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Transposing:

Directive 1999/31/EC

Decision 2003/33/EC

ARRANGEMENT OF SECTIONS.

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**PROVISIONS RELATING TO ACCEPTANCE OF WASTE
SUPPLEMENTARY TO SCHEDULE 1**

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AN ACT TO TRANSPOSE INTO THE LAW OF GIBRALTAR THE PROVISIONS OF COUNCIL DIRECTIVE 1999/31/EC OF 26 APRIL 1999 ON THE LANDFILL OF WASTE.

Title and commencement.

1. This Act may be cited as the Landfill Act 2002 and comes into operation on the day appointed by the Minister for the Environment by notice in the Gazette.

Interpretation and scope.

2. (1) In this Act, unless the context otherwise requires—

“biodegradable waste” means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food or garden waste, and paper and cardboard;

“closure and after-care procedures” means the procedures set out in section 13;

“the Directive” means Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste;

“hazardous waste” has the meaning given by section 192KA of the Public Health Act;

“holder” means the producer of waste or the person who is in possession of it;

“inert waste” means waste which has the following properties—

- (a) it does not undergo any significant physical, chemical or biological transformations;
- (b) it does 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 to human health; and
- (c) its total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water or groundwater;

“landfill” has the meaning given to it by subsection (3);

“landfill gas” means any gas generated from landfilled waste;

“landfill permit” means a permit for landfill issued by the regulator in accordance with this Act;

“leachate” means any liquid percolating through deposited waste and emitted from or contained within a landfill;

“liquid waste” means any waste in liquid form but excluding sludge;

“the Minister” means the Minister with responsibility for the environment;

“municipal waste” means waste from households as well as other waste which because of its nature or composition is similar to waste from households;

“non-hazardous waste” means waste which is not hazardous waste;

“operator” means the person responsible for the landfill;

“temporary storage” in relation to metallic mercury means for a period of more than 1 year but for no more than 5 years;

“the regulator” means the Environmental Agency which is the authority designated as responsible for performing the duties of the regulator set out in this Act;

“relevant waste acceptance criteria” means, in relation to a landfill, the waste acceptance criteria set out in Schedule 1 which apply to the class of landfill to which that landfill belongs;

“treatment” means 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;

“waste” has the meaning given to it in section 192 of the Public Health Act.

(2) Expressions, other than those set out in subsection (1), which are used in this Act and which are also used in the Directive shall have the same meaning as in the Directive.

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(3) For the purposes of this Act, landfill means a waste disposal site for the deposit of waste onto land or underground and shall include sites described in subsection (4) and exclude the sites described in subsection (5).

(4) The sites to be included are—

- (a) internal waste disposal sites, that is to say a site where a producer of waste is carrying its own waste disposal at the place of production; and
- (b) any site which is used for the temporary storage of waste for more than one year.

(5) The sites to be excluded are—

- (a) any facility where waste is unloaded in order to permit its preparation for further transport for recovery, treatment or disposal elsewhere;
- (b) any site where waste is stored prior to recovery or treatment for a period of less than three years as a general rule; and
- (c) any site where waste is stored prior to disposal for a period of less than one year.

(6) This Act does not apply to-

- (a) 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;
- (b) the use of suitable inert waste for redevelopment, restoration and filling-in work or for construction purposes; and
- (c) the deposit of unpolluted soil or of non-hazardous inert waste resulting from prospecting and extraction, treatment and storage of mineral resources and from the operation of quarries.

Requirement for a permit.

3. No person shall operate a landfill except under and to the extent authorised by a landfill permit.

Classification of landfill.

4. Before granting a landfill permit, the regulator shall classify the landfill-

- (a) as a landfill for hazardous waste;
- (b) as a landfill for non-hazardous waste; or
- (c) as a landfill for inert waste.

Prohibition of acceptance of certain wastes.

