acids or bases.	G2
R6	Recovery of components used for pollution abatement.	G2
R7	Recovery of components from catalysts.	G2
R8	Oil re-refining or other re-uses of oil.	G3
R9	Use of any waste principally as a fuel or other means to generate energy: <ul style="list-style-type: none"> <li>• making solid fuel from waste</li> <li>• other</li> </ul>	G4 G3
R10	Spreading of any waste on land with a consequential benefit for an agricultural activity or ecological system, including composting and other biological transformation processes.	G1
R11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.	G2
R12	Exchange of waste for submission to any activity referred to in a preceding paragraph of this Schedule.	G2
R13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced; where <ul style="list-style-type: none"> <li>• <i>Non-Hazardous</i> - &lt; 25,000 tonnes per annum</li> <li>• <i>Non-Hazardous</i> - 25,000 – 100,000 tonnes per annum</li> <li>• <i>Non-Hazardous</i> - &gt; 100,000 tonnes per annum</li> <li>• <i>Hazardous</i> - &lt; 10,000 tonnes per annum</li> <li>• <i>Hazardous</i> - &gt; 10,000 tonnes per annum</li> </ul>	G3 G4 G5 G4 G5

## **APPENDIX C**

### **SAMPLE CLOSURE, RESTORATION AND AFTERCARE MANAGEMENT PLAN**

## **Executive Summary**

A Closure, Restoration and Aftercare Management Plan was prepared in order to comply with Condition 10 of the company's IPPC Licence. The risk classification tool was used and the site was found to be a high-risk site therefore the full scope of CRAMP was found to be required. A site evaluation was carried out and the main closure considerations were found to relate to buildings, plant and equipment underground and at surface level. All buildings, plant and equipment were accounted for and were fully costed. Site restoration was proposed and allowed for the rehabilitation of the site to an agreed end use. Aftercare maintenance and monitoring as it related to the site restoration over a 20-year period were detailed and anticipated costings were outlined.

### **1. Introduction**

Condition 10 of the company's IPPC Licence states that:

"10.1 Following termination, or planned cessation for a period greater than six months, of use or involvement of all or part of the site in the licensed activity, the licensee shall, to the satisfaction of The Agency, decommission, render safe or remove for disposal / recovery, any soil, subsoils, buildings, plant or equipment, or any waste materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

10.2 Closure, Restoration and Aftercare Management Plan:

10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for the decommissioning or closure of the site or part thereof. The plan shall be submitted to the Agency for agreement within 6 months of the date of grant of this licence.

10.2.2 The plan shall be reviewed annually and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Closure, Restoration and Aftercare Management Plan shall include, as a minimum, the following;

10.3.1 A scope statement for the plan

10.3.2 The criteria which define the successful decommissioning of the activity or part thereof, which ensures minimum impact to the environment.

10.3.3 A programme to achieve the stated criteria

10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the decommissioning plan.

10.3.5 Details of costings for the plan and a statement as to how these costs will be underwritten.

10.4 A final validation report to include a certificate of completion for the Closure, Restoration and Aftercare Management Plan, for all or part of the site as necessary, shall be submitted to the Agency within 3 months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment."

This report is intended to comply with the requirements outlined in Closure, Restoration and Aftercare Management Plan guidance.

The site is a proposed mine facility and operations have not yet commenced at the site.

## **2. Site Evaluation**

- Site is currently Greenfield and is the proposed location of an open cast mine
- A Detailed site layout plan and details of the proposed locations of ore bodies can be attached to the report.
- A detailed inventory of proposed site plant and raw materials can be tabulated and included in this section.
- Details of anticipated site wastes and decontamination requirements can be tabulated in this section.
- Based on the use of the Initial Screening Risk Assessment (Step 1 of Guidance) the site is considered High Risk and Site Restoration and Aftercare Management is required. The process used to arrive at the classification can be outlined and detailed in this section.

## **3. Closure Considerations**

### **3.1 Introduction**

This section details the plant, buildings, equipment and other materials which require consideration as part of the closure process.

Non Clean Closure with active aftercare leading eventually to Clean Closure is envisaged for the site.

Closure considerations are outlined under two main headings:

- Underground Decommissioning
- Surface Decommissioning.

### **3.2 Underground Decommissioning**

#### **Plant and Services**

- Mobile plant items consisting of drill rigs, explosive loading vehicles. Load – haul – dump units, haulage trucks and ancillary plant.
- Fixed Plant Items consisting of rock breakers, jaw crushers, conveyor belts, ventilation fans and pumps.
- Plant Services including pipe ranges for water / backfill materials, sub stations and associated cabling.

### **Proposed Disposal Routes**

- All mobile plant to be brought to the surface for scrap or resale.
- All abandoned fixed plant to be drained of oils and decontaminated
- All containers of fuels, oils and greases will be removed to the surface
- All rubber based materials e.g. conveyor belts to be removed to the surface
- Mine Entries & Ventilation Shafts:
- For Environmental and Health & Safety reasons all entries and shafts will be sealed and stabilised.

### **Extraction Areas**

- A backfill programme has been devised and it is proposed to backfill the extraction areas throughout the life of the mine.
- The backfill programme can be included as a figure in the report.
- Backfill is made from cemented high-density backfill made from total mine tailings. Backfill is mixed in s surface plant and piped underground to the point of placement.
- The backfill programme will result in the 60% of the areas to be filled being completed by the time of planned closure.

Drawings showing the location and layout of all plant and equipment can be included in this section.

