Ordinance Simplifying Landfill Law[1)2)]

Of 27 April 2009

The German Federal Government, acting on the basis of

- the third sentence of Section 3(11), Section 7(1)(1), (2) and (4), Section 12(1), the fourth sentence of Section 32(4), Section 36c(1) to (3) and the first sentence of Section 52(2) of the Closed Substance Cycle and Waste Management Act, of which the third sentence of Section 3(11), the fourth sentence of Section 32(4) and Section 36c(1) to (3) have been amended by Article 8(2), (6)(c)(bb) and (10) of the Act of 27 July 2001 (*Federal Law Gazette*, *BGBl.* I, p. 1950) and Section 12(1) by Article 1(4) of the Act of 15 July 2006 (*BGBl.* I, p. 1619; 2007 I, p. 2316), following consultation with interested parties,

- the second sentence of Section 34(1), Section 36c(4) and Section 57 of the Closed Substance Cycle and Waste Management Act, of which the second sentence of Section 34(1) and Section 36c(4) have been amended by Article 8(8)(b) and (10) of the Act of 27 July 2001 (*BGBl.* I, p. 1950),

in the light of Section 7(1)(1) and (4) and Section 57, in each case in conjunction with Section 59, of the Closed Substance Cycle and Waste Management Act, without prejudice to the rights of the Bundestag, and on the basis of

- Section 7(1) to (3) of the Federal Immission Control Act, of which paragraph (1) has been amended by Article 7(1) of the Act of 6 January 2004 (*BGBl.* I, p. 2), following consultation with interested parties,
- Section 7(4) of the Federal Immission Control Act and
- the third sentence of Section 7a (1) in conjunction with Section 7a (2) of the Federal Water Act in the version of the Notification of 19 August 2002 (*BGBl.* I, p. 3245),

and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, acting on the basis of the second sentence of Section 54(1) of the Closed Substance Cycle and Waste Management Act following consultation with interested parties,

hereby adopt the following ordinance:

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[1] This ordinance is intended to implement
- Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (Codified version) (OJ L 24 of 29 January 2008, p. 8),
- Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment (OJ L 73 of 14 March 1997, p. 5),
- Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (OJ L 182 of 16 July 1999, p. 1),
- Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste (OJ L 114 of 27 April 2006, p. 9),
- Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC (OJ L 102 of 11 April 2006, p. 15).

[2] Note has been taken of the obligations that arise out of Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services (OJ L 204 of 21 July 1998, p. 37), most recently amended by Council Directive 2006/96/EC of 20 November 2006 (OJ L 363 of 20 December 2006, p. 81).

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Article 1

Ordinance on Landfill Sites and Long-Term Storage Facilities (Landfill Ordinance – DepV)

Contents

Annex 1:
Requirements with regard to the location, geological barrier and base and surface sealing systems for class 0, I, II and III landfill sites (re Section 3[1], Section 10[1], Section 23, Section 28)
Annex 2:
Requirements with regard to the location, geological barrier, long-term safety records and closures measures for class IV landfill sites in salt rock (re Section 3[2], Section 10[1], Section 11[2])
Annex 3:
Permissibility and allocation criteria (re Section 2[5] to [9], [20] to [23], [33], Section 6[2] to [5], Section 8[1], [3], [5] and [7], Section 14[3], Section 15, Section 23, Section 25[1])
Annex 4:
Guidelines on sampling (taking of samples, preparation of samples and analysis of wastes and landfill replacement construction materials) (re Section 6[2], Section 8[1], [3] and [5], Section 23)
Annex 5:
Information, documentation, controls, operation (re point 2 of the first sentence of Section 4, Section 9, Section 10[2], Section 11[2], Section 12[1] to [3], Section 13[1] to [3] and [5], Section 17[2], the first sentence of Section 23)

Part 1: General provisions

Section 1 Scope of application

(1) This Ordinance applies to
1. the construction, operation, closure and aftercare of landfill sites,
2. the treatment of wastes for the purposes of deposition in landfill sites and their deployment as landfill replacement construction material,
3. the deposition of wastes on landfill sites,
4. the deployment of wastes as, and for the production of, landfill replacement construction material,
5. the construction, operation, closure and aftercare of long-term storage facilities, and
6. the storage of wastes in long-term storage facilities.

(2) This Ordinance applies to
1. the sponsor of a landfill site project,
2. the operators and owners of landfill sites (landfill site operators),
3. the operators of long-term storage facilities,
4. the producers and owners of wastes, and
5. the operators of plants for the production of landfill replacement construction material.

(3) This Ordinance does not apply to
1. private households,
2. the storage and deposition of dredging spoil (waste code 17 05 06 according to the Annex to the Waste Catalogue Ordinance) along waterways and surface bodies of water from which it has been dredged, with the exceptions of the following waterways: the Danube, the Elbe, the Ems below Papenburg, the Mosel, the Neckar, the Oder, the Rhine and the Weser,
3. landfill sites and sections of landfill sites on which the closure phase
   a) commenced prior to 1 January 1997 or
   b) commenced prior to 16 July 2001 and stipulations for the closure phase had been adopted prior to 16 July 2001 in a plan approval, a planning license or an official order,
4. landfill sites and sections of landfill sites that were finally closed on 16 July 2009 by force of a definitive decision as provided for in Section 36(3) of the Closed Substance Cycle and Waste Management Act,

5. the storage of wastes in long-term storage facilities, in so far as the wastes are stored for a period of less than three years prior to their recovery, and
6. the exclusive storage or deposition of wastes that directly and customarily arise during the prospecting, extraction, processing and further processing of mineral resources, and during the storage of mineral resources associated with these activities.

Section 2 Definitions

The following definitions shall apply for the purposes of this Ordinance:

1. Deposition area:
   Area of a landfill site on or in which wastes are deposited without time limitations.
2. Deposition phase:
   Period from the inspection of the facilities required for the operation of a landfill site or a section of a landfill site by the competent authority until the time at which the deposition of waste is terminated.
3. Existing landfill site:
   A landfill site that is in its deposition, closure or aftercare phase on 16 July 2009.
4. Trigger level:
   Groundwater monitoring values; measures to protect groundwater must be initiated when these values are exceeded.
5. Treatment:
   Mechanical, physical, thermal, chemical or biological procedures or combinations of procedures that reduce the volume or harmful characteristics of wastes, make them easier to handle, aid their recovery or disposal, or guarantee the satisfaction of the allocation criteria set out in Annex 3.
6. Class 0 landfill site (landfill class 0, DK 0):
   Overground landfill site for inert wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class 0.
7. Class I landfill site (landfill class I, DK I):
   Overground landfill site for wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class I.
8. Class II landfill site (landfill class II, DK II):
   Overground landfill site for wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class II.
9. Class III landfill site (landfill class III, DK III):
   Overground landfill site for non-hazardous wastes and hazardous wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class III.
10. Class IV landfill site (landfill class IV, DK IV):
    Underground landfill site at which wastes are deposited
    a) in a mine with a self-contained deposition area that is constructed separately from any mineral extraction activities or
    b) in a cavern, completely enclosed in rock.
11. Section of a landfill site:
    Spatially or structurally delimited part of the deposition area of a landfill site that is assigned to a particular landfill class and that may be operated separately.
12. Landfill site operator:
    Natural or legal person that possesses the legal or *de facto* power of disposition over a landfill site or performs the management of its operation.
13. Landfill replacement construction material:
    a) directly deployable wastes and
    b) materials produced from wastes
    used for measures provided for in Section 15 at overground landfill sites.
14. Landfill gas:
    Gases generated as a result of reactions among deposited wastes.

15. Entrance area:
Area on the operational premises of the landfill site in which the wastes are delivered, the weight or volume of the wastes recorded, and the wastes identified.
16. Degasification:
Gathering of landfill gas in collectors and its discharge under suction (active degasification) or at outlets in the surface sealing system making use of the pressure gradient (passive degasification).
17. Liquid wastes:
Wastes that have a liquid consistency, with the exception of paste-like, sludgy and pulpy wastes.
18. Fundamental characterisation:
Determination and evaluation of all information required for the safe long-term deposition of a type of waste, in particular details of its type, origins, composition, homogeneity, leachability and other typical characteristics, and a proposal concerning the stipulation of key parameters, the analytical procedure and the frequency of analyses.
19. Long-term storage facility:
Facility for the storage of waste under Section 4(1) of the Federal Immission Control Act in the version of the Notification of 26 September 2002 (*BGBl.* I, p. 3830), most recently amended by Article 1 of the Act of 23 October 2007 (*BGBl.* I, p. 2470), in conjunction with point 8.14 of the Annex to the Ordinance on Installations subject to Licensing in the version of the Notification of 14 March 1997 (*BGBl.* I, p. 504), most recently amended by Article 3 of the Act of 23 October 2007 (*BGBl.* I, p. 2470).
20. Class 0 long-term storage facility (long-term storage facility class 0, LK 0):
Overground long-term storage facility for inert wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class 0.
21. Class I long-term storage facility (long-term storage facility class I, LK I):
Overground long-term storage facility for non-hazardous wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class I.
22. Class II long-term storage facility (long-term storage facility class II, LK II):
Overground long-term storage facility for non-hazardous wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class II.
23. Class III long-term storage facility (long-term storage facility class III, LK III):
Overground long-term storage facility for hazardous wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class III.
24. Class IV long-term storage facility (long-term storage facility class IV, LK IV):
Underground long-term storage facility for hazardous wastes in a mine with a self-contained storage area that is constructed separately from any mineral extraction activities.
25. Mechanically and biologically treated wastes:
Wastes from the processing or conversion of household wastes and similar commercial and industrial wastes with a high proportion of biodegradeable material in plants that fall within the scope of application of the Ordinance on Biological Waste-Treatment Plants.
26. Mono-landfill site:
Landfill class 0, I, II, III or IV landfill site or section of a landfill site in which exclusively specific mass wastes that are similar in terms of their type, pollutant content and reaction behaviour, and are mutually compatible are deposited.
27. Aftercare phase:
Period from the final closure of a landfill site or section of a landfill site until the date on which the competent authority determines the completion of the aftercare of the landfill site as provided for in Section 36(5) of the Closed Substance Cycle and Waste Management Act.
28. Profiling:
Shaping of the surface of the landfill body on a landfill site or section of a landfill site in order to make it possible for the surface sealing system to be installed on it at the gradient necessary for drainage.

29. Key parameters:
    Parameters with a high degree of significance for checks on the permissibility of the deposition of a waste and its consistency with the fundamentally characterised waste that are to be carried out in the course of acceptance control.
30. Leachate:
    Any fluid that percolates through deposited wastes and is discharged from a landfill site or enclosed in a landfill site.
31. Specific mass wastes:
    Road rubble and mineral wastes that are generated in large quantities with the same composition during defined processes, in particular earth and stones, dredging spoil, ashes, slags and dusts from thermal processes, wastes from the treatment of waste gases, sludges from industrial processes.
32. Closure phase:
    Period from the end of the deposition phase of the landfill site or section of a landfill site until the final closure of the landfill site or section of a landfill site as provided for in Section 36(3) of the Closed Substance Cycle and Waste Management Act.
33. Allocation criteria:
    Allocation values, including the values set out in the footnotes to Table 2 of Annex 3(2) and with due regard to the introductory text of Annex 3(2).

Part 2: Construction, operation, closure and aftercare of landfill sites

Section 3 Construction

(1) Class 0, I, II or III landfill sites or sections of landfill sites shall be constructed in such a way that the requirements set out in paragraph 3 of this section and Annex 1 with regard to their location, the geological barrier and the base liner system are satisfied.
(2) Class IV landfill sites shall only be constructed in salt rock and in such a way that the requirements set out in paragraph 3 of this section and Annex 2(1) with regard to their location and the geological barrier, and in Annex 2(2) with regard to the location-specific safety assessment are satisfied.
(3) Apart from a deposition area, the landfill site operator shall construct at least one entrance area on the landfill site. They shall secure the landfill site in such a way that unauthorised access to the facility is prevented. The competent authority may approve exceptions from the requirements set out in the first and second sentences of this paragraph for class 0 landfill sites and mono-landfill sites if there are no grounds for concern that the public welfare will be impaired.
(4) If the competent authority has decided, with regard to class 0 landfill sites, on the basis of an evaluation of the risks to the environment, that the collection and treatment of leachate are not necessary, or if it has been determined that the landfill site does not represent a danger to soil, groundwater or surface water, the requirements may be relaxed accordingly.

Section 4 Organisation and personnel

The landfill site operator shall arrange the organisation of the landfill site in such a way that

1. sufficient personnel who possess the technical competence and technical skills necessary for their particular activities are available at all times for the tasks to be carried out,
2. persons with management responsibilities participate in courses of the kind specified in Annex 5(9) at least every two years,
3. the personnel possess the up-to-date knowledge necessary for their activities thanks to appropriate professional development provision,
4. it is ensured that the necessary monitoring and control of the waste management activities will be carried out, and
5. accidents are prevented and the potential consequences of any accident are limited.

Section 5 Commissioning

The landfill site operator may only commission the landfill site or section of a landfill site if the competent authority has inspected the facilities necessary for its operation. The first sentence of this section shall apply to substantial modifications to the landfill site or section of a landfill site *mutatis mutandis*.