5.(1) The operator of a landfill shall not accept any of the following types of waste at the landfill—

- (a) liquid waste;
- (b) waste which, in the conditions of landfill, is explosive, corrosive, oxidising, flammable or highly flammable;
- (c) hospital and other clinical wastes which arise from medical or veterinary establishments and which are infectious;
- (d) chemical substances arising from research and development or teaching activities, such as laboratory residues, which are not identified or which are new, and whose effects on man or on the environment are not known;
- (e) as from 16th July 2003, whole used tyres other than—
 - (i) tyres used as engineering material;
 - (ii) bicycle tyres; and
 - (iii) tyres with an outside diameter above 1400mm;
- (f) as from 16th July 2006, shredded used tyres other than -
 - (i) bicycle tyres; and
 - (ii) tyres with an outside diameter above 1400mm; and
- (g) any waste which does not fulfil the relevant waste acceptance criteria.

(2) The operator of a landfill shall not accept waste which has been diluted or mixed solely to meet the relevant waste acceptance criteria.

(3) For the purposes of this section, waste is-

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“corrosive” if it consists of substances and preparations which may destroy living tissue on contact;

“explosive” if it consists of substances and preparations which may explode under the effect of flame or which are more sensitive to shocks or friction than dinitrobenzene;

“flammable” if it consists of liquid substances and preparations having a flash point equal to or greater than 21⁰C and less than or equal to 55⁰C;

“highly flammable” if it consists of-

- (a) liquid substances and preparations having a flash point below 21⁰C (including extremely flammable liquids);
- (b) substances and preparations which may become hot and finally catch fire in contact with air at ambient temperature without any application of energy;
- (c) solid substances and preparations which may readily catch fire after brief contact with a source of ignition and which continue to burn or to be consumed after removal of the source of ignition;
- (d) gaseous substances and preparations which are flammable in air at normal pressure;
- (e) substances and preparations which, in contact with water or damp air, evolve highly flammable gases in dangerous quantities;

“infectious” if it consists of substances containing viable micro-organisms or their toxins which are known or reliably believed to cause disease in man or other living organisms; and

“oxidising” if it consists of substances and preparations which exhibit highly exothermic reactions when in contact with other substances, particularly flammable substances.

Waste to be accepted in the different classes of landfill.

6.(1) Subject to subsection (2), the operator of a landfill shall only accept waste that has been subject to treatment.

(2) The operator of a landfill may accept waste that has not been subject to treatment if–

- (a) it is inert waste for which treatment is not technically feasible; or
- (b) subject to subsections (3), (4) and (5), as appropriate, it is waste other than inert waste and treatment would not reduce the quantity of the waste or the hazards to human health or the environment.

(3) The operator of a landfill for hazardous waste shall only accept waste which fulfils the waste acceptance criteria set out in paragraphs 1 and 2 of Schedule 1 and Schedule 4.

(4) The operator of a landfill for non-hazardous waste shall only accept–

- (a) municipal waste;
- (b) non-hazardous waste of any other origin which fulfils the waste acceptance criteria set out in paragraphs 1 and 3(a) of Schedule 1; and
- (c) stable, non-reactive hazardous waste (such as that which is solidified or vitrified) with leaching behaviour equivalent to that of non-hazardous waste referred to in subsection 4(b) and which fulfils the waste acceptance criteria set out in paragraphs 1 and 3(b) of Schedule 1.

(5) Where waste of the type described in subsection (4)(c) above is disposed of at a landfill for non-hazardous waste, the operator shall ensure it is not deposited in cells used or intended to be used for the disposal of biodegradable non-hazardous waste.

(6) The operator of a landfill for inert waste shall only accept inert waste which meets the waste acceptance criteria set out in paragraphs 1 and 4 of Schedule 1 and Schedule 4.

(7) The sampling and testing methods listed in section 3 of Schedule 4 shall be used for determining the acceptability of waste at landfills.

(8) Nothing in Schedule 4 applies in relation to waste resulting from prospecting, extraction, treatment and storage of mineral resources nor from the working of quarries, when they are deposited on-site.

Application for a permit.

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7.(1) An application to the regulator for a landfill permit shall be in writing and shall contain the following information—

- (a) the name of the applicant and, when they are different persons, the operator;
- (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 environmental statement is required under the Town Planning (Environmental Impact Assessment) Regulations 2000, the information placed on the register pursuant to regulation 12 of those regulations;
- (i) the financial security, or any other equivalent provision, arranged by the applicant to ensure that the obligations arising under the landfill permit are discharged and the closure and after-care procedures are followed.