## **3.3. Surface Decommissioning**

### **Decontamination Works**

- An assessment of the level of contamination with the following residues or materials will be made: fuels, oils, greases, mineral concentrates, process reagents/chemicals, partially treated effluents including sewage sludge and process water.
- All contaminants will be removed, drained or flushed from all plant, tanks and pipelines. All residues containing fuels, oils and other contaminants will be removed off site for recovery or disposal. All other residues to be handled within the Tailings Management Facility (TMF).
- All buildings, structures, plant and surfaces will be hosed down or flushed out with high pressure water. The washwater will be treated in the TMF if necessary.
- Any areas of ground with visual contamination will be excavated directly for off site treatment. Risk assessments will be carried out as necessary in order to establish the most suitable remediation.

### **Surface Plant**

- Surface plant will be treated similarly to underground plant i.e. decontaminated and sold for scrap or resale.

## **Building Demolition**

- There will be a logical sequence of demolition works
- The proposed demolition programme can be included as a figure in the report.
- Demolition debris will be segregated into steelwork, masonry and other materials for efficient recycling or disposal.

## **Removal of Infrastructure & Services**

- All drainage and associated services including sumps to be carefully removed
- All roads and other infrastructure to be removed.
- Decontamination to be carried out as previously outlined if necessary.
- A detailed sequential programme of infrastructure removal can be provided with the report.

## **Materials & Residues**

Provision is made for the appropriate and authorised disposal of the following;

- Process Chemicals & Reagents
- Laboratory Reagents
- Nuclear Sources from monitoring equipment
- Fuels & Oils
- Residual Ore Stock
- Operational equipment wastes
- Cement
- Explosives
- Other hazardous wastes e.g. PCB's in electrical equipment

Detailed inventories of the specific types and quantities of each waste stream can be provided in this section of the report.

Drawings showing the location and details of the buildings, plant and equipment or materials can be included in this section.

## **4. CRITERIA FOR SUCCESSFUL CLOSURE**

The principal criteria against which successful closure will be gauged are as follows;

- The areas occupied by all the surface facilities and ancillary areas, excluding the TMF, will be decommissioned and rehabilitated to a condition as close as possible to a Greenfield site.
- There should be no constraints on future land use due to residual contamination or structures
- Materials will be treated in such a manner that;
  - Equipment or uncontaminated materials will be resold or sold for scrap
  - Uncontaminated rubble will be used to backfill the mine

- Selected contaminated materials will be deposited in the Tailings Management Facility
- Other contaminated materials will be disposed of use authorised hazardous waste contractors
- The overall objective is for initial non clean closure and, following site restoration and aftercare, to achieve clean closure of the site with no residual liabilities or constraints.

Additional details can be provided in this section regarding proposed outlets for scrap and anticipated material balances.

## 5. CLOSURE PLAN COSTING

The expected costs associated with site closure are outlined in this section;

Item	Removal Cost €
Stockpile Building & Mill Buildings Demolition	100,000
Explosives Store Removal	30,000
Dewatering Pumps Stations	30,000
Surfaces Removal e.g. hardstandings, roads etc.	120,000
Pipe work (Water & Sewers)	75,000
Electrical Services	15,000
Security Enclosures	25,000
Mine Access Closure & Backfill	200,000
Ventilation Shafts	150,000
Mobile Plant	0
Decommissioning Plant	50,000
Subsidence Monitoring & Rehabilitation	60,000
Landscaping & Recontouring	300,000
Off Site Waste Disposal e.g. pipework , oils etc.	190,000
Power Consumption During Decommissioning	200,000
Engineering Construction Management During Decommissioning	100,000
Subtotal	1,645,000
Contingency (25%)	411,250
Total (excl. VAT)	2,056,250

## 6. CLOSURE PLAN UPDATE & REVIEW

The Closure Plan will be reviewed and updated annually as part of the Annual Environmental Report submission to the EPA.

The updated and reviewed Closure Plan will take account of any site or process changes, technology changes and costing changes.



## **7. CLOSURE PLAN IMPLEMENTATION**

The closure of the mine is currently projected in 10 years time however the EPA will be given 3 months notice and 6 months notice of any partial or full closures respectively. The form of notice will be in accordance with prevailing guidance and it is expected that there will also be discussions with the EPA as part of the process.

## **8. ENVIRONMENTAL MONITORING DURING DECOMMISSIONING**

An Environmental Exit Audit of the mine site will be carried out following the announcement of closure and prior to actual decommissioning and closure operations taking place. The audit will devise an accurate inventory of all plant, equipment and wastes on the site. This inventory will be used as a benchmark against which successful decommissioning will be assessed.

All IPPC licence monitoring with respect to surfacewater, effluent, groundwater, soil, waste management and noise will remain in effect over the course of the decommissioning phase.

## **9. SITE RESTORATION AND AFTERCARE**

### **Site Restoration or Remediation Proposals**

#### **Rehabilitation of the Land**

- Proposed Afteruse options for the land are:
  - Agricultural
  - Forestry
  - Amenity
- Earthworks: Following decommissioning the ground surface will be contoured to an appropriate landform
- Drainage: Surfacewater drainage using surface ditches will be installed thereafter
- Landscape: The report may contain a proposed landscape layout and vegetation cover.
- Surface preparation including laying of topsoil will be carried out prior to proposed revegetation.
- Vegetation Establishment: Following a 2 year period of “green cropping”
- Landscape Aftercare:

Drawings and other details can be provided here for outlining proposed rehabilitated areas, proposed landscaping and other relevant proposals.

## **Long Term Aftercare**

### **Aftercare of Tailing Management Facility (TMF)**

The Tailings management Facility (TMF) will require the greatest level of aftercare within the overall aftercare management plan. The main aftercare requirements will arise from the following;

- Physical Stability of the TMF particularly relating to the earthworks structure, lining and drainage,
- Chemical stability of the TMF in particular the risks from solubilisation of metals, side reactions with tailings, precipitation, liner chemical degradation and weathering
- Biological Stability of the TMF in particular the vegetation zones and ensuring good vegetation growth and interaction

Drawings detailing the proposed sequential aftercare management of the facility can be provided to support this section.