Section 6 Preconditions for deposition

(1) Wastes may only be deposited on landfill sites or sections of landfill sites if the relevant acceptance criteria set out in paragraphs 3 to 5 of this section and, in addition to this, where wastes have been completely stabilised (waste code 19 03 05 according to the Annex to the Waste Catalogue Ordinance), the requirements set out in paragraph 2 of this section are satisfied. The acceptance criteria shall be satisfied by the individual type of waste, without it being mixed with other substances or wastes. In so far as it is necessary for the satisfaction of the acceptance criteria, wastes shall be treated prior to deposition. Where premixed wastes (waste codes 19 02 03 and 19 02 04 according to the Annex to the Waste Catalogue Ordinance) and partially stabilised and solidified wastes (waste codes 19 03 04, 19 03 06 and 19 03 07 according to the Annex to the Waste Catalogue Ordinance) are to be deposited, the second sentence of this paragraph shall apply to the type of waste in question prior to treatment.

(2) The following provisions shall apply to completely stabilised wastes (waste code 19 03 05 according to the Annex to the Waste Catalogue Ordinance) after stabilisation:

1. the allocation values set out in Annex 3(2) shall be determined from eluates with constant pH values of 4 and 11 as provided for in Annex 4(3.2.1.2),
2. after hardening over a hardening period of at most 28 days, the waste samples shall be crushed to a particle size less than or equal to ten millimetres for elution and,
3. when the measurement results (solid and eluate values) are evaluated, the mass of the substances added shall be taken into consideration,

except where the wastes in question satisfy the acceptance criteria prior to solidification or stabilisation.

(3) Hazardous wastes may only be deposited

1. on landfill sites or sections of landfill sites that fulfil all requirements for landfill class III and if the allocation criteria set out in Annex 3(2) for landfill class III are satisfied or
2. on landfill sites that fulfil all requirements for landfill class IV.

In derogation of the first sentence of this paragraph,

1. hazardous wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class II may be deposited on a class II landfill site or section of a landfill site and
2. hazardous wastes that satisfy the allocation criteria set out in Annex 3(2) for landfill class I may be deposited on a class I landfill site or section of a landfill site.

The second sentence of this paragraph shall apply to wastes that contain asbestos and wastes that contain hazardous mineral fibres, provided that

1. there are no indications that the wastes fail to satisfy the allocation criteria set out in Annex 3(2) for the landfill class in question and
2. deposition will be carried out in a segregated subsection of a section of the landfill site or in a dedicated section of a landfill site.

(4) Non-hazardous wastes may only be deposited on landfill sites or sections of landfill sites that

1. at least fulfil all requirements for landfill class I and if the allocation criteria set out in Annex 3(2) for landfill class I are satisfied or
2. at least fulfil all requirements for landfill class II and if the allocation criteria set out in Annex 3(2) for landfill class II are satisfied or

3. at least fulfil all requirements for landfill class III and if the allocation criteria set out in Annex 3(2) for landfill class III are satisfied or
4. fulfil all requirements for landfill class IV.

The first sentence of this paragraph shall apply to mechanically and biologically treated wastes, provided that

1. deposition is only carried out at class II landfill sites or sections of landfill sites,
2. no hazardous wastes or gypsum-based wastes are deposited on the landfill site or section of a landfill site and
3. wastes with high specific calorific values and other recoverable fractions or fractions that contain pollutants have been largely removed for recovery or thermal treatment in the course of mechanical and biological treatment.

The first sentence of this paragraph shall apply to completely stabilised wastes (waste code 19 03 05 according to the Annex to the Waste Catalogue Ordinance) where they are deposited on a landfill class I or II landfill site or section of a landfill site, provided that organic pollutants that cause the stabilised original wastes to exhibit hazardous characteristics or features set out in Section 3(2) of the Waste Catalogue Ordinance have been destroyed by stabilisation.

(5) Inert wastes may only be deposited on

1. landfill sites or sections of landfill sites that at least fulfil all requirements for landfill class 0 and if the allocation criteria set out in Annex 3(2) for landfill class 0 are satisfied or
2. on landfill sites that fulfil all requirements for landfill class IV.

(6) Furthermore, with the approval of the competent authority, when individual allocation values are exceeded, in particular those for TOC and ignition loss,

1. in derogation of point 1 of the first sentence of paragraph 3 of this section in conjunction with the first sentence of paragraph 1 of this section, hazardous wastes from damaging events such as fires and natural disasters may be deposited on a segregated subsection of a class III section of a landfill site,
2. in derogation of point 2 of the first sentence of paragraph 3 of this section in conjunction with the first sentence of paragraph 1 of this section, non-hazardous wastes from damaging events such as fires and natural disasters may be deposited on a segregated subsection of a class II section of a landfill site and,
3. in derogation of point 3 of the first sentence of paragraph 4 of this section in conjunction with the first sentence of paragraph 1 of this section, non-hazardous wastes from damaging events such as fires and natural disasters may be deposited on a segregated subsection of a class III section of a landfill site,

provided that organic components have previously been sorted out as extensively as possible and the public welfare will not be impaired by the deposition of these wastes. The first sentence of this paragraph shall also apply

1. to wastes from damaging events that contain asbestos or other hazardous artificial mineral fibres, or are mixed with them when they arise, if evidence is furnished that the separation of the fibres is not possible or economically unacceptable, or no other waste management procedure is available, and
2. to wastes that originate from the decommissioning of a landfill site or a contaminated site covered by Section 2(5) of the Federal Soil Protection Act of 17 March 1998 (*BGBl.* I, p. 502), most recently amended by Article 3 of the Act of 9 December 2004 (*BGBl.* I, p. 3214), if waste fractions with high specific calorific values are largely removed and recovered in order to generate energy or the waste treated thermally prior to disposal.

Section 7 Unauthorised wastes

(1) The following wastes may not be deposited on a class 0, I, II or III landfill site:

1. liquid wastes,

2. wastes that are classified by the Hazardous Substances Ordinance of 23 December 2004 (*BGBl.* I, p. 3758, 3759), most recently amended by Article 2 of the Ordinance of 12 October 2007 (*BGBl.* I, p. 2382), in its current version, as explosive, corrosive, fire accelerant, highly flammable or easily flammable,
3. infectious wastes (waste codes 18 01 03 and 18 02 02 according to the Annex to the Waste Catalogue Ordinance), body parts and organs (waste code 18 01 02 according to the Annex to the Waste Catalogue Ordinance),
4. unidentified or new chemical wastes from research, development and educational activities, the impacts of which on humans and the environment are not known,
5. whole or shredded used tyres,
6. wastes that bring about considerable odour nuisances for those employed at the landfill site and the neighbourhood, and
7. wastes listed in Annex V, part 2 of Regulation (EC) No. 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants amending Directive 79/117/EEC (OJ L 158 of 30 April 2004, p. 7, L 229 of 29 June 2004, p. 5), in so far as the lower allocation values set out in Council Regulation (EC) No. 1195/2006 (EC) of 18 July 2006 amending Annex IV to Regulation (EC) No. 850/2004 of the European Parliament and of the Council on persistent organic pollutants (OJ L 217 of 8 August 2006, p. 1) are exceeded, as well as other wastes that, by virtue of their origins or properties, give rise to concerns that, due to the long-lived or bioaccumulable toxic substances they contain, their deposition will impair the public welfare.

(2) The following wastes may not be deposited in a class IV landfill site:
1. the wastes specified in paragraph 1(1), (3) to (6) of this section,
2. biodegradable wastes and wastes with a gross calorific value (H_o) of more than 6,000 kJ/kg,
3. wastes that, under deposition conditions, due to reactions among the wastes or between the wastes and the rock, bring about
   a) increases in volume,
   b) the formation of self-igniting, toxic or explosive substances or gases, or
   c) other hazardous reactions,
   in so far as this would call into question the operational safety and integrity of the barriers,
4. wastes that, under disposal conditions,
   a) are explosive, highly flammable or easily flammable,
   b) release a pungent odour or
   c) do not exhibit sufficient stability under the geomechanical conditions.

Section 8 Acceptance procedure

(1) The waste producer or, where there is collective disposal, the waste collector, shall at least submit the following information in good time to the landfill site operator prior to the first delivery of the waste:
1. the origins of the waste (waste producer or waste collection area),
2. a description of the waste (in-house designation of the waste, waste code and waste designation according to the Annex to the Waste Catalogue Ordinance),
3. the type of pretreatment, in so far as the waste has been pretreated,
4. its appearance, consistency, odour and colour,
5. the mass of the waste as a total quantity or quantity per unit of time,
6. a sampling log as provided for in Annex 4(2),
7. a log of the preparation of the samples as provided for in Annex 4(3.1.1),
8. associated analytical reports concerning the satisfaction of the allocation criteria set out in Annex 3(2) for the landfill class in question, with due regard to the fourth sentence of Section 6(1) for premixed and partially stabilised and solidified wastes, with due regard to Section 6(2) for completely stabilised wastes,

9. in addition to this, for hazardous wastes, details of the total content of deposition-relevant constituents in a solid substance, in so far as this is necessary in order to assess whether the substance may be deposited,
10. in addition to this, for hazardous wastes, in the case of mirror entries, the relevant hazardous characteristics,
11. for wastes listed in Annex V, part 2 of Regulation (EC) No. 850/2004 that exceed the lower allocation values set out in Regulation (EC) No. 1195/2006 and are intended for deposition on a class IV landfill site, evidence for the purposes of Article 7(4)(b)(i) of Regulation (EC) No. 850/2004 that has been approved by the competent authority,
12. a proposal concerning the key parameters and the frequency with which they are to be tested.

In so far as records of waste management or collective records of waste management are to be kept as provided for in Section 43 or Section 44 of the Closed Substance Cycle and Waste Management Act in conjunction with Part 2 of the Ordinance on Waste Recovery and Disposal Records, the information to be presented in accordance with points 1 to 5 of the first sentence of this paragraph may be replaced with the declaration of responsibility required by the Ordinance on Waste Recovery and Disposal Records. In so far as, in the case outlined in the second sentence of this paragraph, declaration analyses are to be presented, the analytical reports provided for in point 8 of the first sentence of this paragraph shall only be presented separately for the allocation criteria that are required in addition to this. Fundamental characterisations that have been drawn up and key parameters that have been stipulated as of 16 July 2009 shall continue to be valid until the end of any time limit. Prior to the first acceptance of a type of waste, the landfill site operator shall stipulate the key parameters for the control analyses. Should modifications in the process that produces the waste bring about relevant alterations in the leaching behaviour or composition of the waste, the producer or, where there is collective disposal, the waste collector shall present the landfill site operator with the information required by the first sentence of this paragraph once again. In this case, the landfill site operator shall stipulate the key parameters for the control analyses once again. The sampling and the waste analyses for the information required by the first, third and sixth sentences of this paragraph shall be carried out in accordance with Annex 4.

(2) Waste analyses for the fundamental characterisation provided for in paragraph 1 of this section shall not be required for wastes that contain asbestos, wastes that contain hazardous mineral fibres and wastes with regard to which all the requisite information concerning their leaching behaviour and composition is known and has been reported to the competent authority. The first sentence of this paragraph shall only apply to wastes that contain asbestos and wastes that contain hazardous mineral fibres if there are no indications that these wastes contain other harmful impurities.

(3) The waste producer or, where there is collective disposal, the waste collector shall take samples from the waste that is to be deposited, by random sampling per started 1,000 megagrams, and at least annually, and review the key parameters to ascertain whether they satisfy the allocation criteria set out in Annex 3(2) for the landfill class in question. For specific mass wastes, the frequency with which samples are taken may be reduced to once every three months with the approval of the competent authority. Annex 4(1) and (2) shall apply to sampling. The samples shall be prepared as set out in Annex 4(3.1.1). The review of the satisfaction of the allocation criteria shall be carried out and logged as provided for in Annex 3(2), with due regard to the fourth sentence of Section 6(1) for premixed and partially stabilised and solidified wastes, with due regard to Section 6(2) for completely stabilised wastes. When the waste is delivered, the logs provided for in the fifth sentence of this paragraph or a declaration from the accredited testing laboratory, as provided for in Annex 4(1), that the leaching behaviour and composition of the waste have not altered since the fundamental characterisation shall be presented to the landfill site operator.

(4) The landfill site operator shall, without delay, carry out an acceptance control for each delivery of waste that encompasses at least:

1. a check to ascertain whether the fundamental characterisation for the waste is available,
2. the determination of the mass, the waste code and the waste designation according to the Annex to the Waste Catalogue Ordinance,
3. a control of the documents required by the fifth sentence of paragraph 3 of this section to ascertain whether they are consistent with the information in the fundamental characterisation,
4. a control of the waste's appearance, consistency, colour and odour that, in justified individual cases, may also be carried out when the waste is emplaced.

In so far as registers are to be kept as provided for in Section 42 of the Closed Substance Cycle and Waste Management Act in conjunction with Part 3 of the Ordinance on Waste Recovery and Disposal Records, the requirements that are to be controlled in accordance with points 2 and 4 of the first sentence of this paragraph may be replaced with the information in the register provided for in the Ordinance on Waste Recovery and Disposal Records.

