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Environmental Permitting Guidance
The Landfill Directive

For the Environmental Permitting (England and Wales) Regulations 2010

Updated March 2010

Version 3.1

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Welsh Assembly Government

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www.defra.gov.uk/environment/policy/permits

Published by the Department for Environment, Food and Rural Affairs

Revision of the Guidance

This publication is updated from time to time with new or amended guidance. The table below is an index to these changes.

date of amendment	**chapter/ paragraph where amendment can be found**	**nature of amendment** - what paragraphs have been inserted, deleted, or amended - what subject matter is covered by the amendment
12/03/08	Annex 1 and front page	Minor typographical corrections
06/05/09	Paragraph 1.19	Paragraph amended to reflect current position on the Mining Waste Directive
06/05/09	Paragraphs 4.124-4.172 (paragraphs 4.124-4.163 in previous version)	Section amended and expanded to reflect revised position on Annex I of the Landfill Directive. Updated numbering of all subsequent paragraphs
06/05/09	Throughout	Minor typographical corrections
10/10/09	Ch 1 and Ch 2	Restructures of text to meet requirements of the Code of Practice on Guidance on Regulation following the Anderson Review and subsequent changes to the numbering of the rest of the document
10/10/09	Throughout	Minor typographical amendments and amendment to reflect the codification of the IPPC Directive
10/10/09	Annex 1	Change at 1 (a) Made by the S1 2009 No. 1799
05/03/10	Throughout	Updated to reflect EP Regulations 2010
05/03/10	Throughout	General typographical changes
12/03/10	Ch 4	Typographical amendments
12/03/10	Footnotes	Updated hyperlinks

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1. Summary

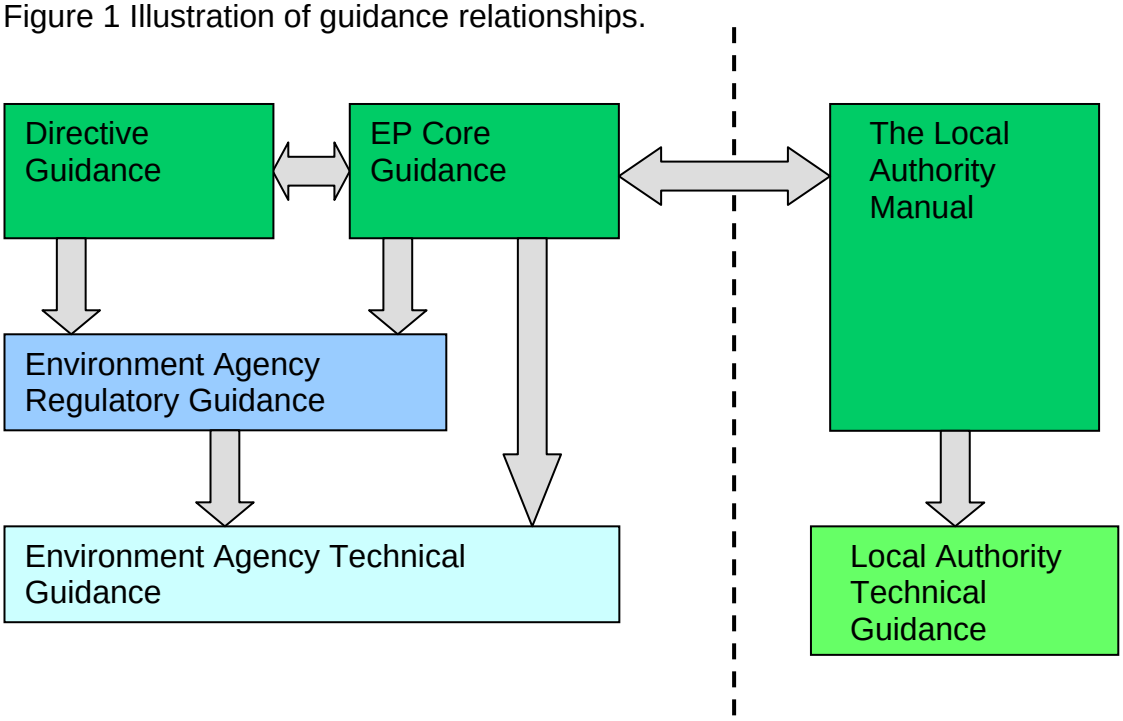
About this guidance

1.1 This guidance is aimed at helping readers understand the permitting requirements of European Community (EC) Directive 1999/31/EC on the landfill of waste (the Directive).

1.2 This guidance is being published to help those regulating and operating landfill sites, but it will also be of interest to others concerned with landfill. It describes the views of the Secretary of State for the Department for Environment, Food and Rural Affairs (Defra) and the Welsh Assembly Government (WAG) on how the Landfill Directive should be applied and how particular terms should be interpreted in England and Wales. This guidance replaces the Government Interpretation of the Landfill (England and Wales) Regulations 2002. The guidance explains the legal requirements but only the national or European Courts can give a definitive interpretation of the legislation.

1.3 This guidance is part of a series of guidance documents which accompany the Environmental Permitting (England and Wales) Regulations 2010 SI 2010 No. 675 (the Regulations)[1].

Figure 1 Illustration of guidance relationships.



1.4 The series consists of the Environmental Permitting Core Guidance[2], which describes the general permitting and compliance requirements, and guidance on each of the European Directives implemented through the regime[3].

[1] Available at www.defra.gov.uk/environment/policy/permits/guidance.htm
[2] *Ibid.*
[3] *Ibid.*

Separate guidance is available for local authority regulation under the regime[4]. This is illustrated in Figure 1.

1.5 This guidance should be read in conjunction with the Environmental Permitting Core Guidance. Reference should also be made to the guidance on the Waste Framework Directive[5] and, for those landfills covered by the IPPC Directive, the guidance on Part A installations[6].

1.6 The Environment Agency has provided more detailed guidance on many aspects of landfill. These are available on its website www.environment-agency.gov.uk.

1.7 To ensure this guidance is current and up to date, from time to time this guidance will be updated. Where made, revisions can be found in the 'Revision of Guidance' section at the front of the document.

1.8 This guidance document is compliant with the Code of Practice on Guidance on Regulation[7]. If you feel this guidance breaches the code, or notice any inaccuracies within the guidance, please contact the EPP team at: eppadministrator@defra.gsi.gov.uk

[4] Available at www.defra.gov.uk/environment/quality/pollution/ppc/localauth/pubs/guidance/manuals.htm
[5] Available at www.defra.gov.uk/environment/policy/permits/guidance.htm
[6] *Ibid.*
[7] See Environmental Permitting Guidance and Glossary Chapter 3: www.defra.gov.uk/environment/policy/permits/guidance.htm

2. Introduction

The Landfill Directive

2.1 The Landfill Directive (the Directive) was published in the Official Journal of the European Communities on 16 July 1999 (OJ L182, 16.7.1999). The Directive requires, amongst other things, that a strategy on biodegradable waste is put in place that achieves the progressive diversion of biodegradable municipal waste from landfill (Articles 5(1) & (2)). This requirement has been implemented in England through Waste Strategy 2007 and across the UK through the Waste and Emissions Trading Act 2003.

2.2 The Directive's overall objective is to supplement the requirements of the Waste Framework Directive (2006/12/EC) and prevent or reduce as far as possible the negative effects of landfilling on the environment as well as any resultant risk to human health. It seeks to achieve this through specifying uniform technical standards at Community level and sets out requirements for the location, management, engineering, closure and monitoring for landfills. The Directive also includes requirements relating to the characteristics of the waste to be landfilled.

2.3 In 2003 a Council Decision was published establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of the Landfill Directive. Council Decision 2003/33/EC (the Decision) was published in the Official Journal of the European Communities on 16 January 2003 (OJ L11, 16.1.2003).

2.4 Information on the transposition of the remainder of the Directive can be found on the Defra website[8].

2.5 The relevant requirements from the Landfill Directive are set out in Schedule 10 to the Regulations (reproduced in this document as Annex 1).

2.6 Chapter 3 of this guidance sets out the scope of the Directive by providing guidance on what is a landfill. Chapter 4 describes the requirements of the Directive which will be delivered through environmental permits and sets out how the Regulations transpose the relevant parts of the Directive. Chapter 5 describes the other Directive requirements relevant to environmental permitting.

2.7 Figure 1 illustrates the relationship between the guidance sections and the Articles of the Directive and the Decision implemented by the Regulations.

2.8 A copy of the Landfill Directive is provided in Annex 2 and a copy of the Council Decision is provided in Annex 3.

[8] www.defra.gov.uk/environment/waste/localauth/lats/intro.htm

2.9 A separate glossary of terms is available[9]. The glossary briefly explains the meaning of many words, phrases and acronyms used in the Regulations and Directives.

Interface with other legislation

2.10 The Integrated Pollution Prevention and Control Directive (2008/1/EC) lists non-inert landfill as an activity to be regulated under its system of integrated permits. It requires that sites above a certain capacity threshold (unless they ceased accepting waste before 31 October 1999) obtained a IPPC permit before 31 October 2007 in order to continue accepting waste. The IPPC Directive applies to all landfills other than very small landfills and those receiving only inert waste.

2.11 The Landfill Directive supplements the IPPC Directive by setting a variety of technical standards of operation for landfill and sets out a timetable for existing sites to be brought up to standard or close. Sites that cease to operate must be closed as soon as possible and by 16 July 2009 at the latest. Existing sites were required to provide conditioning plans to demonstrate that they could continue to accept waste in accordance with the Directive requirements. Those that could not had to close.

2.12 The European Community's Mining Waste Directive (Directive on the management of waste from extraction industries 2006/21/EC) 'covers the management of waste from land-based extractive industries, that is to say, the waste arising from prospecting, extraction (including the pre-production development stage), treatment and storage of mineral resources and from the working of quarries' (recital 6).

2.13 The Waste Framework Directive contains a provision which excludes from its scope waste resulting from prospecting, extraction, treatment and storage of mineral resources and the working of quarries where waste is covered 'by other legislation'. The Mining Waste Directive is considered 'other legislation' and waste falling within the scope of this Directive will be excluded from the scope of the Waste Framework Directive and other waste legislation, including the Landfill Directive, although there are some exceptions.

2.14 A number of other European Directives are relevant to landfills, for example the Habitats and Groundwater Directives. Annex 1 to the Environmental Permitting Core Guidance outlines the connections with other legislation.

[9] Available at www.defra.gov.uk/environment/policy/permits/guidance.htm

Figure 2. A picture of the guidance sections and the relevant legislation

Guidance Section	Directive or Decision Requirement	Schedule 10 to the Regulations
Chapter 2		
Definition of landfill	Article 2(g)	Paragraph 2 (1)
Scope	Article 3(2)	Paragraph 1 (a)
Chapter 3		
Overall objective	Article 1	Paragraph 5 (2)
Landfill classification	Article 4	Paragraph 5 (1) (a)
Unacceptable wastes and treatment	Article 5(3) and (4)	Paragraph 5 (1) (b)
What wastes can go to each landfill class?	Article 6	Paragraph 5 (1) (c)
Waste acceptance	Article 11(1) and Articles 2, 3 and 4 of the Decision	Paragraph 5 (1) (g) and paragraph 5 (3)
Conditions of the permit	Article 8	Paragraph 5 (1) (d)
Content of the permit	Article 9	Paragraph 5 (1) (e)
Cost of landfilling	Article 10	Paragraph 5 (1) (f)
Monitoring	Article 12	Paragraph 5 (1) (h)
Closure, aftercare and surrender	Article 13	Paragraph 5 (1) (i) and paragraph 11
Existing sites	Article 14	Paragraph 5 (1) (j)
Chapter 4		
Application Forms	Article 7	Paragraph 3
Closure Notices	Article 13(a)(iii)	Paragraph 10

3. Scope of the Directive – What is a landfill?

Landfill

3.1 A landfill is a waste disposal site for the deposit of waste onto or into land (Article 2(g) of the Directive).

3.2 The Directive therefore applies only to disposal activities and not to recovery activities (see also the fifteenth introductory paragraph (recital) to the Directive). Guidance on how to distinguish between a recovery and disposal activity can be found in the Waste Framework Directive Guidance.

3.3 For information on the definition of waste see the Government guidance on the definition of waste[10]. Some material is excluded from the scope of the Waste Framework Directive (i.e. under its Article 2 – see Waste Framework Directive Guidance). A site for the disposal of this material will be excluded from the scope of the Landfill Directive.

3.4 A landfill includes internal waste disposal sites (i.e. landfill where the producer of the waste is carrying out its own waste disposal at the place of production).

3.5 A site which is used for the temporary storage of waste may be considered to be a landfill (this includes lagoons). Such a site would be regarded as a landfill if it is used to store waste for:

- one year or more where waste is destined for disposal; or
- three years or more where waste is destined either for recovery or for treatment.

3.6 Underground storage facilities are included within the definition of landfill. Underground storage means a permanent waste storage facility in a deep geological cavity (Article 2(f) of the Directive). The Council Decision sets out waste acceptance criteria for underground storage and includes an Appendix which provides a safety assessment for acceptance of waste in underground storage (see Annex 3 to this guidance). This guidance does not however specifically address underground storage as there is currently only one such facility in England and Wales.

3.7 Facilities such as transfer stations and other sites where waste is stored temporarily prior to onwards transport are excluded from the definition of a landfill.

[10] www.defra.gov.uk/environment/waste/topics/index.htm#what

Exclusions from the Directive

3.8 The Directive requirements do not apply to some activities (Article 3(2)). These are described below.

Sludges and dredgings

3.9 The spreading of sludges on the soil for the purposes of fertilisation or improvement is excluded from the scope of the Directive. Sludges include sewage sludges, and sludges resulting from dredging operations, and similar matter.

3.10 The deposit of non-hazardous dredging sludges alongside small waterways (essentially any inland waterway in England and Wales) from where they have been dredged out is also excluded from the scope of the Directive.

3.11 The disposal of all non-hazardous wet dredgings meets the exclusion contained within Article 3.2 of the Directive if their disposal takes place:

- alongside the banks of a waterway from where they were dredged; or
- on nearby land or in dedicated lagoons located at intervals along a waterway.

3.12 This exclusion does not apply to dredging disposal sites that accept dredgings from other waterways.

3.13 The acceptance of dredgings for disposal at commercially operated landfills is subject to the same requirements as any other type of waste.

Inert waste

3.14 The use of inert waste which is suitable, in redevelopment/restoration and filling-in work, or for construction purposes, in landfills is excluded from the scope of the Directive. This can include the construction of engineered barriers with clay and the construction of roads within the landfill.

Mineral waste

3.15 The deposit of unpolluted soil or of inert waste resulting from prospecting and extraction, treatment and storage of mineral resources as well as from the operation of quarries is excluded from the scope of the Directive.

Landfill installations

3.16 For those landfills which are also subject to the IPPC Directive (IPPC landfills), it is also necessary to understand the extent of the IPPC landfill installation.

3.17 An installation comprises a stationary technical unit where one or more listed[11] activities are carried on and any other location on the same site where any other directly associated activities are carried on. Directly associated

[11] in Part 2 of Schedule 1 to the Environmental Permitting Regulations

activities must have a technical connection with the activities carried out in the stationary technical unit and must be able to have an effect on pollution. The Guidance on Part A installations provides information on deciding what the installation is (chapter 2 of that guidance) and reference should be made to that document.

3.18 An IPPC landfill activity listed in Schedule 1, Part 2, section 5.2 to the Regulations is described as the disposal of waste in a landfill receiving more than 10 tonnes of waste in any day, or with a total capacity of more than 25,000 tonnes but excluding disposals in landfills taking only inert waste.

3.19 The IPPC Directive does not define a landfill and so the definition in the Landfill Directive should be used. This means that the listed landfill activity is the disposal of waste in a 'waste disposal site for the deposit of waste onto or into land' (see paragraph 3.1). The aftercare provisions in the Landfill Directive (in particular Article 13) make it clear that the activity of landfilling is not restricted to the initial deposit of waste. The listed activity of 'disposal of waste in a landfill' includes the aftercare requirements for the waste deposited at the disposal site.

3.20 The technical unit will comprise the landfill activity and generally, any other Schedule 1 activities carried on at the site. For instance leachate treatment plants and landfill gas utilisation plants can be listed activities (Schedule 1, Part 2, section 1,1 and 5.3 to the Regulations respectively) and if listed would form part of the technical unit.

3.21 It is expected that the landfill technical unit should include operations such as waste reception and quarantine, leachate and landfill gas containment and collection, wheel-washing, litter collection and other operations that are inseparable from the disposal of waste to land. These form part of the landfill technical unit as they function together to allow the landfill activity to take place.

3.22 After determining the extent of the technical unit, the second element of the definition of installation is the inclusion of directly associated activities. The following are examples of activities that could potentially be part of the landfill installation as directly associated activities (unless they are listed activities in which case they would be part of the technical unit - see above):

- pre-treatment of waste for disposal;
- landfill gas utilisation plants and flaring; and
- leachate treatment and storage.

Separation between landfills of different classes

3.23 Landfills for different classes of waste (see paragraph 4.10) must be operated as separate installations so that each landfill will separately meet the

requirements of the Directive. Different classes of landfill can operate in close proximity provided they are separate waste disposal sites.

3.24 Landfills for different classes of waste in close proximity to each other must be operated so as to eliminate the possibility that waste may be deposited in the wrong landfill. Operators must demonstrate to the Environment Agency that each load of waste will reach the correct landfill. It is not however necessary to have separate laboratory facilities or main site offices and weighbridges for each landfill.

4. Permitting Requirements

4.1 This chapter describes the technical requirements that environmental permits for landfills must deliver and how the Regulations apply these requirements.

4.2 Schedule 10, paragraph 1 to the Regulations applies the requirements of the Schedule to all landfills other than those that closed before 16 July 2001[12] and excluding the activities mentioned in Article 3(2) of the Directive (see chapter 2 of this guidance).

4.3 Paragraph 5 Schedule 10, to the Regulations requires the regulator to exercise its relevant functions so as to comply with certain provisions of the Directive (see Figure 1). A regulator exercises a relevant function when it determines an application for the grant of a permit, when it makes a regulator-initiated variation of permit conditions or when it exercises enforcement powers in relation to a permit (regulation 9 and see chapters 6, 7 and 11 of the Environmental Permitting Core Guidance).

4.4 The Environment Agency is the regulator for landfills (regulation 32).

[12] The general requirements for surrendering an environmental permit are set out in chapter 6 of the Environmental Permitting Core Guidance. These are relevant to permitted landfills including those that closed before 16 July 2001.

The overall objective - Article 1

4.5 The Environment Agency must exercise its functions under the Regulations with regard to the overall objective set out in Article 1 of the Landfill Directive (Schedule 10, paragraph 5(2)).

4.6 The aim of the Directive is to provide for measures, procedures and guidance to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment including the greenhouse effect, as well as any resulting risk to human health, from landfilling of waste, during the whole life-cycle of the landfill. This is to be achieved through stringent operational and technical requirements on the waste and landfills.

IPPC Landfills

4.7 The Directive states in Article 1(2) that, in respect of the technical characteristics of landfills, the Directive contains, for those landfills to which the IPPC Directive (2008/1/EC) is applicable, the relevant technical requirements in order to elaborate in concrete terms the general requirements of the IPPC Directive. The relevant requirements of the IPPC Directive shall be deemed to be fulfilled if the requirements of the Landfill Directive are complied with.

4.8 The Commission has placed on its website 'Guidance on Interpretation and Implementation of the IPPC Directive' to help explain the interface between the IPPC and Landfill Directives[13]. With respect to the technical requirements for landfills, the guidance explains that the provisions of the Landfill Directive are considered to take the place of the provisions of Article 9(4) of the IPPC Directive. That part of the IPPC Directive requires that emission limit values and the equivalent parameters and technical measures are based on best available techniques (BAT). Other technical requirements of the IPPC Directive will still apply to landfills, including the general principles of Article 3. Further information on these aspects is available in chapter 3 of the Guidance on Part A Installations.

4.9 The main additional consideration for IPPC landfills is the energy efficiency general principle. In addition, the general principles relating to ensuring that no significant pollution of the environment is caused and taking all appropriate preventative measures against pollution, including by the application of BAT, will be relevant. These general principles, including the application of BAT, will be particularly relevant where the Landfill Directive does not set out specific technical requirements (e.g. landfill gas utilisation, leachate treatment, odour management).

[13] Some landfills covered by Council Directive 1999/31/EC on the landfill of waste also fall within the scope of the IPPC Directive (categories 5.1 and 5.4 in annex I). What are the IPPC provisions competent authorities have to take into account for these landfills, in addition to the requirements of the Landfill Directive? Available at ec.europa.eu/environment/ippc/general_guidance.htm

Landfill classification – Article 4

4.10 A landfill must be classified as one of the following (Article 4):

- a landfill for hazardous waste;
- a landfill for non-hazardous waste; or
- a landfill for inert waste.

4.11 The Regulations require that the Environment Agency exercises its functions to ensure that all landfills are classified in accordance with Article 4 (Schedule 10, paragraph 5(1)(a)).

Unacceptable wastes and treatment – Article 5(3) and (4)

Banned wastes

4.12 Certain wastes must not be accepted at a landfill (Article 5(3)). The Environment Agency should impose conditions in environmental permits to ensure this (Schedule 10, paragraph 5(1)(b) to the Regulations).

Liquid waste

4.13 Liquid waste is prohibited due to the potential problems caused by its propensity to flow and be mobile within a landfill (Article 5(3)(a)).

4.14 Liquid waste should be regarded as any waste in liquid form (including waste waters but excluding sludge) and can be defined as:

- any waste that near instantaneously flows into an indentation void made in the surface of the waste; or
- any waste load containing free draining liquid substance in excess of 250 litres or 10% of the load volume, whichever represents the lesser amount.

4.15 The first of these interpretations can be used to distinguish between liquids and sludges. A waste that flows only slowly, rather than near instantaneously, into an indentation void will be a sludge (or possibly a fine-grained solid) and therefore not prohibited by Article 5.

4.16 In the second interpretation ‘free draining’ means a liquid as defined in (i), irrespective of whether that liquid is in a container.

4.17 The second interpretation should be used in two circumstances. The first is where liquids are known to be present in small amounts in a generally solid waste. An example of this might be cartons of milk or juice in mixed commercial waste. The second circumstance is where liquid simply happens to form part of a load of solid waste. For example this would include liquid that has drained or been squeezed from components of the waste, and/or rainwater that has fallen in the waste container.

4.18 The ban on liquid waste relates to the acceptance of waste in a landfill and not to the generation or management of liquid (leachate or gas condensate) within the landfill.

4.19 Where a liquid is used to facilitate the transport of waste to the landfill, usually by pipeline, and the liquid is subsequently removed then this may not amount to the acceptance of waste in a liquid form.

Explosive, corrosive, oxidising, highly flammable and flammable wastes

4.20 Waste which, in the conditions of the landfill, is explosive, corrosive, oxidising, highly flammable or flammable is banned from landfill (Article 5(3)(b)).

4.21 Explosive, corrosive, oxidising, highly flammable and flammable are defined in the Hazardous Waste Regulations[14].

Infectious wastes

4.22 Waste classified as infectious in accordance with the Hazardous Waste Regulations is banned from landfill (Article 5(3)(c)).

4.23 Infectious wastes are prohibited only if they are 'hospital and other clinical wastes which arise from medical or veterinary establishments'. This does not mean that infectious wastes from other sources, or indeed other clinical or healthcare wastes, should be sent to landfill. Reference should be made to Government guidance HTM 07-01[15] on the classification and management of healthcare wastes.