### **Aftercare Maintenance**

The plan can include a detailed programme of aftercare maintenance works included as a Gantt chart. The main works which should be included are the following;

- Landscaping through placing of topsoil
- Seeding, Fertiliser application and crusting
- Aftercare management of shrubs and grasses
- Drainage works including operation and maintenance of pumps and water treatment works
- Maintenance of security fences, access roads and drains

### **Aftercare Monitoring**

A monitoring schedule over the lifetime of the 20-year aftercare period can be included with the report.

The main monitoring requirements relate to the following;

- Effluent and stream sampling and analysis per IPPC Licence
- Groundwater sampling and analysis per IPPC Licence
- Soil / Vegetation sampling and analysis per IPPC Licence
- Dust sampling and analysis per IPPC Licence

Monitoring Frequency will be reviewed, in agreement with the EPA, on a 5-year yearly basis.

## Restoration and Aftercare Costing

The costs associated with site restoration and aftercare is outlined in this section.

### Current Estimated Restoration and Aftercare Costs (Based on a 20 Year Aftercare Period)

Item	Cost ( € )			
	Years 1 to 5	Years 5 to 10	Years 10 to 15	Years 15 to 20
Tailings Management Facility Landscaping				
- Soil Excavation & Spreading	50,000	200,000	0	0
-Seeding, crusting and fertiliser application	15,000	30,000	0	0
-Aftercare of Shrubs & Grasses	10,000	20,000	30,000	10,000
Tailings Management Facility Drainage				
-Pipeline Construction	0	30,000	0	0
-Operation of Pumps & Plant	0	450,000	100,000	0
-Monitoring Standpipes	0	30,000	0	0
Environmental Monitoring				
-Water				
-Groundwater	10,000	12,000	15,000	20,000
-Soil	15,000	17,500	20,000	22,500
-Dust	5,000	7,500	10,000	12,500
	2,500	3,500	5,000	7,500
Subtotal	107,500	800,500	180,000	72,500
Contingency 25%	26,875	200,125	45,000	18,125
Revised Subtotal	134,375	1,000,625	225,000	90,625
Engineering Construction Management 5%	6,719	50,031	11,250	4,531
5 Yearly Total	141,094	1,050,656	236,250	95,156
Total for 20 Year Aftercare Period	1,275,500			

## **APPENDIX D**

### **Example Site-Specific ELRA**

## Introduction

The facility's requirement for Environmental Liability Risk Assessment is contained within Condition 12.2.1 as follows:

### **Condition 12.2.1**

*'Within six months the licensee shall arrange for a risk assessment of the facility to be carried out. The risk assessment shall have particular regard to any accidents, emergencies, or other incidents, which may occur at the facility and their effect on the environment. The risk assessment shall include a comprehensive and fully costed Environmental Liabilities Risk Assessment for the facility including the cost of making such Financial Provision as is required for the purposes of Section 53(1) of the Waste Management Act 1996. The financial provision shall include the costs entered into or incurred in the carrying on of the activities to which this licence relates or will relate including the closure, restoration, remediation and aftercare of the facility'.*

*Risk can be defined as a measure of the likelihood and severity of an occurrence that is in some way harmful.*

The objectives of the study were to:

- Identify operational and post closure major risks at the landfill and risk mitigation measures where risk levels are unacceptable.
- Identify environmental liabilities at the site to allow for the making of a financial provision in accordance with the Waste Management Act 1996

The following steps were undertaken during the study:

Task 1: Risk Identification

Task 2: Risk Assessment

Task 3: Identification and Assessment of Risk Mitigation

Task 4: Development of Risk Management Programme

Task 5: Assessment of Unknown Environmental Liabilities

## **Risk Identification**

### **Methodology**

Risk identification was initially undertaken using a Risk Management Workshop with the main landfill stakeholders. The risk identification process involved:

- The identification of potential environmental receptors at the site.
- The identification of landfill processes that posed potential hazards to the environmental receptors.
- The identification of the risks associated with the processes

### **Identification of Environmental Receptors**

The term 'environmental receptors' describes those parts of the surroundings likely to be affected by the processes that are ongoing at the Landfill. The significant environmental receptors, identified at the workshop, are listed below. These receptors are used as a starting point to ensure that all significant risks are identified and all major aspects of the environment are taken into account.

#### **Environmental Receptors:**

- Groundwater
- Surface water
- Human Beings
- Air Quality

During the workshop all of the 'processes' on site were identified, the hazards associated with each process was listed and any potential causes of failure of the processes was identified. If any effect to the environment could be perceived from the failure the effect was analysed and this became a Risk. A Risk Register was developed which contained all the Risks identified on site.

- **Identification of Processes**

A number of processes carried out during the existing operation of the site and other processes associated with the closure, restoration and aftercare period of the site were identified during the course of the workshop and are listed below:

#### **Processes:**

- Construction – capping of the landfill and other associated infrastructure works;
- Disposal of waste at the Civic Amenity Facility;
- Generation of Landfill Gas – from the decomposition of waste;
- Generation of Leachate – from the decomposition of waste and ingress of water;

- Management of site operations;
- Placement of Waste in cells.

These processes have been identified to cover all activities on site that may result in a risk to the environmental receptors. Each environmental receptor was assessed against the list of processes in order to identify potential hazards.

## Identification of Risks from the processes on Site

Each process was considered separately and the workshop group brainstormed to identify all risks which were associated with the process in question. A list of risks was developed and these were entered into a Risk Register. Table 1 illustrates the Risk Register.