(5) With regard to a type of waste that has been characterised for the first time as provided for in the first sentence of paragraph 1 of this section or once again as provided for in the sixth sentence of paragraph 1 of this section, where the quantity delivered is greater than

1. 50 megagrams for hazardous wastes or
2. 500 megagrams for non-hazardous wastes and inert wastes,

the landfill site operator shall carry out a control analysis of the first 50 or 500 megagrams to ascertain whether it satisfies the allocation criteria. In justified individual cases, a control analysis of the key parameters shall be sufficient. In individual cases, the competent authority may stipulate a higher number of control analyses. If the fundamental characterisation and the results of at least one control analysis are available for a type of waste as of 16 July 2009, the first sentence of this paragraph shall be deemed to be fulfilled. Furthermore, the landfill site operator shall proceed as follows:

1. they shall carry out a control analysis to ascertain whether the allocation criteria are satisfied if indications have been found during the acceptance control provided for in paragraph 4 of this section that the requirements with regard to the properties of the wastes for the intended type of disposal are not satisfied or there are discrepancies between the accompanying papers and the waste that has been delivered;
2. for non-hazardous wastes, they shall use random sampling to carry out a control analysis of the key parameters per started 5,000 megagrams of delivered waste, and at least one control analysis each year;
3. for hazardous wastes, they shall use random sampling to carry out a control analysis of the key parameters per started 2,500 megagrams of delivered waste, and at least one control analysis each year;
4. for specific mass wastes, in derogation of points 2 and 3 of this section, the frequency of the control analyses may be reduced to once a year with the approval of the competent authority.

The control analyses shall be carried out in accordance with Annex 4(3), with due regard to the fourth sentence of Section 6(1) for premixed and partially stabilised and solidified wastes, with due regard to Section 6(2) for completely stabilised wastes, and evaluated in accordance with Annex 4(4). With regard to wastes that contain asbestos and wastes that contain hazardous mineral fibres, it shall be possible to waive a control analysis. In this case, the waste producer shall submit a declaration that the waste delivered corresponds to the fundamentally characterised type of waste and it is not to be anticipated that the allocation criteria of the landfill class in question will be exceeded**.**

(6) Should a control analysis be carried out in accordance with paragraph 5 of this section, the landfill site operator shall take a reserve sample from the waste delivery when the waste is delivered and hold it in safe-keeping for at least one month.

(7) In derogation of paragraphs 1, 4 and 5 of this section, analyses for the fundamental characterisation and control analyses shall not be required for the inert wastes listed in the following table if

1. the waste originates from a single point of origin,
2. there are no indications that the allocation criteria set out in Annex 3 for landfill class 0 are exceeded,
3. there are no indications that the waste is contaminated to such an extent by pollutants for which no allocation criteria are stipulated in Annex 3 that its disposal would impair the public welfare and
4. the waste contains no more than five percent by volume extraneous substances, in particular metals, plastics, humus, wood and rubber.

Waste code according to the Annex to the Waste Catalogue Ordinance	Description	Limitations
10 11 03	Waste glass-based fibrous materials	Only without organic binding agents
15 01 07	Glass packaging	
17 01 01	Concrete	Only selected wastes from construction and demolition sites
17 01 02	Bricks	Only selected wastes from construction and demolition sites
17 01 03	Tiles and ceramics	Only selected wastes from construction and demolition sites
17 01 07	Mixture of concrete, bricks, tiles and ceramics	Only selected wastes from construction and demolition sites
17 02 02	Glass	
17 05 04	Soil and stones	Except topsoil and peat, as well as soil and stones from land where harmful changes in soils of the kind specified in Section 2(3) of the Federal Soil Protection Act have occurred
19 12 05	Glass	
20 01 02	Glass	Only separately collected glass
20 02 02	Soil and stones	Only waste from gardens and parking facilities; except topsoil and peat

(8) The landfill site operator shall issue a confirmation of receipt for each delivery of waste, stating the mass determined and the six-figure waste code according to the Annex to the Waste Catalogue Ordinance. Should the delivery of possession of the waste be confirmed by means of a consignment note or acceptance note as provided for in the Ordinance on Waste Recovery and Disposal Records, these records shall replace the confirmation of receipt provided for in the first sentence of this paragraph. At the application of the operator, the competent authority may adopt provisions that deviate from those above for class 0 landfill sites and mono-landfill sites.

(9) The landfill site operator shall inform the competent authority without delay concerning delivered wastes that are not authorised for deposition on the landfill site.

Section 9 Handling of wastes

The operator of a class 0, I, II or III landfill site shall ensure that there are no grounds for concern that the deposited wastes will impair the stability of the landfill body. Furthermore, they shall handle the wastes to be deposited as set out in Annex 5(4). The operator of a class IV landfill site shall handle the wastes as set out in Annex 5(5).

Section 10 Closure

(1) During the closure phase,

1. the operator of a class 0, I, II or III landfill site shall carry out all measures required for the construction of the surface sealing system in accordance with Annex 1(2) without delay,
2. the operator of a class IV landfill site shall carry out all measures required by Annex 2(3) without delay

in order to prevent any impairment of the public welfare.

(2) The landfill site operator shall apply to the competent authority for the final closure of the landfill site or section of a landfill site as provided for in Section 36(3) of the Closed Substance Cycle and Waste Management Act. Further to the stock plans provided for in Section 13(6), evaluatory summaries of the annual reports provided for in Section 13(5), at least, shall be enclosed with the application.

Section 11 Aftercare

(1) During the aftercare phase, the landfill site operator shall carry out all measures that are required in order to prevent impairments of the public welfare, in particular the control and monitoring measures provided for in Section 12.

(2) Should the competent authority,

1. giving due regard to the testing criteria set out in Annex 5(10), come to the conclusion that the behaviour of a class 0, I, II or III landfill site gives no reason to anticipate impairments of the public welfare in future or,
2. giving due regard to the documentation concerning the condition of the installations that secure the surface access points as provided for in Annex 2(4), come to the conclusion that the behaviour of a class IV landfill site gives no reason to anticipate impairments of the public welfare in future,

it may, at the application of the landfill site operator, rescind the control and monitoring measures provided for in Section 12 and determine the completion of the aftercare phase as provided for in Section 36(5) of the Closed Substance Cycle and Waste Management Act.

Section 12 Measures for the control, reduction and prevention of emissions, immissions, nuisances and hazards

(1) In order to determine whether a landfill site gives grounds for concern about harmful contamination of groundwater or any other adverse alteration of its characteristics, the competent authority shall, prior to the commencement of the deposition phase, giving due regard to the specific hydrological circumstances at the location of the landfill site and groundwater quality, stipulate corresponding trigger levels and suitable groundwater measuring stations in order to control these thresholds as provided for in Annex 5(3.1)(1). At the application of the landfill site operator, the competent authority may approve exceptions from the requirements set out in the first sentence of this paragraph concerning the stipulation of trigger levels at class 0 landfill sites.

(2) Prior to the commencement of the deposition phase, the operator of a class 0, I, II or III landfill site shall install groundwater measuring stations as provided for in paragraph 1 of this section, as well as other measuring facilities provided for in Annex 5(3.1). They shall maintain the groundwater measuring stations and other measuring facilities until the end of the aftercare phase. Prior to the commencement of the deposition phase, the operator of a class IV landfill site shall install groundwater measuring stations as provided for in paragraph 1 of this section. They shall maintain the groundwater measuring stations until the end of the aftercare phase.

(3) The landfill site operator shall carry out measurements and controls as provided for in Annex 5(3.2) until the end of the aftercare phase. In addition to this, the operator of a class 0, I, II or III landfill site shall

1. handle leachate as provided for in Annex 5(6),

2. handle landfill gas as provided for in Annex 5(7) and
3. minimise other nuisances and hazards that emanate from the landfill site as set out in Annex 5(8) until the end of the aftercare phase.

At the application of the landfill site operator, the competent authority may approve exceptions from the requirements set out in the first and second sentences of this paragraph at class 0 landfill sites and at mono-landfill sites.

(4) The landfill site operator shall specify the measures that are carried out if the trigger levels are exceeded in action plans and submit them to the competent authority for approval. Should the trigger levels be exceeded, the landfill site operator shall

1. inform the competent authority without delay and
2. proceed in accordance with the action plans.

(5) The competent authority may order that the landfill site operator arrange for any emissions into air, water or soil that emanate from the landfill site to be identified by one of the bodies that are nominated by the authority, if there are grounds for concern that the public welfare is being impaired by the landfill site. The Länder may regulate the particulars of the measurements and controls and the information to be provided in accordance with point 1 of the second sentence of paragraph 4 of this section.

Section 13 Information and documentation

(1) The landfill site operator shall draw up the following documents prior to the commencement of the deposition phase:

1. operational regulations as provided for in Annex 5(1.1) and
2. an operating manual as provided for in Annex 5(1.2).

They shall revise the documents as necessary and present them at the request of the competent authority.

(2) The operator of a class I, II, III or IV landfill site shall establish a waste inventory as provided for in Annex 5(1.3) and document the information required by this provision. With regard to mono-landfill sites, the competent authority may release the landfill site operator from the requirements set out in the first sentence of this paragraph if only one type of waste is deposited at the landfill site or section of a landfill site.

(3) The landfill site operator shall keep an operating journal as provided for in Annex 5(1.4) and hold it in safe-keeping until the end of the aftercare phase. They shall present the operating journal at the request of the competent authority.

(4) The landfill site operator shall notify the competent authority without delay concerning

1. all adverse impacts of the landfill site on the environment that are identified and
2. disruptions that bring about any significant departure from the orderly operation of the landfill site.

(5) The landfill site operator shall present an annual report as provided for in Annex 5(2) to the competent authority by 31 March of the following year. The Länder may regulate the particulars of the requirements that are to be placed on the annual reports and their presentation.

(6) The landfill site operator shall draw up a stock plan by a date six months after the backfilling of a section of a landfill site at the latest. The whole section of the landfill site, including its technical barriers, shall be surveyed and documented in the stock plan. Should a waste inventory have been drawn up as provided for in paragraph 2 of this section, it shall be included in the stock plan.

Part 3: Recovery of landfill replacement construction materials

Section 14 Principles

(1) Landfill replacement construction materials may only be used for areas of deployment within the meaning of Section 15 at class 0, I, II or III landfill sites in so far as this does not impair the public welfare. In particular, landfill replacement construction materials may only be deployed in a quantity that is necessary for the conduct of the orderly operation of a landfill site and the construction measures necessary for this purpose. Apart from the recultivation layer of the surface sealing system, exclusively mineral wastes shall be approved as landfill site replacement construction materials or source materials for the production of landfill replacement construction materials.

(2) The following may not be used for the production of a landfill replacement construction material and directly as a landfill replacement construction material:

1. wastes specified in Section 7(1) and wastes that contain asbestos or artificial mineral fibres,
2. wastes that reach the metal contents listed in Appendix 1 of the Ordinance on Underground Waste Stowage of 24 July 2002 (*BGBl.* I, p. 2833), most recently amended by Article 11 of the Act of 15 July 2006 (*BGBl.* I, p. 1619), if the extraction of the metals from the wastes is technically possible and economically acceptable, and may be carried out while satisfying the requirements placed on the permissibility of recovery by these means and
3. wastes with regard to which, as a consequence of their type, properties or durability, it is not guaranteed that they are suitable in functional or structural terms.

(3) The allocation criteria set out in Annex 3(2) shall be satisfied by the individual type of waste, without its being mixed with other substances or types of waste. Where premixed and partially stabilised and solidified wastes (waste codes 19 02 03, 19 02 04, 19 03 04, 19 03 06 and 19 03 07 according to the Annex to the Waste Catalogue Ordinance) are used, the first sentence of this paragraph shall apply to the type of waste in question prior to mixing. The first sentence of this paragraph shall apply to completely stabilised wastes (waste code 19 03 05 according to the Annex to the Waste Catalogue Ordinance), provided that the allocation criteria set out in Section 6(2) are determined and satisfied.

Section 15 Areas of deployment and allocation

The use of landfill replacement construction materials for the areas of deployment set out in Annex 3(1) shall only be permissible if the allocation criteria set out in Annex 3(2) for the area of deployment in question are satisfied. In addition to this, when landfill replacement construction materials are used for profiling, note shall be taken that

1. the landfill site or section of a landfill site shall be in its closure phase and the deposition phase shall have been terminated without the landfill site or section of a landfill site being completely backfilled on the basis of the requirements set out in the Ordinance on Environmentally Compatible Storage of Waste from Human Settlements and in Biological Waste-Treatment Facilities of 20 February 2001 (*BGBl.* I, p. 305), most recently amended by Article 1 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860), or the Landfill Ordinance of 24 July 2002 (*BGBl.* I, p. 2807), most recently amended by Article 2 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860),

and

2. the profiling shall be required for landfill-engineering reasons and it shall not be possible for it to be implemented by modifying the approved form of the landfill site or rearranging

previously deposited wastes – in so far as this is technically possible and economically acceptable.

Section 16 Placing of wastes on the market

Wastes may only be placed on the market for the production of landfill replacement construction material in order to supply them to facilities for the production of landfill replacement construction materials at which the requirements set out in Section 14(2) and (3) are satisfied. Landfill replacement construction materials and wastes to be used directly as landfill replacement construction material may only be placed on the market in order to supply them to landfill sites at which the requirements set out in Sections 14 and 15 are satisfied.