Tyres

4.24 Whole and shredded tyres are banned from disposal at landfills (Article 5(3)(d)). Bicycle tyres and tyres with an outside diameter of above 1.4 metres are excluded from this ban.

4.25 Whole, used tyres may be accepted at landfills provided that they are used as engineering material.

4.26 Shredded tyres may be used as an engineering material only where that use constitutes recovery. The Directive relates to disposal and, where shredded tyres are recovered, their use does not fall under the ban on disposal.

Waste not meeting the waste acceptance criteria

4.27 Waste cannot be disposed of at a landfill unless it meets the relevant waste acceptance criteria (Article 5(3)(e))

4.28 The waste acceptance criteria are described in the section on Waste Acceptance Criteria.

Dilution of waste

4.29 The Directive prohibits the dilution or mixing of waste solely to meet the waste acceptance criteria (Article 5(4)).

4.30 For example, it is unacceptable to dilute contaminated soil with other soils or minerals outside the excavation process solely in order to bring the concentrations of toxic components below those for hazardous waste. Mixing of wastes, or of wastes with other materials, such as to achieve a chemical or physico-chemical change in pursuance of the third criterion of treatment (see the section on What is treatment?), is acceptable.

[14] The Hazardous (England and Wales) Regulations 2005 and the Hazardous Waste (Wales) Regulations 2005

[15] Health Technical Memorandum 07-01:Safe management of healthcare waste, Department of Health, 2006
www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_063274

4.31 The mixing of liquid wastes with materials such as sawdust or sand is not acceptable, as its purpose is to evade the ban on liquid wastes. These wastes, which are likely to leach out again once in the landfill, have been only temporarily immobilised or disguised and, therefore, have not ceased to be liquid wastes for the purpose of the Directive. In addition, such mixing would not be acceptable as a form of pre-treatment, in that it would not satisfy the three-point test (see the section on What is treatment?). It cannot therefore be advanced as being consistent with the objectives of the Directive.

What wastes can go to each landfill class? – Article 6

Treatment

4.32 Only waste that has been treated can be landfilled (Article 6(a)).

4.33 This does not apply to:

- inert waste for which treatment is not technically feasible;
- waste other than inert waste where treatment would not reduce its quantity or the hazards to human health or the environment.

What is treatment?

4.34 Treatment is defined in Article 2 as physical, thermal, chemical or biological processes (including sorting) that change the characteristics of waste in order to reduce its volume or hazardous nature, facilitate its handling or enhance recovery. This definition is explained in the following paragraphs.

4.35 Any potential treatment must fulfil each of these three criteria:

- It must be a physical/thermal/chemical or biological process including sorting.
- It must change the characteristics of the waste.
- It must do so in order to:
  - reduce its volume; or
  - reduce its hazardous nature; or
  - facilitate its handling; or
  - enhance its recovery.

4.36 The first criterion specifically includes sorting. If, for example, paper and plastic are produced as a mixed waste and then sorted this clearly meets the first criterion. However, where steps are taken to ensure that those two waste streams are kept separate at source, it appears perverse not to accept that as a potential treatment. Therefore source segregation is considered to be a physical process that could meet the first criterion.

4.37 ‘Characteristics’ must be properties of the waste that affect its potential impact on human health or the environment in a landfill. It is these characteristics that must be changed in order to meet the third criterion.

4.38 The four objectives of the third criterion are alternative possibilities; any one of them can be met. For example, some treatments may, in reducing hazardous nature, increase the quantity of waste landfilled (however note paragraph4.29). Other treatments, such as separation, may reduce the

quantity landfilled, but that fraction may be more hazardous. In both cases, one of the four objectives is met.

4.39 Compaction does reduce the volume of waste. However, compaction would also have to change the characteristics of the waste in a way that would reduce its potential impact on human health or the environment in a landfill.

4.40 The reduction of the hazardous nature of waste relates to the hazards listed in Annex III to Directive 91/689/EC (the Hazardous Waste Directive) and replicated in Schedule 3 to the Hazardous Waste Regulations 2005.

4.41 There are two alternative ways of reducing the hazardous nature of the waste. The first is a reduction of one or more hazards from corrosive to irritant, or from very toxic to toxic or harmful, or from toxic to harmful. The second is to remove, for the long term, the risk from one or more hazards. For example, solidification should prevent ingestion of some toxic wastes and this would be regarded as reducing the hazardous nature, even though the waste remains hazardous.

4.42 The handling of waste that must be facilitated (criterion 3(c)) relates to the placement and behaviour of the waste in the landfill and excludes handling prior to landfilling. The change in characteristics that will bring about the facilitation of handling should be such as to result in some reduction in the negative effects on the environment or health arising from the landfilling of the waste. Examples would be treatments that change the characteristics of the waste in terms of leachability, generation of gas, volatile compounds or odour, or emission of dust, and which do so on a permanent basis.

4.43 With respect to enhancing recovery, the key provision is that the requirement is ‘in order to’ enhance recovery. The common processes of sorting or segregating will not enhance recovery unless there is the intention to recover one or more of the sorted/segregated fractions. It follows that it is not acceptable to sort wastes and then landfill all the sorted materials. An example of enhancing recovery would be the chemical separation for printed circuit boards which enables the recovery of precious metals from the boards.

When is treatment not required?

4.44 If the waste to be landfilled is itself a product of a waste treatment process that meets the three criteria (see section 3.35 on What is treatment?) then further treatment is not required. The treatment does not have to take place outside the site of production and the residues of a waste treatment process do not automatically require further treatment. Common examples of landfilled wastes that are products of waste treatment processes include effluent treatment sludges and ash from waste to energy facilities.

4.45 Wastes that already meet the numerical waste acceptance criteria still require treatment prior to landfill. The requirement to pre-treat contributes to the aim of reducing the overall impact of landfilling on human health and/or the environment. Waste acceptance criteria are aimed at specifying the chemical properties that are actually landfilled in order to provide an acceptable level of

risk. This means that, even where the waste inherently meets the waste acceptance limit values, treatment prior to landfill must still take place.

4.46 Article 6(a) requires treatment for inert waste unless treatment is not technically feasible. The decision that treatment is not technically feasible can only be made following a thorough evaluation of the treatment options. Possible treatments for inert waste are generally physical sorting or conditioning processes to render some of the waste suitable for re-use. The residual inert waste that is still not suitable for re-use after treatment can be landfilled as a treated waste. If a waste is inert and would not be suitable for use, even following such a treatment, then it may be said that treatment is not technically feasible and the waste may be landfilled without treatment.

4.47 Article 6(a) goes on to say that the treatment requirement may not apply if it is waste other than inert waste and treatment would not reduce its quantity or the hazards that it poses to human health or the environment. Non-inert wastes must therefore be treated if a treatment is available which will reduce the mass to be landfilled or the hazards to human health or the environment. In most cases a treatment will be available which will achieve such a reduction. Any decision that there is not a treatment available can only be made following a thorough evaluation of the treatment options.

Responsibilities relating to treatment

4.48 The Environment Agency will include conditions in the environmental permit requiring landfill operators to take all reasonable steps to ensure that they accept only waste that has been treated (or that does not need to be – see the section on When is treatment not required?).

4.49 However, waste producers make the initial decisions about the management of their waste and so are in the best position either to treat the waste or secure its treatment by others.

4.50 Waste holders must (section 34 of the Environmental Protection Act 1990) prevent any unauthorised disposal of their waste (section 33 of the Act and regulation 12 of the Regulations) [16]. They must also ensure that a written description is transferred to enable other persons to avoid such unauthorised disposal.

4.51 Waste holders are required by the Duty of Care legislation in England and Wales to use the codes specified in the List of Wastes Regulations. The correct use of the codes in consignment notes may provide some assistance in determining whether a waste has been treated. Wastes that are coded under chapter 19 of the List of Wastes will have been subject to some treatment but this will not automatically signify that they have fully met with the treatment requirements.

4.52 Waste holders and operators will need to work together in order to ensure that the requirements of the Directive are met. In many cases, the holder will have important information as to the treatment which waste has undergone. Such

[16] The Environmental Protection (Duty of Care) Regulations 1991

information will help the landfill operator assess what further treatment is required. Without this information, an operator may be obliged to reject the waste or to treat it themselves, increasing the disposal costs. Section 34 of the Environmental Protection Act 1990 requires the waste holder to transfer the information in such form as to enable the operator to comply with its obligations.

Waste acceptable in each class of landfill

4.53 The Directive sets out which wastes can be accepted in the different classes of landfill (Article 6(b), (c) and (d)).

4.54 The Decision requires that waste shall be accepted at a landfill only if it meets the acceptance criteria for the relevant class of landfill (Article 3 of the Decision and section 2 of the Annex).

4.55 A landfill for hazardous waste can only accept hazardous waste and only then if it meets the relevant waste acceptance criteria set out in the Annex to the Decision (see the section on Waste Acceptance Criteria).

4.56 A landfill for non-hazardous waste can accept municipal waste and any other non-hazardous waste of a similar nature that meets the relevant waste acceptance criteria.

4.57 Landfills for non-hazardous waste can accept stable non reactive hazardous waste, for example those vitrified or solidified. In order for these wastes to be accepted they must meet the relevant waste acceptance criteria which ensure that the leaching behaviour is similar to the non-hazardous waste. The stable non-reactive hazardous waste cannot be accepted into cells where bio-degradable non-hazardous waste has been or will be deposited (see paragraphs 4.110 to 4.112).

4.58 A landfill for inert waste can only accept waste that meets the Directive definition of inert (Article 2(e)) and the relevant waste acceptance criteria (section 2.1 of the Annex to the Decision).

Waste Acceptance - Article 11(1) and Articles 2, 3 and 4 of the Council Decision

4.59 The Directive establishes waste acceptance procedures for landfills (Article 11(1)). These require the basic characterisation of all waste to be accepted at landfill. A system of compliance testing is required to demonstrate that the basic characterisation accurately describes the waste accepted at the landfill.

4.60 Council Decision 2003/33/EC (the Decision – reproduced in Annex 3 to this guidance) provides a new Annex of waste acceptance procedures.

4.61 Section 1 of the Annex to the Decision provides the procedure for the acceptance of waste at landfills (Article 2 of the Decision).

4.62 The Decision establishes waste acceptance criteria, including numerical limit values for some parameters and classes of landfill (section 2 of the Annex to the Decision). These numerical criteria must be met in order for a waste to be acceptable at a landfill (Article 3 of the Decision).

4.63 The necessary sampling and testing methods are given in section 3 of the Annex to the Decision.

4.64 The Environment Agency should impose permit conditions to ensure the requirements of Article 11(1) and Articles 2, 3 and 4 of the Decision are met (Schedule 10, paragraphs 5(1)(g) and 5(3) to the Regulations).

Waste acceptance procedures

4.65 The Decision sets out three stages in waste acceptance.

- Basic characterisation.
- Compliance testing.
- On-site verification.

Basic Characterisation

4.66 Basic characterisation must provide all the information on the waste necessary to ensure its safe disposal (section 1.1 of the Decision Annex).

4.67 Basic characterisation is required for each type of waste.

4.68 The waste producer should be responsible for characterising its waste. The waste producer may either be the person whose activities produced the waste or the person who has treated the waste in some way to change its characteristics.

4.69 It is the producer who sends the waste to landfill who is responsible for basic characterisation. This is usually a secondary producer because waste must generally be treated prior to landfill. The secondary producer normally needs information from the original producer in order to decide upon the treatment

required. Many of the principles of basic characterisation will help original producers to decide on the best overall management of waste, whether by landfill or otherwise, and to comply with the Duty of Care.

4.70 Section 1.1.2 of the Decision Annex sets out the fundamental information requirements for basic characterisation of waste.

4.71 A review of the Duty of Care regime is currently being undertaken[17]. This may require the provision of characterisation data to be included as part of waste transfer. [Awaiting WM's comments]

4.72 Section 1.1.4 of the Decision Annex identifies where testing for basic characterisation is not required. Where testing is not required due to impracticalities of testing (or the unavailability of test methods) or the waste is on the list of inert wastes in section 2.1 of the Decision Annex, the waste is also exempt from compliance testing.

Compliance testing

4.73 Compliance testing is required to demonstrate that the waste is consistent with the basic characterisation and meets the waste acceptance criteria for the relevant class of landfill (Section 1.2 of the Decision Annex).

4.74 The basic characterisation of the waste will have identified all of the properties of the waste which are relevant to its potential for pollution or harm to health. Compliance testing is a periodic check of the waste to ensure that those properties have not changed. Wastes that are exempt from the testing requirements of basic characterisation are also exempt from compliance testing.

4.75 Compliance testing should focus on the key variables and behaviour identified by basic characterisation.

4.76 The landfill operator is responsible for compliance testing. The operator must ensure (and demonstrate) that any given waste stream complies with the waste acceptance criteria for the landfill and meets the conditions of the permit.

4.77 The operator must keep the results of any tests for at least two years (Schedule 10, paragraph 7(a) to the Regulations).

On-site verification

4.78 On-site verification is the final step in waste acceptance (section 1.3 of the Decision Annex). Its purpose is to ensure that the waste is the same as the waste that has been subject to basic characterisation and compliance testing and that the waste is correctly described in the accompanying documentation.

[17] www.defra.gov.uk/environment/waste/controls/duty.htm

4.79 On-site verification requires:

- the checking of the waste documentation;
- a visual inspection of the waste at the entrance to the landfill and at the point of deposit;
- where samples of waste are taken that the sampling is in accordance with Annex II and that samples are kept for at least one month;
- that a register is kept of the waste deposited including the location of hazardous waste.

4.80 Visual inspection at the landfill entrance should take place unless it is not practicable to see the waste due to the vehicle or container in which the waste is delivered. Visual inspection is not usually practicable where the waste is delivered in:

- a front end loader;
- a rear end loader;
- compaction container;
- road sweeper collector;
- a sheeted container; or
- any other enclosed vehicle where there is no access for inspecting the waste without unloading the vehicle.

4.81 In these circumstances the operator should check that the delivery vehicle is consistent with vehicle type normally used for the waste described in the documentation. If, for whatever reason, a landfill operator is concerned or suspicious about the nature of the waste, then particular effort should be made to complete a visual inspection at the landfill entrance. Where the waste is not consistent with the description provided, then the load should be refused from site or quarantined while further checks are undertaken.

4.82 All samples taken for on-site verification shall be kept for at least one month (paragraph 1.3 of the Decision Annex). The operator should keep the results of the analysis for at least two years. Paragraph 3 of the Decision Annex requires a sampling plan for on-site verification.

4.83 The operator should keep a record of the quantity and characteristics of the waste. This must include the date of delivery, the origin and the relevant holder of the waste. For municipal waste the collector should be identified. In the case of multiple collection vehicles the origin of the waste should be recorded as far as is possible and, where it is not practical to identify the producer, the collector of the waste should be recorded.

4.84 The operator shall maintain a record of the location of all hazardous waste deposits made at the landfill. The purpose of this record is in relation to any future need to disturb the waste, for instance the drilling of boreholes in the waste.

Waste Acceptance Criteria

4.85 The Directive requires that before waste can be accepted the holder has to demonstrate that it meets the acceptance criteria in Annex II (Article 11(1)(a)).

4.86 The waste acceptance criteria (WAC) are limits that have been derived by modelling the impacts of a typical landfill on groundwater and are thus aimed at avoiding groundwater pollution.

4.87 The Decision specifies the testing methods to be used to demonstrate compliance with the numerical WAC limits. The limit values to be used for compliance are those relating to a solid liquid ratio of 10 (L/S = 10 l/kg). This is required by Schedule 10, paragraph 7 (e).

4.88 Schedule 10, paragraphs 8 and 9 to the Regulations amend the WAC to be met by granular waste and also set new WAC for monolithic waste and Polycyclic Aromatic Hydrocarbons (PAH) values for inert waste.

4.89 Different WAC and testing methods apply depending upon whether the waste is in a granular or monolithic form. A monolithic waste is a waste that has been deliberately treated to solidify it and strongly bind it. A granular waste can simply be regarded as waste which is not monolithic.

Landfills for Hazardous Waste

4.90 Waste identified as hazardous can only be accepted at a facility classified as a landfill for hazardous waste. The List of Waste Regulations 2005, identifies entries for hazardous waste, and are subject to the requirements of the Hazardous Waste Regulations 2005. These Regulations require that each movement of hazardous waste is accompanied by a uniquely numbered consignment note, which identifies the waste and its hazards.

4.91 Hazardous wastes being landfilled must meet the relevant WAC. For hazardous wastes there are numerical limit values for leachable inorganic substances, organic content along with standards for physical stability. These exist for both granular and monolithic hazardous waste. WAC for landfills for hazardous waste are set out in paragraph 2.4 of the Annex to the Decision.

Increased certain leaching limits by up to three times

4.92 Under certain circumstances landfills for hazardous waste may accept wastes that exceed the WAC leaching limit values on inorganic components. The Regulations allow the Environment Agency to include conditions in a permit authorising limit values for specific parameters (other than Dissolved Organic Carbon) up to three times higher for specified wastes accepted in a landfill (Schedule 10, paragraph 7(i)).

4.93 Higher WAC limits will only be allowed in respect of specified wastes. A specified waste is one that can be assigned a specific List of Waste (LOW) code. Additionally a specified waste should, where possible, be a clearly identifiable waste type arising from a specific process, albeit one that may arise at a number of separate locations.

4.94 Landfill operators need to apply to the Environment Agency if they wish to accept such wastes. In order that the Environment Agency can approve this, the landfill operator must demonstrate that the emissions from the landfill will not present an additional risk to the environment as a result of accepting this waste. This will take the form of an environmental risk assessment (see paragraphs 4.125 to 4.127). The leachate source term in the environmental risk assessment will need to accurately reflect the additional contaminant load resulting from acceptance of the waste in question.

4.95 The approach can be viewed in two parts, the first is demonstration through environmental risk assessment that it is acceptable for a specific site to increase the WAC for a given parameter (potentially up to a factor of 3). The second part is the demonstration through waste testing that for a specified waste there is a justification for a specific increase in the WAC limits, based on the contaminants present.

4.96 Where there is an identified need for an increase, permit variations will limit these increases to specific parameters. For example a permit variation may allow a landfill to accept Air Pollution Control (APC) residues. Waste characterisation of the APC residue has identified the parameters above WAC as chlorides, lead and cadmium. Although a risk assessment may indicate that it is acceptable to increase a range of parameters, the permit variation will limit an increase in WAC to lead and cadmium only for this specified waste.

4.97 It is for a landfill operator to justify, through an environmental risk assessment, which parameters of the specified waste need to be increased and the level of that increase . Where there is an identified need for an increase, permit variations also include the requirement for the operator to submit an annual report for each waste listed as benefiting from the higher WAC provision to confirm that there are no alternative waste management options available. This demonstrates a risk based approach whilst reducing year on year our reliance on landfill.

4.98 The Environment Agency should require an annual review of alternative options for managing the waste. In effect this will require the original justification for the derogation to be re-visited. These reviews, together with information provided in support of any future applications for permit variations, will allow the Environment Agency to maintain an overview of whether use of higher limits continue to be appropriate for particular waste streams.

4.99 Three times WAC should be seen as the Directive’s way of allowing Member States some flexibility to deal with particular problem wastes but it should not be seen as an opportunity to raise WAC by a factor of three across the board.

It is not expected that the use of this option to be the norm as most wastes should be treatable to meet the WAC limits. The Government must report to the European Commission the number of environmental permits that include conditions authorising higher limit values.

Organic content

4.100 There are three parameters that can be used to limit the organic content of hazardous waste destined for landfill. The three parameters are Dissolved Organic Carbon (DOC), Total Organic Carbon (TOC) and Loss on Ignition (LOI).

4.101 The TOC content is limited for the following wastes:

- granular hazardous wastes landfilled at hazardous waste landfills;
- monolithic hazardous waste entering a treatment plant;
- stable non-reactive hazardous wastes at non-hazardous waste landfills (see paragraph 4.108); and
- non-hazardous wastes deposited in these cells (see paragraph 4.110).

4.102 Landfill operators can use either of the following measures to meet the WAC for organic content for granular hazardous waste entering a landfill or hazardous waste entering a monolithic treatment plant:

- the waste must show LOI of 10% or less; or
- TOC content of no greater than 6%.

4.103 The Environment Agency can use its discretion to allow a higher level of TOC for a specified hazardous wastes going to specific landfill sites provided the waste does not also exceed the limit for DOC that is set out in Paragraph 2.4.2 of the Council Decision.

4.104 This derogation for organic content will only be allowed where the operator can demonstrate that it is not possible or practicable either to separate out the component of the waste stream causing elevated organic content or to treat the waste to reduce its organic content below the limit. Proposals and approvals for derogations on organic content of wastes can be dealt with by exchange of correspondence with the Environment Agency; they do not require a variation to the permit.

4.105 For certain waste streams there are difficulties in restricting the TOC limits to 6% and limited availability of alternative disposal routes.

4.106 The Environment Agency will consider time limited variations to individual environmental permits for specific wastes with TOC over 6%. These applications will be considered if the following general criteria are met:

- No viable alternative waste management option is readily available

- An agreed waste management plan is developed by the producer, treatment operator and landfill operator to ensure the waste will comply with the 6% TOC limit by 1 July 2008.

- The landfill operator provides an acceptable risk assessment that demonstrates that the presence of high TOC waste at their landfill does not compromise its integrity.

- The waste producer provides acceptable assurance that elimination/reduction of the waste at source is not an option.

- The waste is pre-treated to meet the Directive requirements.

4.107 From July 2008 all waste entering landfills should meet the 6% TOC limit.

Landfills for non-hazardous wastes

4.108 WAC for landfills for non- hazardous waste are set out in paragraphs 2.2 and 2.3 of the Annex to the Decision.

4.109 There are no numerical WAC for waste destined for disposal in landfills for non-hazardous waste other than for separate cells where stable non-reactive hazardous waste or gypsum waste is to be disposed of.

Separate cells

4.110 Stable non-reactive hazardous waste should only be disposed of in landfills for non-hazardous waste in cells where no biodegradable waste is accepted (Article 6(c)(iii) of the Directive).

4.111 For waste in granular form, the WAC for stable non-reactive hazardous waste is provided in paragraph 2.3 of the Annex to the Decision. Paragraph 2.2 provides the WAC for the non- hazardous waste to be disposed of in the same cell as the stable non-reactive hazardous waste. The WAC for stable non-reactive hazardous waste in a monolithic form is set out in Schedule 10, paragraph 9 to the Regulations.

4.112 Paragraph 2.3 of the Decision Annex gives the limit value for organic content of granular stable non-reactive hazardous waste and any non-hazardous waste deposited in the same cells. These wastes must normally have a TOC of 5% or less. However, the Environment Agency can permit a higher TOC limit for specified wastes at specific sites provided that the alternative DOC value is not exceeded (paragraph 2.3.2. of the Decision Annex). Alternative waste treatment options should be considered prior to the application of this provision.

4.113 Non-hazardous gypsum-based waste should only be disposed of in landfills for non-hazardous waste in cells where no biodegradable waste is accepted (paragraph 2.2.3 of the Decision Annex). This requirement should relate to both gypsum and other forms of high sulphate bearing materials (Schedule 10, paragraph 7 (g) to the Regulations).

4.114 In determining the requirement for disposal in a separate cell, it is important to consider that the purpose of separating sulphate waste from biodegradable waste is to minimise the production of hydrogen sulphide gas which is toxic and odorous.