**Table 1 Project Risk Register**

<b>Risk</b>	<b>Potential Failure Mode / Risk</b>
1	Poor installation of the landfill cap resulting in leachate escaping the landfill surface
2	Cracking of cap due to settlement resulting in leachate escaping the landfill surface
3	Cracking of the landfill liner due to age
4	Cracking of the landfill liner due to sunlight exposure
5	Poor installation of lining system
6	Landfill fire causing the release of noxious/poisonous gases
7	Improper disposal of batteries and chemical
8	Improper disposal of glass
9	Improper disposal of heavy white goods and metals
10	Uncontrolled release of combustible gases to atmosphere
11	Uncontrolled venting to air of landfill gas
12	Uncontrolled release of dust and aerosols
13	Breach of landfill liner during drilling operations
14	Escape of landfill gas due to malfunction of flare or gas control system
15	Overflow of leachate sumps
16	Failure of leachate containment lagoons
17	Damage to leachate pipes and escape of leachate
18	Loss of integrity of fuel bund
19	Mobile fuel tanker accident
20	Employee struck by large plant or reversing trucks
21	Drowning in lagoons, stormwater settling tanks, the White River or inspection chambers
22	Damage to liner on initial filling of new cells
23	Landfill fire causing damage to liner

## Assessment of Risks

### Methodology

A large number of risks were identified during the workshop at the landfill and are listed in **Table 1**. These risks were assessed against the risk classification table (RCT) as provided in **Table 2**. The risk classification table was designed to reflect the critical levels of risk appropriate to the landfill.

Ratings, taken from a risk classification table, were applied to the severity and chance of occurrence of each risk. A risk score was calculated for each risk using the ratings. The risks were then ranked and compared based on the risk scores.

Risk management measures were identified for each risk during the workshop. These measures are presented in Section 4.0.

### Risk Classification Table

The Risk Classification Table (RCT) has been designed to reflect the critical levels of risk appropriate to the landfill. The table is provided in **Table 2** below.

**Table 2 Risk Classification Table**

Rating	Occurrence		Severity
	Description	Probability (%)	Financial Cost (€'000's)
1	Very Low	0 – 5	0 – 1
2	Low	5 - 10	1 – 10
3	Medium	10 - 20	10 – 50
4	High	20 - 50	50 – 100
5	Very High	> 50	100 - 1000

The RCT provides appropriate levels of probability and severity for the ranking of risks. The levels for each parameter reflect suitable levels for assessing and ranking the risks identified at the landfill, and allocating appropriate management measures.

### Risk Ranking

Risk ratings were applied to each risk for severity and occurrence as taken from the RCT. A risk score was then calculated for each risk using the ratings. The risk score is based on the product of the severity rating and the occurrence rating. This system allowed the risks to be ranked and compared.

The project risk register listing all the major risks identified at the landfill was provided in **Table 1**. This register has been expanded and rearranged in **Table 3** to include the risk scores and rank the risks in order of risk score.



**Table 3 Project Risk Register – Ranked by Risk Score**

<b>Risk</b>	<b>Potential Failure Mode</b>	<b>Risk Score</b>
<b>3</b>	Cracking of the landfill liner due to age	16
<b>14</b>	Escape of landfill gas due to malfunction of flare or gas control system	16
<b>12</b>	Uncontrolled release of dust and aerosols	12
<b>10</b>	Uncontrolled release of combustible gases to atmosphere	12
<b>6</b>	Landfill fire causing the release of noxious/poisonous gases	12
<b>20</b>	Employee struck by large plant or reversing trucks	12
<b>21</b>	Drowning in lagoons, stormwater settling tanks, the White River or inspection chambers	12
<b>23</b>	Landfill fire causing damage to liner	12
<b>1</b>	Poor installation of the landfill cap resulting in leachate escaping the landfill surface	9
<b>2</b>	Cracking of cap due to settlement resulting in leachate escaping the landfill surface	9
<b>5</b>	Poor installation of lining system	9
<b>9</b>	Improper disposal of heavy white goods and metals	9
<b>19</b>	Mobile fuel tanker accident	8
<b>4</b>	Cracking of the landfill liner due to sunlight exposure	6
<b>8</b>	Improper disposal of glass	6
<b>11</b>	Uncontrolled venting to air of landfill gas	6
<b>13</b>	Breach of landfill liner during drilling operations	6
<b>15</b>	Overflow of leachate sumps	6
<b>16</b>	Failure of leachate containment lagoons	6
<b>17</b>	Damage to leachate pipes and escape of leachate	6
<b>22</b>	Damage to liner on initial filling of new cells	6
<b>7</b>	Improper disposal of batteries and chemicals	4
<b>18</b>	Loss of integrity of fuel bund	4

## Risk Matrix

The Risk Matrix has been developed to allow the risks to be easily displayed and prioritised. The severity and occurrence ratings are used in the matrix; with the level of severity forming the x-axis and the likelihood of occurrence forming the y-axis. This matrix will provide a visual tool for regular risk reviews since the success of mitigation can be easily identified. The risk matrix is displayed here in **Table 4**. The risks have been colour coded in the matrix to provide a broad indication of the critical nature of each risk. The colour code is as follows:

- Red (deep red and light red) – These are considered to be high-level risks requiring priority attention. These risks have the potential to be catastrophic and as such should be addressed quickly.
- Amber / Yellow – These are medium-level risks requiring action, but are not as critical as a red coded risk.
- Green (light and dark green) – These are lowest-level risks and indicate a need for continuing awareness and monitoring on a regular basis. Whilst they are currently low or minor risks, some have the potential to increase to medium or even high-level risks and must therefore be regularly monitored and if cost effective mitigation can be carried out to reduce the risk even further this should be pursued.