Section 17 Acceptance procedure and documentation

(1) Section 8 shall apply to the acceptance of landfill replacement construction materials *mutatis mutandis*.

(2) The landfill site operator shall register the origins of the landfill replacement construction materials in the register provided for in Section 24 of the Ordinance on Waste Recovery and Disposal Records. Section 13(2) shall apply to the documentation of landfill replacement construction materials in the waste inventory *mutatis mutandis*.

(3) The operator of facilities for the production of landfill replacement construction materials shall include the origins of the waste and details of the waste management chain in the register provided for in Section 24 of the Ordinance on Waste Recovery and Disposal Records.

Part 4: Other provisions

Section 18 Provision of security

(1) Prior to the commencement of the deposition phase, the landfill site operator shall provide the competent authority with a security for the fulfilment of restrictions and conditions that are ordered with the plan approval decision or the planning license for the deposition, closure or aftercare phase in order to prevent or rectify impairments of the public welfare. The first sentence of this paragraph shall apply to the fulfilment of the restrictions and conditions of any authorisation for modifications to be carried out *mutatis mutandis*.

(2) The authority shall determine the type and level of the security. Apart from the types of security provided for in Section 232(1) of the German Civil Code, the authority may approve the provision of a security by means of

1. the nomination of a fit surety, in particular a group suretyship, or
2. a guarantee or an undertaking to pay from a bank.

Sureties covered by point 1 of the second sentence of this paragraph and banks covered by point 2 of the second sentence of this paragraph shall make an irrevocable commitment to the authority to pay the sum determined when this is first requested by the authority. The authority may require the landfill site operator to demonstrate the fitness of a surety. When the level of the security is determined, it shall be based on aftercare operations as scheduled, in which respect an aftercare period of at least ten years shall be assumed for class 0 landfill sites, and an aftercare period of at least 30 years shall be assumed for landfill sites in classes I to IV.

(3) The financial security shall be reviewed regularly by the competent authority with the objective of preserving the true value of the security. It shall be determined once again if the relationship between the security and the desired purpose of the security has changed significantly. Should the relationship between the security and the desired purpose of the security have changed significantly, the landfill site operator may apply to the competent

authority for a review of the security. Reserves that have been accumulated should be offset against the level of the security required, in so far as the amount necessary to collateralise the purpose of the security is removed from the power of disposal of the landfill site operator. Should the review conclude that the security needs to be increased, the competent authority may set the landfill site operator a time limit of six months at most for the provision of the increased security. Should the review conclude that the security needs to be reduced, the competent authority shall release the security that is no longer required immediately. The total security shall be released if the competent authority has determined the completion of the aftercare phase.

(4) In derogation of paragraph 1 of this section, the competent authority should waive the provision of a security if a public corporation, or an enterprise or company wholly owned by a public corporation, a consortium of municipalities or a public institution operates the landfill site and it is ensured, by way of guarantee obligations entered into by the German Federal Government, the Länder or municipalities, that the desired purpose of the security is guaranteed at all times.

Section 19 Application, notification

(1) The sponsor of the project shall submit a written application to the competent authority for the construction and operation of a landfill site as provided for in Section 31(2) and (3) of the Closed Substance Cycle and Waste Management Act, as well as the authorisation of premature commencement provided for in Section 33 of the Closed Substance Cycle and Waste Management Act, which must at least contain:

1. the name and place of residence or legal domicile of the sponsor of the project, the operator and the person who drew up the design,
2. an indication as to whether an application is being made for a plan approval, a planning licence or an authorisation of premature commencement,
3. the location and designation of the landfill site,
4. the grounds on which the necessity of the measure is justified,
5. the capacity of the landfill site,
6. a list of the wastes, stating their waste codes and waste designations according to the Annex to the Waste Catalogue Ordinance, and a description of the wastes broken down by type and properties,
7. details of the planning-law zoning classifications that apply to the location, the conditions at the location, the hydrology, the hydrogeology, and the geological, engineering-geological and geotechnical conditions,
8. measures for the construction and deposition phases, including the measures provided for to prevent and abate contaminations, and control and monitoring measures,
9. measures for the closure and aftercare phases,
10. information concerning the provision of a security,
11. where landfill replacement construction materials are to be deployed, a list of the wastes to be used, stating their waste codes and waste designations according to the Annex to the Waste Catalogue Ordinance, including details of the total quantities to be deployed and their properties, as well as a specification of the areas of deployment and the grounds on which the necessity of their deployment is justified.

In addition to this, the application for the granting of an authorisation of premature commencement must contain:

1. an explanation of the public interest or the project sponsor’s justified interest in premature commencement and
2. a commitment from the project sponsor to make good all damages caused until the issue of the authorisation as a result of the construction, trial operation and operation of the facility and, should the project not be authorised, to restore the location to its previous condition.

The first sentence of this paragraph shall apply to the substantive modification of a landfill site or its operation *mutatis mutandis*, limited to the amendment of the details that are affected. With

the approval of the competent authority, the application may be submitted electronically or in an electronic form. The requirements set out in Section 6 of the Act on the Assessment of Environmental Impacts with regard to the documents to be presented shall remain unaffected.

(2) With regard to a modification of a landfill site or its operation for which notification is mandatory as provided for in Section 31(4) and (5) of the Closed Substance Cycle and Waste Management Act, the sponsor of the project shall submit a written notification to the competent authority at least one month prior to the intended modification. The first, fourth and fifth sentences of paragraph 1 of this section shall apply *mutatis mutandis*, limited to the information that relates to the modification.

(3) The landfill site operator shall notify the competent authority in writing of the closure of a landfill site or section of a landfill site as provided for in Section 36(1) of the Closed Substance Cycle and Waste Management Act at least one year prior to the intended end of the deposition phase. The first, fourth and fifth sentences of paragraph 1 of this section shall apply *mutatis mutandis*, limited to the information that relates to the closure.

Section 20 Transboundary consultation of authorities and the general public

If a project that requires plan approval as provided for in Section 31(2) of the Closed Substance Cycle and Waste Management Act may have significant impacts in another state, which shall be specified in the application documents, or if another state that will possibly be significantly affected by its impacts so requests, the competent authority shall notify the authorities nominated by the other state at the same time and to the same extent as those authorities that are to be consulted under Section 73(2) of the Administrative Procedures Act. Section 11a of the Ordinance on the Licensing Procedure shall be applied to the subsequent procedure for the transboundary consultation of authorities and the general public *mutatis mutandis*.

Section 21 Official decisions

(1) In the plan approval decision or planning license provided for in Section 31(2) or (3) of the Closed Substance Cycle and Waste Management Act, the competent authority shall at least stipulate, with regard to a landfill site:

1. the details of the name and place of residence or legal domicile of the sponsor of the project and the landfill site operator,
2. an indication that a plan approval or a planning licence is being issued, and a statement of the legal foundations,
3. the landfill class,
4. the designation of the landfill site,
5. the details of the location,
6. the types of waste identified by their the waste codes and waste designations according to the Annex to the Waste Catalogue Ordinance,
7. the allocation values,
8. the permissible volume of the landfill site and, with regard to overground landfill sites, the permissible size of the deposition area, the shape of the surface and final heights,
9. requirements prior to the commissioning of the landfill site,
10. requirements with regard to the operation of the landfill site during the deposition phase, and the measurement and monitoring procedures, including the action plans,
11. requirements with regard to the closure and aftercare phases,
12. the obligation of the sponsor of the project to present annual reports to the competent authority,
13. the type and level of the security or equivalent collateral, in so far as this is required,
14. the trigger levels,
15. when landfill replacement construction materials are deployed, a listing of these materials broken down by their type, quantity and properties and the construction

measures in which landfill replacement construction materials may be used, broken down by their type and size, and
16. a justification statement intended to set out the essential *de facto* and legal grounds that have persuaded the authority to take its decision, and the treatment of objections.

(2) In the decision concerning the authorisation of premature commencement as provided for in Section 33 of the Closed Substance Cycle and Waste Management Act, the competent authority shall at least stipulate:
1. the details of the name and place of residence or legal domicile of the sponsor of the project,
2. an indication that premature commencement is being authorised and an indication of the legal foundations,
3. incidental provisions of the authorisation of premature commencement, including the designation of the landfill site, the details of the location and the provision of a security in accordance with Section 33(2) of the Closed Substance Cycle and Waste Management Act.

(3) Paragraph 1 of this section shall apply to a plan approval or planning license for the modification of a landfill site *mutatis mutandis*, limited to the information that relates to the modification.

(4) In order to prepare for the decision concerning the authorisation of premature commencement, the plan approval decision or the planning license, the competent authority may arrange for parts or the whole of the application documents to be scrutinised by an authorised expert, whom it shall appoint after consulting the sponsor of the project.

Section 22 Review of official decisions

The competent authority shall review the official decisions provided for in Section 21 every four years to ascertain whether further conditions, restrictions or time limits need to be imposed or existing conditions, restrictions or time limits amended to ensure compliance with the state of the art within the meaning of Section 3(12) of the Closed Substance Cycle and Waste Management Act and the requirements set out in Section 32(1)(1) to (3) and (5) of the Closed Substance Cycle and Waste Management Act.

Part 5: Long-term storage facilities

Section 23 Construction and operation

1. Section 3(1) and (3), Sections 4 to 6, Section 7(1), Sections 8, 9, 12, 13 and 18 shall apply to the construction and operation of class 0, I, II and III long-term storage facilities,
2. Section 3(2) and (3), Sections 4 to 6, Section 7(2), Sections 8, 9, 12, 13 and 18 shall apply to the construction and operation of class IV long-term storage facilities,

in each case with due regard to the second and fourth sentences of this section *mutatis mutandis*.

1. In derogation of Section 7(1)(1), metallic mercury waste may be accepted at a class III long-term storage facility,
2. in derogation of Section 7(2)(1), metallic mercury waste may be accepted at a class IV long-term storage facility.

In the case outlined in point 1 of the second sentence of this section, the long-term storage facility must be expressly intended and operationally/technically equipped for the storage of metallic mercury. In the case outlined in point 2 of the second sentence of this section, the long-term storage facility must be adapted for the disposal of metallic mercury and the location-specific safety assessment must particularly take this into consideration. Section 8(4) shall apply, provided that the only wastes that may be accepted are those for which written evidence

is available to the effect that their subsequent orderly and non-detrimental recovery or disposal compatible with the public welfare is ensured. Section 18(2) shall apply, provided that, instead of taking an aftercare period into consideration, the costs for the environmentally sound management of the maximum permissible quantity of wastes that is to be stored and the costs for the restoration of the facility premises are to be computed in order to calculate the level of the security.

Section 24 Closure and aftercare

Should there be grounds for concern that, following the closure of the long-term storage facility, harmful environmental impacts or other hazards that emanate from the facility or the plot on which the facility is located may cause significant disadvantages and significant nuisances to the public and the neighbourhood within the meaning of Section 5(3)(1) of the Federal Immission Control Act, the operator shall, at the request of the competent authority, arrange for an authorised expert appointed by agreement with the authority to scrutinise whether the requirements set out in Section 5(3)(1) of the Federal Immission Control Act are fulfilled. The other requirements set out in the Federal Immission Control Act concerning closure and aftercare shall remain unaffected.

Part 6: Final provisions

Section 25 Existing landfill sites in the deposition phase

(1) In derogation of Sections 3 to 6, Section 9, Section 12(1) and (2), Section 13(1) and (2) and Sections 14 to 16, it shall be possible to continue the operation of a landfill site or section of a landfill site that is under construction or in its deposition phase on 16 July 2009 and with regard to which stipulations concerning its construction and the further deposition phase as provided for in

1. the Ordinance on Environmentally Compatible Storage of Waste from Human Settlements and in Biological Waste-Treatment Facilities of 20 February 2001 (*BGBl.* I, p. 305), most recently amended by Article 1 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860),
2. the Landfill Ordinance of 24 July 2002 (*BGBl.* I, p. 2807), most recently amended by Article 2 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860), or
3. the Landfill Recovery Ordinance of 25 July 2005 (*BGBl.* I, p. 2252), most recently amended by Article 3 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860),

have been adopted definitively in a plan approval as provided for in Section 31(2), a planning license as provided for in Section 31(3) or an order as provided for in Section 35 or Section 36(2) of the Closed Substance Cycle and Waste Management Act, or with regard to which a notification as provided for in the first sentence of Section 14(1) of the Landfill Ordinance of 24 July 2002 (*BGBl.* I, p. 2807), most recently amended by Article 2 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860), is available. The first sentence of this paragraph shall apply, provided that the wastes to be deposited or the landfill replacement construction materials to be used satisfy the allocation criteria for ignition loss or total carbon (TOC) and dissolved organic carbon (DOC) set out in Annex 3(2) for the landfill class in question. Should stipulations also have been adopted for the closure phase, final closure and the aftercare phase as provided for in the first sentence of this paragraph, the landfill site or section of a landfill site may be closed and aftercare measures taken in accordance with these stipulations.