4.115 Asbestos waste should only be disposed of in landfills for non-hazardous waste in self-contained cells (paragraph 2.3.3 of the Decision Annex to be read with Schedule 10, paragraph 7(h) to the Regulations. Although not a requirement of the Directive, asbestos waste disposed of in a landfill for hazardous waste should be within areas dedicated to asbestos waste disposal.

4.116 Interaction between the wastes in the separate cells should be prevented in accordance with the following principles:

- no direct physical contact with biodegradable non-hazardous waste;
- no contact between waste products (including leachate or landfill gas);
- separate leachate collection and extraction systems (but not necessarily separate treatment and discharge systems);
- where landfill gas collection and extraction systems are required they should be separate (however separate treatment plant may not be required); and
- operation of separate cells must not compromise the continuing management of cells for biodegradable wastes.

4.117 The design and operation of the landfill and the means of cell separation should account for these principles for the long-term.

4.118 Separation relying on construction of cells by lining over pre-existing waste deposits is unlikely to be acceptable due to:

- problems in ensuring the long-term integrity of such a liner to provide adequate separation (e.g. due to unacceptable settlements);
- problems with continuing management of the underlying wastes; or
- problems with the effective management of leachate and gas due to the presence of barriers within the waste body.

Landfills for inert wastes

4.119 WAC for landfills for inert waste are set out in paragraph 2.1 of the Annex to the Council Decision.

4.120 The Decision provides a list of inert wastes that can be accepted without testing where there is confidence that the waste is not contaminated.

4.121 All other inert wastes must be tested to demonstrate that they meet the leaching limit values given in the Decision.

4.122 The Decision requires Member States to set a limit for PAH content of wastes accepted for disposal at inert waste sites. The 17 specified PAHs are set out in Schedule 10, paragraph 2(d). Materials disposed of at inert landfills that may contain PAHs include soils and stones, concrete, bricks and tiles. Soils are the most likely source of PAHs. A single limit value of 100 mg/kg for PAHs applies for waste acceptable at landfills for inert waste (Schedule 10, paragraph 7(f) to the Regulations).

Conditions of the permit – Article 8

4.123 Article 8 of the Directive sets out certain requirements that must be met in order for the Environment Agency to grant a permit. The Environment Agency must exercise its relevant functions in order to comply with these requirements (Schedule 10, paragraph 5(d)) to the Regulations.

Overall requirement

4.124 The first of the requirements in Article 8 is that the landfill project complies with all the relevant requirements of the Directive including the Annexes. Annex II relates to waste acceptance and is covered under Article 11 above. Annex III relates to monitoring and the requirements are dealt with under Article 12 below. The following sections set out the requirements of Annex I then deal with the remaining requirements of Article 8.

General requirements for all landfills – Annex I to the Directive

Environmental risk assessment

4.125 In implementing Annex I to the Landfill Directive, there are decisions that must be supported by an assessment of the environmental risk. The main decisions relate to the risk from a landfill in its specific location, the need to collect contaminated water and leachate and the standards of protection for soils and water (Annex I to the Directive paragraphs 1, 2 and 3.4).

4.126 The relevant decisions of the Environment Agency should be informed by an environmental risk assessment submitted by the landfill operator with the permit application. This environmental risk assessment should address both normal, unusual and unplanned operating conditions. It should cover the entire lifecycle of the landfill from initial construction to the point where the landfill no longer poses a risk to the environment. The eventual surrender of the landfill permit should form part of the environmental risk assessment and needs to be explicitly considered at the permitting stage.

4.127 The environmental risk assessment must consider the landfill as a whole and not deal with each impact separately. For instance there are significant interactions between managing the risk to groundwater and managing landfill gas.

4.128 The environmental risk assessment should include consideration of stability, the management of landfill gas and future failure and degradation of the active controls. Active controls include the artificial sealing liner, leachate management systems and operational/management controls such as groundwater pumping.

4.129 The environmental risk assessment should be undertaken in accordance with the requirements of the Regulations that relate to groundwater (Schedule 22). The Regulations require that the regulator must, in exercising its relevant functions, take all necessary measures to:

4.130 (a) prevent the input of any hazardous substance to groundwater; and

4.131 (b) limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater..

4.132 The requirements of the Groundwater Directive apply independently and in addition to the requirements in Annex I to the Landfill Directive. The Environment Agency is required to ensure the requirements of the Groundwater Directive are also met. Annex 1 to the Environmental Permitting Core Guidance outlines the connection with the Groundwater Directive.

4.133 The following sections cover situations where a decision by the Environment Agency must be informed by an environmental risk assessment, supplied by the operator.

Landfill location

4.134 The Environment Agency can only grant an environmental permit (paragraph 1 of Annex I to the Directive) where:

- the location of the landfill is such that the landfill would not pose a serious environmental risk; or
- the corrective measures proposed indicate that the landfill would not pose a serious environmental risk.

4.135 With respect to the proposed mitigation (corrective) measures, an environmental risk assessment (see paragraphs 4.125to4.128) must demonstrate to the Environment Agency that the selected techniques in the form of engineered design and operational procedures are sufficient to provide a high level of protection for the environment as a whole. The selection of techniques to protect the environment should achieve an appropriate balance between the environmental benefits they bring and the costs to implement them.

4.136 Schedule 25, Part 2, paragraph 4(2) to the Regulations places a specific responsibility on Waste Planning Authorities (WPA) to consider the requirements of Annex 1, paragraph 1.1 to the Landfill Directive when considering whether or not to grant planning permission for a landfill. These requirements are: the distances from residential and recreational areas; the proximity to water sources; geological and hydro-geological conditions; the risk of natural disasters; and protection of the site's heritage.

4.137 The Environment Agency and the WPA should discharge their duties in respect of Annex 1, paragraph 1.1 to the Directive in accordance with Government policy on their complementary roles, as set out in PPS 10[18]. The Environment Agency will provide advice to the WPA in relation to both development plans and planning applications, regarding circumstances where

[18] Planning Policy Statement 10: Planning for Sustainable Waste Management Published July 2005.

it considers that a landfill should not be developed for pollution control reasons. The Environment Agency will also assess the environmental risk as part of its assessment of a permit application. Both the Environment Agency and the WPA therefore have a role in determining landfill location, but the roles are complementary. The WPA is responsible for land use matters and the Environment Agency for pollution control matters.

Landfill location with respect to groundwater

4.138 No landfills should be located within a Source Protection Zone I. A Source Protection Zone I is the closest and most vulnerable area around a groundwater abstraction.

4.139 Beyond a Source Protection Zone I, landfills should not be developed where an environmental risk assessment demonstrates that active long-term site management is essential to prevent long-term groundwater pollution, and the proposed site is:

- below the water table in any strata where the groundwater provides an important contribution to river flow or other sensitive surface waters;
- on or in a major aquifer; or
- within Source Protection Zones II or III.

4.140 Landfills for inert waste should not require active long-term site management and can therefore, with respect to groundwater protection, be located anywhere outside a Source Protection Zone I.

Water control and leachate management

4.141 The Directive requires that appropriate measures are taken to control rainwater entering the landfill and to prevent surface water and groundwater entering the landfilled waste (paragraph 2 of Annex I to the Directive).

4.142 The Environment Agency should interpret the requirement to prevent groundwater entering the landfilled waste in a risk-based manner. Groundwater must be prevented from entering the landfill as far as is necessary to ensure that there is no unacceptable risk to the stability or effectiveness of engineering controls (e.g. the lining and leachate collection systems), other environmental protection measures and the environment.

4.143 The Environment Agency can decide that the collection of contaminated water and leachate is not required if it considers that the landfill poses no potential hazard to the environment (paragraph 2 of Annex I to the Directive). This decision should be based upon an environmental risk assessment produced by the operator which considers the location of the landfill and the waste types to be accepted (see paragraphs 4.125 to 4.128). Landfills for inert waste are not required to collect contaminated water and leachate (Annex 1, paragraph 2to the Directive and Schedule 10, paragraph 6(c)to the Regulations).

4.144 ‘No potential hazard’ in this context means there is no likelihood of an unacceptable discharge over the entire lifecycle of the site. The Environment Agency is only likely to decide that the collection of leachate is unnecessary, and therefore that there is no need for an artificial sealing liner (see paragraph 4.162), if the quantity or quality of any leachate produced by the waste is insignificant or if there is no identified pathway or receptor for contamination.

4.145 Paragraph 2 requires the treatment of water and leachate to an appropriate standard required for their discharge, but does not specify methods of treatment or what those standards should be. The Environment Agency will assess appropriate techniques on the basis of the objectives of the Landfill Directive (and for IPPC landfills, the IPPC Directive (see paragraphs 4.7 to 4.9).

Protection of soil and water

4.146 Paragraph 3.1 of Annex I to the Directive sets out the technical requirements for the protection of soil and water. The paragraph requires that landfills must be situated and designed so as to meet the necessary conditions for preventing pollution of the soil, groundwater or surface water and ensuring efficient collection of leachate as and when required according to paragraph 2 of Annex I. Paragraph 3.1 states that the protection of soil, groundwater and surface water is to be achieved by the combination of a geological barrier and a bottom liner during the operational phase, and by the combination of a geological barrier and a top liner after closure.

4.147 Paragraphs 3.2 and 3.3 of Annex I provide further technical detail on the requirements in paragraph 3.1. Paragraph 3.2 sets out the detailed requirements for the geological barrier and paragraph 3.3 the detailed requirements for the bottom liner and top liner. The sentence in paragraph 3.3 of Annex I allowing for Member States to set requirements for landfills for inert waste and for the characteristics of the technical requirements must be ignored as this has not been adopted in the UK (Schedule 10, paragraph 6 (d) to the Regulations).

Appropriate standards

4.148 Paragraph 3.4 of Annex I to the Directive provides for the reduction of the requirements in paragraphs 3.2 and 3.3 in two situations, on the basis of an assessment of environmental risks:

- if, in accordance with paragraph 2, the competent authority has decided that collection and treatment of leachate is not necessary; or

- if it has been established that the landfill poses no potential hazard to soil, groundwater or surface water.

4.149 ‘No potential hazard’ in this context means that the environmental risk assessment has to demonstrate that the reduction in a requirement in paragraphs 3.2 and 3.3 of Annex I will result in an acceptable risk to soil and water.

4.150 Where an operator considers that the required level of environmental protection can be provided by proposals that reduce the requirements in paragraphs 3.2 and 3.3 of Annex I this must be demonstrated through an environmental risk assessment submitted to the Environment Agency (see paragraphs 4.125 to 4.128).

4.151 Paragraph 3.4 of Annex I does not itself provide for the complete removal of the paragraph 3.1 requirements for a combination of a geological barrier and a bottom liner or top liner. However, there are limited circumstances where the requirements of paragraph 3.1 (i.e. a geological barrier, bottom or top liner) are not needed to meet the overall objective of the Directive, and in particular the purpose of paragraph 3.1 - the protection of soil and water.

4.152 One or more of a geological barrier, bottom or top liner can be removed only where a particular requirement would provide a negligible contribution to the protection of soil and water. ‘Negligible contribution’ means that, for certain landfills, the Environment Agency would consider that the necessary conditions were in place to protect soil and water and the addition of the barrier or liner in question would add little or nothing to environmental protection.

4.153 Where an operator considers that one or more of a geological barrier, bottom or top liner would provide a negligible contribution to the protection of soil and water this must be demonstrated through an environmental risk assessment submitted to the Environment Agency. This risk assessment must demonstrate that soil and water will be protected in the absence of a geological barrier, bottom or top liner. If the Environment Agency is satisfied that the addition of the particular measure would make little or no difference (i.e. would provide only a negligible contribution) to securing the necessary protection of soil and water then the Environment Agency may take the decision that it can be dispensed with.

The geological barrier

4.154 A geological barrier is required for each class of landfill. The requirements for a geological barrier are set out in paragraph 3.2 of Annex I to the Directive.

4.155 A natural geological barrier is the geological formation underlying and surrounding the landfill. The geological barrier can be either natural, artificial or a combination of the two, depending on the location. Where the natural geology does not naturally provide sufficient environmental protection it can be artificially enhanced.

4.156 An artificial geological barrier is a mineral layer on the base and sides of the landfill and must be at least half a metre thick. This thickness is regarded as a reasonable minimum due to the practical difficulties inherent in constructing an engineered barrier and the need for a robust system.

4.157 The geological barrier must provide sufficient attenuation to prevent a potential risk to soil and groundwater. The adequacy of the geological barrier

should be demonstrated through an environmental risk assessment (paragraphs 4.125 to 4.128).

4.158 The consideration of the attenuation capacity of the geological barrier should be regarded as the same as the consideration of the purifying powers of the soil and subsoil required by the Groundwater Regulations.

4.159 Where the Environment Agency has decided in accordance with paragraph 2 of Annex I that leachate collection is not needed, a bottom liner (artificial sealing liner) is not required (see paragraph 4.143). Additionally in these cases, the risk assessment, based on the location of the landfill and the waste types, may demonstrate that the hazard posed by the waste in that location is such that the attenuation requirements are sufficiently limited so as not to require any special engineering measures. This could arise, for example, where a landfill for inert waste is in a low sensitivity setting, but without a natural geological barrier, and the waste will come from one well-characterised source. In these cases a geological barrier would provide a negligible contribution to the protection of soil and water and may not be required (see paragraphs 4.151 to 4.153).

4.160 A low sensitivity setting would not include sites that are:

- below the water table in any strata where the groundwater provides an important contribution to river flow or other sensitive surface waters;
- on or in a Major Aquifer;
- within any Source Protection Zones.

Leachate collection and liners

4.161 Landfills for non-hazardous and hazardous waste should have a leachate collection and sealing system in addition to the geological barrier. This system comprises a basal artificial sealing liner and a drainage layer and its stated purpose is to ensure leachate accumulation is kept to a minimum (paragraph 3.3 of Annex I to the Directive).

Artificial sealing liners

4.162 An artificial sealing liner on the base of the landfill is required unless the collection of leachate is unnecessary (see paragraph 4.143 and also paragraph 4.163 below). The collection of leachate is not required at a landfill for inert waste and so an artificial sealing liner is not needed.

4.163 The purpose of the artificial sealing liner is to control leachate leakage from the base of the site and enable its collection, ensuring leachate accumulation at the base of the landfill is controlled. The main property required of this element is therefore low permeability.

4.164 Where the natural geological barrier alone will provide the necessary conditions for preventing pollution of soil and water and - in combination with a leachate drainage system - ensure sufficient collection of leachate, then the artificial sealing liner may not be required. This could arise where a landfill is

in a non-aquifer location and on a significant depth of consistently low permeability stratum (such as clay) which could provide a bottom sealing system. In these cases the further addition of an artificial sealing liner to provide additional bottom sealing would provide a negligible contribution to the protection of soil and water and so may not be required (see paragraphs 4.151 to 4.153).

4.165 In these circumstances, the operator's risk assessment should be based on a detailed understanding of the site's location.

Leachate collection

4.166 A leachate drainage layer is required as part of the leachate collection system. The drainage layer must, as a minimum, extend across the basal areas of the landfill. The Environment Agency can decide to permit a drainage layer with a thickness of less than 0.5 metres on the basis of an environmental risk assessment (see paragraph 4.148).

4.167 The primary objectives for a leachate management system are to:

- remove leachate, contained within the site by the liner system, for treatment and disposal;
- control leachate heads within the site; and
- minimise any threat to the integrity of the lining system by providing a physical barrier between the waste and the lining system.

4.168 Leachate levels in landfills should be set and managed in order to provide for a high level of environmental protection.

4.169 Where a landfill operator proposes to manage leachate levels above the lowest level that can technically be achieved, this should be justified on the basis of a detailed site specific assessment (see paragraphs 4.125 to 4.128). The environmental risk assessment must include consideration of:

- the ability to provide for effective management of landfill gas including prevention of lateral migration;
- landfill stability;
- accident scenarios (such as liner failure or leachate pumping failure); and
- the level that is justified on the basis of the hydrogeological risk assessment as delivering an acceptable risk to soil, groundwater or surface water.

Capping liners

4.170 Paragraph 3.3 of Annex I to the Directive allows the Environment Agency to require a surface sealing if the hazard to the environment means that the

prevention of leachate formation is necessary. A 'surface sealing' means a 'top liner' (commonly referred to as a cap). Where the prevention of leachate formation is not necessary a cap would provide a negligible contribution to the protection of soil and water and so may not be required. All landfills for hazardous and non-hazardous waste would normally require a cap.

4.171 The Directive includes recommendations for capping but these can be changed (increased as well as reduced) on the basis of a risk assessment (see paragraphs 4.125 to 4.128).

4.172 The need for a cap (and its specification) is related to the balance between the need to minimise leachate generation and the need to flush contaminants from the waste. An active landfill gas management system will normally require a cap. There is also the potential need to physically separate the waste from the environment even where there is no leachate risk (e.g. for asbestos waste).

4.173 As a minimum, a capping system should contain a sealing layer, a surface water drainage system and cover soils.

Landfill gas management

4.174 One of the main purposes of the Landfill Directive is to minimise the contribution of landfill sites to the production of greenhouse gases. This is to be achieved by taking measures to reduce the production of methane and also through landfill gas controls (recital 16 of the Directive).

4.175 Annex I of the Directive requires in paragraph 4 that:

- appropriate measures are taken to control the escape and movement of landfill gas from the landfilled waste;
- landfill gas should be collected and must be used for energy generation or if that is not possible it must be flared; and
- the collection, treatment and use of the landfill gas should minimise the impact on the environment and human health.

4.176 The Environment Agency should regulate the management of landfill gas in accordance with the following principles:

- effective engineered containment;
- active extraction as early as possible;
- passive venting is not acceptable;
- optimising extraction efficiencies;
- optimising energy generation;
- emission limits on all point source releases;

- emission monitoring of point and diffuse sources; and
- ambient air monitoring where the site specific risk justifies it.

4.177 The Directive establishes the fundamental principles for landfill gas management but does not provide detailed technical measures. The Environment Agency must therefore assess appropriate techniques for landfill gas management based on the objectives of the Landfill Directive and, for IPPC landfills, the IPPC Directive (see paragraphs 4.7 to 4.9).

Nuisances and hazards

4.178 Measures must be taken to minimise nuisances and hazards arising from the operation of the landfill (paragraph 5 Annex I to the Directive). The Environment Agency should set permit conditions to ensure this requirement is met.

4.179 Nuisance is also regulated through the planning system and the Environment Agency and the WPA should work together to ensure that landfills are appropriately regulated and that requirements do not conflict. Government guidance on the relationship between planning and pollution control is available in PPS 23[19], PPS 10[20] and for Wales in the Technical Advice Note on waste (TAN 21)[21].

4.180 The Directive requires that measures are taken to address nuisances and hazards but does not provide detailed technical measures. The Environment Agency must therefore assess appropriate techniques based on the objectives of the Landfill Directive and, for IPPC landfills, the IPPC Directive (see paragraphs 4.7 to 4.9).

Stability

4.181 Waste must be deposited in a way that ensures the stability of the waste body and avoids slippages (paragraph 6 of Annex I to the Directive). The stability of structures such as an artificial geological barrier, liners and leachate and landfill gas infrastructure must also be ensured.

4.182 The stability and settlement of the waste, the constructed landform, its foundation and the environmental management must be assessed. This assessment must demonstrate that the environmental management infrastructure will not be compromised, neither will there be any risk to safety or detriment to the landform over the entire lifecycle of the landfill. In assessing the landfill engineering proposals for all landfill sites the structural/physical stability over the entire lifecycle of the landfill must be demonstrated.

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[19] Available at: http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/planningpolicystatements/pps23/

[20] Available at: http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/mineralsandwaste/wastemanagement/pps10/

[21] Available at: Will be updated

Barriers

4.183 The Directive requires that the landfill should be kept secure. The Environment Agency should impose permit conditions to ensure that all reasonable measures are taken to prevent unauthorised access to the landfill.

Operator competence

4.184 The Environment Agency can only grant an environmental permit for a landfill where the management of the landfill is in the hands of a person competent to manage the site and appropriate professional and technical development is provided (Article 8(a)(ii)).

4.185 These requirements for operator competence are met through the provisions in the Regulations that set out that the operator must be in control of the landfill (regulation 7) and that the Environment Agency must refuse a permit application if the applicant will not be the operator and if they will not operate in accordance with the permit (Schedule 5, Part 1, paragraph 13(2) and see chapter 9 of the Environmental Permitting Core Guidance).

4.186 The introductory sections of the Directive (recital 31) explain the Directive requirement: '... to ensure the proper application of the provisions implementing this Directive throughout the Community, and to ensure that the training and knowledge acquired by landfill operators and staff afford them the necessary skills'.

4.187 The required training and development are those necessary to enable the staff to carry out their duties so as to implement the permit conditions. It does not mean that all staff must be trained in all aspects of management and operation of the landfill.

Accidents

4.188 Environment Agency can only grant an environmental permit for a landfill where it is satisfied that the landfill shall be operated in such a manner that the necessary measures are taken to prevent accidents and limit their consequences (Article 8(a)(iii)). Accident prevention is also one of the general principles of the IPPC Directive.

4.189 The operator must ensure that accidents are considered as part of carrying out the permitted activities. Accidents are one of the common causes of environmental incidents. Accidents must be considered in the environmental risk assessment submitted with the permit application (see paragraphs 4.125 to 4.128).

4.190 The Environment Agency should include permit conditions to require the operator to have an appropriate environmental accident management plan in place.

Financial provision

4.191 Environment Agency can only grant an environmental permit for a landfill where it is satisfied that adequate financial provisions have been made by the operator.

4.192 The operator must be aware of costs over the whole life of the landfill installation. Adequate provision must be made for post-closure aftercare and for response to any unforeseen incidents. It is vital that the provisions reflect the long-term management requirements up until the point of completion and surrender.

4.193 Article 8(a)(iv) requires the operator to make financial provision to ensure that:

- the obligations (including after-care provisions) arising from the permit are discharged; and
- the financial provision is maintained until the permit is surrendered in accordance with the Regulations.

4.194 The Environment Agency already has standard mechanisms, taking account of the following objectives:

- adequate funding is secured for as long as a landfill presents a hazard to the environment to meet the operational obligations, including the post-closure costs; and
- this funding is available to a competent operator when required.

4.195 Article 8 (a) (iv) gives Member States the option not to apply the financial provision requirement to landfills for inert waste. This sentence should be ignored and the Environment Agency should require financial provision for landfills for inert waste (Schedule 10, paragraph 6(b) to the Regulations).

Waste management plans

4.196 Article 8(b) requires that the landfill project be in line with the relevant waste management plans referred to in Article 7 of the Waste Framework Directive. Reference should be made to the Guidance on the Waste Framework Directive.

Initial site inspection

4.197 The Environment Agency should inspect the landfill prior to the commencement of disposal operations both at the beginning of the life of the landfill and, where the landfill is engineered in discrete cells, for each newly engineered area (Article 8(c) and Schedule 10, paragraph 4 to the Regulations). This inspection should assess the landfill engineering but need not be restricted to this.

Content of the environmental permit – Article 9

4.198 The Environment Agency must ensure that the content of the environmental permit meets the requirements of Article 9 of the Landfill Directive (Schedule 10, paragraph 5(1) (e)).

4.199 The environmental permit must specify the landfill class and include a list of the waste types (in accordance with the List of Waste Regulations[22]). The permit must also specify the total amount of waste that can be deposited This will generally be in the form of a total volume based on the pre-settlement contours (Article 9(a) and (b)).