(2) The information contained in an application for a permit may be made available by the regulator—

- (a) to a member of the public, on request; and
- (b) to such persons as the regulator may think fit.

Conditions of the permit.

8.(1) The regulator shall not issue a landfill permit unless it is satisfied that—

- (a) the site complies with the requirements of this Act;

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- (b) the site will be managed by a person who is technically competent;
 - (c) the management and staff of the operator are provided with professional and technical development and training;
 - (d) the site will be operated in such a manner that the necessary measures are taken to prevent accidents and limit their consequences;
 - (e) the financial security, or any other equivalent provision, arranged by the applicant to ensure that the obligations arising under the landfill permit are discharged and the closure and after-care procedures are followed.
- (2) The regulator shall include conditions in the landfill permit to ensure that—
- (a) the provision required by subsection (1)(e) is maintained until the landfill permit is surrendered in accordance with this Act.
 - (b) the landfill is in line with the waste management plan prepared under section 192M of the Public Health Act.
- (3) The regulator shall inspect the site prior to the commencement of disposal operations in order to ensure that it complies with the relevant conditions of the landfill permit.

Content of the landfill permit.

9. A landfill permit shall include—
- (a) a statement of the class of the landfill;
 - (b) conditions specifying the defined types and total quantity of waste authorised to be deposited in the landfill;
 - (c) conditions applying to—
 - (i) preparations for landfill operations;
 - (ii) carrying out landfill operations; and
 - (iii) monitoring and control procedures, including contingency plans;

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- (d) conditions making provisional requirements for the closure and after-care operations;
- (e) conditions requiring the operator to report at least annually to the regulator on—
 - (i) the types and quantities of waste disposed of; and
 - (ii) the results of the monitoring programme required by sections 12 and 13;
- (f) conditions requiring compliance with this Act including Schedule 2; and
- (g) such other conditions as appear appropriate to the regulator.

Cost of the landfill of waste.

10. The operator of a landfill shall ensure that the charges it makes for the disposal of waste on its landfill cover—

- (a) the costs of the setting up and operation of the landfill;
- (b) the costs of the provision of financial security, or any other equivalent provision, to ensure that the obligations arising under the landfill permit are discharged and the closure and after-care procedures are followed; and
- (c) the estimated costs of the closure and after-care of the site for a period of at least 30 years from its closure.

Waste acceptance procedures.

11.(1) Prior to or at the time of delivery of the waste to the landfill—

- (a) the operator shall have supplied the holder with documentation setting out the conditions set in the landfill permit; and
- (b) the holder shall have supplied the operator with documentation showing that the waste fulfils—
 - (i) the conditions set in the landfill permit; and
 - (ii) the relevant waste acceptance criteria.

(2) The operator shall check the waste documentation required by legislation including, where relevant—

- (a) the identification form applying to hazardous waste; and
- (b) the documents 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.

(3) The operator shall, in accordance with such procedures as are specified by the regulator, test waste to establish whether it corresponds to the description in the accompanying documents and, if representative samples are taken for analysis, the operator shall retain the samples and results of any analysis for at least one month.

(4) The operator shall keep a register showing—

- (a) the quantities of waste deposited;
- (b) its characteristics;
- (c) its origin;
- (d) the dates of its delivery;
- (e) the identity of the producer or, in the case of municipal waste, the collector; and
- (f) in the case of hazardous waste, its precise location on the site.

(5) The information required to be kept under subsection (4) shall be made available to the regulator on request.

(6) The operator on accepting each delivery of waste shall provide a written receipt to the person delivering it.

(7) Where waste is not accepted at a landfill, the operator shall inform the regulator of that fact as soon as reasonably possible.

(8) The operator shall visually inspect the waste at the entrance and at the point of deposit and, as appropriate, he shall verify conformity with the description provided in the documentation submitted by the holder. Where representative samples are taken in accordance with the provisions of this

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Act, results of the analyses shall be kept in accordance with the provisions of this Act. The samples shall be kept for at least one month.

Control and monitoring procedures in the operational phase.

12.(1) The following requirements shall apply to landfill sites from the start of the operational phase until definitive closure.

(2) The operator shall carry out the control and monitoring procedures set out in Schedule 3.