**Table 4 Risk Matrix – Current Risk Status**

<b>Occurrence</b>	<b>V. High</b>	<b>5</b>					
	<b>High</b>	<b>4</b>			12	3, 14	
	<b>Medium</b>	<b>3</b>		8, 17	1, 2, 5, 9	10	
	<b>Low</b>	<b>2</b>		7, 18	4, 11, 13, 15, 16, 22	19	
	<b>V. Low</b>	<b>1</b>					
			<b>V. Low</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>V. High</b>
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
			<b>Severity</b>				

The risk matrix indicates that there are no risks in the red zone requiring priority attention. Two risks are in the yellow/amber zone indicating that these risks require mitigation or management action. All remaining risks are located in the green zone indicating a need for continuing awareness and monitoring on a regular basis. However, assessment of the green zone risks during the process has indicated that many of these risks can be reduced through the implementation of mitigation measures. These measures should be adopted where considered cost-effective to further reduce the risks.

### Discussion of Risk Levels

The risk matrix indicates that two of the risks, *Risk 3 – Cracking of the landfill liner due to age* and *Risk 14 – Escape of landfill gas due to malfunction of flare or gas control system* lie in the amber/yellow zone. These risks therefore require mitigation or management actions.

All remaining risks lie in the green zone. These risks require continuing awareness and monitoring on a regular basis. As these risks may have the potential to increase to yellow or red zone risks, risk management measures should be put in place to manage them at their current levels, or preferably to reduce them further.

During the Risk Management Workshop recommended mitigation measures were identified for all risks except *Risk 18-Loss of integrity to fuel bund*. This risk is located in the green zone and the

## Identification and Assessment of Mitigation Actions

### Identification of Mitigation Actions

The risk assessment and categorisation phase identified that two of the risks, *Risk 3 – Cracking of the landfill liner due to age* and *Risk 14 – Escape of landfill gas due to malfunction of flare or gas control system* lie in the amber/yellow zone.

Management measures should be identified and implemented for these risks as a matter of priority, whilst all other risks require monitoring on a regular basis. However, the green zone risks may have the potential to increase to yellow or red zone risks, and where additional risk management measures are available to manage them at their current levels or reduce them further, these should be implemented if considered cost-effective. During the Risk Management Workshop suitable additional management measures were identified for all green zone risks with the exception of one risk, being *Risk 18 – Loss of integrity of fuel bund*. The current risk management measures were considered acceptable for this risk.

The recommended risk mitigation measures identified during the workshop are provided in **Table 5**. This table provides the risks in descending order of risk score with the proposed mitigation measure. The current controls are also provided.

### Effectiveness of Mitigation Measures in Risk Reduction

The Risk Scores have been re-calculated on the basis that the mitigation measures are fully implemented. **Table 5** provides the revised risk scores after the implementation of the risk mitigation measures, and compares them to the current risk score. **Table 6** provides a revised risk matrix following the implementation of the risk mitigation measures.

**Table 5** indicates that the risk levels for 12 of the risks are reduced by the implementation of the measures, whilst there would be no significant change to 12 of the risks. However, recommended mitigation measures have been proposed and assessed for 11 of the 12 risks, which do not exhibit improved risk, scores, and these measures should increase the robustness of the risk controls already in place.

In addition, the risk matrix indicates that the two yellow/amber code risks have been reduced to green, whilst 5 of the green code risks have moved to a lower level of green because of a reduction in severity or likelihood of occurrence.

The recommended mitigation measures therefore show a real reduction in risk at the landfill and since they are considered cost-effective, should be implemented. Section 6.0 provides a management plan for the implementation of the recommended mitigation measures.

**Table 5 Proposed Risk Mitigation Measures**

Risk	Potential Failure Mode / Risk	Current Controls	Recommended Mitigation Measures	Current Risk Score	Revised Risk Score
3	Cracking of the landfill liner due to age	Ongoing research by manufactures to ascertain life span of HDPE	Ensure HDPE is compliant with GRI standard GM10 for stress crack resistance. Write procedure to ensure all monitoring for WL is complied with and checked for exceedence of limits, Review/Write Site inspection procedure, Maintain awareness of research into basal liners and caps	16	12
14	Escape of landfill gas due to malfunction of flare or gas control system	Routine maintenance and monitoring. Prior notification of power outage to allow generator to be brought on site. Spare parts held on site.	Write procedure for regular maintenance and inspection of gas system including flare.	16	8
12	Uncontrolled release of dust and aerosols	Water spraying on access tracks to suppress dust raised by heavy vehicles. Suction sweeping of site entrance.	Review /Write road watering procedures and maintain equipment.	12	6
10	Uncontrolled release of combustible gases to atmosphere	Continuous gas monitoring on site; gas collection system installed	Review gas monitoring schedule. Implement gas utilisation project as soon as possible. Install temporary extraction wells prior to capping. Construct the final cap to Cells 11, 12, and 13 as soon as possible after filling ceases.	12	8
6	Landfill fire causing the release of noxious/poisonous gases	Control of ignition sources; smoking banned; correct electric installations; proper welding tools and operation flare installed to BS guidance; inspection of waste	Fire training of all personnel to be carried out. Review waste inspection procedure. Review site security and assess risk of vandalism or arson	12	10
20	Employee struck by large plant or reversing trucks	Proper traffic management system and signage is in place. Reversing beacons on machinery.	Review speed limits and traffic management procedures	12	12
21	Drowning in lagoons, stormwater settling tanks, the White River or inspection chambers	Operational Procedure for working near lagoons _ Refer to ERP's	Review /Write procedure for working near the lagoons. Review PPE and safety equipment for working near water	12	12
23	Landfill fire causing damage to liner	Control of ignition sources - ban smoking, correct electric installations, proper welding tools in operation, flare installed to BS guidance, inspection of waste, regular balancing of gas field.	Carry out fire training. Review procedure on waste inspection. Review site security and assess risk of vandalism /arson	12	12
1	Poor installation of the landfill cap resulting in leachate escaping the landfill surface	Capping installation supervised by RE	Review /Write Site inspection procedures. Write procedure to ensure all monitoring for WL is complied with and checked for exceedence of limits	9	4
2	Cracking of cap due to settlement resulting in leachate escaping the landfill surface	Adequate time is given for the waste body to settle before the permanent cap is installed	Review /Write Site inspection procedures. Write procedure to ensure all monitoring for WL is complied with and checked for exceedence of limits	9	4
5	Poor installation of lining system	Destructive and non-destructive testing of liner was carried out as were permeability tests on the clay lining system	Ensure that all appointed contractors are complying with contract.	9	4
9	Improper disposal of heavy white goods and metals	Staff properly trained in removal of heavy goods	All staff are to be trained in manual handling.	9	6
19	Mobile fuel tanker accident	Good traffic management. Supervision by site staff.	Enforcement of speed limits and traffic control measurements.	8	8
4	Cracking of the landfill HDPE liner due to sunlight exposure	Visual check during and after construction	Ensure that all appointed contractors are complying with contract.	6	4
8	Improper disposal of glass	Civic Amenity area is cleaned regularly	Erect warning signs for parents to supervise their children at all	6	4