4.200 The environmental permit must include, either directly through permit conditions or by reference to controlled documents of the operator:

- requirements for preparing the landfill including landfill engineering;
- operational procedures;
- monitoring procedures;
- closure and aftercare procedures; and
- contingency plans in the event of the exceedance of a groundwater trigger level.

4.201 The environmental permit must include conditions requiring the operator to submit to the Environment Agency, at least once a year, reports of the waste types and quantities disposed of and the results of the monitoring programme. The Environment Agency may specify the form in which this information should be submitted (see paragraphs 4.205 to 4.210).

[22] The List of Wastes (England) Regulations 2005 (SI 2005 No. 895), or The List of Wastes (Wales) Regulations 2005 (SI 2005 No.1820) (W.148).

Cost of landfilling – Article 10

4.202 The operator of a landfill shall ensure (Article 10) that the charges it makes for the disposal of waste in its landfill covers all of the following:

- the costs of setting up and operating the landfill;
- the costs of the financial provision required by Article 8(a)(iv); and
- the estimated costs for the closure and after-care of the landfill site for a period of at least 30 years from its closure.

4.203 Operators must be aware of the cost of each element of the works and of the landform as a whole. This should include the costs of site assessment, operations, environmental control and monitoring, restoration and aftercare, as well as of the preparation and development works. Costs should be assessed in terms of the total costs, the costs expressed per tonne of waste, and costs against time over the whole life of the landfill.

4.204 The Environment Agency is not required to interfere directly with the commercial decisions of individual companies in applying the Article 10 provision. Operators of landfills are private sector companies who are performing this role for profit and are required separately to ensure that financial provision is in place to deal with the costs of closure and aftercare. It follows that the relevant costs will be met by the prices charged, including in-house sites where no specific charge for waste is made.

Monitoring – Article 12

4.205 The Directive requires that minimum standards for control and monitoring procedures are met (Article 12). Annex III to the Directive sets out these control and monitoring procedures for all classes of landfill during both the operational and after-care phases of site development.

4.206 Ongoing monitoring is an essential part of the risk assessment approach to landfill management. The environmental risk assessment will have identified receptors and pathways for which mitigation measures will have been incorporated in the landfill design. One of the objectives of monitoring is to determine whether the assumptions made in the environmental risk assessment were correct and whether the mitigation measures are performing to specification. Most of the impacts of a landfill are more difficult and expensive to remedy the longer they remain uncorrected.

4.207 Monitoring includes measurements undertaken for compliance purposes and those undertaken to assess landfill performance. Compliance is the process of complying with a regulatory standard (e.g. maximum leachate head). Under the Directive, the compliance level for groundwater quality is specifically termed a 'trigger level'. Assessment is the process of evaluating the significance of a departure from baseline conditions by reference to an adverse trend in data or the breach of a specified limit. Under the Directive, the assessment criterion for groundwater quality is specifically termed the 'control level'.

4.208 One specific area of monitoring covered by Annex III is data on the landfill body. This should include an assessment of the settlement behaviour of the landfill body based on the difference between subsequent topographical surveys. A calculation of the remaining capacity is required based on the difference between the pre-settlement contours and the topographical survey.

4.209 The Environment Agency should set out the monitoring requirements for the landfill in the conditions of the environmental permit. This should include the requirement to report specified information at least annually (Article 12(b)). The Environment Agency can specify the form in which the monitoring information must be supplied. This can include a comparison of the monitoring information against the assumptions made in the environmental risk assessment. This can help meet the purpose of Annex III in checking that the processes of the landfill are proceeding as they should and that the environmental protection systems are functioning as intended.

4.210 The Directive also requires the operator to notify the Environment Agency of any significant adverse environmental effects, as revealed by the control and monitoring programme, and to follow the decision of the Environment Agency on the corrective measures to be taken. With respect to groundwater, this determination should be made using the landfill's control and trigger levels.

Closure, aftercare and surrender – Article 13

4.211 The Directive sets out requirements for closure and aftercare procedures (Article 13).

4.212 The Environment Agency should include conditions in the environmental permit specifying the monitoring requirements for the aftercare phase. These must satisfy the requirements of Annex III. The operator must also be required to notify the Environment Agency of any significant adverse environmental effects (Article 13(c)).

4.213 The closure procedure for a landfill (or part of a landfill) can begin:

- when the conditions specified in the permit are satisfied;
- when the Environment Agency approves the initiation of the closure procedure following a request from the operator; or
- by reasoned decision of the Environment Agency.

4.214 A landfill cannot be considered to be definitely closed until the Environment Agency has inspected the site, considered a closure report and informed the operator of its approval. This applies equally to the closure of any part of a landfill.

4.215 As part of the closure procedure, the Environment Agency should consider modification of the permit to secure any necessary aftercare requirements. The permit should not allow any deposits of waste after definite closure, and a new permit application will be required for any proposals for such deposits.

Surrender

4.216 The Environment Agency must satisfy the requirements of Article 13(d) (Schedule 10, paragraph 11) when it determines an application to surrender the environmental permit.

4.217 It is important to note that at surrender, a site may not be suitable for all development. It simply confirms that the Environment Agency considers that additional or active control measures are unlikely to be required to prevent pollution or harm as a result of emissions from the undisturbed site. Development work which disturbs the contents of the site or which introduces a new receptor will not have formed part of that decision.

Existing landfill sites - Article 14

4.218 The Directive sets out requirements for existing landfill sites (Article 14).

4.219 Many of the transitional provisions of the Directive have been completed. For instance, in accordance with Article 14(a) and (b) the Environment Agency received conditioning plans in respect of about 900 existing landfills. The sites were subject to risk assessment and were repermitted in tranches according to the results of those risk assessments.

4.220 The provision of Article 14 that remains current is that any existing site must comply with all the requirements of the Directive by no later than 16 July 2009 (Article 14(c)). The only exception to this is the requirement relating to the location of the landfill since, for an existing site, the location is already determined.

4.221 The Environment Agency shall exercise its relevant functions under the Regulations to ensure that all existing sites meet the requirements of the Directive as soon as possible and no later than 16 July 2009.

4.222 The Environment Agency should ensure that existing landfills which cannot be brought into line with Directive requirements are closed down as soon as possible and cease to operate not later than 16 July 2009. The closure requirements of the Directive have been applied to all sites that closed after 16 July 2001.

4.223 An existing site would need to close where it is not possible to eliminate an unacceptable risk to the environment. With respect to the Groundwater Directive, an existing site would need to cease to accept waste where further deposits of waste would cause, exacerbate or hinder the remediation of a discharge contrary to the Groundwater Directive requirements.

4.224 Where it is necessary for an existing site to close on the basis of environmental risk, the closure notice should set out any remediation measures necessary to deal with that risk.

4.225 In determining when the existing landfill should close, the Environment Agency should give priority to protection of the environment and human health. The following issues will however have a bearing on how quickly the landfill can be closed.

4.226 Closure should take place as soon as an acceptable landform can be achieved. An acceptable landform will be one which is compatible with any remediation requirements such as capping and surface gradients. The operator should discuss any revision of the landform with the Waste Planning Authority and gain any necessary approvals.

4.227 Operators are expected to have financial plans for the restoration and aftercare of the landfill. An earlier than anticipated closure may leave a shortfall of funds for these purposes. In considering options for remediation

proposed by the operator, the Environment Agency could where necessary also consult the planning authority.

4.228 The Environment Agency should have regard to the equitable treatment of landfill operators and should also consider whether there are alternative outlets for the waste. The loss of any significant landfill is bound to impact on the local and regional waste strategy. An assessment of the scale and nature of the environmental impacts of early closure and the need to close due to compliance with the Directive should be discussed and documented with the Waste Planning Authority.

5. Other requirements

Application forms

5.1 The Environment Agency must ensure that any form it provides for environmental permit applications requires the applicant to provide the information specified in Article 7 of the Landfill Directive (Schedule 10, paragraph 3 to the Regulations). For IPPC landfills, the requirements of Article 6(1) of the IPPC Directive (on the content of applications) must also be met.

Closure

5.2 The Environment Agency must explain why any closure notice under Article 13(a) (iii) is being served and the notice must specify what steps must be taken and by when (Schedule 10, paragraph 10).

IPPC requirements

5.3 For IPPC landfills there are additional administrative requirements from the IPPC Directive. The Commission guidance[23] identifies these. They include substantial change, public participation and periodic reviews. Reference should be made to the guidance on Part A installations[24].

[23] Available at ec.europa.eu/environment/ippc/general_guidance.htm
[24] Available at www.defra.gov.uk/environment/policy/permits/guidance.htm

Annex 1 Schedule 10 to the Environmental Permitting Regulations

SCHEDULE 10

Regulation 35(2)(d)

Landfill

Application

1. This Schedule applies in relation to every landfill except a landfill which finally ceased to accept waste for disposal before 16th July 2001.

Interpretation: general

2.—(1) In this Schedule—

(a) unless otherwise provided, an expression that is defined in the Landfill Directive has the meaning given in that Directive;

(b) "the Decision" means Council Decision 2003/33/EC(**a**);

(c) "the Decision Annex" means the Annex to the Decision; and

(d) "landfill" has the meaning given in Article 2(g) of the Landfill Directive, but does not include any operation excluded from the scope of that Directive by Article 3(2).

(2) When interpreting the Landfill Directive and the Decision for the purposes of this Schedule—

(a) an expression that is defined in Part 1 of these Regulations has the meaning given in that Part;

(b) "landfill permit" means environmental permit;

(c) "nature protection zone" means any—

(i) site of special scientific interest within the meaning given in section 52 of the Wildlife and Countryside Act 1981(**b**), or

(ii) European site within the meaning given in regulation 10(1) of the Conservation (Natural Habitats, &c) Regulations 1994(**c**);

(d) "PAHs (polycyclic aromatic hydrocarbons)" means Napthalene, Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Coronene, Dibenzo(a,h)anthracene, Fluorene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene and Pyrene;

(e) "permit" means environmental permit;

(f) "SIC code" means the UK Standard Industrial Classification of Economic Activities 2007 (SIC 2007) published by the Office for National Statistics on 14th December 2007 and implemented on 1st January 2008(d); and

(g) the competent authority is the regulator.

Applications for the grant of an environmental permit

3. The regulator must require that every application for the grant of an environmental permit includes the information specified in Article 7 of the Landfill Directive.

(**a**) OJ No L 11, 16.1.2003, p 27.
(**b**) 1981 c. 69; the definition was inserted by the Countryside and Rights of Way Act 2000, section 75(1) and Schedule 9.

Inspection prior to operation

4. The regulator must inspect every landfill site so as to comply with the requirements in Article 8(c) of the Landfill Directive.

Exercise of relevant functions

5.—(1) The regulator must exercise its relevant functions so as to ensure compliance with the following provisions of the Landfill Directive—

(a) Article 4;

(b) Article 5(3) and (4);

(c) Article 6;

(d) Article 8;

(e) Article 9;

(f) Article 10;

(g) Article 11(1);

(h) Article 12;

(i) Article 13;

(j) Article 14.

(2) The regulator must exercise those relevant functions having regard to Article 1 of the Landfill Directive.

(3) The regulator must exercise those relevant functions so as to ensure compliance with the requirements imposed on the Member State by the following provisions of the Decision—

(a) Article 2;

(b) Article 3;

(c) Article 4.

Interpretation of the Landfill Directive for the exercise of relevant functions

6. When interpreting the Landfill Directive for the purposes of paragraph 5(1)—

(a) in Article 6(a), the words "This provision may not apply to" is to be read as "This provision does not apply to";

(b) in Article 8(a)(iv), ignore the last sentence;

(c) the last sentence of paragraph 2 of Annex I is to be read as "The above provisions do not apply to inert landfills."; and

(d) in paragraph 3(3) of Annex I, ignore the sentence immediately following the table headed "Leachate collection and bottom sealing".

(**c**) S.I. 1994/2716, amended by S.I. 2000/192. There are other amending instruments but none is relevant.
(**d**) ISBN: 0116216417.

Interpretation of the Decision Annex for the exercise of relevant functions: general

7. When interpreting the Decision Annex for the purposes of paragraph 5(3)—

(a) in points 1.1.1 and 1.2, the periods referred to as to be defined or determined by the Member State are in each case 2 years;

(b) point 1.1.2(b) is to be read as requiring the SIC code of the process producing the waste to be part of the information referred to;

(c) in point 1.1.2(g), ignore the words "in case of mirror entries";

(d) ignore the third sentence of section 2;

(e) in points 2.1.2.1, 2.2.2, 2.3.1 and 2.4.1 the table columns headed "L/S = 10 l/kg" must be used to determine limit values;

(f) in the table in point 2.1.2.2, the limit value for PAHs (polycyclic aromatic hydrocarbons) is set at 100 mg/kg;

(g) in point 2.2.3, the first reference to "gypsum-based materials" is to be read as "gypsum-based and other high sulphate-bearing materials";

(h) in point 2.3.3, the first reference to "suitable asbestos waste" is to be read as "suitable materials"; and

(i) in the table in point 2.4.1, the limit values are subject to the qualification that the regulator may include conditions in an environmental permit authorising limit values for specific parameters (other than Dissolved Organic Carbon) up to 3 times higher than those listed for specified wastes accepted at a landfill, taking into account the characteristics of the landfill and its surroundings and provided a risk assessment demonstrates that emissions (including leachate) from the landfill will present no additional risk to the environment.

Interpretation of the Decision Annex for the exercise of relevant functions: additional acceptance criteria relating to physical stability and bearing capacity of granular waste

8. When interpreting the Decision Annex for the purposes of paragraph 5(3)—

(a) in point 2.3.2, the criteria to ensure that granular waste will have sufficient physical stability and bearing capacity are that it has either—

(i) if it is cohesive waste, a mean in situ shear strength of at least 50kPa, or

(ii) if it is non-cohesive waste, an in situ bearing ratio of at least 5%;

(b) point 2.4.2 is to be read as if, in addition to the criteria listed, it requires the satisfaction of the criteria in paragraph (a)(i) and (a)(ii).

Interpretation of the Decision Annex for the exercise of relevant functions: additional acceptance criteria in relating to monolithic waste

9. When interpreting the Decision Annex for the purposes of paragraph 5(3)—

(a) point 2.3.1 is to be read as if, in addition to the criteria listed, it requires the satisfaction of the following criteria in relation to stable, non-reactive monolithic hazardous waste and non-hazardous waste which is to be landfilled in the same cell with such waste—

(i) it meets either—

(aa) the limit values for leaching set out in the table in point 2.3.1, or

(bb) the limit values for leaching set out in the following table—

Component	*Symbol*	*mg/m²*
Arsenic	As	1.3
Barium	Ba	45
Cadmium	Cd	0.2
Total Chromium	Cr_{total}	5
Copper	Cu	45
Mercury	Hg	0.1
Molybdenum	Mo	7
Nickel	Ni	6
Lead	Pb	6
Antimony	Sb	0.3
Selenium	Se	0.4
Zinc	Zn	30
Chloride	Cl^-	10,000
Fluoride	F^-	60
Sulphate	SO_4^{2-}	10,000
Dissolved Organic Carbon	DOC	Must be evaluated

(ii) it meets the additional criteria set out in the following table—

Parameter	*Value*
pH of the eluate from the monolith or crushed monolith	Must be evaluated
Electrical conductivity (μ S.cm-1m-2) of the eluate from the monolith or crushed monolith	Must be evaluated
Acid Neutralisation Capacity (ANC) of the crushed monolith	Must be evaluated

(iii) it has a mean unconfined compressive strength of at least 1Mpa after 28 days curing;

(iv) it has either—

(aa) dimensions of greater than 40cm along each side, or

(bb) a depth and fracture spacing when hardened of greater than 40cm; and

(v) where the waste was subjected to treatment to render it monolithic, prior to such treatment it met the following limit values—

(aa) loss on ignition of 10%, or

(bb) total organic carbon of 6%;

(b) point 2.4.1 in the Decision Annex is to be read as if, in addition to the criteria listed, it requires the satisfaction of the following criteria in relation to monolithic waste to be accepted at a landfill for hazardous waste—

(i) it complies with paragraphs (a)(ii) to (a)(v), and

(ii) it meets either—

(aa) the limit values for leaching set out in the table in point 2.4.1, or

(bb) the limit values for leaching set out in the following table—

Components	*Symbol*	*mg/m²* [1]
Arsenic	As	20
Barium	Ba	150
Cadmium	Cd	1
Total Chromium	Cr_{total}	25
Copper	Cu	60
Mercury	Hg	0.4
Molybdenum	Mo	20
Nickel	Ni	15
Lead	Pb	20
Antimony	Sb	2.5
Selenium	Se	5
Zinc	Zn	100
Chloride	Cl^-	20,000
Fluoride	F^-	200
Sulphate	SO_4^{2-}	20,000
Dissolved Organic Carbon	DOC	Must be evaluated

[1] The regulator may include conditions in an environmental permit authorising limit values for specific parameters (other than Dissolved Organic Carbon) up to 3 times higher for specified wastes accepted in a landfill, taking into account the characteristics of the landfill and its surroundings and provided a risk assessment demonstrates that emissions (including leachate) from the landfill will present no additional risk to the environment.

Closure of a landfill

10.—(1) The regulator must set out any reasoned decision under Article 13(a)(iii) of the Landfill Directive in a closure notice served on the operator.

(2) A closure notice must, in addition to stating the regulator's reasons for requiring initiation of the closure procedure, specify—

(a) the steps the operator is required to take to initiate the procedure; and

(b) the period within which they must be taken.

(3) The regulator may withdraw a closure notice at any time by further notice served on the operator.

(4) Closure of a landfill does not relieve the operator of liability under the conditions of the environmental permit.

Surrender applications

11. When determining an application for the surrender, in whole or in part, of an environmental permit, the regulator must exercise its functions so as to ensure the operator complies with the requirements in Article 13(d) of the Landfill Directive.

Annex 2 Landfill Directive

I

(Acts whose publication is obligatory)

COUNCIL DIRECTIVE 1999/31/EC

of 26 April 1999

on the landfill of waste

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130s(1) thereof,

Having regard to the proposal from the Commission [1],

Having regard to the opinion of the Economic and Social Committee [2],

Acting in accordance with the procedure laid down in Article 189c of the Treaty [3],

(1) Whereas the Council resolution of 7 May 1990 [4] on waste policy welcomes and supports the Community strategy document and invites the Commission to propose criteria and standards for the disposal of waste by landfill;

(2) Whereas the Council resolution of 9 December 1996 on waste policy considers that, in the future, only safe and controlled landfill activities should be carried out throughout the Community;

(3) Whereas the prevention, recycling and recovery of waste should be encouraged as should the use of recovered materials and energy so as to safeguard natural resources and obviate wasteful use of land;

(4) Whereas further consideration should be given to the issues of incineration of municipal and non-hazardous waste, composting, biomethanisation, and the processing of dredging sludges;

(5) Whereas under the polluter pays principle it is necessary, *inter alia*, to take into account any damage to the environment produced by a landfill;

(6) Whereas, like any other type of waste treatment, landfill should be adequately monitored and managed to prevent or reduce potential adverse effects on the environment and risks to human health;

(7) Whereas it is necessary to take appropriate measures to avoid the abandonment, dumping or uncontrolled disposal of waste; whereas, accordingly, it must be possible to monitor landfill sites with respect to the substances contained in the waste deposited there, whereas such substances should, as far as possible, react only in foreseeable ways;

(8) Whereas both the quantity and hazardous nature of waste intended for landfill should be reduced where appropriate; whereas the handling of waste should be facilitated and its recovery enhanced; whereas the use of treatment processes should therefore be encouraged to ensure that landfill is compatible with the objectives of this Directive; whereas sorting is included in the definition of treatment;

(9) Whereas Member States should be able to apply the principles of proximity and self-sufficiency for the elimination of their waste at Community and national level, in accordance with Council Directive 75/442/EEC of 15 July 1975 on waste [5] whereas the objectives of this Directive must be pursued and clarified through the establishment of an adequate, integrated network of disposal plants based on a high level of environmental protection;

(10) Whereas disparities between technical standards for the disposal of waste by landfill and the lower costs associated with it might give rise to increased disposal of waste in facilities with low standards of

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[1] OJ C 156, 24.5.1997, p. 10.
[2] OJ C 355, 21.11.1997, p. 4.
[3] Opinion of the European Parliament of 19 February 1998 (OJ C 80, 16.3.1998, p. 196), Council common position of 4 June 1998 (OJ C 333, 30.10.1998, p. 15) and Decision of the European Parliament of 3 February 1999 (OJ C 150, 28.5.1999, p. 78)
[4] OJ C 122, 18.5.1990, p. 2.
[5] OJ L 194, 25.7.1975, p. 39. Directive as last amended by Commission Decision 96/350/EC (OJ L 135, 6.6.1996, p. 32).

environmental protection and thus create a potentially serious threat to the environment, owing to transport of waste over unnecessarily long distances as well as to inappropriate disposal practices;

(11) Whereas it is therefore necessary to lay down technical standards for the landfill of waste at Community level in order to protect, preserve and improve the quality of the environment in the Community;

(12) Whereas it is necessary to indicate clearly the requirements with which landfill sites must comply as regards location, conditioning, management, control, closure and preventive and protective measures to be taken against any threat to the environment in the short as well as in the long-term perspective, and more especially against the pollution of groundwater by leachate infiltration into the soil;

(13) Whereas in view of the foregoing it is necessary to define clearly the classes of landfill to be considered and the types of waste to be accepted in the various classes of landfill;

(14) Whereas sites for temporary storage of waste should comply with the relevant requirements of Directive 75/442/EEC;

(15) Whereas the recovery, in accordance with Directive 75/442/EEC, of inert or non-hazardous waste which is suitable, through their use in redevelopment/restoration and filling-in work, or for construction purposes may not constitute a landfilling activity;

(16) Whereas measures should be taken to reduce the production of methane gas from landfills, *inter alia*, in order to reduce global warming, through the reduction of the landfill of biodegradable waste and the requirements to introduce landfill gas control;

(17) Whereas the measures taken to reduce the landfill of biodegradable waste should also aim at encouraging the separate collection of biodegradable waste, sorting in general, recovery and recycling;

(18) Whereeas, because of the particular features of the landfill method of waste disposal, it is necessary to introduce a specific permit procedure for all classes of landfill in accordance with the general licensing requirements already set down in Directive 75/442/EEC and the general requirements of Directive 96/61/EC concerning integrated pollution prevention and control [1] whereas the landfill site's compliance with such a permit must be verified in the course of an inspection by the competent authority before the start of disposal operations;

(19) Whereas, in each case, checks should be made to establish whether the waste may be placed in the landfill for which it is intended, in particular as regards hazardous waste;

(20) Whereas, in order to prevent threats to the environment, it is necessary to introduce a uniform waste acceptance procedure on the basis of a classification procedure for waste acceptable in the different categories of landfill, including in particular standardised limit values; whereas to that end a consistent and standardised system of waste characterisation, sampling and analysis must be established in time to facilitate implementation of this Directive; whereas the acceptance criteria must be particularly specific with regard to inert waste;

(21) Whereas, pending the establishment of such methods of analysis or of the limit values necessary for characterisation, Member States may for the purposes of this Directive maintain or draw up national lists of waste which is acceptable or unacceptable for landfill, or define criteria, including limit values, similar to those laid down in this Directive for the uniform acceptance procedure;

(22) Whereas for certain hazardous waste to be accepted in landfills for non-hazardous waste acceptance criteria should be developed by the technical committee;

(23) Whereas it is necessary to establish common monitoring procedures during the operation and after-care phases of a landfill in order to indentify any possible adverse environmental effect of the landfill and take the appropriate corrective measures;

(24) Whereas it is necessary to define when and how a landfill should be closed and the obligations and responsibility of the operator on the site during the after-care period;

(25) Whereas landfill sites that have been closed prior to the date of transposition of this Directive should not be suject to its provisions on closure procedure;

(26) Whereas the future conditions of operation of existing landfills should be regulated in order to take the necessary measures, within a specified period of time, for their adaptation to this Directive on the basis of a site-conditioning plan;

[1] OJ L 257, 10.10.1996, p. 26.