(2) A security acknowledged or authorised by the competent authority prior to 16 July 2009 shall continue to be valid for a landfill site or section of a landfill site covered by the first sentence of paragraph 1 of this section as a security of the kind provided for in Section 18(1). The first sentence of this paragraph shall also apply to operational reserves accumulated to meet the requirements of commercial law.

(3) With regard to landfill sites or sections of landfill sites on which domestic refuse, commercial wastes similar to domestic refuse, sewage sludges and other wastes with high organic contents have been deposited, the competent authority may, in derogation of Section 10(1), approve the installation of a temporary covering until the abatement of the main settling processes, if major settling processes are expected. This temporary covering shall be intended to minimise the formation of new leachate and landfill gas emissions.

(4) With regard to landfill sites or sections of landfill sites covered by paragraph 3 of this section, the competent authority may, at the application of the landfill site operator, in order to accelerate biological degradation processes and to improve long-term behaviour, further to the requirements set out in Sections 6 and 9, approve targeted wetting by means of the infiltration of water or, in derogation of Section 7(1)(1), leachate from the same landfill site, aeration of the waste body or a combination of procedures if the following minimum requirements are fulfilled:

1. With regard to targeted wetting by means of infiltration:
   a) leachate that arises shall be gathered,
   b) measures shall be taken to actively gather landfill gas, largely prevent emissions of landfill gas and control landfill gas,
   c) relevant quantities of organic substances that are still biodegradable shall be detected in the landfill body,
   d) facilities for regulated and controlled infiltration and for the control of the gas and water regime at the landfill site shall be installed, and
   e) evidence shall be furnished of the sufficient stability of the landfill body with due regard to the additional water that will be added to it.
2. With regard to the aeration of the waste body:
   a) facilities for targeted and controlled aeration, and discharged air gathering and treatment shall be installed so that uncontrolled gaseous emissions are largely prevented,
   b) discharged air treatment adapted to the characteristics of the discharged air shall be carried out so that harmful emissions are largely avoided,
   c) relevant quantities of organic substances that are still biodegradable shall be detected in the landfill body.
3. With regard to targeted wetting or aeration of the waste body: the water regime, the gas regime, the development of temperatures and settling processes in the landfill body shall be controlled in order to demonstrate that no adverse impacts on the landfill body and the environment are occurring and sufficiently intensified or accelerated biological degradation processes are taking place.

Section 26 Existing landfill sites in the closure phase

(1) In derogation of Sections 10, 11, 12(1) and (2), Section 13(1) and (2) and Sections 14 to 16, at a landfill site or section of a landfill site that is in its closure phase on 16 July 2009 and for which stipulations concerning the further closure phase provided for in Sections 12 or 14 of the Landfill Ordinance of 24 July 2002 (*BGBl.* I, p. 2807), most recently amended by Article 2 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860), and the Landfill Recovery Ordinance of 25 July 2005 (*BGBl.* I, p. 2252), most recently amended by Article 2 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860), have been adopted definitively in a plan approval as provided for in Section 31(2), a planning license as provided for in Section 31(3) or an order as provided for in Section 35 or Section 36(2) of the Closed Substance Cycle and Waste Management Act, closure measures may continue to be taken in accordance with the stipulations that have been adopted. If stipulations have also been adopted concerning its final closure and the aftercare phase as provided for in the first sentence of this paragraph, the landfill site or section of a landfill site may be finally closed and aftercare measures taken in accordance with these stipulations.

(2) Section 25(4) shall apply to landfill sites or sections of landfill sites covered by paragraph 1 of this section *mutatis mutandis*.

Section 27 Administrative offences

(1) An administrative offence within the meaning of Section 61(1)(5) of the Closed Substance Cycle and Waste Management Act shall be deemed to have been committed by any person who wilfully or negligently,

1. in contravention of the second sentence of Section 3(3), fails to secure or incorrectly secures a landfill site,
2. in contravention of the first sentence of Section 4, fails to arrange the organisation of a landfill site or arranges the organisation of a landfill site incorrectly,
3. in contravention of the first sentence of Section 5, also in conjunction with the second sentence of Section 5, commissions a landfill site, a section of a landfill site or a substantive modification to a facility of this kind,
4. in contravention of the first sentence of Section 6(1) or Section 7(1) or Section 7(2)(1), (2) or (3), deposits waste,
5. in contravention of the first sentence or the sixth sentence of Section 8(1), fails to present a fundamental characterisation, fails to present a fundamental characterisation correctly, fails to present a fundamental characterisation completely or fails to present a fundamental characterisation in good time,
6. in contravention of the fifth sentence or seventh sentence of Section 8(1), fails to stipulate key parameters or fails to stipulate key parameters in good time ,
7. in contravention of the first sentence of Section 8(3), also in conjunction with Section 17(1), fails to review wastes or fails to review wastes in good time,
8. in contravention of the first sentence of Section 8(4), also in conjunction with Section 17(1), fails to carry out an acceptance control, fails to carry out an acceptance control correctly, fails to carry out an acceptance control completely or fails to carry out an acceptance control in good time,
9. in contravention of the first sentence or points 1, 2 or 3 of the fifth sentence of Section 8(5), in each case also in conjunction with Section 17(1), fails to carry out a control analysis, fails to carry out a control analysis correctly, fails to carry out a control analysis completely or fails to carry out a control analysis in good time,
10. in contravention of Section 8(6), also in conjunction with Section 17(1), fails to take a reserve sample, fails to take a reserve sample in good time or fails to hold a reserve sample in safe-keeping for at least one month,
11. in contravention of the second sentence of Section 9 in conjunction with Annex 5(4)(2) or (3), fails to water wastes, fails to cover wastes or fails to cover wastes in good time,
12. in contravention of the second sentence of Section 9 in conjunction with the first sentence of Annex 5(4)(4), structures the landfill site in such a way that adverse reactions occur,
13. in contravention of the second sentence of Section 9 in conjunction with Annex 5(4)(5), fails to ensure that wastes drain, consolidate or solidify,
14. in contravention of the second sentence of Section 9 in conjunction with Annex 5(4)(6), fails to emplace wastes correctly,
15. in contravention of the third sentence of Section 9 in conjunction with Annex 5(5)(2), fails to condition wastes correctly,
16. in contravention of the third sentence of Section 9 in conjunction with Annex 5(5)(4), handles wastes in such a way that there are reactions among them after deposition,
17. in contravention of Section 10(1)(1) in conjunction with the first sentence of Annex 1(2.1), uses a geoplastic, a polymer, a leak detection system, a construction material, a liner component or a liner system,

. . .

18. in contravention of Section 10(1)(1) in conjunction with the second sentence of Annex 1(2.3), fails to install a levelling layer, fails to install a levelling layer correctly or fails to install a levelling layer in good time,

19. in contravention of Section 10(1)(1) in conjunction with the fourth sentence or the fifth sentence of Annex 1(2.3), fails to establish a control field, fails to establish a control field correctly, fails to establish a control field in good time or fails to operate a control field for the prescribed period,

20. in contravention of Section 10(1)(1) in conjunction with the first or second sentence of Annex 1(2.3.1)(1) or Annex 1(2.3.1.1)(1), fails to calculate the thickness of the recultivation layer or fails to calculate the thickness of the recultivation layer correctly,

21. in contravention of Section 10(1)(1) in conjunction with the second sentence of Annex 1(2.3.1)(4) or subpoint 2 of the third sentence of Annex 1(2.3.2), fails to ensure that only the material specified in these provisions is deployed,

22. in contravention of Section 10(1)(2) in conjunction with the first sentence or second sentence of Annex 2(3.1), fails to carry out a sealing measure, fails to carry out a sealing measure correctly, fails to carry out a sealing measure completely or fails to carry out a sealing measure in good time,

23. in contravention of Section 10(1)(2) in conjunction with the third sentence of Annex 2(3.1) fails to establish a safety zone or fails to establish a safety zone in good time,

24. in contravention of Section 12(2), fails to install a measuring station or measuring facility, fails to install a measuring station or measuring facility in good time, fails to maintain the measuring station or measuring facility, or fails to maintain the measuring station or measuring facility for the prescribed period,

25. in contravention of the first sentence of Section 12(3), fails to carry out a measurement or control or fails to carry out a measurement or control in good time,

26. in contravention of point 1 or point 2 of the second sentence of Section 12(3) in conjunction with the first, second or third sentence of Annex 5(7), fails to handle leachate or landfill gas, or fails to handle leachate or landfill gas correctly,

27. in contravention of point 1 of the second sentence of Section 12(4), fails to inform the authority or fails to inform the authority in good time,

28. in contravention of point 2 of the second sentence of Section 12(4), fails to proceed in accordance with the action plans,

29. in contravention of the first sentence of Section 13(1), fails to draw up operational regulations or an operating manual, or fails to draw up operational regulations or an operating manual in good time,

30. in contravention of the first sentence of Section 13(2) in conjunction with the fifth sentence of Annex 5(1.3), in each case also in conjunction with the second sentence of Section 17(2), fails to document a piece of information specified in these provisions, fails to document a piece of information specified in these provisions correctly or fails to document a piece of information specified in these provisions completely,

31. in contravention of the first sentence of Section 13(3), fails to keep an operating journal, fails to keep an operating journal correctly or fails to keep an operating journal completely,

32. in contravention of Section 13(4)(1) and (2), fails to notify the competent authority without delay concerning adverse impacts of the landfill site on the environment that have been identified and disruptions,

33. in contravention of the first sentence of Section 13(5), fails to present the annual report, fails to present the annual report in good time, fails to present the annual report correctly or fails to present the annual report completely,

34. in contravention of the first sentence of Section 13(6), fails to draw up a stock plan, fails to draw up a stock plan correctly, fails to draw up a stock plan completely or fails to draw up a stock plan in good time or,

35. in contravention of Section 14(2), uses wastes.

(2) The provisions set out in paragraph 1(1) to (16) and (24) to (34) of this section shall also apply to long-term storage facilities within the meaning of the first sentence of Section 23.

Section 28 Transitional provisions

In derogation of Section 3(1), Section 10(1) and Section 23, in each case in conjunction with Annex 1(2.1)(1), geoplastics (with the exception of plastic sealing liners and protective layers), polymers and leak detection systems for which suitability reports drawn up by the Federal Institute for Materials Research and Testing or another appropriate assessor are available may be deployed until 29 April 2010.

Annex 1:

Requirements with regard to the location, geological barrier and base and surface sealing systems for class 0, I, II and III landfill sites (re Section 3[1], Section 10[1], Section 23, Section 28)

1. Location and geological barrier

1.1 Suitability of the location

The suitability of the location for a landfill site is an essential precondition if the public welfare is not to be impaired by the landfill site as set out in Section 10(4) of the Closed Substance Cycle and Waste Management Act. In particular, the following issues are to be taken into consideration when the location is chosen:

1. geological and hydrogeological conditions in the area, including a distance, which shall be permanently guaranteed, of at least one metre between the upper edge of the geological barrier and the highest unconfined groundwater table to be anticipated,
2. areas of land that are particularly protected or deserving of protection such as drinking water protection areas, mineral spring protection areas, water priority areas, woodland protection areas, nature conservation areas and biotope areas,
3. a sufficient protective distance from sensitive areas such as residential buildings and recreational areas,
4. the danger of earthquakes, floods, subsidence, sinkholes, landslides or avalanches on the site,
5. whether it is possible for the leachate collected to be discharged using gravity.

1.2 Substrate of a landfill site

The substrate of a landfill site must fulfil the following requirements:

1. the substrate must be able to absorb all soil mechanical stresses induced by the landfill site, settling processes that occur must cause no damage to the base sealing and leachate collection system.
2. the substrate of the landfill site and the substrate in the wider surrounding area should, by virtue of their low permeability, their thickness and homogeneity, and their capacity to retain pollutants, be able to substantially obstruct any pollutant dispersion from the landfill site (effect as geological barrier), so that there are no grounds for concern that there may be any harmful contamination of groundwater or other adverse alteration of its quality.
3. The minimum requirements with regard to the water permeability (k) and thickness (d) of the geological barrier in accordance with subpoint 2 of this point are shown in Table 1, no. 1. If the geological barrier fails to fulfil these requirements by virtue of its natural properties, such a barrier may be created, completed or improved by means of technical measures. In the case outlined in the second sentence of this subpoint, the thickness (d) may be reduced to a minimum thickness of 0.5 metres if, due to a correspondingly lower level of water permeability, it is possible for the same protective effect to be achieved as provided for in the first sentence of this subpoint.
4. In derogation of subpoint 2 of this point, the second sentence of subpoint 3 of this point shall apply at a landfill site that does not possess a geological barrier in accordance with subpoint 2 of this point, provided that the technical measures are implemented with the minimum thickness set out in Table 1, no. 1.

2. Liner systems

2.1 General requirements

Only

1. geoplastics (plastic sealing liners, protective layers, plastic drainage components, reinforcing grids made of plastic, etc.), polymers and series-produced leak detection systems certified or found to be suitable by the Federal Institute for Materials Research and Testing as provided for in point 2.4 of this annex, and
2. other construction materials, liner components and liner systems that correspond to a quality standard guaranteed uniformly throughout the Federal Republic of Germany, the suitability of which has been demonstrated to the competent authority,

that comply with the state of the art as defined in point 2.1.1 of this annex may be deployed for the liner system. In so far as harmonised technical specifications of the kind provided for in Directive 89/106/EEC are available for construction products in liner systems and their performance characteristics make full allowance for the state of the art provided for with regard to their intended use, in particular their durability, certification under the first sentence of this point shall not be required. Certifications issued by the Federal Institute for Materials Research and Testing and suitability assessments issued by the Länder shall continue to have validity, except where they have been declared invalid. The evidence required by subpoint 2 of the second sentence of this point shall be deemed to have been provided if a suitability assessment valid uniformly throughout Federal Republic of Germany has been issued by the Länder for another construction material, a liner component or a liner system.