(3) Where the procedures required by subsection (2) reveal any significant adverse environmental effects, the operator shall notify the regulator as soon as reasonably possible.

(4) When it receives a notification of significant adverse environmental effects in accordance with subsection (3), the regulator shall determine the nature and timing of corrective measures that are necessary and shall require the operator to carry them out.

(5) The operator shall report at least once a year or at intervals specified by the regulator if they are more frequent, on the basis of aggregated data, the results of monitoring and on such other matters which the regulator requires to demonstrate compliance with the conditions of the landfill permit or to increase its knowledge of the behaviour of waste in landfill.

(6) The operator shall ensure that quality control in respect of the following is carried out by competent laboratories-

- (a) analytical operations of control and monitoring procedures; and
- (b) analyses of representative samples taken in accordance with section 11(3).

Closure and after-care procedures.

13.(1) The following procedures shall apply to all landfill sites.

(2) The procedures may relate to the closure of the whole of the landfill or part of it.

(3) The closure shall begin-

- (a) when the conditions specified in the landfill permit are satisfied;

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- (b) when the regulator approves a request from the operator for closure to begin; or
 - (c) when the regulator issues a reasoned decision that closure should begin.
- (4) A landfill shall not be definitively closed until-
- (a) such reports as may be required by the regulator have been submitted to it by the operator; and
 - (b) the regulator-
 - (i) has assessed all the reports submitted by the operator;
 - (ii) has carried out a final on-site inspection ; and
 - (iii) has notified the operator in writing that it approves the closure.
- (5) Following definitive closure of a landfill, the operator shall-
- (a) remain responsible for the maintenance, monitoring and control for such period as the regulator determines is reasonable, taking into account the time during which the landfill could present hazards;
 - (b) notify the regulator of any significant adverse environmental effects revealed by the control procedures and take the remedial steps required or approved by the regulator; and
 - (c) be responsible for monitoring and analysing landfill gas and leachate from the landfill and the groundwater regime in its vicinity in accordance with Schedule 3 for as long as the regulator considers that the landfill is likely to cause a hazard to the environment.
- (6) The operator shall not be relieved from liability under the conditions of the landfill permit by reason of the approval of closure by the regulator under subsection (4)(b)(iii).

National strategy.

14. The Minister shall set up a national strategy for the implementation of the reduction of biodegradable waste going to landfills and shall ensure that it is notified to the Commission by 16 July 2003.

Charges by the regulator.

15.(1) Where the regulator incurs costs in carrying out its functions under this Act it may charge a fee determined in accordance with this section to any person carrying on an activity to which this Act applies.

(2) The fee shall not exceed the sum of the costs reasonably incurred by the regulator in dealing with the activity to which this Act applies.

(3) Where, in the opinion of the regulator, it can properly carry out its functions under this Act only by engaging specialists and consultants, the cost of such specialists and consultants shall be included in the fee payable under sub-section (1).

(4) When requiring payment the regulator shall send or give to the person by whom the fee is payable, if that person so requests, a detailed statement of the work done and costs incurred and the period to which the statement relates and the requirements of this Act shall be deemed not to have been complied with unless the fee, or such proportion of it as the regulator may in its discretion specify, has been paid.

(5) The fee or such part of it as remains unpaid shall be recoverable as a civil debt.

Offences.

16.(1) It shall be an offence for a landfill operator to contravene the provisions of this Act.

(2) A person who is guilty of an offence under subsection (1) shall be liable on summary conviction to a fine up to level 5 on the standard scale.

(3) Where an offence under this section committed by a body corporate is proved to have been committed with the consent or connivance of, or to have been attributable to any neglect on the part of, any director, manager, secretary or other similar officer of the body corporate or a person who was purporting to act in any such capacity, he as well as the body corporate shall be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

(4) Where the affairs of a body corporate are managed by its members, subsection (3) shall apply in relation to the acts or defaults of a member in connection with his functions of management as if he were a director of the body corporate.

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(5) Where the commission by any person of an offence under this section is due to the act or default of some other person, that other person may be charged with and convicted of the offence by virtue of this subsection whether or not proceedings for the offence are taken against the first-mentioned person.

Regulations.