(27) Whereas for operators of existing landfills having, in compliance with binding national rules equivalent to those of Article 14 of this Directive, already submitted the documentation referred to in Article 14(a) of this Directive prior to its entry into force and for which the competent authority authorised the continuation of their operation, there is no need to resubmit this documentation nor for the competent authority to deliver a new authorisation;

(28) Whereas the operator should make adequate provision by way of a financial security or any other equivalent to ensure that all the obligations flowing from the permit are fulfilled, including those relating to the closure procedure and after-care of the site;

(29) Whereas measures should be taken to ensure that the price charged for waste disposal in a landfill cover all the costs involved in the setting up and operation of the facility, including as far as possible the financial security or its equivalent which the site operator must provide, and the estimated cost of closing the site including the necessary after-care;

(30) Whereas, when a competent authority considers that a landfill is unlikely to cause a hazard to the environment for longer than a certain period, the estimated costs to be included in the price to be charged by an operator may be limited to that period;

(31) Whereas it is necessary to ensure the proper application of the provisions implementing this Directive throughout the Community, and to ensure that the training and knowledge acquired by landfill operators and staff afford them the necessary skills;

(32) Whereas the Commission must establish a standard procedure for the acceptance of waste and set up a standard classification of waste acceptable in a landfill in accordance with the committee procedure laid down in Article 18 of Directive 75/442/EEC;

(33) Whereas adaptation of the Annexes to this Directive to scientific and technical progress and the standardisation of the monitoring, sampling and analysis methods must be adopted under the same committee procedure;

(34) Whereas the Member States must send regular reports to the Commission on the implementation of this Directive paying particular attention to the national strategies to be set up in pursuance of Article 5; whereas on the basis of these reports the Commission shall report to the European Parliament and the Council;

HAS ADOPTED THIS DIRECTIVE

Article 1

Overall objective

1. With a view to meeting the requirements of Directive 75/442/EEC, and in particular Articles 3 and 4 thereof, the aim of this Directive is, by way of stringent operational and technical requirements on the waste and landfills, to provide for measures, procedures and guidance to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk to human health, from landfilling of waste, during the whole life-cycle of the landfill.

2. In respect of the technical characteristics of landfills, this Directive contains, for those landfills to which Directive 96/61/EC is applicable, the relevant technical requirements in order to elaborate in concrete terms the general requirements of that Directive. The relevant requirements of Directive 96/61/EC shall be deemed to be fulfilled if the requirements of this Directive are complied with.

Article 2

Definitions

For the purposes of this Directive:

(a) '*waste*' means any substance or object which is covered by Directive 75/442/EEC;

(b) '*municipal waste*' means waste from households, as well as other waste which, because of its nature or composition, is similar to waste from household;

(c) '*hazardous waste*' means any waste which is covered by Article 1(4) of Council Directive 91/689/EEC of 12 December 1991 on hazardous waste [1]

(d) '*non-hazardous waste*' means waste which is not covered by paragraph (c);

(e) '*inert waste*' means waste that does not undergo any significant physical, chemical or biological transformations. Inert waste will not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health. The total leachability and pollutant content of the waste and the ecotoxicity of the leachate must be insignificant, and in particular not endanger the quality of surface water and/or groundwater;

[1] OJ L 377, 31.12.1991, p. 20. Directive as last amended by Directive 94/31/EC (OJ L 168, 2.7.1994, p. 28);

(f) '*underground storage*' means a permanent waste storage facility in a deep geological cavity such as a salt or potassium mine;

(g) '*landfill*' means a waste disposal site for the deposit of the waste onto or into land (i.e. underground), including:

— internal waste disposal sites (i.e. landfill where a producer of waste is carrying out its own waste disposal at the place of production), and

— a permanent site (i.e. more than one year) which is used for temporary storage of waste,

but excluding:

— facilities where waste is unloaded in order to permit its preparation for further transport for recovery, treatment or dispsal elsewhere, and

— stoarage of waste prior to recovery or treatment for a period less than three years as a general rule, or

— storage of waste prior to disposal for a period less than one year;

(h) '*treatment*' means the physical, thermal, chemical or biological processes, including sorting, that change the characteristics of the waste in order to reduce its volume or hazardous nature, facilitate its handling or enhance recovery;

(i) '*leachate*' means any liquid percolating through the deposited waste and emitted from or contained within a landfill;

(j) '*landfill gas*' means all the gases generated from the landfilled waste;

(k) '*eluate*' means the solution obtained by a laboratory leaching test;

(l) '*operator*' means the natural or legal person responsible for a landfill in accordance with the internal legislation of the Member State where the landfill is located; this person may change from the preparation to the after-care phase;

(m) '*biodegradable waste*' means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard;

(n) '*holder*' means the producer of the waste or the natural or legal person who is in possession of it;

(o) '*applicant*' means any person who applies for a landfill permit under this Directive;

(p) '*competent authority*' means that authority which the Member States designate as responsible for performing the duties arising from this Directive;

(q) '*liquid waste*' means any waste in liquid form including waste waters but excluding sludge;

(r) '*isolated settlement*' means a settlement:

— with no more than 500 inhabitants per municipality or settlement and no more than five inhabitants per square kilometre and,

— where the distance to the nearest urban agglomeration with at least 250 inhabitants per square kilometre is not less than 50 km, or with difficult access by road to those nearest agglomerations, due to harsh meteorological conditions during a significant part of the year.

Article 3

Scope

1. Member States shall apply this Directive to any landfill as defined in Article 2(g).

2. Without prejudice to existing Community legislation, the following shall be excluded from the scope of this Directive:

— the spreading of sludges, including sewage sludges, and sludges resulting from dredging operations, and similar matter on the soil for the purposes of fertilisation or improvement,

— the use of inert waste which is suitable, in redevelopment/restoration and filling-in work, or for construction purposes, in landfills,

— the deposit of non-hazardous dredging sludges alongside small waterways from where they have been dredged out and of non-hazardous sludges in surface water including the bed and its sub soil,

— the deposit of unpolluted soil or of non-hazardous inert waste resulting from prospecting and extraction, treatment, and storage of mineral resources as well as from the operation of quarries.

3. Without prejudice to Directive 75/442/EEC Member States may declare at their own option, that the deposit of non-hazardous waste, to be defined by the committee established under Article 17 of this Directive, other than inert waste, resulting from prospecting and extraction, treatment and storage of mineral resources as well as from the operation of quarries and which are deposited in a manner preventing environmental pollution or harm to human health, can be exempted from the provisions in Annex I, points 2, 3.1, 3.2 and 3.3 of this Directive.

4. Without prejudice to Directive 75/442/EEC Member States may declare, at their own option, parts or all of Articles 6(d), 7(i), 8(a)(iv), 10, 11(1)(a), (b) and (c), 12(a) and (c), Annex I, points 3 and 4, Annex II (except point 3, level 3, and point 4) and Annex III, points 3 to 5 to this Directive not applicable to:

(a) landfill sites for non-hazardous or inert wastes with a total capacity not exceeding 15 000 tonnes or with an annual intake not exceeding 1 000 tonnes serving islands, where this is the only landfill on the island and where this is exclusively destined for the disposal of waste generated on that island. Once the total capacity of that landfill has been used, any new landfill site established on the island shall comply with the requirements of this Directive;

(b) landfill sites for non-hazardous or inert waste in isolated settlements if the landfill site is destined for the disposal of waste generated only by that isolated settlement.

Not later than two years after the date laid down in Article 18(1), Member States shall notify the Commission of the list of islands and isolated settlements that are exempted. The Commission shall publish the list of islands and isolated settlements.

5. Without prejudice to Directive 75/442/EEC Member States may declare, at their own option, that underground storage as defined in Article 2(f) of this Directive can be exempted from the provisions in Article 13(d) and in Annex I, point 2, except first indent, points 3 to 5 and in Annex III, points 2, 3 and 5 to this Directive.

Article 4

Classes of landfill

Each landfill shall be classified in one of the following classes:

— landfill for hazardous waste,

— landfill for non-hazardous waste,

— landfill for inert waste.

Article 5

Waste and treatment not acceptable in landfills

1. Member States shall set up a national strategy for the implementation of the reduction of biodegradable waste going to landfills, not later than two years after the date laid down in Article 18(1) and notify the Commission of this strategy. This strategy should include measures to achieve the targets set out in paragraph 2 by means of in particular, recycling, composting, biogas production or materials/energy recovery. Within 30 months of the date laid down in Article 18(1) the Commission shall provide the European Parliament and the Council with a report drawing together the national strategies.

2. This strategy shall ensure that:

(a) not later than five years after the date laid down in Article 18(1), biodegradable municipal waste going to landfills must be reduced to 75 % of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data is available

(b) not later than eight years afte the date laid down in Article 18(1), biodegradable municipal waste going to landfills must be reduced to 50 % of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which stadardised Eurostat data is available;

(c) not later than 15 years after the date laid down in Article 18(1), biodegradable municipal waste going to landfills must be reduced to 35 % of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the lates year before 1995 for which standardised Eurostat data is available.

Two years before the date referred to in paragraph (c) the Council shall reexamine the above target, on the basis of a report from the Commission on the practical experience gained by Member States in the pursuance of the targets laid down in paragraphs (a) and (b) accompanied, if appropriate, by a proposal with a view to confirming or amending this target in order to ensure a high level of environmental protection.

Member States which in 1995 or the latest year before 1995 for which standardised EUROSTAT data is available put more than 80 % of their collected municipal waste to landfill may postpone the attainment of the targets set out in paragraphs (a), (b), or (c) by a period not exceeding four years. Member States intending to make use of this provision shall inform in advance the Commission of their decision. The Commission shall inform other Member States and the European Parliament of these decisions.

The implementation of the provisions set out in the preceding subparagraph may in no circumstances lead to the attainment of the target set out in paragraph (c) at a date later than four years after the date set out in paragraph (c).

3. Member States shall take measures in order that the following wastes are not accepted in a landfill:

(a) liquid waste;

(b) waste which, in the conditions of landfill, is explosive, corrosive, oxidising, highly flammable or flammable, as defined in Annex III to Directive 91/689/EEC;

(c) hospital and other clinical wastes arising from medical or veterinary establishments, which are infectious as defined (property H9 in Annex III) by Directive 91/689/EEC and waste falling within category 14 (Annex I.A) of that Directive.

(d) whole used tyres from two years from the date laid down in Article 18(1), excluding tyres used as engineering material, and shredded used tyres five years from the date laid down in Article 18(1) (excluding in both instances bicylce tyres and tyres with an outside diameter above 1 400 mm);

(e) any other type of waste which does not fulfil the acceptance criteria determined in accordance with Annex II.

4. The dilution of mixture of waste solely in order to meet the waste acceptance criteria is prohibited.

Article 6

Waste to be accepted in the different classes of landfill

Member States shall take measures in order that:

(a) only waste that has been subject to treatment is landfilled. This provision may not apply to inert waste for which treatment is not technically feasible, nor to any other waste for which such treatment does not contribute to the objectives of this Directive, as set out in Article 1, by reducing the quantity of the waste or the hazards to human health or the environment;

(b) only hazardous waste that fulfils the criteria set out in accordance with Annex II is assigned to a hazardous landfill;

(c) landfill for non-hazardous waste may be used for:

(i) municipal waste;

(ii) non-hazardous waste of any other origin, which fulfil the criteria for the acceptance of waste at landfill for non-hazardous waste set out in accordance with Annex II;

(iii) stable, non-reactive hazardous wastes (e.g. solidified, vitrified), with leaching behaviour equivalent to those of the non-hazardous wastes referred to in point (ii), which fulfil the relevant acceptance criteria set out in accordance with Annex II. These hazarouds wastes shall not be deposited in cells destined for biodegradable non-hazardous waste,

(d) inert waste landfill sites shall be used only for inert waste.

Article 7

Application for a permit

Member States shall take measures in order that the application for a landfill permit must contain at least particulars of the following:

(a) the identity of the applicant and of the operator when they are different entities;

(b) the description of the types and total quantity of waste to be deposited;

(c) the proposed capacity of the disposal site;

(d) the description of the site, including its hydrogeological and geological characteristics;

(e) the proposed methods for pollution prevention and abatement;

(f) the proposed operation, monitoring and control plan;

(g) the proposed plan for the closure and after-care procedures;

(h) where an impact assessment is required under Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment [1], the information provided by the developer in accordance with Article 5 of that Directive;

(i) the financial security by the applicant, or any other equivalent provision, as required under Article 8(a)(iv) of this Directive.

Following a successful application for a permit, this information shall be made available to the competent national and Community statistical authorities when requested for statistical purposes.

Article 8

Conditions of the permit

Member States shall take measures in order that:

(a) the competent authority does not issue a landfill permit unless it is satisfied that:

(i) without prejudice to Article 3(4) and (5), the landfill project complies with all the relevant requirements of this Directive, including the Annexes;

[1] OJ L 175, 5.7.1985, p. 40. Directive as amended by Directive 97/11/EC (OJ L 73, 14.3.1997, p. 5).

(ii) the management of the landfill site will be in the hands of a natural person who is technically competent to manage the site; professional and technical development and training of landfill operators and staff are provided;

(iii) the landfill shall be operated in such a manner that the necessary measures are taken to prevent accidents and limit their consequences;

(iv) adequate provisions, by way of a 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 the 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 the closure 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). Member States may declare, at their own option, that this point does not apply to landfills for inert waste;

(b) the landfill project is in line with the relevant waste management plan or plans referred to in Article 7 of Directive 75/442/EEC;

(c) prior to the commencement of disposal operations, the competent authority shall inspect the site in order to ensure that it complies with the relevant conditions of the permit. This will not reduce in any way the responsibility of the operator under the conditions of the permit.

Article 9

Content of the permit

Specifying and supplementing the provisions set out in Article 9 of Directive 75/442/EEC and Article 9 of Directive 96/61/EC, the landfill permit shall state at least the following:

(a) the class of the landfill;

(b) the list of defined types and the total quantity of waste which are authorised to be deposited in the landfill;

(c) requirements for the landfill preparations, landfilling operations and monitoring and control procedures, including contingency plans (Annex III, point 4.B), as well as provisional requirements for the closure and after-care operations;

(d) the obligation on the applicant to report at least annually to the competent authority on the types and quantities of waste disposed of and on the results of the monitoring programme as required in Articles 12 and 13 and Annex III.

Article 10

Cost of the landfill of waste

Member States shall take measures to ensure that all of the costs involved in the setting up and operation of a landfill site, including as far as possible the cost of the financial security or its equivalent referred to in Article 8(a)(iv), and the estimated costs of the closure and after-care of the site for a period of at least 30 years shall be covered by the price to be charged by the operator for the disposal of any type of waste in that site. Subject to the requirements of Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment [1]Member States shall ensure transparency in the collection and use of any necessary cost information.

Article 11

Waste acceptance procedures

1. Member States shall take measures in order that prior to accepting the waste at the landfill site:

(a) before or at the time of delivery, or of the first in a series of deliveries, provided the type of waste remains unchanged, the holder or the operator can show, by means of the appropraite documentation, that the waste in question can be accepted at that site according to the conditions set in the permit, and that it fulfils the acceptance criteria set out in Annex II;

(b) the following reception procedures are respected by the operator:

— checking of the waste documentation, including those documents required by Article 5(3) of Directive 91/689/EEC and, where they apply, those required by Council Regulation (EEC) No 259/93 of 1 February 1993 on the supervision and control of shipments of waste within, into and out of the European Community [2];

— visual inspection of the waste at the entrance and at the point of deposit and, as appropriate, verification of conformity with the description provided in the documentation submitted by the holder. If representative samples have to be taken in order to implement Annex II, point 3, level 3, the results of the analyses shall be kept and the sampling shall be made in conformity with Annex II, point 5. These samples shall be kept at least one month;

— keeping a register of the quantities and characteristics of the waste deposited, indicating origin, date of delivery, identity of the producer or collector in the case of municipal waste, and, in the case of hazardous

[1] OJ L 158, 23.6.1990, p. 56.
[2] OJ L 30, 6.2.1993, p. 1. Regulation as amended by Regulation (EC) No 120/97 (OJ L 22, 24.1.1997, p. 14).

waste, the precise location on the site. This information shall be made available to the competent national and Community statistical authorities when requested for statistical purposes;

(c) the operator of the landfill shall always provide written acknowledgement of receipt of each delivery acepted on the site;

(d) without prejudice to the provisions of Regulation (EEC) No 259/93, if waste is not accepted at a landfill the operator shall notify without delay the competent authority of the non-acceptance of the waste.

2. For landfill sites which have been exempted from provisions of this Directive by virtue of Article 3(4) and (5), Member States shall take the necessary measures to provide for:

— regular visual inspection of the waste at the point of deposit in order to ensure that only non-hazardous waste from the island or the isolated settlement is accepted at the site; and

— a register on the quantities of waste that are deposited at the site be kept.

Member States shall ensure that information on the quantities and, where possible, the type of waste going to such exempted sites forms part of the regular reports to the Commission on the implementation of the Directive.

Article 12

Control and monitoring procedures in the operational phase

Member States shall take measures in order that control and monitoring procedures in the operational phase meet at least the following requirements:

(a) the operator of a landfill shall carry out during the operational phase a control and monitoring programme as specified in Annex III;

(b) the operator shall notify the competent authority of any significant adverse environmental effects revealed by the control and monitoring procedures and follow the decision of the competent authority on the nature and timing of the corrective measures to be taken. These measures shall be undertaken at the expense of the operator.

At a frequency to be determined by the competent authority, and in any event at least once a year, the operator shall report, on the basis of aggregated data, all monitoring results to the competent authorities for the purpose of demonstrating compliance with permit conditions and increasing the knowledge on waste behaviour in the landfills;

(c) the quality control of the analytical operations of the control and monitoring procedures and/or of the analyses referred to in Article 11(1)(b) are carried out by competent laboratories.

Article 13

Closure and after-care procedures

Member States shall take measures in order that, in accordance, where appropriate, with the permit:

(a) a landfill or part of it shall start the closure procedure:

(i) when the relevant conditions stated in the permit are met; or

(ii) under the authorisation of the competent authority, at the request of the operator; or

(iii) by reasoned decision of the competent authority;

(b) a landfill or part of it may only be considered as definitely closed after the competent authority has carried out a final on-site inspection, has assessed all the reports submitted by the operator and has communicated to the operator its approval for the closure. This shall not in any way reduce the responsibility of the operator under the conditions of the permit;

(c) after a landfill has been definitely closed, the operator shall be responsible for its maintenance, monitoring and control in the after-care phase for as long as may be required by the competent authority, taking into account the time during which the landfill could present hazards.

The operator shall notify the competent authority of any significant adverse environmental effects revealed by the control procedures and shall follow the decision of the competent authority on the nature and timing of the corrective measures to be taken;

(d) for as long as the competent authority considers that a landfill is likely to cause a hazard to the environment and without prejudice to any Community or national legislation as regards liability of the waste holder, the operator of the site shall be responsible for monitoring and analysing landfill gas and leachate from the site and the groundwater regime in the vicinity of the site in accordance with Annex III.

Article 14

Existing landfill sites

Member States shall take measures in order that landfills which have been granted a permit, or which are already in operation at the time of transposition of this Directive, may not continue

to operate unless the steps outlined below are accomplished as soon as possible and within eight years after the date laid down in Article 18(1) at the latest:

(a) with a period of one year after the date laid down in Article 18(1), the operator of a landfill shall prepare and present to the competent authorities, for their approval, a conditioning plan for the site including the particulars listed in Article 8 and any corrective measures which the operator considers will be needed in order to comply with the requirements of this Directive with the exception of the requirements in Annex I, point 1;

(b) following the presentation of the conditioning plan, the competent authorities shall take a definite decision on whether operations may continue on the basis of the said conditioning plan and this Directive. Member States shall take the necessary measures to close down as soon as possible, in accordance with Article 7(g) and 13, sites which have not been granted, in accordance with Article 8, a permit to continue to operate;

(c) on the basis of the approved site-conditioning plan, the competent authority shall authorise the necessary work and shall lay down a transitional period for the completion of the plan. Any existing landfill shall comply with the requirements of this Directive with the exception of the requirements in Annex I, point 1 within eight years after the date laid down in Article 18(1);

(d) (i) within one year after the date laid down in Article 18(1), Articles 4, 5, and 11 and Annex II shall apply to landfills for hazardous waste;

(ii) within three years after the date laid down in Article 18(1), Article 6 shall apply to landfills for hazardous waste.

Article 15

Obligation to report

At intervals of three years Member States shall send to the Commission a report on the implementation of this Directive, paying particular attention to the national strategies to be set up in pursuance of Article 5. The report shall be drawn up on the basis of a questionnaire or outline drafted by the Commission in accordance with the procedure laid down in Article 6 of Directive 91/692/EEC [1] The questionnaire or outline shall be sent to Member States six months before the start of the period covered by the report. The report shall be sent to the Commission within nine months of the end of the three-year period covered by it.

The Commission shall publish a Community report on the implementation of this Directive within nine months of receiving the reports from the Member States.

[1] OJ L 377, 31.12.1991, p. 48.

Article 16

Committee

Any amendments necessary for adapting the Annexes to this Directive to scientific and technical progress and any proposals for the standardisation of control, sampling and analysis methods in relation to the landfill of waste shall be adopted by the Commission, assisted by the Committee established by Article 18 of Directive 75/442/EEC and in accordance with the procedure set out in Article 17 of this Directive. Any amendments to the Annexes shall only be made in line with the principles laid down in this Directive as expressed in the Annexes. To this end, as regards Annex II, the following shall be observed by the Committee: taking into account the general principles and general procedures for testing and acceptance criteria as set out in Annex II, specific criteria and/or test methods and associated limit values should be set for each class of landfill, including if necessary specific types of landfill within each class, including underground storage. Proposals for the standardisation of control, sampling and analysis methods in relation to the Annexes of this Directive shall be adopted by the Commission, assisted by the Committee, within two years after the entry into force of this Directive.

The Commission, assisted by the Committee, will adopt provisions for the harmonisation and regular transmission of the statistical date referred to in Articles 5, 7 and 11 of this Directive, within two years after the entry into force of this Directive, and for the amendments of such provisions when necessary.

Article 17

Committee procedure

The Commission shall be assisted by a Committee composed of the representatives of the Member States and chaired by the representative of the Commission.

The representative of the Commission shall submit to the Committee a draft of the measures to be taken. The Committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148(2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the Committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the Committee.

If the measures envisaged are not in accordance with the opinion of the Committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

If on the expiry of a period of three months from the date of referral to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

Article 18

Transposition

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive not later than two years after its entry into force. They shall forthwith inform the Commission thereof.

When Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such a reference shall be laid down by Member States.

2. Member States shall communicate the texts of the provisions of national law which they adopt in the field covered by this Directive to the Commission.

Article 19

Entry into force

This Directive will enter into force on the day of its publication in the *Official Journal of the European Communities*.