The practicality of the liner components and the liner system shall be demonstrated to the competent authority under on-site conditions prior to the construction of the liner system by means of the installation of trial fields. The competent authority may approve exceptions from this provision in so far as it is possible to demonstrate practicality under on-site conditions by furnishing other evidence.

All components shall be constructed stably. The competent authority shall be presented with a record that shows this is the case and, in particular, takes the layers' shearing strength into consideration.

The production of the liner components shall be subject to quality management during prefabrication and the execution of the construction work. During prefabrication, the quality management shall consist of in-house monitoring by the manufacturer and external monitoring by a contracted third party, during the execution of the construction work, the quality management shall consist of in-house checks by the company that executes the construction work, external checks by a contracted third party and monitoring by the competent authority. The third party contracted to carry out the external checks must possess sufficient qualified, competent personnel. The external body that carries out the checks and the extent of the external checks to be performed shall be agreed with the competent authority. The costs of the external checks shall be borne by the landfill site operator.

A quality management plan shall be drawn up in accordance with the 'Grundsätze des Qualitätsmanagements', chapter E5-1 of the *GDA-Empfehlungen des Arbeitskreises 6.1 – Geotechnik der Deponiebauwerke*, 3rd edition, German Geotechnical Society, 1997, Ernst & Sohn Verlag, Berlin. This plan shall be intended to stipulate the specific elements of the quality management system and responsibilities, material resources and activities such that the quality features for landfill liner systems specified in this Annex are satisfied.

2.1.1 Requirements with regard to the state of the art

The liner system, the materials and the production of the system components and their installation, as well as the properties of these components once installed must be chosen in such a way that it is demonstrated that the individual components and the overall system will fulfil their functions subject to all external impacts and interactions over a period of at least 100

years. In derogation of this provision, a period of at least 30 years shall apply for control systems for convection barriers.

Furthermore, at least the following criteria and mechanisms of action shall be taken into consideration, subject to the special constraints encountered in landfill liner systems:

1. impermeability, measured against the requirements set out in Tables 1 and 2,
2. the deformation capacity to absorb unavoidable settling processes,
3. the ability to withstand forces that have mechanical impacts,
4. the ability to withstand hydraulic impacts (suffosion and erosion),
5. resistance to chemical and biological impacts,
6. resistance to the influences of weathering,
7. resistance to adverse changes in materials induced by aging,
8. the assured, reproducible, quality-monitored prefabrication of liner components,
9. the assured, quality-monitored production of system components, and the installation of the system components and the liner system using methods that preserve their functionality, in particular including suitable measures for the prevention of damage induced by surcharge loads,
10. where a flow rate has been predetermined and is to be satisfied: appropriate records,
11. with regard to mineral liner components: the composition of the materials, the installation technique and the components' integration into the liner system in order to achieve a very low level of permeability and minimise the danger of desiccation cracks forming,
12. with regard to landfill replacement construction materials: the satisfaction of the additional requirements set out in Sections 14 and 15 of this Ordinance,
13. with regard to a mineral drainage layer: DIN 19667, May 1991 edition, *Drainage of landfills; code of practice for design, construction and operation*.

A single accountable contractor should be appointed for the construction of the liner system.

2.2 Special requirements with regard to the geological barrier and the base liner system

The permanent protection of soil and groundwater shall be achieved by means of the combination of a geological barrier as provided for in point 1.2 and a base liner system in the deposition area as provided for in Table 1, nos. 2 to 4. Where two liner components are required, these should consist of a convection barrier (plastic sealing liner or asphalt membrane) over a mineral component. The mineral component shall be constructed with several layers. The liner components shall be protected from damage induced by surcharge loads.

Table 1
Structure of the geological barrier and the base liner system

No.	System component	DK 0	DK I	DK II	DK III
1	Geological barrier[1)]	$k \leq 1 \cdot 10^{-7}$ m/s d ≥ 1.00 m	$k \leq 1 \cdot 10^{-9}$ m/s d ≥ 1.00 m	$k \leq 1 \cdot 10^{-9}$ m/s d ≥ 1.00 m	$k \leq 1 \cdot 10^{-9}$ m/s d ≥ 5.00 m
2	First liner component[2)]	Not required	Required	Required	Required
3	Second liner component[2)]	Not required	Not required	Required	Required
4	Mineral drainage layer,[3)] particle size in accordance with DIN 19667	d ≥ 0.30 m	d ≥ 0.50 m	d ≥ 0.50 m	d ≥ 0.50 m

. . .

1) The permeability coefficient k shall be satisfied at a pressure gradient of i = 30 (laboratory reading according to DIN 18130-1, May 1998 edition, *Soil – investigation and testing; Determination of the coefficient of water permeability – Part 1: Laboratory tests*).
2) If liner components are produced from mineral constituents, these must satisfy a minimum thickness of 0.50 m and a permeability coefficient of $k \leq 5 \times 10^{-10}$ m/s at a pressure gradient of i = 30 (laboratory reading according to DIN 18130-1, May 1998 edition, *Soil – investigation and testing; Determination of the coefficient of water permeability – Part 1: Laboratory tests*). If plastic sealing liners are deployed as liner components, they may not be less than 2.5 mm thick.
3) If it is demonstrated that there will be no retention of water in the landfill body over the long term, the drainage layer may be constructed with a lower layer thickness or different particle size at class I, II and III landfill sites with the approval of the competent authority.

2.3 Special requirements with regard to the surface sealing system

The surface sealing system shall be constructed in accordance with Table 2.

If irregularities in the surface of the deposited waste need to be compensated for or particular load-bearing capacities created in order to allow the system components to be installed properly, a sufficiently large levelling layer shall be installed on the surface.

Where two system components are required, these components should consist of different materials that react differently to impacts (e.g. desiccation, mechanical perforation) such that their functioning compensates for faults that affect the system's impermeability.

If the surface sealing system is constructed without a convection barrier at class I, II and III landfill sites, a control field of at least 300 square metres in area, with which the flow rate through the surface sealing system can be determined, shall be established at a representative point in the surface sealing system. The control field shall be operated until the end of the aftercare phase.

In cases where this is required by the desired, permissible subsequent use, the recultivation layer may be replaced with a technical functional layer adapted to the use in question.

2.3.1 Recultivation layer

The following provisions shall apply to a recultivation layer that is not used as a technical functional layer:

1. The thickness, the selection of materials and the vegetation of the recultivation layer shall be calculated according to the protective requirements of the system components located beneath it (greatest possible avoidance of root penetration through the drainage layer, no other impairment of the long-term functionality of the drainage layer, protection of system components against the impacts of roots and frost, as well as desiccation, subsequent uses). The minimum thickness may not be less than 1 m.
2. The material should have a useful field capacity of at least 140 mm, in terms of the total thickness of the recultivation layer.
3. The surface should be protected against wind and water erosion, and the highest possible evapotranspiration achieved by means of the selection of suitable vegetation.
4. The material deployed must comply with Annex 3(2). It must be ensured that only material is deployed that allows the water gathered in the drainage layer to be discharged in accordance with the provisions of water legislation.

2.3.1.1 Water regime layer

If the recultivation layer is designed as a water regime layer, the following provisions shall apply:

1. In derogation of the second sentence of point 2.3.1(1), the minimum thickness must be 1.50 m.
2. In derogation of point 2.3.1(2), the water regime layer should have a useful field capacity of at least 220 mm, in terms of the total thickness of the water regime layer.

3. Percolation through the layer may amount to at most ten percent of mean precipitation over a long period of years (as a rule 30 years), and at most 60 mm per year five years after construction at the latest.

At the application of the landfill site operator, the competent authority may approve variations in the useful field capacity required by subpoint 2 of this point in locations with low levels of precipitation (less than 600 mm per year) if it is demonstrated that an equivalent sealing and protective effect will be achieved by an increase in thickness.

2.3.1.2 Methane oxidation layer

Should the recultivation layer simultaneously perform functions involved in the methane oxidation of residual gases, additional requirements with regard to the layer shall be agreed with the competent authority. Interactions between methane oxidation and the water regime of the recultivation layer shall be evaluated.

2.3.2 Technical functional layer

If the surface of the landfill site is to accommodate transport infrastructure, car parks or built developments, or be used in a similar fashion after final closure, the recultivation layer may be replaced with a technical functional layer. When this is done, the material to be incorporated into the technical functional layer must at least satisfy the requirements with regard to pollutant content and leachability under which its use away from the location of the landfill site would be permissible subject to comparable constraints. The following provisions shall apply to the technical functional layer:

1. Its thickness shall be calculated according to the protective requirements of the system components located beneath it (no impairment of the long-term functionality of the drainage layer, protection of liner components from the impact of roots and frost, as well as desiccation).
2. It shall be necessary to ensure that only material is deployed that allows the water gathered in the drainage layer to be discharged in accordance with the provisions of water legislation.
3. Depending on the purpose of the usage that justifies the technical functional layer, the surface shall be constructed in such a way that it can fulfil a natural function of the location and the protective requirements set out in subpoint 1 of this point continue to be satisfied.

Table 2

Structure of the surface sealing system

No.	System component	DK 0	DK I [5)]	DK II [6)]	DK III
1	Levelling layer[1)]	Not required	Sometimes required[7)]	Sometimes required[7)]	Sometimes required[7)]
2	Gas drainage layer[1)]	Not required	Not required	Sometimes required[8)]	Sometimes required[8)]
3	First liner component	Not required	Required[2)]	Required[2)]	Required[3)]
4	Second liner component	Not required	Not required	Required[2)]	Required[3)]
5	Leak detection system	Not required	Not required	Not required	Required
6	Drainage layer[4)] $d \geq 0.30$ m, $k \geq 1 \cdot 10^{-3}$ m/s, gradient > 5%	Not required	Required	Required	Required
7	Recultivation layer/technical functional layer	Required	Required	Required	Required

1) Where it is of sufficient gas permeability and thickness, the levelling layer may help to fulfil the function of the gas drainage layer provided for in no. 2.

2) If liner components made out of mineral materials are used, their computed permeation rate may not be greater than that of a 50-cm-thick mineral seal with a permeability coefficient of $k \leq 5x10^{-9}$ m/s at a pressure gradient of i = 30 (laboratory reading according to DIN 18130-1, May 1998 edition, *Soil – investigation and testing; Determination of the coefficient of water permeability – Part 1: Laboratory tests*), and they must withstand a permanent head of water of 0.30 m. In derogation of the first sentence of this footnote, where their effectiveness cannot be specified with permeability coefficients, mineral liner components may be deployed if they have a five-year mean flow rate of no more than 20 mm/year. If plastic sealing liners are deployed as liner components, they may not be less than 2.5 mm thick.

3) If liner components made of mineral materials are used, their computed permeation rate may not be greater than that of a 50-cm-thick mineral seal with a permeability coefficient of $k \leq 5x10^{-10}$ m/s at a pressure gradient of i = 30 (laboratory reading according to DIN 18130-1, May 1998 edition, *Soil – investigation and testing; Determination of the coefficient of water permeability – Part 1: Laboratory tests*), and they must withstand a permanent head of water of 0.30 m. In derogation of the first sentence of this footnote, where their effectiveness cannot be specified with permeability coefficients, mineral liner components may be deployed if they have a five-year mean flow rate of no more than 10 mm/year. If plastic sealing liners are deployed as liners, they may not be less than 2.5 mm thick.

4) The competent authority may, at the application of the landfill site operator, approve variations in the minimum thickness, permeability coefficient and gradient of the drainage layer if it is demonstrated that the hydraulic performance of the drainage layer and the stability of the recultivation layer will be permanently guaranteed.

5) Instead of the liner component, the drainage layer and the recultivation layer, a recultivation layer designed as a water regime layer may be approved if, in derogation of the requirements set out in point 2.3.1.1(3), the five-year mean of the flow rate through the water regime layer is no more than 20 mm/year.

6) Instead of the second liner component and the recultivation layer, a recultivation layer designed as a water regime layer as provided for in point 2.3.1.1 may be installed. If the first liner component is implemented as a convection barrier, a control system for the convection barrier may also be installed instead of the second liner component. In this case, a second liner component shall be installed directly under the convection barrier in areas around points at which the drainage water is collected and discharged, or equivalent systems provided for. The first to the third sentences of this footnote shall apply at landfill sites or sections of landfill sites on which domestic refuse, commercial wastes similar to domestic refuse, sewage sludges and other wastes with high organic contents have been deposited, provided that the landfill site operator carries out measures provided for in Section 25(4) or arranges for such measures to be carried out in order to accelerate biological degradation processes and improve long-term behaviour with demonstrable success.

7) This requirement is dependent on the second sentence of point 2.3.

8) This requirement is dependent on Annex 5(7).