17. The Minister may make regulations for the purposes of implementing this Act and the Directive.

SCHEDULE 1

Section 2 and 6

WASTE ACCEPTANCE CRITERIA

Criteria for acceptance of waste which apply to all kinds of landfill.

1.(1) The following criteria shall apply to the acceptance of waste at any landfill.

(2) Waste may only be accepted at a landfill where its acceptance would not-

- (a) result in unacceptable emissions to groundwater, surface water or the surrounding environment;
- (b) jeopardise environment protection systems (such as liners, leachate and gas collection and treatment systems) at the landfill;
- (c) put at risk waste stabilisation processes (such as degradation or wash out) within the landfill; or
- (d) endanger human health.

Additional criteria for acceptance of waste at landfills for hazardous waste.

2. Waste may only be accepted at a landfill for hazardous waste if-

- (a) it is-
 - (i) any waste listed in the index annexed to the Commission Decision on Wastes which is identified as hazardous waste pursuant to paragraph 4 of the Annex to that Decision; or
 - (ii) any waste which has similar characteristics to the wastes referred to in sub-paragraph (i); and
- (b) its total content or leachability-
 - (i) does not present a short term occupational risk or an environmental risk; and

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- (ii) would not prevent the stabilisation of the landfill within its projected lifetime taking account of its after care period following closure.

Additional criteria for acceptance of waste at landfills for non-hazardous waste.

3. Waste may only be accepted at a landfill for non-hazardous waste if-

- (a) it is-
 - (i) any waste listed in the index annexed to the Commission Decision on Wastes but which is not identified as hazardous waste pursuant to paragraph 4 of the Annex to that Decision; or
 - (ii) any waste which has similar characteristics to the wastes referred to in sub-paragraph (i); or
- (b) it is-
 - (i) any waste listed in the index annexed to the Commission Decision on Wastes which is identified as hazardous waste pursuant to paragraph 4 of the Annex to that Decision; or
 - (ii) any waste which has similar characteristics to the wastes referred to in sub-paragraph (i),

and its deposit at the landfill otherwise meets the requirements of section 6(4)(c) and (5).

Additional criteria for acceptance of waste at landfills for inert waste.

4. Waste may only be accepted at a landfill for inert waste if it is listed in the following Table or it otherwise falls within the definition of inert waste.

WASTE ACCEPTABLE AT LANDFILLS FOR INERT WASTE

European Waste Catalogue Code	Description	Exclusions
10 11 03	Waste glass based fibrous materials	
15 01 07	Glass packaging	
17 01 01	Concrete	
17 01 02	Bricks	

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17 01 03	Tiles and ceramics	
17 02 02	Glass	
17 05 04	Soil and stones	Excluding topsoil, peat
20 01 02	Glass	
20 02 02	Soil and stones	Excluding topsoil, peat

5. In this Schedule, “the Commission Decision on Wastes” means the Commission Decision 2000/532/EC replacing Decision 94/3 establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EC on hazardous waste.

SCHEDULE 2

Section 9

GENERAL REQUIREMENTS FOR ALL CLASSES OF LANDFILLS**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 recreational 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 or hydrogeological conditions in the area;
- (d) the risk of flooding, subsidence, landslides or avalanches on the site; and
- (e) the protection of the natural or cultural heritage in the area.

(2) A landfill permit may be issued for the landfill only if-

- (a) the characteristics of the site with respect to the requirements in sub-paragraph (1); or
- (b) the corrective measures to be taken,

indicate that the landfill does not pose a serious environmental risk.

(3) In this regulation “nature protection zone” means—

- (a) a marine nature area or a nature conservation area as defined in section 2(1) of the Nature Protection Act 1991; or
- (b) a European site or a European Marine site within the meaning of section 17E of the Nature Protection Act 1991.

Water control and leachate management.

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2.(1) Subject to the following provisions of this paragraph, appropriate arrangements shall be made with regard to the characteristics of the landfill and prevailing meteorological conditions in order to-

- (a) control water from precipitations entering the landfill body;
- (b) prevent surface water or groundwater from entering into the landfilled waste;
- (c) collect contaminated water and leachate;
- (d) treat contaminated water and leachate to the appropriate standard so that it can be discharged.

(2) Arrangements need not be made in accordance with sub-paragraph (1)(c) if the regulator decides that the landfill poses no potential hazard to the environment in view of its location and the kinds of waste to be accepted at the landfill.