Article 20

Addressees

This Directive is addressed to the Member States.

Done at Luxembourg, 26 April 1999.

For the Council

The President

J. FISCHER

ANNEX I

GENERAL REGUIREMENTS FOR ALL CLASSES OF LANDFILLS

1. Location

1.1. The location of a landfill must take into consideration requirements relating to:

(a) the distances from the boundary of the site to residential and recreation areas, waterways, water bodies and other agricultural or urban sites;

(b) the existence of groundwater, coastal water or nature protection zones in the area;

(c) the geological and hydrogeological conditions in the area;

(d) the risk of flooding, subsidence, landslides or avalanches on the site;

(e) the protection of the nature or cultural patrimony in the area.

1.2. The landfill can be authorised only if the characteristics of the site with respect to the abovementioned requirements, or the corrective measures to be taken, indicate that the landfill does not pose a serious environmental risk.

2. Water control and leachate management

Appropriate measures shall be taken, with respect to the characteristics of the landfill and the meteorological conditions, in order to:

— control water from precipitations entering into the landfill body,

— prevent surface water and/or groundwater from entering into the landfilled waste,

— collect contaminated water and leachate. If an assessment based on consideration of the location of the landfill and the waste to be accepted shows that the landfill poses no potential hazard to the environment, the competent authority may decide that this provision does not apply,

— treat contaminated water and leachate collected from the landfill to the appropriate standard required for their discharge.

The above provisions may not apply to landfills for inert waste.

3. Protection of soil and water

3.1. A landfill must be situated and designed so as to meet the necessary conditions for preventing pollution of the soil, groundwater or surface water and ensuring efficient collection of leachate as and when required according to Section 2. Protection of soil, groundwater and surface water is to be achieved by the combination of a geological barrier and a bottom liner during the operational/active phase and by the combination of a geological barrier and a bottom liner during the operational/active phase and by the combination of a geological barrier and a top liner during the passive phase/post closure.

3.2. The geological barrier is determined by geological and hydrogeological conditions below and in the vicinity of a landfill site providing sufficient attenuation capacity to prevent a potential risk to soil and groundwater.

The landfill base and sides shall consist of a mineral layer which satisfies permeability and thickness requirements with a combined effect in terms of protection of soil, groundwater and surface water at least equivalent to the one resulting from the following requirements:

— landfill for hazardous waste: $K \leq 1{,}0 \times 10^{-9}$ m/s; thickness ≥ 5 m,

— landfill for non-hazardous waste: $K \leq 1{,}0 \times 10^{-9}$ m/s; thickness ≥ 1 m,

— landfill for inert waste: $K \leq 1{,}0 \times 10^{-7}$ m/s; thickness ≥ 1 m,

m/s: meter/second.

Where the geological barrier does not naturally meet the above conditions it can be completed artificially and reinforced by other means giving equivalent protection. An artificially established geological barrier should be no less than 0,5 metres thick.

3.3. In addition to the geological barrier described above a leachate collection and sealing system must be added in accordance with the following principles so as to ensure that leachate accumulation at the base of the landfill is kept to a minimum:

Leachate collection and bottom sealing

Landfill category	non hazardous	hazardous
Artificial sealing liner	required	required
Drainage layer ≥ 0,5 m	required	required

Member States may set general or specific requirements for inert waste landfills and for the characteristics of the abovementioned technical means.

If the competent authority after a consideration of the potential hazards to the environment finds that the prevention of leachate formation is necessary, a surface sealing may be prescribed. Recommendations for the surface sealing are as follows:

Landfill category	non hazardous	hazardous
Gas drainage layer	required	not required
Artificial sealing liner	not required	required
Impermeable mineral layer	required	required
Drainage layer > 0,5 m	required	required
Top soil cover > 1 m	required	required.

3.4. If, on the basis of an assessment of environmental risks taking into account, in particular, Directive 80/68/EEC [1], the competent authority has decided, in accordance with Section 2 ('Water control and leachate management'), that collection and treatment of leachate is not necessary or it has been established that the landfill poses no potential hazard to soil, groundwater or surface water, the requirements in paragraphs 3.2 and 3.3 above may be reduced accordingly. In the case of landfills for inert waste these requirements may be adapted by national legislation.

3.5. The method to be used for the determination of the permeability coefficient for landfills, in the field and for the whole extension of the site, is to be developed and approved by the Committee set up under Article 17 of this Directive.

4. **Gas control**

4.1. Appropriate measures shall be taken in order to control the accumulation and migration of landfill gas (Annex III).

4.2. Landfill gas shall be collected from all landfills receiving biodegradable waste and the landfill gas must be treated and used. If the gas collected cannot be used to produce energy, it must be flared.

4.3. The collection, treatment and use of landfill gas under paragraph 4.2 shall be carried on in a manner which minimises damage to or deterioration of the environment and risk to human health.

[1] OJ L 20, 26.1.1980, p. 43. Directive as last amended by Directive 91/692/EEC (OJ L 377, 31.12.1991, p. 48).

5. **Nuisances and hazards**

Measures shall be taken to minimise nuisances and hazards arising from the landfill through:

— emissions of odours and dust,

— wind-blown materials,

— noise and traffic,

— birds, vermin and insects,

— formation and aerosols,

— fires.

The landfill shall be equipped so that dirt originating from the site is not dispersed onto public roads and the surrounding land.

6. **Stability**

The emplacement of waste on the site shall take place in such a way as to ensure stability of the mass of waste and associated structures, particularly in respect of avoidance of slippages. Where an artificial barrier is established it must be ascertained that the geological substratum, considering the morphology of the landfill, is sufficiently stable to prevent settlement that may cause damage to the barrier.

7. **Barriers**

The landfill shall be secured to prevent free access to the site. The gates shall be locked outside operating hours. The system of control and access to each facility should contain a programme of measures to detect and discourage illegal dumping in the facility.

ANNEX II

WASTE ACCEPTANCE CRITERIA AND PROCEDURES

1. Introduction

This Annex describes:

— general principles for acceptance of waste at the various classes of landfills. The future waste classification procedure should be based on these principles,

— guidelines outlining preliminary waste acceptance procedures to be followed until a uniform waste classification and acceptance procedure has been developed. This procedure will, together with the relevant sampling procedures, be developed by the technical Committee referred to in Article 16 of this Directive. The technical Committee shall develop criteria which have to be fulfilled for certain hazardous waste to be accepted in landfills for non-hazardous waste. These criteria should, in particular, take into account the short, medium and long term leaching behaviour of such waste. These criteria shall be developed within two years of the entry into force of this Directive. The technical Committee shall also develop criteria which have to be fulfilled for waste to be accepted in underground storage. These criteria must take into account, in particular, that the waste is not to be expected to react with each other and with the rock.

This work by the technical Committee, with the exception of proposals for the standardisation of control, sampling and analysis methods in relation to the Annexes of this Directive which shall be adopted within two years after the entry into force of this Directive, shall be completed within three years from the entry into force of this Directive and must be carried out having regard to the objectives set forth in Article 1 of this Directive.

2. General principles

The composition, leachability, long-term behaviour and general properties of a waste to be landfilled must be known as precisely as possible. Waste acceptance at a landfill can be based either on lists of accepted or refused waste, defined by nature and origin, and on waste analysis methods and limit values for the properties of the waste to be accepted. The future waste acceptance procedures described in this Directive shall as far as possible be based on standardised waste analysis methods and limit values for the properties of waste to be accepted.

Before the definition of such analysis methods and limit values, Member States should at least set national lists of waste to be accepted or refuses at each class of landfill, or defined the criteria required to be on the lists. In order to be accepted at a particular class of landfill, a type of waste must be on the relevant national list or fulfil criteria similar to those required to be on the list. These lists, or the equivalent criteria, and the analysis methods and limit values shall be sent to the Commission within six months of the transposition of this Directive or whenever they are adopted at national level.

These lists or acceptance criteria should be used to establish site specific lists, i.e. the list of accepted waste specified in the permit in accordance with Article 9 of this Directive.

The criteria for acceptance of waste on the reference lists or at a class of landfill may be based on other legislation and/or on waste properties.

Criteria for acceptance at a specific class of landfill must be derived from considerations pertaining to:

— protection of the surrounding environment (in particular groundwater and surface water),

— protection of the environmental protection systems (e.g. liners and leachate treatment systems),

— protection of the desired waste-stabilisation processes within the landfill,

— protection against human-health hazards.

Examples of waste property-based criteria are:

— requirements on knowledge of total composition,

— limitations on the amount of organic matter in the waste,

— requirements or limitations on the biodegradability of the organic waste components,

— limitations on the amount of specified, potentially harmful/hazardous components (in relation to the abovementioned protection criteria),

— limitations on the potential and expected leachability of specified, potentially harmful/hazardous components (in relation to the abovementioned protection criteria),

— ecotoxicological properties of the waste and the resulting leachate.

The property-based criteria for acceptance of waste must generally be most extensive for inert waste landfills and can be less extensive for non-hazardous waste landfills and least extensive for hazardous waste landfills owing to the higher environmental protection level of the latter two.

3. **General procedures for testing and acceptance of waste**

The general characterisation and testing of waste must be based on the following three-level hierarchy:

Level 1: *Basic characterisation*. This constitutes a thorough determination, according to standardised analysis and behaviour-testing methods, of the short and long-term leaching behaviour and/or characteristic properties of the waste.

Level 2: *Compliance testing*. This constitutes periodical testing by simpler standardised analysis and behaviour-testing methods to determine whether a waste complies with permit conditions and/or specific reference criteria. The tests focus on key variables and behaviour identified by basic characterisation.

Level 3: *On-site verification*. This constitutes rapid check methods to confirm that a waste is the same as that which has been subjected to compliance testing and that which is described in the accompanying documents. It may merely consist of a visual inspection of a load of waste before and after unloading at the landfill site.

A particular type of waste must normally be characterised at Level 1 and pass the appropriate criteria in order to be accepted on a reference list. In order to remain on a site-specific list, a particular type of waste must a regular intervals (e.g. annually) be tested at Level 2 and pass the appropriate criteria. Each waste load arriving at the gate of a landfill must be subjected to Level 3 verification.

Certain waste types may be exempted permanently to temporarily from testing at Level 1. This may be due to impracticability to testing, to unavailability of appropriate testing procedures and acceptance criteria or to overriding legislation.

4. **Guidelines for preliminary waste acceptance procedures**

Until this Annex is fully completed only Level 3 testing is mandatory and Level 1 and Level 2 applied to the extent possible. At this preliminary stage waste to be accepted at a particular class of landfill must either be on a restrictive national or site-specific list for that class of landfill or fulfil criteria similar to those required to get on the list.

The following general guidelines may be used to set preliminary criteria for acceptance of waste at the three major classes of landfill or the corresponding lists.

Inert waste landfills: only inert waste as defined in Article 2(e) can be accepted on the list.

Non-hazardous waste landfills: in order to be accepted on the list a waste type must not be covered by Directive 91/689/EEC.

Hazardous waste landfills: a preliminary rough list for hazardous waste landfills would consist of only those waste types covered by Directive 91/689/EEC. Such waste types should, however not be accepted on the list without prior treatment if they exhibit total contents or leachability of potentially hazardous components that are high enough to constitute a short-term occupational or environmental risk or to prevent sufficient waste stabilisation within the projected lifetime of the landfill.

5. **Sampling of waste**

Sampling of waste may pose serious problems with respect to representation and techniques owing to the heterogeneous nature of many wastes. A European standard for sampling of waste will be developed. Until this standard is approved by Member States in accordance with Article 17 of this Directive, the Member States may apply national standards and procedures.

ANNEX III

CONTROL AND MONITORING PROCEDURES IN OPERATION AND AFTER-CARE PHASES

1. Introduction

The purpose of this Annex is to provide the minimum procedures for monitoring to be carried out to check:

— that waste has been accepted to disposal in accordance with the criteria set for the category of landfill in question,

— that the processes within the landfill proceed as desired,

— that the environmental protection systems are functioning fully as intended,

— that the permit conditions for the landfill are fulfilled.

2. Meteorological data

Under their reporting obligation (Article 15), Member States should supply data on the collection method for meteorological data. It us up to Member States to decide how the data should be collected (*in situ*, national meteorological network, etc.).

Should Member States decide that water balances are an effective tool for evaluating whether leachate is building up in the landfill body or whether the site is leaking, it is recommended that the following data are collected from monitoring at the landfill or from the nearest meteorological station, as long as required by the competent authority in accordance with Article 13(c) of this Directive:

	Operation phase	After-care phase
1.1. Volume of precipitation	daily	daily, added to monthly values
1.2. Temperature (min., max., 14.00 h CET)	daily	monthly average
1.3. Direction and force of prevailing wind	daily	not required
1.4. Evaporation (lysimeter) ([1])	daily	daily, added to monthly values
1.5. Atmospheric humidity (14.00 h CET)	daily	monthly average

([1]) Or through other suitable methods.

3. Emission data: water, leachate and gas control

Sampling of leachate and surface water if present must be collected at representative points. Sampling and measuring (volume and composition) of leachate must be performed separately at each point at which leachate is discharged from the site. Reference: general guidelines on sampling technology, ISO 5667-2 (1991).

Monitoring of surface water is present shall be carried out at not less than two points, one upstream from the landfill and one downstream.

Gas monitoring must be representative for each section of the landfill. The frequency of sampling and analysis is listed in the following table. For leachate and water, a sample, representative of the average composition, shall be taken for monitoring.

The frequency of sampling could be adapted on the basis of the morphology of the landfill waste (in tumulus, buried, etc). This has to be specified in the permit.

	Operating phase	After-care phase ([3])
2.1. Leachate volume	monthly ([1]) ([3])	every six months
2.2. Leachate composition ([2])	quarterly ([3])	every six months
2.3. Volume and composition of surface water ([7])	quarterly ([3])	every six months
2.4. Potential gas emissions and atmospheric pressure ([4]) (CH_4, CO_2, O_2, H_2S, H_2 etc.)	monthly ([3]) ([5])	every six months ([6])

([1]) The frequency of sampling could be adapted on the basis of the morphology of the landfill waste (in tumulus, buried, etc.). This has to be specified in the permit.
([2]) The parameters to be measured and the substances to be analysed vary according to the composition of the waste deposited; they must be laid down in the permit document and reflect the leaching characteristics of the wastes.
([3]) If the evaluation of data indicates that longer intervals are equally effective, they may be adapted. For leachates, conductivity must always be measured at least once a year.
([4]) Thease measurements are related mainly to the content of organic material in the waste.
([5]) CH_4, CO_2, O_2, regularly, other gases as required, according to the composition of the waste deposited, with a view to reflecting its leaching properties.
([6]) Efficiency of the gas extraction system must be checked regularly.
([7]) On the basis of the characteristics of the landfill site, the competent authority may determine that these measurements are not required, and will report accordingly in the way laid down in Article 15 of the Directive.

2.1 and 2.2 apply only where leachate collection takes place (see Annex I(2)).

4. **Protection of groundwater**

A. *Sampling*

The measurements must be such as to provide information on groundwater likely to be affected by the discharging of waste, with at least one measuring point in the groundwater inflow region and two in the outflow region. This number can be increased on the basis of a specific hydrogeological survey and the need for an early identification of accidental leachate release in the groundwater.

Sampling must be carried out in at least three locations before the filling operations in order to establish reference values for future sampling. Reference: Sampling Groundwaters, ISO 5667, Part 11, 1993.

B. *Monitoring*

The parameters to be analysed in the samples taken must be derived from the expected composition of the leachate and the groundwater quality in the area. In selecting the parameters for analysis account should be taken of mobility in the groundwater zone. Parameters could include indicator parameters in order to ensure an early recognition of change in water quality ([1]).

	Operation phase	After-care phase
Level of groundwater	every six months ([1])	every six months ([1])
Groundwater composition	site-specific frequency ([2]) ([3])	site-specific frequency ([2]) ([3])

([1]) If there are fluctuating groundwater levels, the frequency must be increased.
([2]) The frequency must be based on possibility for remedial actions between two samplings if a trigger level is reached, i.e. the frequency must be determined on the basis of knowledge and the evaluation of the velocity of groundwater flow.
([3]) When a trigger level is reached (see C), verification is necessary by repeating the sampling. When the level has been confirmed, a contingency plan (laid down in the permit) must be followed.

([1]) Recommended parameters: ph, TOC, phenols, heavy metals, fluoride, AS, oil/hydrocarbons.

C. *Trigger levels*

Significant adverse environmental effects, as referred to in Articles 12 and 13 of this Directive, should be considered to have occurred in the case of groundwater, when an analysis of a groundwater sample shows a significant change in water quality. A trigger level must be determined taking account of the specific hydrogeological formations in the location of the landfill and groundwater quality. The trigger level must be laid down in the permit whenever possible.

The observations must be evaluated by means of control charts with established control rules and levels for each downgradient well. The control levels must be determined from local variations in groundwater quality.

5. **Topography of the site: data on the landfill body**

	Operating phase	After-care phase
5.1. Structure and composition of landfill body ([1])	yearly	
5.2. Settling behaviour of the level of the landfill body	yearly	yearly reading

([1]) Data for the status plan of the concerned landfill: surface occupied by waste, volume and composition of waste, methods of depositing, time and duration of depositing, calculation of the remaining capacity still available at the landfill.

Annex 3 Council Decision 2003/33/EC

COUNCIL

COUNCIL DECISION

of 19 December 2002

establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC

(2003/33/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community,

Having regard to Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste [1], and in particular Article 16 thereof and Annex II thereto,

Whereas:

(1) Pursuant to Article 16 of Directive 1999/31/EC, the Commission is to adopt specific criteria and/or test methods and associated limit values for each class of landfill.

(2) A procedure should be laid down to determine the acceptability of waste at landfills.

(3) Limit values and other criteria should be set for waste acceptable at the different classes of landfills.

(4) The test methods to be used for determining the acceptability of waste at landfills should be determined.

(5) It is appropriate from a technical point of view to exempt from the criteria and procedures set out in the Annex to this Decision those wastes generated by the extractive industry that are deposited on-site.

(6) A suitably short transition period should be granted to Member States to develop the necessary system to apply this Decision and a further brief transition period may be necessary for Member States to ensure the application of the limit values.

(7) The measures provided for in this Decision are not in accordance with the opinion of the Committee established by Article 18 of Council Directive 75/442/EEC of 15 July 1975 on waste [2]. They therefore have to be adopted by the Council in accordance with Article 18(4) of that Directive,

HAS ADOPTED THIS DECISION:

Article 1

This Decision establishes the criteria and procedures for the acceptance of waste at landfills in accordance with the principles set out in Directive 1999/31/EC and in particular Annex II thereto.

Article 2

Member States shall apply the procedure as set out in section 1 of the Annex to this Decision to determine the acceptability of waste at landfills.

Article 3

Member States shall ensure that waste is accepted at a landfill only if it fulfils the acceptance criteria of the relevant landfill class as set out in section 2 of the Annex to this Decision.

Article 4

The sampling and testing methods listed in section 3 of the Annex to this Decision shall be used for determining the acceptability of waste at landfills.

[1] OJ L 182, 16.7.1999, p. 1.

[2] OJ L 194, 25.7.1975, p. 39. Directive as last amended by Commission Decision 96/350/EC (OJ L 135, 6.6.1996, p. 32).

Article 5

Without prejudice to existing Community legislation, the criteria and procedures as set out in the Annex to this Decision shall not apply to waste resulting from prospecting, extraction, treatment and storage of mineral resources nor from the working of quarries, when they are deposited on-site. In the absence of specific Community legislation, Member States shall apply national criteria and procedures.

Article 6

Any amendments necessary for future updating of this Decision to scientific and technical progress shall be adopted by the Commission, assisted by the Committee established under Article 18 of Directive 75/442/EEC, for example adjustment of the parameters in the lists of limit values and/or development of acceptance criteria and limit values for additional subcategories of landfills for non-hazardous waste.

Article 7

1. This Decision shall take effect on 16 July 2004.

2. Member States shall apply the criteria set out in section 2 of the Annex to this Decision by 16 July 2005.

Article 8

This Decision is addressed to the Member States.

Done at Brussels, 19 December 2002.

For the Council

The President

M. FISCHER BOEL

ANNEX

CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS

Introduction

This Annex lays down the uniform waste classification and acceptance procedure according to Annex II to Directive 1999/31/EC on the landfill of waste (the 'Landfill Directive').

In accordance with Article 176 of the Treaty, Member States are not prevented from maintaining or introducing more stringent protective measures than those established in this Annex, provided that such measures are compatible with the Treaty. Such measures shall be notified to the Commission. This could be of particular relevance with reference to the limit values for cadmium and mercury in section 2. Member States may also introduce limit values for components not included in section 2.

Section 1 of this Annex lays down the procedure to determine the acceptability of waste at landfills. This procedure consists of the basic characterisation, compliance testing and on-site verification as defined in section 3 of Annex II to the Landfill Directive.

Section 2 of this Annex lays down the acceptance criteria for each landfill class. Waste may be accepted at a landfill only if it fulfils the acceptance criteria of the relevant landfill class as laid down in section 2 of this Annex.

Section 3 of this Annex lists the methods to be used for the sampling and testing of waste.

Appendix A defines the safety assessment to be carried out for underground storage.

Appendix B is an informative Annex providing an overview of the landfill options available within the Directive and examples of possible subcategorisation of landfills' non-hazardous waste.

1. PROCEDURE FOR THE ACCEPTANCE OF WASTE AT LANDFILLS

1.1. Basic characterisation

Basic characterisation is the first step in the acceptance procedure and constitutes a full characterisation of the waste by gathering all the necessary information for a safe disposal of the waste in the long term. Basic characterisation is required for each type of waste.

1.1.1. *Functions of basic characterisation*

(a) Basic information on the waste (type and origin, composition, consistency, leachability and — where necessary and available — other characteristic properties)

(b) Basic information for understanding the behaviour of waste in landfills and options for treatment as laid out in Article 6(a) of the Landfill Directive

(c) Assessing waste against limit values

(d) Detection of key variables (critical parameters) for compliance testing and options for simplification of compliance testing (leading to a significant decrease of constituents to be measured, but only after demonstration of relevant information). Characterisation may deliver ratios between basic characterisation and results of simplified test procedures as well as frequency for compliance testing.

If the basic characterisation of waste shows that the waste fulfils the criteria for a landfill class as laid down in section 2 of this Annex, the waste is deemed to be acceptable at this landfill class. If this is not the case, the waste is not acceptable at this landfill class.

The producer of the waste or, in default, the person responsible for its management, is responsible for ensuring that the characterisation information is correct.

The operator shall keep records of the required information for a period to be defined by the Member State.

1.1.2. *Fundamental requirements for basic characterisation of the waste*

(a) Source and origin of the waste

(b) Information on the process producing the waste (description and characteristics of raw materials and products)

(c) Description of the waste treatment applied in compliance with Article 6(a) of the Landfill Directive, or a statement of reasons why such treatment is not considered necessary

(d) Data on the composition of the waste and the leaching behaviour, where relevant

(e) Appearance of the waste (smell, colour, physical form)

(f) Code according to the European waste list (Commission Decision 2001/118/EC) [1]

(g) For hazardous waste in case of mirror entries: the relevant hazard properties according to Annex III to Council Directive 91/689/EEC of 12 December 1991 on hazardous waste [2]

(h) Information to prove that the waste does not fall under the exclusions of Article 5(3) of the Landfill Directive

(i) The landfill class at which the waste may be accepted

(j) If necessary, additional precautions to be taken at the landfill

(k) Check if the waste can be recycled or recovered.