2.4 Certification of geoplastics, polymers and leak detection systems

2.4.1 Responsibilities and functions

The Federal Institute for Materials Research and Testing shall be responsible for the testing and certification of geoplastics such as plastic sealing liners, protective layers, plastic drainage components, reinforcing grids made from plastic, polymers and leak detection systems for application in the base and surface seals of landfill sites on the basis of its own analyses and the results reached by accredited bodies. In this context, it shall have the following functions:

1. the definition of testing criteria.
2. the inclusion of incidental provisions in the certification.
3. the stipulation of requirements with regard to expert installation and quality management.

2.4.2 Certification

When certifying geoplastics, polymers and control systems, the Federal Institute for Materials Research and Testing shall take into consideration at least the criteria and mechanisms of action set out in point 2.1.1 with regard to the state of the art.

2.4.3 Application

Certification shall be applied for by the manufacturer of the geoplastic, polymer or control system product.

2.4.4 Advisory Council
An Advisory Council, on which representatives of the technical authorities of the Länder, the Federal Environmental Agency and specialists from other relevant fields shall be represented, shall contribute in a consultative capacity to the drafting of the certification guidelines that specify the preconditions and requirements for certification by the Federal Institute for Materials Research and Testing. The management of the Advisory Council shall be vested in the Federal Institute for Materials Research and Testing.

2.4.5 Publication
The certification guidelines and the certification documents for certifications shall be made publicly accessible by the Federal Institute for Materials Research and Testing in a suitable form.

3. Mono-landfill sites

Where, with regard to a mono-landfill site for dredging spoil from bodies of water, a mono-landfill site for regionally specific contaminated soil material or an enterprise's in-house mono-landfill site on which exclusively that enterprise's in-house specific mass wastes or specific mass wastes from an enterprise in the same group are deposited, on the basis of an evaluation of the risks to the environment, the competent authority has decided that the collection and treatment of leachate is not required, or where it has been determined that a mono-landfill site does not represent a danger to soil, groundwater or surface water, the requirements set out in points 1 and 2 may be relaxed accordingly.

4. Publications issued by expert bodies

DIN standards are published by, and may be purchased from, Beuth Verlag GmbH, Berlin, and are archived and preserved at the German Patent and Trade Mark Office in Munich.

Annex 2:

Requirements with regard to the location, geological barrier, long-term safety records and closure measures for class IV landfill sites in salt rock (re Section 3[2], Section 10[1], Section 11[2])

1. Location and geological barrier

When the location for a class IV landfill site in salt rock (underground landfill site) is chosen, it shall be taken into consideration that the wastes will be permanently removed from the biosphere and may be deposited in such a way that no aftercare measures are required. As the crucial geological barrier, the salt rock at the location must

1. be impervious to liquids and gases,
2. be of sufficient spatial extent,
3. possess a sufficient unworked thickness of salt in the selected deposition area, which shall be so great that the barrier function will not be permanently impaired, and
4. gradually close around the wastes and, at the end of the deformation process, enclose them with a frictional closure as a result of its convergence behaviour.

In addition to this,

5. the underground cavities used with the landfill site must be stable for at least the duration of the deposition and closure phase, and
6. locations in which there is a 99-percent probability that the regional intensity of earthquakes will exceed 8 on the Medvedev-Sponheuer-Karnik scale (MSK scale) shall be avoided.

2. Location-specific safety assessment

Evidence of the suitability of the rock mass for the construction of an underground landfill site must be furnished by means of a location-specific safety assessment. The basis of the location-specific safety assessment shall be the analysis of the possible hazards of which note is to be taken during construction, operation and the post-operational phase. This shall be used to derive the control and protective measures that are required. The following individual records shall be kept for the location-specific safety assessment:

1. the geotechnical stability record,
2. the safety record for the disposal and closure phases, and
3. the long-term safety record.

With regard to the keeping of the individual records, note shall be taken of the guidance set out in point 2.1.

2.1. Guidance on the keeping of the long-term safety record

2.1.1 Scope and requirements

Where hazardous wastes are disposed of in class IV landfill sites, the long-term safety record for the entire ‘waste/underground construction/rock mass’ system shall be kept with due regard to scheduled and unscheduled (hypothetical) sequences of events, in which respect account shall be taken of the location-specific circumstances.

As a comprehensive, summary individual record within the framework of the location-specific safety assessment, the long-term safety record shall be based in essence on the results of two individual records,

1. the geotechnical stability record and
2. the safety record for the deposition and closure phases.

In particular, the geotechnical stability record shall be accorded decisive significance in the assessment of the long-term effectiveness and integrity of the salt barrier.

If complete enclosure is proven by the geotechnical stability record, it is possible to dispense with model calculations for unscheduled sequences of events, in so far as it is plausibly set out whether and how unscheduled events will have an impact. As a rule, a verbal examination of the arguments shall be deemed to be sufficient, although it shall be verified specifically for each location. Should complete enclosure be substantiated in the geotechnical stability record, it shall also be possible to dispense with model calculations concerning pollutant dispersion in the overburden in the long-term safety record.

2.1.2 Basic information required

In order to assess long-term safety, detailed basic information shall be required concerning the geological, geotechnical, hydrogeological and geochemical parameters of the location, as well as the concentration and mobility behaviour of the pollutants to be emplaced. This shall include, *inter alia*:

2.1.2.1 Geological conditions

1. The geological barrier; the vertical distance from the salt roof zone to the nearest upper workings; the horizontal distances from the cavities to the flanks of the salt rock and the vertical distance to the footwall; the thickness of the entire salt deposit or salt rock mass.
2. The extent to which the deposit has been explored.
3. Exploratory boreholes from above and below ground.
4. The stratigraphy in the mining concession (incl. thicknesses, rock face transitions).
5. The material composition of the salt deposit with the ratio of rock salt to potash salts, clays, anhydrites, carboniferous rocks.
6. The structure of the salt deposit/internal structure, structural development including movements in the salt deposit and its surroundings, convergence, strikes and inclines in the deposit, flank formation, transformations at the surface of the salt deposit, the position and formation of potential alkaline reservoirs (e.g. hauptanhydrit).
7. The degree of tectonic stress on the salt structure, predominant fault directions.
8. Geological cross-sections through the workings.
9. The geothermal gradient.
10. Regional seismic activity in the past and present.
11. Subrosion, the formation of sinkholes at the surface.
12. Halokinesis.

2.1.2.2 Information about the workings

1. Layout (depth of the workings, volume of cavities, roadway cross-sections, shafts, blind shafts, spiral chutes and ramps, horizontal extent of the workings, location and depth of all shafts in the workings, areas and locations of the levels or sublevels, distances between levels or sublevels, levels connected to a filling station on the air shaft, locations and sizes of the planned deposition spaces).
2. Safety:
   a) stability of the shafts, roadways, blind shafts and worked spaces,
   b) roof subsidence, sidewall flaking and rising footwalls in the mining concession area, where applicable,
   c) inflows of solutions (locations, quantities per unit of time, occurrence, temperature/density, saturated/unsaturated, pH value/chemical analysis, impacts on mining operations or individual parts of the mine, where applicable), cause and origins, where applicable,
   d) gas release/risk (location, quantity, composition, cause), where applicable,

e) petroleum/natural gas deposits (in the interior or in the salt slope/flank region of the salt deposits), where applicable,

f) safety pillars to the overburden/flanks/foundations/pockets of solution/boreholes/shafts/neighbouring mines,

g) existing exploratory boreholes from above ground and below ground (see also point 2.1.2.1),

h) parts of the workings that are dammed off or due to be dammed off.

2.1.2.3 Hydrogeological conditions

1. Stratigraphy, petrography, tectonics, thickness and stratification conditions of the layers in the overburden and adjacent rock.
2. Details of the structure of aquifer layers and groundwater movement.
3. Permeabilities and flow speeds.
4. Mineralisation of the groundwater, groundwater chemism, location of the salt water/fresh water boundary.
5. Groundwater usage, designated or planned drinking water protection areas, mineral spring protection areas and water priority areas.
6. Location, formation and properties of overground watercourses, standing bodies of water and bodies of water in water-filled underground caverns.

2.1.2.4 Emplacement of waste

1. Types and quantities of wastes, properties of the waste.
2. Deposition concept and technology.
3. Geomechanical behaviour of the wastes.
4. Reaction behaviour of the wastes in the case of the ingress of water and saline solutions:
   a) solubility behaviour,
   b) development of gases at raised temperatures underground,
   c) interactions among the wastes or between the wastes and the host rock.

2.1.3 Development of a safety concept

A safety concept should initially be drawn up on the basis of the basic information required by point 2.1.2. When this is done, an initial evaluation shall be carried out within the framework of the location-specific safety assessment to ascertain whether it appears possible to demonstrate the complete enclosure of the emplaced wastes over the long term under the conditions at the location. At the same time, it will become evident whether supplementary or additional exploratory work may be required.

2.1.4 Geotechnical stability record

In order to guarantee the permanent sealing of wastes from the biosphere, it is necessary to demonstrate, with regard to the stability of the cavities in particular, that

1. no deformations – either in the cavity itself or on the surface – that could impair the functionality of the mine are to be anticipated during and after the creation of the cavities,
2. the load-bearing behaviour of the rock is sufficient to prevent any caving-in of cavities that could impair the long-term safety of the class IV landfill site and

3. the emplaced wastes will have a stabilising effect over the longer term.

Evidence of stability during the deposition, closure and aftercare phases shall be provided by means of a rock-mechanical report. This shall, in particular, address the following issues:

1. Classification and evaluation of geological/tectonic and hydrogeological/hydrological findings with regard to their relevance for the rock-mechanical situation encountered and to be forecast in the area of the workings.
2. Analysis of the mining situation that draws on operational experience (where available), in particular concerning the dimensions of the underground excavations and the evaluation of their stability.
3. Analysis of the behaviour of the rock on the basis of measurements above ground and below ground, the results of geotechnical laboratory experiments and forecasts in mine surveys and rock-mechanical evaluations. Available results and data held by a mining enterprise may be used.
4. Generation of a representation of potential rock-mechanical risk situations on the basis of the analyses that have been carried out.
5. Preparation of a safety plan to demonstrate stability and to evaluate the long-term safety (integrity/intactness) of the geological barriers from a rock-mechanical perspective; in this respect, the possible risks shall be described and the possible hazards of which note is to be taken defined, and these shall then be taken as the basis for the computational evidence.
6. Stipulation of factors of a geological/tectonic nature (including the primary stress condition, temperature field, earthquakes) or anthropogenic nature (e.g. due to the drivage of cavities, emplacement of wastes) that may have an impact and are to be taken into consideration.
7. Performance of laboratory tests to determine the rock-mechanical properties (strength and deformation properties) of the solid salt rocks and, where applicable, the wastes to be emplaced as well.
8. In-situ measurements to evaluate the loading condition (deformation and stress condition) of the deposit as a consequence of the mining work that has been carried out; in-situ measurements of permeability in critical areas as well.
9. Computational rock-mechanical modelling to simulate the loading condition of the rock and the long-term behaviour of the emplacement area and the drifts with due regard to long-term convergence, the stabilising effect of the wastes and seismologically induced dynamic effects.
10. Evaluation of rock-mechanical conditions:
    a) stability (estimation of the possibility of a strength/deformation failure, seismic stability of the system),
    b) the convergence of the drifts and surface depressions, and
    c) the long-term effectiveness of the geological barriers.
11. Formulation of the measures required from a rock-mechanical perspective during waste emplacement operations and at the completion of operations:
    a) geotechnical measurements to accompany operations and
    b) rock-mechanical principles for the securing measures and sealing structures.

2.1.5 Record of long-term safety

Building on the results of the previous analyses, the following individual systems shall be evaluated in the comprehensive, summary long-term safety record for the entire 'waste/underground construction/rock mass' system on the basis of the multibarrier system:

1. Evaluation of natural barriers – behaviour of the host rock, adjacent rock and overburden.
2. Evaluation of technical interventions in natural barriers:
   a) shafts,
   b) other underground excavations (e.g. drifts, blind shafts),
   c) overground boreholes,
   d) underground boreholes and
   e) mining-induced rock loosening.
3. Evaluation of barriers:
   a) properties and, where applicable, conditioning of wastes,
   b) type of emplacement,
   c) roadway packs and
   d) shaft plugs.
4. Evaluation of natural events, in so far as they endanger the complete enclosure of the wastes and, where applicable, may bring about a mobilisation of pollutants:
   a) diapirism and subrosion,
   b) earthquakes.
5. Evaluation of technically induced events and processes, in so far as they endanger the complete enclosure of the wastes and, where applicable, may bring about a mobilisation of pollutants:
   a) leaks in exploratory boreholes,
   b) ingress of water during the deposition and closure phases, e.g. via shafts,
   c) ingress of lyes or gases during the disposal and closure phases,
   d) failure of the shaft plugs
   e) mining-induced rock loosening,
   f) boreholes or other interventions during the post-operational phase.

   The selection of additional events shall be guided by the location-specific circumstances in each case.
6. Summary evaluation of the entire system with due regard to all safety-relevant aspects.