				times. Write procedure on maintenance of Civic amenity area			
11	Uncontrolled venting to air of landfill gas	All welds are checked using destructive and non-destructive testing		Review gas monitoring schedule. Implement gas utilisation project as soon as possible. Construct the final cap to Cells 11, 12, and 13 as soon as possible after filling ceases. Ensure all monitoring outlined in the Waste Licence is complied with.	6	4	
13	Breach of landfill liner during drilling operations	All calculations regarding drilling depths are checked and reviewed. Site supervision during drilling works		Conduct strict design checks on gas well depths. Ensure all monitoring for Waste Licence is complied with.	6	6	
15	Overflow of leachate sumps	Seven -day a week checking of pumps, SCADA system, manual controls exist on all pumps.		Review /Write Site inspection procedure	6	6	
16	Failure of leachate containment lagoons	Monitoring of groundwater parameters in line with Waste Licence requirements. Integrity tests carried out as per Waste licence.		Review /Write Site inspection procedure. Set trigger levels for surface water and groundwater to indicate if pollution is happening. Ensure all monitoring for Waste Licence is complied with	6	6	
17	Damage to leachate pipes and escape of leachate	Referral to as-builts for pipe locations, suitable construction design, experienced supervision of machinery		Review /Write Site inspection procedure. Set trigger levels for surface water and groundwater to indicate if pollution is happening. Ensure all monitoring for Waste Licence is complied with	6	6	
22	Damage to liner on initial filling of new cells	Site supervision by experienced personnel		Write filling plan; to be included in EMA	6	6	
7	Improper disposal of batteries and chemicals	Specific area to collect batteries in special Returnbatt containers.		Review /Write procedure on inspection of Civic Amenity area. Review personal protective equipment, the quantity and suitability.	4	2	
18	Loss of integrity of fuel bund	Site management; signposted; integrity test every three years		None - actions in place already result in low risk	4	4	

**Table 6 Revised Risk Matrix – Post Recommended Mitigation Measures**

<b>Occurrence</b>	<b>V. High</b>	<b>5</b>					
	<b>High</b>	<b>4</b>					
	<b>Medium</b>	<b>3</b>		17		3	
	<b>Low</b>	<b>2</b>		1, 2, 4, 5, 8, 11, 18	12, 9, 13, 15, 16, 22	10,14, 19	6, 20, 21, 23
	<b>V. Low</b>	<b>1</b>		7			
			<b>V. Low</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>V. High</b>
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
			<b>Severity</b>				

## Risk Management Program

### General

Every risk requires a certain amount of management in order to reduce the risk or manage the risk at an acceptable level. Risk owners have therefore been allocated to each risk to undertake this role. For the majority of the risks identified, the management of the risk will involve the implementation of the recommended mitigation measures and the maintenance of current controls. The recommended mitigation measures were listed in **Table 5**.

One of the risks was judged to have satisfactory current risk controls and additional mitigation measures were not identified. In this instance the Risk owner is required to ensure that the current levels of controls are maintained and that the level of risk does not increase.

A time scale has also been applied to all proposed risk mitigation measures in order to ensure that the mitigation measures are implemented in a timely fashion.

### Risk Management Programme

The risk owner must be someone competent enough to understand the risk and the suggested mitigation proposals for that risk, and have the authority to implement the mitigation measure. The risk owner must also be able to be held ultimately responsible for the risk also. Persons considered suitable to act as risk owners at the landfill included:

- Licensee
- Landfill Manager
- Engineering Manager
- Resident Engineer (Construction)
- Contractor

The proposed timescales for the implementation of the mitigation measures must be realistic and appropriate to the level of risk. The timescales have been prepared in consultation with the risk owners where available.

The risks, current controls, proposed additional mitigation measures have been tabulated in the last section in **Table 5**. The mitigation measures have been assigned to various risk owners and a timescale selected. A list of these measures, owners and a completion date has been tabulated in **Table 7** grouped by the owner. It should however be noted that ultimately the licensee is responsible and is the risk owner for all of the risks at the landfill.