1.1.3. *Testing*

As a general rule waste must be tested to obtain the above information. In addition to the leaching behaviour, the composition of the waste must be known or determined by testing. The tests used for basic characterisation must always include those to be used for compliance testing.

The content of the characterisation, the extent of laboratory testing required and the relationship between basic characterisation and compliance checking depends on the type of waste. A differentiation can be made between:

(a) wastes that are regularly generated in the same process;

(b) wastes that are not regularly generated.

The characterisations outlined in points (a) and (b) will provide information that can be directly compared with acceptance criteria for the relevant class of landfill and, in addition, descriptive information can be supplied (e.g. the consequences of depositing with municipal waste).

(a) Wastes regularly generated in the same process

These are individual and consistent wastes regularly generated in the same process, where:

— the installation and the process generating the waste are well known and the input materials to the process and the process itself are well defined,

— the operator of the installation provides all necessary information and informs the operator of the landfill of changes to the process (especially changes to the input material).

The process will often be at a single installation. The waste can also be from different installations, if it can be identified as single stream with common characteristics within known boundaries (e.g. bottom ash from the incineration of municipal waste).

For these wastes the basic characterisation will comprise the fundamental requirements listed in section 1.1.2 and especially the following:

— compositional range for the individual wastes,

— range and variability of characteristic properties,

— if required, the leachability of the wastes determined by a batch leaching test and/or a percolation test and/or a pH dependence test,

— key variables to be tested on a regular basis.

[1] OJ L 47, 16.2.2001, p. 1.
[2] OJ L 377, 31.12.1991, p. 20. Directive as last amended by Directive 31/1994/EC (OJ L 168, 2.7.1994, p. 28).

If the waste is produced in the same process in different installations, information must be given on the scope of the evaluation. Consequently, a sufficient number of measurements must be taken to show the range and variability of the characteristic properties of the waste. The waste can then be considered characterised and shall subsequently be subject to compliance testing only, unless significant change in the generation processes occur.

For wastes from the same process in the same installation, the results of the measurements may show only minor variations of the properties of the waste in comparison with the appropriate limit values. The waste can then be considered characterised, and shall subsequently be subject to compliance testing only, unless significant changes in the generation process occur.

Waste from facilities for the bulking or mixing of waste, from waste transfer stations or mixed waste streams from waste collectors, can vary considerably in their properties. This must be taken into consideration in the basic characterisation. Such wastes may fall under case (b).

(b) Wastes that are not regularly generated

These wastes are not regularly generated in the same process in the same installation and are not part of a well-characterised waste stream. Each batch produced of such waste will need to be characterised. The basic characterisation shall include the fundamental requirements for basic characterisation. As each batch produced has to be characterised, no compliance testing is needed.

1.1.4. *Cases where testing is not required*

Testing for basic characterisation can be dispensed with in the following cases:

(a) the waste is on a list of wastes not requiring testing as laid down in section 2 of this Annex;

(b) all the necessary information, for the basic characterisation, is known and duly justified to the full satisfaction of the competent authority;

(c) certain waste types where testing is impractical or where appropriate testing procedures and acceptance criteria are unavailable. This must be justified and documented, including the reasons why the waste is deemed acceptable at this landfill class.

1.2. **Compliance testing**

When waste has been deemed acceptable for a landfill class on the basis of a basic characterisation pursuant to section 1, it shall subsequently be subject to compliance testing to determine if it complies with the results of the basic characterisation and the relevant acceptance criteria as laid down in section 2.

The function of compliance testing is periodically to check regularly arising waste streams.

The relevant parameters to be tested are determined in the basic characterisation. Parameters should be related to basic characterisation information; only a check on critical parameters (key variables), as determined in the basic characterisation, is necessary. The check has to show that the waste meets the limit values for the critical parameters.

The tests used for compliance testing shall be one or more of those used in the basic characterisation. The testing shall consist at least of a batch leaching test. For this purpose the methods listed under section 3 shall be used.

Wastes that are exempted from the testing requirements for basic characterisation in section 1.1.4(a) and section 1.1.4(c) are also exempted from compliance testing. They will, however, need checking for compliance with basic characterisation information other than testing.

Compliance testing shall be carried out at least once a year and the operator must, in any event, ensure that compliance testing is carried out in the scope and frequency determined by basic characterisation.

Records of the test results shall be kept for a period that will be determined by the Member State.

1.3. **On-site verification**

Each load of waste delivered to a landfill shall be visually inspected before and after unloading. The required documentation shall be checked.

For waste deposited by the waste producer at a landfill in his control, this verification may be made at the point of dispatch.

The waste may be accepted at the landfill, if it is the same as that which has been subjected to basic characterisation and compliance testing and which is described in the accompanying documents. If this is not the case, the waste must not be accepted.

Member States shall determine the testing requirements for on-site verification, including where appropriate rapid test methods.

Upon delivery, samples shall be taken periodically. The samples taken shall be kept after acceptance of the waste for a period that will be determined by the Member State (not less than one month; see Article 11(b) of the Landfill Directive.

2. WASTE ACCEPTANCE CRITERIA

This section sets out the criteria for the acceptance of waste at each landfill class, including criteria for underground storage.

In certain circumstances, up to three times higher limit values for specific parameters listed in this section (other than dissolved organic carbon (DOC) in sections 2.1.2.1, 2.2.2, 2.3.1 and 2.4.1, BTEX, PCBs and mineral oil in section 2.1.2.2, total organic carbon (TOC) and pH in section 2.3.2 and loss on ignition (LOI) and/or TOC in section 2.4.2, and restricting the possible increase of the limit value for TOC in section 2.1.2.2 to only two times the limit value) are acceptable, if

— the competent authority gives a permit for specified wastes on a case-by-case basis for the recipient landfill, taking into account the characteristics of the landfill and its surroundings, and

— emissions (including leachate) from the landfill, taking into account the limits for those specific parameters in this section, will present no additional risk to the environment according to a risk assessment.

Member States shall report to the Commission on the annual number of permits issued under this provision. The reports shall be sent to the Commission at intervals of three years as part of the reporting on the implementation of the Landfill Directive in accordance with the specifications laid down in Article 15 thereof.

Member States shall define criteria for compliance with the limit values set out in this section.

2.1. **Criteria for landfills for inert waste**

2.1.1. *List of wastes acceptable at landfills for inert waste without testing*

Wastes on the following short list are assumed to fulfil the criteria as set out in the definition of inert waste in Article 2(e) of the Landfill Directive and the criteria listed in section 2.1.2. The wastes can be admitted without testing at a landfill for inert waste.

The waste must be a single stream (only one source) of a single waste type. Different wastes contained in the list may be accepted together, provided they are from the same source.

In case of suspicion of contamination (either from visual inspection or from knowledge of the origin of the waste) testing should be applied or the waste refused. If the listed wastes are contaminated or contain other material or substances such as metals, asbestos, plastics, chemicals, etc. to an extent which increases the risk associated with the waste sufficiently to justify their disposal in other classes of landfills, they may not be accepted in a landfill for inert waste.

If there is a doubt that the waste fulfils the definition of inert waste according to Article 2(e) of the Landfill Directive and the criteria listed in section 2.1.2 or about the lack of contamination of the waste, testing must be applied. For this purpose the methods listed under section 3 shall be used.

EWC code	Description	Restrictions
1011 03	Waste glass-based fibrous materials	Only without organic binders
1501 07	Glass packagingGlas	
1701 01	Concrete	Selected C & D waste only (*)
1701 02	Bricks	Selected C & D waste only (*)
1701 03	Tiles and ceramics	Selected C & D waste only (*)
1701 07	Mixtures of concrete, bricks, tiles and ceramics	Selected C & D waste only (*)
1702 02	Glass	
1705 04	Soil and stones	Excluding topsoil, peat; excluding soil and stones from contaminated sites
1912 05	Glass	
2001 02	Glass	Separately collected glass only
2002 02	Soil and stones	Only from garden and parks waste; Excluding top soil, peat

(*) Selected construction and demolition waste (C & D waste): with low contents of other types of materials (like metals, plastic, soil, organics, wood, rubber, etc). The origin of the waste must be known.

— No C & D waste from constructions, polluted with inorganic or organic dangerous substances, e.g. because of production processes in the construction, soil pollution, storage and usage of pesticides or other dangerous substances, etc., unless it is made clear that the demolished construction was not significantly polluted.

— No C & D waste from constructions, treated, covered or painted with materials, containing dangerous substances in significant amounts.

Waste not appearing on this list must be subject to testing as laid down under section 1 to determine if it fulfils the criteria for waste acceptable at landfills for inert waste as set out in section 2.1.2.

2.1.2. *Limit values for waste acceptable at landfills for inert waste*

2.1.2.1. Leaching limit values

The following leaching limit values apply for waste acceptable at landfills for inert waste, calculated at liquid to solid ratios (L/S) of 2 l/kg and 10 l/kg for total release and directly expressed in mg/l for C_0 (the first eluate of percolation test at L/S = 0,1 l/kg). Member States shall determine which of the test methods (see section 3) and corresponding limit values in the table should be used.

Component	L/S = 2 l/kg	L/S = 10 l/kg	C_0 (percolation test)
	mg/kg dry substance	mg/kg dry substance	mg/l
As	0,1	0,5	0,06
Ba	7	20	4
Cd	0,03	0,04	0,02
Cr total	0,2	0,5	0,1

Component	L/S = 2 l/kg	L/S = 10 l/kg	C_0 (percolation test)
	mg/kg dry substance	mg/kg dry substance	mg/l
Cu	0,9	2	0,6
Hg	0,003	0,01	0,002
Mo	0,3	0,5	0,2
Ni	0,2	0,4	0,12
Pb	0,2	0,5	0,15
Sb	0,02	0,06	0,1
Se	0,06	0,1	0,04
Zn	2	4	1,2
Chloride	550	800	460
Fluoride	4	10	2,5
Sulphate	560 (*)	1 000 (*)	1 500
Phenol index	0,5	1	0,3
DOC (**)	240	500	160
TDS (***)	2 500	4 000	—

(*) If the waste does not meet these values for sulphate, it may still be considered as complying with the acceptance criteria if the leaching does not exceed either of the following values: 1 500 mg/l as C0 at L/S = 0,1 l/kg and 6 000 mg/kg at L/S = 10 l/kg. It will be necessary to use a percolation test to determine the limit value at L/S = 0,1 l/kg under initial equilibrium conditions, whereas the value at L/S = 10 l/kg may be determined either by a batch leaching test or by a percolation test under conditions approaching local equilibrium.

(**) If the waste does not meet these values for DOC at its own pH value, it may alternatively be tested at L/S = 10 l/kg and a pH between 7,5 and 8,0. The waste may be considered as complying with the acceptance criteria for DOC, if the result of this determination does not exceed 500 mg/kg. (A draft method based on prEN 14429 is available).

(***) The values for total dissolved solids (TDS) can be used alternatively to the values for sulphate and chloride.

2.1.2.2. Limit values for total content of organic parameters

In addition to the leaching limit values under section 2.1.2.1, inert wastes must meet the following additional limit values:

Parameter	Value mg/kg
TOC (total organic carbon)	30 000 (*)
BTEX (benzene, toluene, ethylbenzene and xylenes)	6
PCBs (polychlorinated biphenyls, 7 congeners)	1
Mineral oil (C10 to C40)	500
PAHs (polycyclic aromatic hydrocarbons)	Member States to set limit value

(*) In the case of soils, a higher limit value may be admitted by the competent authority, provided the DOC value of 500 mg/kg is achieved at L/S = 10 l/kg, either at the soil's own pH or at a pH value between 7,5 and 8,0.

2.2. **Criteria for landfills for non-hazardous waste**

Member States may create subcategories of landfills for non-hazardous waste.

In this Annex limit values are laid down only for non-hazardous waste, which is landfilled in the same cell with stable, non-reactive hazardous waste.

2.2.1. *Wastes acceptable at landfills for non-hazardous waste without testing*

Municipal waste as defined in Article 2(b) of the Landfill Directive that is classified as non-hazardous in Chapter 20 of the European waste list, separately collected non-hazardous fractions of household wastes and the same non-hazardous materials from other origins can be admitted without testing at landfills for non-hazardous waste.

The wastes may not be admitted if they have not been subjected to prior treatment according to Article 6(a) of the Landfill Directive, or if they are contaminated to an extent which increases the risk associated with the waste sufficiently to justify their disposal in other facilities.

They may not be accepted in cells, where stable, non-reactive hazardous waste is accepted pursuant to Article 6(c)(iii) of the Landfill Directive.

2.2.2. *Limit values for non-hazardous waste*

The following limit values apply to granular non-hazardous waste accepted in the same cell as stable, non-reactive hazardous waste, calculated at L/S = 2 and 10 l/kg for total release and directly expressed in mg/l for C_0 (in the first eluate of percolation test at L/S = 0,1 l/kg). Granular wastes include all wastes that are not monolithic. Member States shall determine which of the test methods (see section 3) and corresponding limit values in the table should be used.

Components	L/S = 2 l/kg	L/S = 10 l/kg	C_0 (percolation test)
	mg/kg dry substance	mg/kg dry substance	mg/l
As	0,4	2	0,3
Ba	30	100	20
Cd	0,6	1	0,3
Cr total	4	10	2,5
Cu	25	50	30
Hg	0,05	0,2	0,03
Mo	5	10	3,5
Ni	5	10	3
Pb	5	10	3
Sb	0,2	0,7	0,15
Se	0,3	0,5	0,2
Zn	25	50	15
Chloride	10 000	15 000	8 500

Components	L/S = 2 l/kg	L/S = 10 l/kg	C_0 (percolation test)
	mg/kg dry substance	mg/kg dry substance	mg/l
Fluoride	60	150	40
Sulphate	10 000	20 000	7 000
DOC (*)	380	800	250
TDS (**)	40 000	60 000	—

(*) If the waste does not meet these values for DOC at its own pH, it may alternatively be tested at L/S = 10 l/kg and a pH of 7,5-8,0. The waste may be considered as complying with the acceptance criteria for DOC, if the result of this determination does not exceed 800 mg/kg (A draft method based on prEN 14429 is available).
(**) The values for TDS can be used alternatively to the values for sulphate and chloride.

Member States shall set criteria for monolithic waste to provide the same level of environmental protection given by the above limit values.

2.2.3. *Gypsum waste*

Non-hazardous gypsum-based materials should be disposed of only in landfills for non-hazardous waste in cells where no biodegradable waste is accepted. The limit values for TOC and DOC given in sections 2.3.2 and 2.3.1 shall apply to wastes landfilled together with gypsum-based materials.

2.3. **Criteria for hazardous waste acceptable at landfills for non-hazardous waste pursuant to Article 6(c)(iii)**

Stable, non-reactive means that the leaching behaviour of the waste will not change adversely in the long-term, under landfill design conditions or foreseeable accidents:

— in the waste alone (for example, by biodegradation),

— under the impact of long-term ambient conditions (for example, water, air, temperature, mechanical constraints),

— by the impact of other wastes (including waste products such as leachate and gas).

2.3.1. *Leaching limit values*

The following leaching limit values apply to granular hazardous waste acceptable at landfills for non-hazardous waste, calculated at L/S = 2 and 10 l/kg for total release and directly expressed in mg/l for C_0 (the first eluate of percolation test at L/S = 0,1 l/kg). Granular wastes include all wastes that are not monolithic. Member States shall determine which of the test methods and corresponding limit values should be used.

Components	L/S = 2 l/kg	L/S = 10 l/kg	C_0 (percolation test)
	mg/kg dry substance	mg/kg dry substance	mg/l
As	0,4	2	0,3
Ba	30	100	20
Cd	0,6	1	0,3
Cr total	4	10	2,5

Components	L/S = 2 l/kg	L/S = 10 l/kg	C_0 (percolation test)
	mg/kg dry substance	mg/kg dry substance	mg/l
Cu	25	50	30
Hg	0,05	0,2	0,03
Mo	5	10	3,5
Ni	5	10	3
Pb	5	10	3
Sb	0,2	0,7	0,15
Se	0,3	0,5	0,2
Zn	25	50	15
Chloride	10 000	15 000	8 500
Fluoride	60	150	40
Sulphate	10 000	20 000	7 000
DOC (*)	380	800	250
TDS (**)	40 000	60 000	—

(*) If the waste does not meet these values for DOC at its own pH, it may alternatively be tested at L/S = 10 l/kg and a pH of 7,5-8,0. The waste may be considered as complying with the acceptance criteria for DOC, if the result of this determination does not exceed 800 mg/kg (A draft method based on prEN 14429 is available).
(**) The values for TDS can be used alternatively to the values for sulphate and chloride.

Member States shall set criteria for monolithic waste to provide the same level of environmental protection given by the above limit values.

2.3.2. *Other criteria*

In addition to the leaching limit values under section 2.3.1, granular wastes must meet the following additional criteria:

Parameter	Value
TOC (total organic carbon)	5 % (*)
pH	Minimum 6
ANC (acid neutralisation capacity)	Must be evaluated

(*) If this value is not achieved, a higher limit value may be admitted by the competent authority, provided that the DOC value of 800 mg/kg is achieved at L/S = 10 l/kg, either at the material's own pH or at a pH value between 7,5 and 8,0.

Member States must set criteria to ensure that the waste will have sufficient physical stability and bearing capacity.

Member States shall set criteria to ensure that hazardous monolithic wastes are stable and non-reactive before acceptance in landfills for non-hazardous waste.

2.3.3. *Asbestos waste*

Construction materials containing asbestos and other suitable asbestos waste may be landfilled at landfills for non-hazardous waste in accordance with Article 6(c)(iii) of the Landfill Directive without testing.

For landfills receiving construction materials containing asbestos and other suitable asbestos waste the following requirements must be fulfilled:

— the waste contains no other hazardous substances than bound asbestos, including fibres bound by a binding agent or packed in plastic,

— the landfill accepts only construction material containing asbestos and other suitable asbestos waste. These wastes may also be landfilled in a separate cell of a landfill for non-hazardous waste, if the cell is sufficiently self-contained,

— in order to avoid dispersion of fibres, the zone of deposit is covered daily and before each compacting operation with appropriate material and, if the waste is not packed, it is regularly sprinkled,

— a final top cover is put on the landfill/cell in order to avoid the dispersion of fibres,

— no works are carried out on the landfill/cell that could lead to a release of fibres (e.g. drilling of holes),

— after closure a plan is kept of the location of the landfill/cell indicating that asbestos wastes have been deposited,

— appropriate measures are taken to limit the possible uses of the land after closure of the landfill in order to avoid human contact with the waste.

For landfills receiving only construction material containing asbestos, the requirements set out in Annex I, point 3.2 and 3.3 of the Landfill Directive can be reduced, if the above requirements are fulfilled.

2.4. **Criteria for waste acceptable at landfills for hazardous waste**

2.4.1. *Leaching limit values*

The following leaching limit values apply for granular waste acceptable at landfills for hazardous waste, calculated at L/S = 2 and 10 l/kg for total release and directly expressed in mg/l for C_0 (in the first eluate of percolation test at L/S = 0,1 l/kg). Granular wastes include all wastes that are not monolithic. Member States shall determine which of the test methods and corresponding limit values in the table should be used.

Components	L/S = 2 l/kg	L/S = 10 l/kg	C_0 (percolation test)
	mg/kg dry substance	mg/kg dry substance	mg/l
As	6	25	3
Ba	100	300	60
Cd	3	5	1,7
Cr total	25	70	15
Cu	50	100	60
Hg	0,5	2	0,3
Mo	20	30	10
Ni	20	40	12
Pb	25	50	15

Components	L/S = 2 l/kg	L/S = 10 l/kg	C_0 (percolation test)
	mg/kg dry substance	mg/kg dry substance	mg/l
Sb	2	5	1
Se	4	7	3
Zn	90	200	60
Chloride	17 000	25 000	15 000
Fluoride	200	500	120
Sulphate	25 000	50 000	17 000
DOC (*)	480	1 000	320
TDS (**)	70 000	100 000	—

(*) If the waste does not meet these values for DOC at its own pH, it may alternatively be tested at L/S = 10 l/kg and a pH of 7,5-8,0. The waste may be considered as complying with the acceptance criteria for DOC, if the result of this determination does not exceed 1 000 mg/kg. (A draft method based on prEN 14429 is available.)
(**) The values for TDS can be used alternatively to the values for sulphate and chloride.

Member States shall set criteria for monolithic waste to provide the same level of environmental protection given by the above limit values.

2.4.2. *Other criteria*

In addition to the leaching limit values under section 2.4.1, hazardous wastes must meet the following additional criteria:

Parameter	Value
LOI (*)	10 %
TOC (*)	6 % (**)
ANC (acid neutralisation capacity)	Must be evaluated

(*) Either LOI or TOC must be used.
(**) If this value is not achieved, a higher limit value may be admitted by the competent authority, provided that the DOC value of 1 000 mg/kg is achieved at L/S = 10 l/kg, either at the material's own pH or at a pH value between 7,5 and 8,0.

2.5. **Criteria for underground storage**

For the acceptance of waste in underground storage sites, a site-specific safety assessment as defined in Annex A must be carried out. Waste may be accepted only if it is compatible with the site-specific safety assessment.

At underground storage sites for inert waste, only waste that fulfils the criteria set out in section 2.1 may be accepted.

At underground storage sites for non-hazardous waste, only waste that fulfils the criteria set out in section 2.2 or in section 2.3 may be accepted.

At underground storage sites for hazardous waste, waste may be accepted only if it is compatible with the site-specific safety assessment. In this case, the criteria set out in section 2.4 do not apply. However, the waste must be subject to the acceptance procedure as set out in section 1.

3. SAMPLING AND TEST METHODS

Sampling and testing for basic characterisation and compliance testing shall be carried out by independent and qualified persons and institutions. Laboratories shall have proven experience in waste testing and analysis and an efficient quality assurance system.

Member States may decide that:

1. the sampling may be carried out by producers of waste or operators under the condition that sufficient supervision of independent and qualified persons or institutions ensures that the objectives set out in this Decision are achieved;
2. the testing of the waste may be carried out by producers of waste or operators if they have set up an appropriate quality assurance system including periodic independent checking.

As long as a CEN standard is not available as formal EN, Member States will use either national standards or procedures or the draft CEN standard, when it has reached the prEN stage.

The following methods shall be used.

Sampling

For the sampling of waste — for basic characterisation, compliance testing and on-site verification testing — a sampling plan shall be developed according to part 1 of the sampling standard currently developed by CEN.

General waste properties

EN 13137	Determination of TOC in waste, sludge and sediments
prEN 14346	Calculation of dry matter by determination of dry residue or water content

Leaching tests

prEN 14405	Leaching behaviour test - Up-flow percolation test (Up-flow percolation test for inorganic constituents)
EN 12457/1-4	Leaching — Compliance test for leaching of granular waste materials and sludges:
	part 1: L/S = 2 l/kg, particle size < 4 mm
	part 2: L/S = 10 l/kg, particle size < 4 mm
	part 3: L/S = 2 and 8 l/kg, particle size < 4 mm
	part 4: L/S = 10 l/kg, particle size < 10 mm

Digestion of raw waste

EN 13657	Digestion for subsequent determination of aqua regia soluble portion of elements (partial digestion of the solid waste prior to elementary analysis, leaving the silicate matrix intact)
EN 13656	Microwave-assisted digestion with hydrofluoric (HF), nitric (HNO_3) and hydrochloric (HCl) acid mixture for subsequent determination of elements (total digestion of the solid waste prior to elementary analysis)

Analysis

ENV 12506	Analysis of eluates — Determination of pH, As, Ba, Cd, Cl, Co, Cr, CrVI, Cu, Mo, Ni, NO_2, Pb, total S, SO_4, V and Zn (analysis of inorganic constituents of solid waste and/or its eluate; major, minor and trace elements)
ENV 13370	Analysis of eluates — Determination of ammonium, AOX, conductivity, Hg, phenol index, TOC, easily liberatable CN, F (analysis of inorganic constituents of solid waste and/or its eluate (anions))
prEN 14039	Determination of hydrocarbon content in the range of C10 to C40 by gas chromatography

This list will be amended when more CEN standards are available.