(3) This paragraph shall not apply to landfills for inert waste.

Protection of soil and water.

3.(1) The landfill must be situated and designed so as to-

- (a) provide the conditions for prevention of pollution of the soil, groundwater or surface water; and
- (b) ensure efficient collection of leachate as and when required by paragraph 2.

(2) Soil, groundwater and surface water is to be protected by-

- (a) the use of a geological barrier combined with a bottom liner during the operational phase of the landfill; and
- (b) the use of a geological barrier combined with a top liner following closure and during the passive phase.

(3) The geological barrier shall comply with the requirements of sub-paragraph (4) and shall also provide sufficient attenuation capacity to prevent a potential risk to soil and groundwater, taking into account the geographic and hydrogeological conditions below and in the vicinity of the landfill site.

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(4) The landfill base and sides shall consist of a mineral layer which provides protection of soil, groundwater and surface water at least equivalent to that resulting from the following permeability and thickness requirements–

- (a) in a landfill for hazardous waste: $k \leq 1.0 \times 10^{-9}$ metre/second: thickness ≥ 5 metres;
- (b) in a landfill for non-hazardous waste: $k \leq 1.0 \times 10^{-9}$ metre/second: thickness ≥ 1 metres;
- (c) in a landfill for inert waste: $k \leq 1.0 \times 10^{-7}$ metre/second: thickness ≥ 1 metres.

(5) Where the geological barrier does not meet the requirements of sub-paragraph (4) naturally, it may be completed artificially and reinforced by other means providing equivalent protection but in any such case, a geological barrier established by artificial means must be at least 0.5 metres thick.

(6) A leachate collection and sealing system to ensure that leachate accumulation at the base of the landfill is kept to a minimum must also be provided in any hazardous or non-hazardous landfill in accordance with the following table-

Leachate collection and bottom sealing

Landfill category	Non-hazardous	Hazardous
Artificial sealing liner	Required	Required
Drainage layer ≥ 0.5 metres	Required	Required

(7) Where, the potential hazards to the environment indicate that the prevention of leachate formation is necessary, surface sealing may be prescribed by the regulator taking account of the following guidelines-

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 metres	Required	Required
Top soil cover > 1 metres	Required	Required

(8) The requirements of sub-paragraphs (3) to (7) may be reduced to an appropriate extent if on the basis of an assessment of environmental risks,

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having regard in particular to the principles of Directive 80/68/EEC of 17 December 1997 on the protection of groundwater against pollution-

- (a) it has been decided in accordance with paragraph 2 that the collection and treatment of leachate is not necessary; or
- (b) it is established that the landfill poses no potential hazard to soil, groundwater or surface water.

Gas control.

4.(1) Appropriate measures must be taken in order to control the accumulation and migration of landfill gas.

(2) Landfill gas must be collected from all landfills receiving biodegradable waste and the landfill gas must be treated and, to the extent possible, used. If the gas collected cannot be used to produce energy, it must be flared,

(3) The collection, treatment and use of landfill gas under sub-paragraph (2) must be carried on in a manner which minimises damage to or deterioration of the environment and risk to human health.

Nuisances and hazards.

5.(1) Measures must be taken to minimise the nuisances arising from the landfill through-

- (a) emissions of odours and dust;
- (b) wind-blown materials;
- (c) noise and traffic;
- (d) birds, vermin and insects;
- (e) the formation of aerosols; and
- (f) fires.

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

Stability.

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6.(1) The placement of waste must ensure stability of all the waste on the site and associated structures and in particular must avoid slippages.

(2) Where an artificial barrier is used, the geological substratum must be sufficiently stable, taking into account the morphology of the landfill, to prevent settlement that may cause damage to the barrier.

Barriers.

7.(1) The landfill must be secured to prevent free access to the site.

(2) The gates of the landfill must be locked outside operating hours.

(3) The system of control and access to each facility must provide systems to detect and discourage illegal dumping in the facility.