**Table 7 Proposed Risk Mitigation Measures with owners and timescales**

<b>Owner</b>	<b>Mitigation measure</b>	<b>Relevant risk id</b>	<b>Mitigation measure completion date</b>
	Review/Write Site inspection procedure	1, 2, 3	
	Review /Write road watering procedures and maintain equipment.	12	
	Fire training of all personnel to be carried out.	6, 23	
	Review waste inspection procedure	6, 23	
	Review site security and assess risk of vandalism or arson	6, 23	
	Review speed limits and traffic management procedures	19, 20	
	Review /Write procedure for working near the lagoons	21	
	Review PPE and safety equipment for working near water	21	
	All staff are to be trained in manual handling.	9	
	Erect warning signs for parents to supervise their children at all times	8	
	Write procedure on maintenance of Civic amenity area	8, 7	
	Write filling plan; to be included in EMA	22	
	Review all PPE, the quantity and suitability	7	
	Ensure that all appointed contractors are complying with contract.	5	
Landfill Manager	Conduct strict design checks on gas well depths	13	
Landfill Engineer/RE	Write procedure to ensure all monitoring for WL is complied with and checked for exceedence of limits	1,2, 3, 11, 13, 15, 16, 17	
	Maintain awareness of research into basal liners and caps	3	
Landfill Engineer	Write procedure for regular maintenance and inspection of gas system including flare	14	
	Review gas monitoring schedule	10, 11	
	Implement gas utilisation project as soon as possible	10, 11	
	Construct the final cap to Cells 11, 12, and 13 as soon as possible after filling ceases.	10, 11	
	Review pest control contracts and procedures	24	



## **Risk Management Review**

Risk management at the landfill is a dynamic process. This assessment and report provides a baseline assessment of the major risks at the landfill, and provides recommendations for risk mitigation and management measures. However, landfill processes and conditions will change and this assessment should be reviewed periodically to ensure that all risks are being identified and managed.

This document should therefore be considered to be a live document. It is recommended that the landfill operators review the risk management at the site on a regular basis and update the risk register and risk management programme as appropriate. It is also recommended that a formal risk assessment be undertaken annually at the landfill to assist in this process.

## Assessment of Potential Environmental Liabilities

### Types of Environmental Liabilities

The assessment of potential environmental liabilities can be broken down into two separate sections, the “known” environmental liabilities and the potential or “unknown” environmental liabilities associated with the environmental risks identified at the site.

The “known” environmental liabilities are those liabilities associated with environmental protection events that will definitely occur in the course of the landfill life. These include the restoration of the landfill and the provision of leachate management and are included in the Closure, Restoration, Management and Aftercare Plan (CRAMP) for the site. The “unknown” environmental liabilities are those that may or may not arise due to the occurrence of the environmental risks identified in the risk assessment.

### ‘Unknown’ Environmental Liabilities – Current Status

The ‘unknown’ environmental liabilities are associated with the environmental risks at the landfill and may or may not occur. The best case scenario is that none of the environmental risks occur, and hence at the end of the assessment period of 30 yrs, the additional costs incurred by the landfill owner due to the environmental risks are zero. Alternatively, should a significant number of the risks materialise, significant additional costs could be incurred.

In order to identify an indicative level of environmental liability associated with the environmental risks for the purposes of the Waste Licence, a cost model has been used to generate the expected cumulative cost of the risks. The modelling has been undertaken using the median probability and severity of occurrence of each risk after implementation of the Risk Management Programme.

**Table 8 Summary of Potential “Unknown” Environmental Liabilities**

Description	Estimate of “Unknown” Environmental Liabilities	Assumptions
Highest Cost Scenario	€ 14,000,000	Assumes all risks occur at their maximum cost
Lowest Cost Scenario	€ 0	Assumes none of the risks occur
Most Likely Scenario	€ 201,975	Based on median probability and severity for each risk after implementation of Risk Management Programme.

## **APPENDIX E**

### **Example Unit Rate Costs**

**Table D1 Example Unit Costs for Soil & Groundwater Investigation, Monitoring and Remediation**

<b>Item</b>	<b>Unit Cost Estimate *</b> <b>(excl. VAT)</b>	<b>Comments</b>
Hydrogeological Site Investigation – Low Risk	€5,000 - 10,000	Depending on scale of activity, number of potential source areas and contaminant types
Hydrogeological Site Investigation – Medium Risk	€20,000 - 30,000	Depending on scale of activity, number of potential source areas and contaminant types
Hydrogeological Site Investigation – High Risk	€50,000 – 100,000	Depending on scale of activity, number of potential source areas and contaminant types
Groundwater Monitoring Well Installation (per well, assuming 10m depth)	€2,000 – 2,500	Depending on local ground conditions and site location
Groundwater Monitoring Well Installation (per well, assuming 20m depth)	€3,000 – 3,500	Depending on local ground conditions and site location
Groundwater Monitoring Round (per well)	€250 - 350	Depending on monitoring suite and number of wells
Groundwater Monitoring Report (per round)	€3,000 – 10,000	Depending on scale of project and complexity of contaminants
Contaminated Soil Excavation and Off-site treatment (per m <sup>3</sup> )	€150 - 250	Depending on contaminant type, amount and treatment location

\* Note Cost estimates are based on 2005 rates.

**Table D2 Example Unit Costs for Landfill Closure, Restoration and Aftercare**

Item	Non-Hazardous Landfill	Inert Landfill	Hazardous Landfill
Final Capping	€30/m <sup>2</sup>	€12/m <sup>2</sup>	€38/m <sup>2</sup>
Capping Gas Management	€2.5/m <sup>2</sup>		
Gas Flaring	€ 25,000 + €1 per tonne intake		
Gas Utilisation	€0 - should be self funding		
Leachate Recirculation	€2/m <sup>2</sup>		€2/m <sup>2</sup>
Leachate Pumping And Tankering (30 Year Period)	€83/m <sup>2</sup>		€83/m <sup>2</sup>
Leachate Pumping And Treating (30 Year Period)	€17.50/m <sup>2</sup>		€17.50/m <sup>2</sup>
Aftercare Monitoring And Management (30 Year Period)	€38/m <sup>2</sup>	€10/m <sup>2</sup>	€19/m <sup>2</sup>

**Table D3 Example Unit Costs for Demolition of Building Structures**

Item	Unit Cost Estimate	Comments
Demolish Buildings- Containing No Waste	€16/m <sup>3</sup>	10,000m <sup>2</sup> reinforced concrete slay, 2 story high warehouse, new materials
Demolish Buildings- Non-Hazardous Waste	€30/m <sup>3</sup>	Safety precautions associated with contaminated building materials and their disposal to non-hazardous landfill
Demolish Buildings- Hazardous Waste	€60/m <sup>3</sup>	Special demolition required, chimneys for incinerators etc. containing fly ash, disposal of building materials required at hazardous landfill, testing of materials required.
Asbestos disposal costs	€300-350 per tonne	Depending on asbestos type

# An Gníomhaireacht um Chaomhnú Comhshaoil

## STÁDAS NA GNÍOMHAIREACHTA

Is comhlacht poiblí neamhspleách í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil, 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil agus Rialtais Áitiúil a dhéanann urraíocht uirthi.