For tests and analyses, for which CEN methods are not (yet) available, the methods used must be approved by the competent authorities.

Appendix A

SAFETY ASSESSMENT FOR ACCEPTANCE OF WASTE IN UNDERGROUND STORAGE

1. SAFETY PHILOSOPHY FOR UNDERGROUND STORAGE: ALL TYPES

1.1. **The importance of the geological barrier**

Isolation of wastes from the biosphere is the ultimate objective for the final disposal of wastes in underground storage. The wastes, the geological barrier and the cavities, including any engineered structures constitute a system that together with all other technical aspects must fulfil the corresponding requirements.

The requirements of the Water Framework Directive (2000/60/EC) can be fulfilled only by demonstrating the long-term safety of the installation (see section 1.2.7). Article 11(3)(j) of Directive 2000/60/EC generally prohibits the direct discharge of pollutants into groundwater. Article 4(1)(b)(i) of Directive 2000/60/EC requires Member States to take measures to prevent the deterioration of the status of all bodies of groundwater.

1.2. **Site-specific risk assessment**

The assessment of risk requires the identification of:

— the hazard (in this case the deposited wastes),

— the receptors (in this case the biosphere and possibly groundwater),

— the pathways by which substances from the wastes may reach the biosphere, and

— the assessment of impact of substances that may reach the biosphere.

Acceptance criteria for underground storage are to be derived from, *inter alia*, the analysis of the host rock, so it must be confirmed that no site-related conditions specified in Annex I to the Landfill Directive (with an exemption of Annex I(2), (3), (4) and (5)) are of relevance.

The acceptance criteria for underground storage can be obtained only by referring to the local conditions. This requires a demonstration of the suitability of the strata for establishing a storage, i.e. an assessment of the risks to containment, taking into account the overall system of the waste, engineered structures and cavities and the host rock body.

The site specific risk assessment of the installation must be carried out for both the operational and post-operational phases. From these assessments, the required control and safety measures can be derived and the acceptance criteria can be developed.

An integrated performance assessment analysis shall be prepared, including the following components:

1. geological assessment;

2. geomechanical assessment;

3. hydrogeological assessment;

4. geochemical assessment;

5. biosphere impact assessment;

6. assessment of the operational phase;

7. long-term assessment;

8. assessment of the impact of all the surface facilities at the site.

1.2.1. *Geological assessment*

A thorough investigation or knowledge of the geological setting of a site is required. This includes investigations and analyses of kind of rocks, soils and the topography. The geological assessment should demonstrate the suitability of the site for underground storage. The location, frequency and structure of any faulting or fracturing in surrounding geological strata and the potential impact of seismic activity on these structures should be included. Alternative site locations should be considered.

1.2.2. *Geomechanical assessment*

The stability of the cavities must be demonstrated by appropriate investigations and predictions. The deposited waste must be part of this assessment. The processes should be analysed and documented in a systematic way.

The following should be demonstrated:

1. that during and after the formation of the cavities, no major deformation is to be expected either in the cavity itself or at the earth surface which could impair the operability of the underground storage or provide a pathway to the biosphere;

2. that the load-bearing capacity of the cavity is sufficient to prevent its collapse during operation;

3. that the deposited material must have the necessary stability compatible with the geo-mechanical properties of the host rock.

1.2.3. *Hydrogeological assessment*

A thorough investigation of the hydraulic properties is required to assess the groundwater flow pattern in the surrounding strata based on information on the hydraulic conductivity of the rock mass, fractures and the hydraulic gradients.

1.2.4. *Geochemical assessment*

A thorough investigation of the rock and the groundwater composition is required to assess the present groundwater composition and its potential evolution over time, the nature and abundance of fracture filling minerals, as well as a quantitative mineralogical description of the host rock. The impact of variability on the geochemical system should be assessed.

1.2.5. *Biosphere impact assessment*

An investigation of the biosphere that could be impacted by the underground storage is required. Baseline studies should be performed to define local natural background levels of relevant substances.

1.2.6. *Assessment of the operational phase*

For the operational phase, the analysis should demonstrate the following:

1. the stability of the cavities as in section 1.2.2;

2. no unacceptable risk of a pathway developing between the wastes and the biosphere;

3. no unacceptable risks affecting the operation of the facility.

When demonstrating operational safety, a systematic analysis of the operation of the facility must be made on the basis of specific data on the waste inventory, facility management and the scheme of operation. It is to be shown that the waste will not react with the rock in any chemical or physical way, which could impair the strength and tightness of the rock and endanger the storage itself. For these reasons, in addition to wastes that are banned by Article 5(3) of the Landfill Directive, wastes that are liable to spontaneous combustion under the storage conditions (temperature, humidity), gaseous products, volatile wastes, wastes coming from collections in the form of unidentified mixtures should not be accepted.

Particular incidents that might lead to the development of a pathway between the wastes and the biosphere in the operational phase should be identified. The different types of potential operational risks should be summarised in specific categories. Their possible effects should be evaluated. It should be shown that there is no unacceptable risk that the containment of the operation will be breached. Contingency measures should be provided.

1.2.7. *Long-term assessment*

In order to comply with the objectives of sustainable landfilling, risk assessment should cover the long-term. It must be ascertained that no pathways to the biosphere will be generated during the long-term post-operation of the underground storage.

The barriers of the underground storage site (e.g. the waste quality, engineered structures, back filling and sealing of shafts and drillings), the performance of the host rock, the surrounding strata and the overburden should be quantitatively assessed over the long-term and evaluated on the basis of site-specific data or sufficiently conservative assumptions. The geochemical and geohydrological conditions such as groundwater flow (see sections 1.2.3 and 1.2.4), barrier efficiency, natural attenuation as well as leaching of the deposited wastes should be taken into consideration.

The long-term safety of an underground storage should be demonstrated by a safety assessment comprising a description of the initial status at a specified time (e.g. time of closure) followed by a scenario outlining important changes that are expected over geological time. Finally, the consequences of the release of relevant substances from the underground storage should be assessed for different scenarios reflecting the possible long-term evolution of the biosphere, geosphere and the underground storage.

Containers and cavity lining should not be taken into account when assessing the long-term risks of waste deposits because of their limited lifetime.

1.2.8. *Impact assessment of the surface reception facilities*

Although the wastes taken at the site may be destined for subsurface disposal, wastes will be unloaded, tested and possibly stored on the surface, before reaching their final destination. The reception facilities must be designed and operated in a manner that will prevent harm to human health and the local environment. They must fulfil the same requirements as any other waste reception facility.

1.2.9. *Assessment of other risks*

For reasons of protection of workers, wastes should be deposited only in an underground storage securely separated from mining activities. Waste should not be accepted if it contains, or could generate, hazardous substances which might harm human health, e.g. pathogenic germs of communicable diseases.

2. ACCEPTANCE CRITERIA FOR UNDERGROUND STORAGE: ALL TYPES

2.1. **Excluded wastes**

In the light of sections 1.2.1 to 1.2.8, wastes that may undergo undesired physical, chemical or biological transformation after they have been deposited must not be disposed of in underground storage. This includes the following:

(a) wastes listed in Article 5(3) of the Landfill Directive;

(b) wastes and their containers which might react with water or with the host rock under the storage conditions and lead to:

— a change in the volume,

— generation of auto-flammable or toxic or explosive substances or gases, or

— any other reactions which could endanger the operational safety and/or the integrity of the barrier.

Wastes which might react with each other must be defined and classified in groups of compatibility; the different groups of compatibility must be physically separated in the storage;

(c) wastes that are biodegradable;

(d) wastes that have a pungent smell;

(e) wastes that can generate a gas-air mixture which is toxic or explosive. This particularly refers to wastes that:

— cause toxic gas concentrations due to the partial pressures of their components,

— form concentrations when saturated within a container, which are higher than 10 % of the concentration which corresponds to the lower explosive limit;

(f) wastes with insufficient stability to correspond to the geomechanical conditions;

(g) wastes that are auto-flammable or liable to spontaneous combustion under the storage conditions, gaseous products, volatile wastes, wastes coming from collections in the form of unidentified mixtures;

(h) wastes that contain, or could generate, pathogenic germs of communicable diseases (already provided for by Article 5(3)(c) of the Landfill Directive).

2.2. **Lists of waste suitable for underground storage**

Inert wastes, hazardous and non-hazardous wastes, not excluded by sections 2.1 and 2.2 may be suitable for underground storage.

Member States may produce lists of wastes acceptable at underground storage facilities in accordance with the classes given in Article 4 of the Landfill Directive.

2.3. **Site-specific risk assessment**

Acceptance of waste at a specific site must be subject to site-specific risk assessment.

The site-specific assessments outlined in section 1.2 for the wastes to be accepted at an underground storage should demonstrate that the level of isolation from the biosphere is acceptable. The criteria have to be fulfilled under storage conditions.

2.4. **Acceptance conditions**

Wastes can be deposited only in an underground storage securely separated from mining activities.

Wastes that might react with each other must be defined and classified in groups of compatibility; the different groups of compatibility must be physically separated in the storage.

3. ADDITIONAL CONSIDERATIONS: SALT MINES

3.1. **Importance of the geological barrier**

In the safety philosophy for salt mines, the rock surrounding the waste has a two-fold role:

— it acts as host rock in which the wastes are encapsulated;

— together with the overlying and underlying impermeable rock strata (e.g. anhydrite), it acts as a geological barrier intended to prevent groundwater entering the landfill and, where necessary, effectively to stop liquids or gases escaping from the disposal area. Where this geological barrier is pierced by shafts and boreholes, these must be sealed during operation to secure against ingress of water, and must be hermetically closed after the underground landfill ceases to operate. If mineral extraction continues longer than the landfill operation, the disposal area must, after the landfill has ceased operating, be sealed with a hydraulically impermeable dam which is constructed according to the calculated hydraulically operative pressure corresponding to the depth, so that water which may seep into the still operating mine cannot penetrate through to the landfill area;

— in salt mines, the salt is considered to provide total containment. The wastes will only make contact with the biosphere in the case of an accident or an event in geological time such as earth movement or erosion (for example, associated with sea-level rise). The waste is unlikely to change in storage, and the consequences of such failure scenarios must be considered.

3.2. **Long-term assessment**

The demonstration of long-term safety of underground disposal in a salt rock should be principally undertaken by designating the salt rock as the barrier rock. Salt rock fulfils the requirement of being impermeable to gases and liquids, of being able to encase the waste because of its convergent behaviour and of confining it entirely at the end of the transformation process.

The convergent behaviour of the salt rock thus does not contradict the requirement to have stable cavities in the operation phase. The stability is important, in order to guarantee the operational safety and in order to maintain the integrity of the geological barrier over unlimited time, so that there is continued protection of the biosphere. The wastes should be isolated permanently from the biosphere. Controlled subsidence of the overburden or other defects over long time are acceptable only if it can be shown, that only rupture-free transformations will occur, the integrity of the geological barrier is maintained and no pathways are formed by which water would be able to contact the wastes or the wastes or components of the waste migrate to the biosphere.

4. ADDITIONAL CONSIDERATIONS: HARD ROCK

Deep storage in hard rock is here defined as an underground storage at several hundred metres depth, where hard rock includes various igneous rocks, e.g. granite or gneiss, it may also include sedimentary rocks, e.g. limestone and sandstone.

4.1. **Safety philosophy**

A deep storage in hard rock is a feasible way to avoid burdening future generations with the responsibility of the wastes since it should be constructed to be passive and with no need for maintenance. Furthermore, the construction should not obstruct recovery of the wastes or the ability to undertake future corrective measures. It should also be designed to ensure that negative environmental effects or liabilities resulting from the activities of present generations do not fall upon future generations.

In the safety philosophy of underground disposal of wastes, the main concept is isolation of the waste from the biosphere, as well as natural attenuation of any pollutants leaking from the waste. For certain types of hazardous substances and waste, a need has been identified to protect the society and the environment against sustained exposure over extended periods of time. An extended period of time implies several thousands of years. Such levels of protection can be achieved by deep storage in hard rock. A deep storage for waste in hard rock can be located either in a former mine, where the mining activities have come to an end, or in a new storage facility.

In the case of hard-rock storage, total containment is not possible. In this case, an underground storage needs to be constructed so that natural attenuation of the surrounding strata mediates the effect of pollutants to the extent that they have no irreversible negative effects on the environment. This means that the capacity of the near environment to attenuate and degrade pollutants will determine the acceptability of a release from such a facility.

The requirements of the EU Water Framework Directive (2000/60/EC) can only be fulfilled by demonstrating the long-term safety of the installation (see section 1.2.7). The performance of a deep storage system must be assessed in a holistic way, accounting for the coherent function of different components of the system. In a deep storage in hard rock, the storage will reside below the groundwater table. Article 11(3)(j) of the Directive generally prohibits the direct discharge of pollutants into groundwater. Article 4(1)(b)(i) of the Directive requires Member States to take measures to prevent the deterioration of the status of all bodies of groundwater. For a deep storage in the hard rock, this requirement is respected in that any discharges of hazardous substances from the storage will not reach the biosphere, including the upper parts of the groundwater system accessible for the biosphere, in amounts or concentrations that will cause adverse effects. Therefore the water flow paths to and in the biosphere should be evaluated. The impact of variability on the geohydraulic system should assessed.

Gas formation may occur in deep storage in hard rock due to long-term deterioration of waste, packaging and engineered structures. Therefore, this must be considered in the design of premises for a deep storage in hard rock.

Appendix B

OVERVIEW OF LANDFILLING OPTIONS PROVIDED BY THE LANDFILL DIRECTIVE

Introduction

Figure 1 gives an overview of the landfilling possibilities for waste provided by the Landfill Directive together with some examples of subcategories of the main classes of landfills. The starting point (upper left corner) is a waste which should be landfilled. In accordance with Article 6(a) of the Landfill Directive, some treatment is required prior to landfilling for most wastes. The general definition of 'treatment' is relatively broad and to a large extent left to the competent authorities in the Member States. It is assumed that the waste does not belong to any of the categories listed in Article 5(3) of the Landfill Directive.

Inert-waste landfill

The first question to ask could be whether or not the waste is classified as hazardous. If the waste is not hazardous (according to the Hazardous Waste Directive (91/689/EC) and the current waste list), the next question could be whether or not the waste is inert. If it meets the criteria for waste to be landfilled at an inert landfill (class A, see figure 1 and table 1), the waste may be placed at an inert landfill.

Inert waste may alternatively be placed in landfills for non-hazardous waste provided it fulfils the appropriate criteria (which it generally should).

Non-hazardous waste landfill, including subcategories

If the waste is neither hazardous nor inert, then it must be non-hazardous, and it should go to a landfill for non-hazardous waste. Member States may define subcategories of landfills for non-hazardous waste in accordance with their national waste management strategies as long as the requirements of the Landfill Directive are met. Three major subcategories of non-hazardous waste landfills are shown in figure 1: landfill for inorganic waste with low organic/biodegradable content (B1), landfill for organic waste (B2), and landfill for mixed non-hazardous waste with substantial contents of both organic/biodegradable and inorganic materials. Category B1 sites can be subdivided further into sites for wastes that do not meet the criteria set out in section 2.2.2 for inorganic non-hazardous wastes that may be co-disposed with stable, non reactive hazardous wastes (B1a) and sites for wastes that do meet those criteria (B1b). Category B2 sites may, for example, be further subdivided into bioreactor landfills and landfills for less reactive, biologically treated waste. Further subclassification of non-hazardous landfills may be desired by some Member States, and monofills and landfills for solidified/monolithic waste may be defined within each subcategory (see the footnote below table 1). National acceptance criteria may be developed by the Member States to ensure proper allocation of non-hazardous waste to the various subcategories of non-hazardous waste landfills. If sub-classification of non-hazardous waste landfills is not desired, all non-hazardous waste (subject of course to the provisions of Articles 3 and 5 of the Landfill Directive) may go to a landfill for mixed non-hazardous waste (class B3).

Placement of stable, non-reactive hazardous waste in landfill for non-hazardous waste

If the waste is hazardous (according to Directive 91/689/EC and the current waste list), the treatment may have enabled the waste to meet the criteria for placement of stable, non-reactive hazardous waste in non-hazardous waste landfills within cells for inorganic waste with low organic/biodegradable content that meet the criteria in section 2.2.2 (class B1b). The waste may be granular (rendered chemically stable) or solidified/monolithic.

Hazardous waste landfill

If the hazardous waste does not meet the criteria for placement in a class B1b landfill or cell for non-hazardous waste, the next question could be whether or not it meets the criteria for acceptance at a landfill for hazardous waste (class C). If the criteria are met, then the waste may be placed at a hazardous waste landfill.

If the criteria for acceptance at a hazardous waste landfill are not met, the waste may be subjected to further treatment and tested again against the criteria, until they are met.

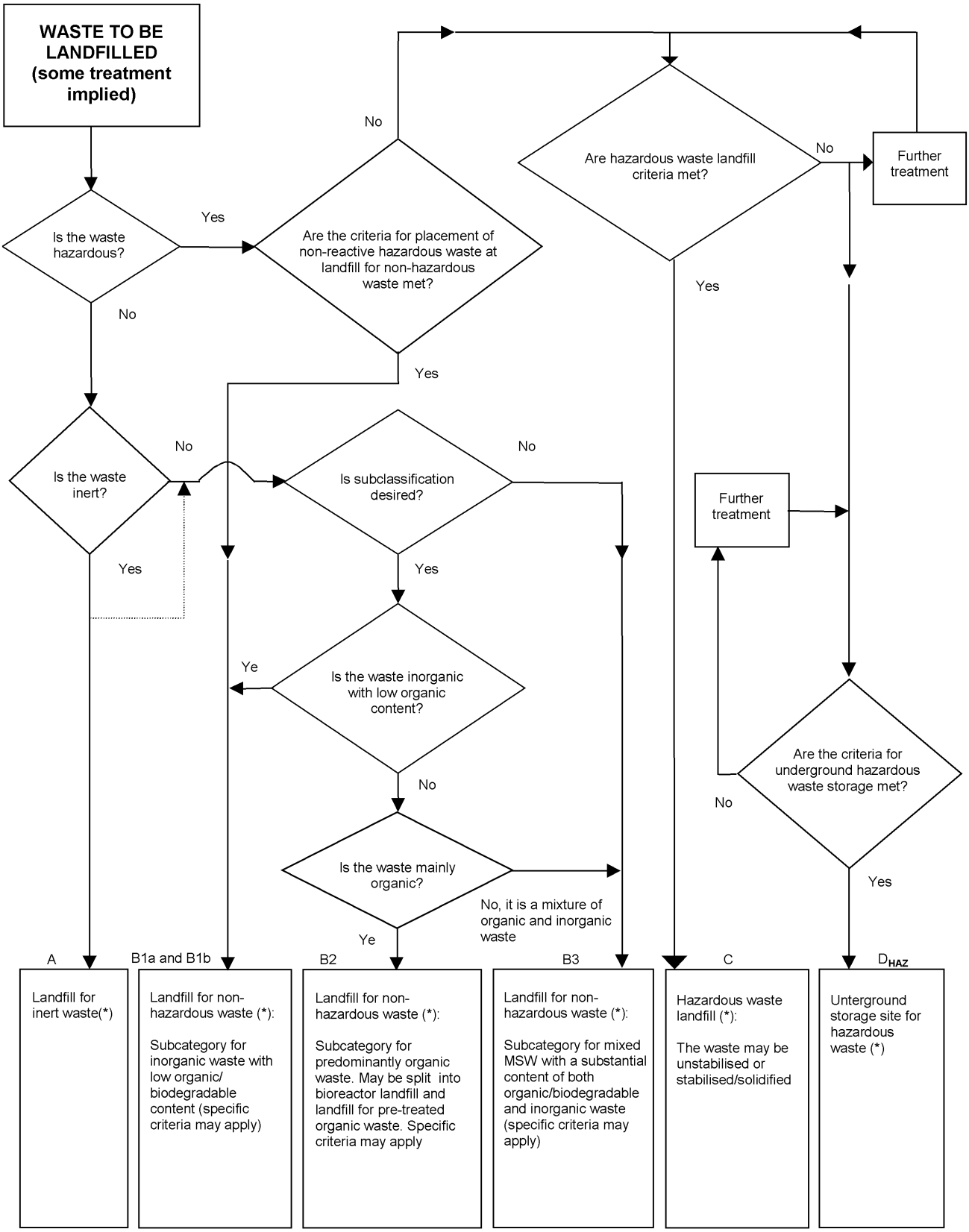
Underground storage

Alternatively, the waste may be tested against the criteria for underground storage. If the criteria are met, the waste may go to an underground storage facility for hazardous waste (landfill class D_{HAZ}). If the underground storage criteria are not met, the waste may be subjected to further treatment and tested again.

Although underground storage is likely to be reserved for special hazardous wastes, this subcategory may in principle be used also for inert waste (class D_{INERT}) and non-hazardous waste (class $D_{NON-HAZ}$).

Figure 1

Diagram showing the landfilling options provided by the Landfill Directive



(*) In principle, underground storage is also possible for inert and non-hazardous waste.

Table 1

Overview of landfill classes and examples of subcategories

Landfill class	Major subcategories (underground storage facilities, monofills and landfills for solidified, monolithic (*) waste possible for all landfill classes)	ID	Acceptance criteria
Landfill for inert waste	Landfill accepting inert waste	A	Criteria for leaching and for content of organic components are set at EU level (section 2.1.2). Criteria for content of inorganic components may be set at Member State level.
Landfill for non-hazardous waste	Landfill for inorganic non-hazardous waste with a low content of organic/biodegradable matter, where the wastes do not meet the criteria set out in section 2.2.2. for those inorganic non-hazardous wastes that may be landfilled together with stable, non-reactive hazardous waste	B1a	Criteria for leaching and total content are not set at EU level
	Landfill for inorganic non-hazardous waste with a low content of organic/biodegradable matter	B1b	Criteria for leaching and content of organics (TOC) and other properties are set at EU level, common for granular non-hazardous waste and for stable, non-reactive hazardous waste (section 2.2). Additional stability criteria for the latter are to be set at Member State level. Criteria for monolithic waste must be set at Member State level
	Landfill for organic non-hazardous waste	B2	Criteria for leaching and total content are not set at EU level
	Landfill for mixed non-hazardous waste with substantial contents of both organic/biodegradable waste and inorganic waste.	B3	Criteria for leaching and total content are not set at EU level
Landfill for hazardous waste	Surface landfill for hazardous waste	C	Criteria for leaching for granular hazardous waste and total content of certain components have been laid down at EU level (section 2.4). Criteria for monolithic waste must be set at Member State level Additional criteria on content of contaminants can be set at MS level
	Underground storage site	D_{HAZ}	Special requirements at EU level are listed in Annex A

(*) Monolithic waste subcategories are only relevant for B1, C and D_{HAZ}, and possibly A.