SCHEDULE 3

Sections 12(2) and 13(5)(c)

MONITORING PROCEDURES IN OPERATION AND AFTER-CARE PHASES**Minimum procedures.**

1. This Schedule sets out minimum procedures for monitoring to be carried out to check-

- (a) that waste has been accepted for disposal only if it fulfils the relevant waste acceptance criteria;
- (b) that the processes within the landfill proceed as desired;
- (c) that environmental protection systems are functioning fully as intended; and
- (d) that the conditions of the landfill permit are fulfilled.

Emission data.

2.(1) Samples of leachate or surface water (if present) must be collected at representative points.

(2) Sampling and measuring of the volume and composition of any leachate must be performed separately at each point at which leachate is discharged from the site.

(3) Monitoring of surface water (if present) shall take place at least two points, one upstream from the landfill and one downstream.

(4) Gas monitoring must be carried out for each section of the landfill and representative samples must be collected and analysed in accordance with Table 1.

(5) A representative sample of leachate and water shall be taken for monitoring purposes in accordance with Table 1.

TABLE 1

	Operational phase	After-care phase ¹
Leachate volume ²	Monthly ^{1, 3}	Every six months

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Leachate composition ^{2,4}	Quarterly ¹	Every six months
Volume and composition of surface water ⁵	Quarterly ¹	Every six months
Potential gas emissions and atmospheric pressure ⁶ (CH ₄ , CO ₂ , O ₂ , H ₂ S, H ₂ etc)	Monthly ^{1,7}	Every six months ⁸

Notes to Table 1

¹ Longer intervals may be allowed if the evaluation of data indicates that they would be equally effective. For leachates, the conductivity must always be measured at least once a year.

² These do not apply where leachate collection is not required under paragraph 2(1)(c) of Schedule 2.

³ The frequency of sampling may be adapted on the basis of the morphology of the landfill waste (in tumulus, buried, etc) (but only if the Environment Agency considers that the conditions of the landfill permit should allow for it).

⁴ The parameters to be measured and substances to be analysed vary according to the composition of the waste deposited. They must be specified in the conditions of the landfill permit and reflect the leaching characteristics of the wastes.

⁵ On the basis of the characteristics of the landfill site, the Environment Agency may determine that these measurements are not required.

⁶ These measurements are related mainly to the content of the organic material in the waste.

⁷ CH₄, CO₂, O₂ regularly, other gases as required, according to the composition of the waste deposited, with a view to reflecting its leaching properties.

⁸ Efficiency of the gas extraction system must be checked regularly.

Protection of groundwater.

3.(1) The sampling measurements taken must be sufficient to provide information on groundwater likely to be affected by the discharge from the landfill, with at least one measuring point in the groundwater inflow region and two in the outflow region.

(2) The number of measurements referred to sub-paragraph (1) may be increased on the basis of a specific hydrogeological survey or the need for an early identification of accidental leachate release in the groundwater.

(3) Sampling must be carried out in at least three locations before filling operations in order to establish reference values for future sampling.

4.(1) The monitoring of groundwater shall be carried out in accordance with Table 2.

(2) 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.

(3) In selecting the parameters for analysis, the mobility in the groundwater zone must be taken into account.

(4) Parameters may include indicator parameters in order to ensure an early recognition of change in water quality (the recommended parameters are pH, TOC, phenols, heavy metals, fluoride, AS, oil/hydrocarbons).

This version is out of date

TABLE 2

	Operational 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}

Notes to Table 2

¹ If there are fluctuating groundwater levels, the frequency must be increased.

² The frequency must be based on the possibility for remedial action 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 paragraph 5), verification is necessary by repeating the sampling. When the level has been confirmed, a contingency plan set out in the landfill permit conditions must be followed.

Trigger levels.

5.(1) Significant adverse environmental effects, as referred to in sections 12(4) and 13(5)(b), 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.

(2) The level at which the effects referred to in sub-paragraph (1) are considered to have occurred (“the trigger level”) must be determined taking account of the specific hydrogeological formations in the location of the landfill and groundwater quality.

(3) The trigger level must be set out in the conditions of the landfill permit whenever possible.

(4) The observations must be evaluated by means of control charts with established control rules and levels for each downgradient well.

(5) The control levels must be determined from local variations in groundwater quality.

Topography.