Déanann Bord Feidhmeach lánaimseartha comhdhéanta d'Ard-Stiúrthóir agus ceathrar Stiúrthóirí bainistíocht ar an EPA. Cinntítear neamhspleáchas trí nósanna imeachta roghnaithe i gcás an Ard-Stiúrthóra agus na Stiúrthóirí agus an tsaoirse, de réir mar a sholáthraítear sa reachtaíocht, gníomhú as a stuaim féin. Tá an sannadh, faoin reachtaíocht, maidir le freagracht dhíreach as réimse leathan feidhmeanna mar bhonn taca ag an neamhspleáchas sin. Faoin reachtaíocht, is cion sainsiúil é iarracht a dhéanamh tionchar a imirt ar an Gníomhaireacht, nó ar aon duine a bhíonn ag gníomhú thar ceann na Gníomhaireachta, ar bhealach míchuí.

Cuidíonn Coiste Comhairleach ar a bhfuil dhá chomhalta déag arna gceapadh ag an Aire Comhshaoil, Oidhreacht agus Rialtais Áitiúil leis an nGníomhaireacht.

## FREAGRACHTAÍ

Tá réimse leathan dualgas agus cumhachtaí reachtúla ag an EPA faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil. Chomh maith leis sin, tá curtha le hacmhainn an EPA maidir le forfheidhmiú le cumhachtaí san Acht um Chaomhnú an Chomhshaoil 2003. Áirítear orthu seo a leanas príomhfhreagrachtaí an EPA:

- ceadúnú a dhéanamh ar phróisis thionsclaíocha mhóra/choimpléascacha a bhféadfadh cumas truaillithe suntasach a bheith ag baint leo;
- monatóireacht ar chaighdeán comhshaoil, lena n-áirítear bunachair shonraí a bhunú ar a mbeidh rochtain ag an bpobal;
- tuarascálacha tréimhsiúla maidir le staid an chomhshaoil a fhoilsiú;
- sárchleachtais comhshaoil a chur chun cinn;
- taighde comhshaoil a chur chun cinn agus a chomhordú;
- gníomhaíochtaí diúscartha dramhaíola agus aísghabhála suntasacha, lena n-áirítear láithreacha líonta talún a cheadúnú agus plean bainistíochta guaisdramhaíola náisiúnta a ullmhú;
- córas a chur i bhfeidhm a cheadaíonn rialú astaithe VOC a bhíonn mar thoradh ar scaoileadh GMOanna isteach sa chomhshaoil in aon turas;

- rialacháin GMO a chur i bhfeidhm agus a fhorfheidhmiú ó thaobh GMOanna a choinneáil agus a scaoileadh amach sa chomhshaoil in aon turas;
- clár hidriméadrach náisiúnta a ullmhú agus a chur i bhfeidhm;
- dréacht a chur le chéile de Phlean Leithroinnte Náisiúnta do thrádáil liúntas astaithe gáis ceaptha teasa; Údarás Inniúla Náisiúnta a bhunú le ceadanna trádála agus liúntais a eisiúint orthu siúd atá clúdaithe ag an scéim; monatóireacht, léargas, agus fíorú maidir le hastuithe ó chuideachtaí rannpháirteacha; agus Clár Trádála Astuithe Náisiúnta a bhunú;

agus, faoin Oifig Forfheidhmiúcháin Comhshaoil, a bunaíodh i 2003 agus atá tiomanta as reachtaíocht comhshaoil a chur i bhfeidhm agus a fhorfheidhmiú in Éirinn;

- feabhas a chur ar chomhlíonadh reachtaíocht cosanta comhshaoil in Éirinn;
- feasacht a ardú maidir leis an tábhacht a bhaineann le forfheidhmiú i gcás reachtaíochta cosanta comhshaoil in Éirinn;
- ceadúnais IPPC agus ceadúnais Dramhaíola a eisiúint an EPA a fhorfheidhmiú;
- iniúchadh agus tuairisciú ar fheidhmíocht údarás áitiúil maidir lena bhfeidhmeanna cosanta comhshaoil a chur ar bun, lena n-áirítear:
  - forfheidhmiú maidir le ceadúnais dramhaíola a sháraítear;
  - gníomh maidir le dumpáil mhídhleathach;
  - ceadanna bailithe dramhaíola a chur i bhfeidhm, agus
  - tionscnaimh a bheidh mar fhreagracht ar an táirgeoir a fhorfheidhmiú (mar shampla, sa réimse a bhaineann le dramhaíl pacáiste);
- gníomh in aghaidh údarás áitiúil nach bhfuil ag comhlíonadh a gcuid feidhmeanna cosanta comhshaoil ar bhealach cuí;
- an dlí a chur nó cuidiú le húdaráis áitiúla an dlí a chur ó thaobh sháraithe suntasacha reachtaíochta cosanta comhshaoil ar bhealach caoithiúil; agus
- cuidiú le húdaráis áitiúla a gcuid feidhmíocht cosanta comhshaoil a fheabhsú ar bhonn cás ar chás, trí ghréasán forfheidhmithe a bhunú le malartú eolais a chur chun cinn chomh maith le sárchleachtas, agus trí threoir chuí a sholáthar.



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