6. The topography of the site and settling behaviour of the landfill body shall be monitored in accordance with Table 3.

TABLE 3

	Operational phase	After-care phase

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Structure and composition of landfill body ¹	Yearly	
Settling behaviour of the level of the landfill body	Yearly	Yearly reading

Note to Table 3

¹ Data for the status plan of the relevant 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.

SCHEDULE 4

**PROVISIONS RELATING TO ACCEPTANCE OF WASTE
SUPPLEMENTARY TO SCHEDULE 1
(Annex to Council Decision 2003/33/EC)**

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, 27.1994, p. 28).

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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 but 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.

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EWIC code	Description	Restrictions
1011 03	Waste glass-based fibrous materials	Only without organic binders
1501 07	Glass packaging	
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

This version is out of date

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 CO 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.

This version is out of date

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

This version is out of date

Componentes	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 C₀ (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.

Componentes	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

This version is out of date

Components	L/S - 2 l/kg	L/S - 10 l/kg	C _p (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.

This version is out of date

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.

Componentes	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

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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.

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Appendix A

SAFETY ASSESSMENT FOR A CCEPTANCE 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)(f) 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.

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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.

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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 be assessed.

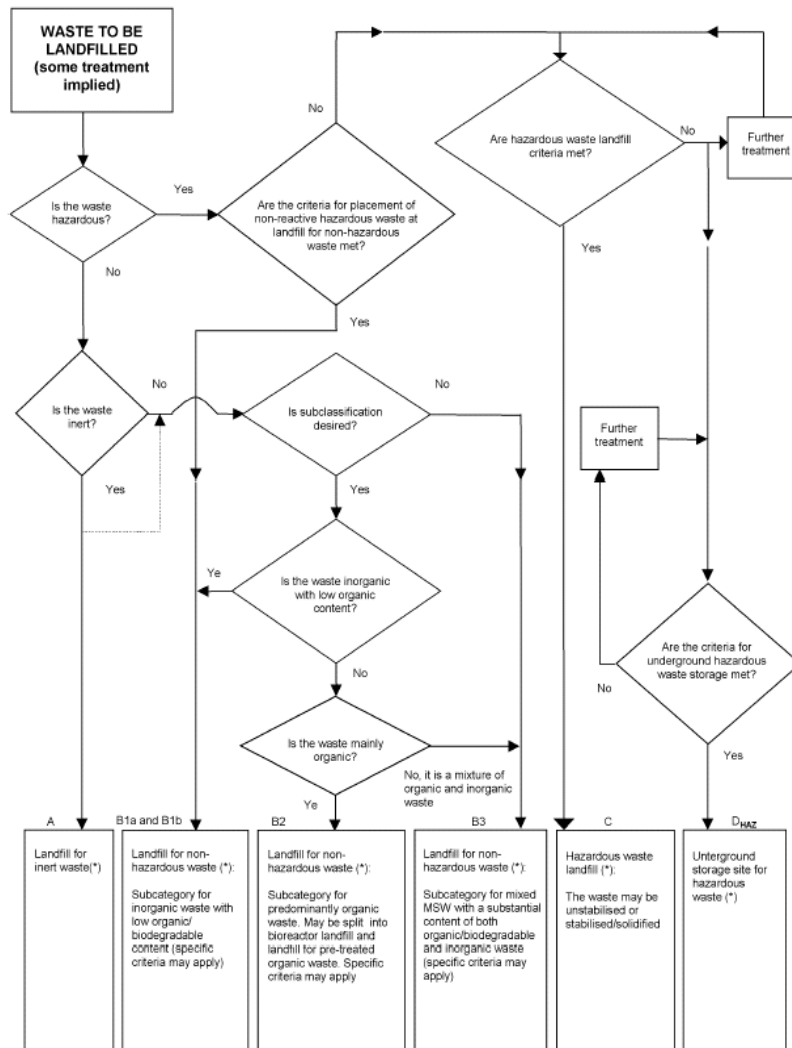
Gas formation may occur in deep storage in hard rock due to long-term deterioration of waste, packaging and engineered structures. Therefore, this must be considered in the design of premises for a deep storage in hard rock.

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_{NONHAZ}).

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.

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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 _{MSZ}	Special requirements at EU level are listed in Annex A

(*) Monolithic waste subcategories are only relevant for B1, C and D_{MSZ} and possibly A.