3. Closure

3.1 General provisions

In the course of the closure of a class IV landfill site, sealing measures shall be carried out that guarantee that the deposited wastes are reliably removed from the biosphere. The requirements set out in points 3.2 or 3.3 shall be observed for this purpose.

A safety zone, which shall be fenced off and permanently marked, shall be established around the plots of land where shafts are located and other access points to the landfill site. These areas shall be excluded from any eventual use on the site and additionally secured by means of

a construction prohibition zone. After the completion of the measures, the rest of the site shall be rehabilitated.

When notification is given of the termination of the deposition of wastes, the competent authority shall be presented with verifiable documents concerning the sealing measures.

3.2 Mines

Prior to the commencement of sealing measures, a final rock-monitoring measurement shall be carried out below ground.

The shafts shall be fully backfilled.

The technical structure of the backfill column shall be stipulated with due regard to the geological profile and the shaft lining, in particular, such that any connection between the deposition area and the biosphere is prevented securely over the long term.

At the surface of the site, the shafts and other access points shall be covered securely. The covering shall be designed in such a way that the backfill column can be controlled.

If a class IV landfill site is operated in association with a salt mine and mineral extraction continues longer than the deposition operations, a hydraulically leakproof underground seal between the extraction area and the deposition area that is designed to withstand the pressure to be anticipated must be installed after the termination of deposition, the technical design of which shall give due regard to the events considered in the long-term safety record as set out in subpoints 4 and 5 of point 2.1.5.

The guidance set out in ‘Leitfaden für das Verwahren von Tagesschächten’ of 5 December 2007, in particular ‘Anhang 2’, shall be drawn on for the design of the technical structure of the backfill columns in shafts, quality assurance and the measures taken after the completion of the backfilling.

3.3 Caverns

A plug construction shall be installed in the area around the roof of the cavern and the neck of the cavern. All removable pipework shall be removed from the cavern borehole. The last cemented pipe string shall be completely backfilled with suitable sealing material. The plug of the cavern borehole shall be constructed in such a way that the inflow of groundwater and formation water to the deposited wastes and the release of pollutants into the biosphere are prevented. It must at least satisfy the following requirements:

1. The long-term stability and maintenance-freedom of the plug must be guaranteed.
2. The impermeability of the plug must approximate to that of the salt rock or the adjacent rock.
3. In order to achieve rapid impermeability, rapid positive closure and frictional closure between the plug and the salt rock must be guaranteed.
4. The material of the plug must be adapted to the solid-mechanical properties of its surroundings.
5. The shrinkage in the volume of the plug material after installation must be negligible.

4. Documentation of securing of surface access points

With regard to the measures taken to secure surface access points, documentation shall be drawn up and passed to the competent mining authority. The documentation must contain at least the following documents:

1. the entire design including its legal framework and objectives,
2. the condition of the shaft or the borehole and the relevant surrounding area prior to the

commencement of securing or plugging measures,
3. the condition of the shaft or the borehole and the relevant surrounding area following the preparations for backfilling or plugging measures, including the steps that have been taken and the firms that performed the work,
4. the condition of the shaft or the borehole and the relevant surrounding area after it has been secured or plugged, including the steps that have been taken and the firms that performed the work,
5. a textual explanation of the securing or plugging measures with the results of the determination of any hazardous areas that may remain,
6. graphic representations (site plan showing the shaft or borehole, shaft or borehole profile with the structure of the backfill, hazardous areas, where applicable),
7. quantitative records,
8. record of the performance of the securing or plugging measures to the requisite quality standards,
9. photographic documentation.

The results of ongoing measurements of the height of the upper edge of the backfill column as provided for in no. 6 of the table in Annex 5(3.2) and the quantitative records of any repeated backfilling measures that may be required in the aftercare phase, where applicable, shall be documented separately and passed to the competent mining authority.

5. Publications issued by expert bodies

1. The MSK scale is published in *Brockhaus Naturwissenschaft und Technik*, Bibliographisches Institut & F. A. Brockhaus AG, Mannheim, 2003.

2. 'Leitfaden für das Verwahren von Tagesschächten' is published in the *Sammelblatt der Bezirksregierung Arnsberg*, Arnsberg District Authority, Department 6, doc. ref.: 86.18.13.1-8-35.

Annex 3:

Permissibility and allocation criteria (re Section 2[5] to [9], [20] to [23], [33], Section 6[2] to [5], Section 8[1], [3], [5] and [7], Section 14[3], Section 15, Section 23, Section 25[1])

1. Use of wastes for the production of landfill replacement construction material and their direct deployment as landfill replacement construction material at class 0, I, II or III landfill sites

Where wastes are used for the production of landfill replacement construction material and used directly as a landfill replacement construction material, the allocation criteria set out in point 2 shall be satisfied for the areas of deployment specified in Table 1, nos. 2.2, 2.3 and 3, the allocation values set out in Table 2 shall be satisfied for the areas of deployment set out in Table 1, nos. 1.1, 2.1 and 4.1 to 4.3. The figures 4 to 9, which are entered in columns 3 to 6 for the areas of deployment set out in Table 1, nos. 1 to 4, stand for the relevant allocation values, which are set out in columns 4 to 9 of Table 2.

Table 1:

Permissibility criteria for the deployment of landfill replacement construction materials

1 No.	2 Area of deployment	3 DK 0	4 DK I	5 DK II	6 DK III
1	**Geological barrier**				
1.1	Technical measures to create, complete or improve the geological barrier	4	4	4	4
2	**Base liner system**				
2.1	Mineral liner component		5	5	5
2.2	Protective layer		6	7	8
2.3	Mineral drainage layer	5	6	7	8
3	**Construction measures in the landfill body required for landfill-engineering purposes (e.g. separating dams, roads, gas collectors), profiling of the landfill body, as well as the levelling layer and gas drainage layer of the surface sealing system at landfill sites or sections of landfill sites that**[1)]				
3.1	satisfy all requirements with regard to the geological barrier and the base liner system set out in Annex 1	5	6	7	8
3.2	satisfy at least all requirements with regard to the geological barrier or the base liner system set out in Annex 1	5	5[2)]	6	7
3.3	fail to completely satisfy either the requirements with regard to the geological barrier or the requirements with regard to the base liner system set out in Annex 1	[3)]	5[2)]	5[2)]	5[2)]
4	**Surface sealing system**				
4.1	Mineral liner component		5[2)]	5[2)]	5[2)]
4.2	Protective layer			[4)]	[4)]
4.3	Drainage layer		[4)]	[4)]	[4)]
4.4.1	Recultivation layer	9	9	9	9
4.4.2	Technical functional layer	Annex 1(2.3.2)	Annex 1(2.3.2)	Annex 1(2.3.2)	Annex 1(2.3.2)

1) Where high levels of naturally exposed soil are found in the vicinity of landfill sites, the competent authority may give its approval for soil material from this area to be used for the specified areas of deployment, even if individual allocation values set out in Table 2, no. 2 are exceeded. In this respect, no adverse impacts on the behaviour of the landfill site shall be anticipated.

2) If, on the basis of an evaluation of the risks to the environment, the landfill site operator is able to furnish the competent authority with evidence that the use of landfill replacement construction materials that do not satisfy the individual allocation values set out in Table 2, no. 2, column 5 does not represent a danger to soil or groundwater, it may also approve more heavily contaminated landfill replacement construction materials. In the case outlined in the first sentence of this footnote, however, the landfill replacement construction materials must at least satisfy the requirements under which the recovery of corresponding waste would be permissible outside the landfill body in technical structures with defined technical safety measures. In the case outlined in the first sentence of this footnote, however, landfill replacement construction materials must at least satisfy the allocation values set out in Table 2, column 6 where they are deployed in the first liner component under a second liner component. Deployment in the areas provided for in Table 1, no. 3 shall remain unaffected by the limitation set out in the second sentence of this footnote if, in the case outlined in the first sentence of this footnote, at least the allocation values set out in Table 2, column 6 are satisfied at a class II landfill site and at least the allocation values set out in Table 2, column 7 are satisfied at a class III landfill site.

3) Where they are deployed on a class 0 landfill site that does not possess a complete geological barrier as required by Table 1 of Annex 1, landfill replacement construction materials must at least satisfy the requirements under which the recovery of corresponding wastes would be permissible outside the landfill body.

4) In these areas of deployment, the landfill replacement construction materials must at least satisfy the requirements for a comparable area of deployment outside landfill sites in technical structures without special requirements with regard to the location and without technical safety measures.

2. Allocation criteria for class 0, I, II or III landfill sites

The allocation values set out in Table 2 shall be satisfied when waste and landfill replacement construction materials are allocated to class 0, I, II or III landfill sites or sections of landfill sites.
In derogation of the first sentence of this point, with the approval of the competent authority, wastes and landfill replacement construction materials may, in individual cases, be deposited or deployed, even where individual allocation values are exceeded, if the landfill site operator demonstrates that the public welfare – measured against the requirements set out in this Ordinance – will not be impaired.
Where the allocation values are exceeded as provided for in the second sentence of this point, the measured value that exceeds the allocation value may amount to a maximum of three times the allocation value in question, except where higher excessive values are approved by the footnotes to the table.
In derogation of the third sentence of this point, the second sentence of this point shall apply to specific mass wastes that are disposed of at a class I mono-landfill site or mono-section of a landfill site, provided that the excessive value may amount to a maximum of three times the allocation value in question for class II (Table 2, column 7), except where higher levels are approved by the footnotes to the table.
An excessive value of the kind provided for in the second to fourth sentences of this point shall not be permissible for the parameters ignition loss, TOC, BTEX, PCB, petroleum hydrocarbons, pH value and DOC, except where excessive values are approved by the footnotes to the table.
Any excessive value of the kind provided for in the second to fourth sentences of this point shall not be permissible for mechanically and biologically treated wastes. The sixth sentence of this point shall apply with the following provisos:
a) the requirements with regard to the organic component of the dry residue of the original substance shall be deemed to be satisfied if TOC does not exceed 18 percent by mass or the gross calorific value (H_o) does not exceed 6,000 kJ/kg,
b) the max. DOC shall be 300mg/l and
c) the biological degradability of the dry residue of the original substance shall not exceed 5 mg/g (determined as AT_4 respirometric activity) or 20 l/kg (determined as the gas formation rate in a GB_{21} fermentation test).
Further parameters and the determination of the total solid contents for selected parameters may be stipulated in view of the type of waste, pretreatment steps and special deposition or deployment conditions.
Annex 4 and, for completely stabilised waste, Section 6(2) shall be observed when samples are taken, prepared and analysed.
The competent authority shall keep a register of the decisions taken in accordance with the second sentence of this point.

Table 2:
Allocation values

1 No.	2 Parameter	3	4	5 DK 0	6 DK I	7 DK II	8 DK III	9 Recultiv-ation layer
1	**Organic component of dry residue of original substance**[1)]							
1.01	Determined as ignition loss	In % by mass	≤ 3	≤ 3[2)]	≤ 3[2) 3)]	≤ 5[2)3)]	≤ 10[2)3)]	
1.02	Determined as TOC	In % by mass	≤ 1	≤ 1[2)]	≤ 1[2)3)]	≤ 3[2)3)]	≤ 6[2)3)]	
2	**Criteria for solids**							

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2.01	Total BTEX (benzene, toluene, ethyl benzene, o-, m-, p-xylene, styrene, cumene)	In mg/kg dry mass	≤ 1	≤ 6				
2.02	PCBs (sum of 6 PCB congeners after Ballschmiter, PCB-28, -52, -101, -138, -153, -180)	In mg/kg dry mass	≤ 0.02	≤ 1				≤ 0.1
2.03	Petroleum hydrocarbons (C10 to C40)	In mg/kg dry mass	≤ 100	≤ 500				
2.04	Total PAHs after the EPA	In mg/kg dry mass	≤ 1	≤ 30				≤ 5[4)]
2.05	Benzo(a)pyrene	In mg/kg dry mass						≤ 0.6
2.06	Acid neutralisation capacity	In mmol/kg						
2.07	Extractable lipophile substances in the original substance	In % by mass		≤ 0.1	≤ 0.4[5)]	≤ 0.8[5)]	≤ 4[5)]	
2.08	Lead	In mg/kg dry mass						≤ 140
2.09	Cadmium	In mg/kg dry mass						≤ 1.0
2.10	Chrome	In mg/kg dry mass						≤ 120
2.11	Copper	In mg/kg dry mass						≤ 80
2.12	Nickel	In mg/kg dry mass						≤ 100
2.13	Mercury	In mg/kg dry mass						≤ 1.0
2.14	Zinc	In mg/kg dry mass						≤ 300
3	**Criteria for eluates**							
3.01	pH value[6)]		6.5-9	5.5-13	5.5-13	5.5-13	4-13	≤ 6.5-9
3.02	DOC[7)]	In mg/l		≤ 50	≤ 50 [8)]	≤ 80[8) 9)]	≤ 100 [10)]	
3.03	Phenols	In mg/l	≤ 0.05	≤ 0.1	≤ 0.2	≤ 50	≤ 100	
3.04	Arsenic	In mg/l	≤ 0.01	≤ 0.05	≤ 0.2	≤ 0.2	≤ 2.5	≤ 0.01
3.05	Lead	In mg/l	≤ 0.02	≤ 0.05	≤ 0.2	≤ 1	≤ 5	≤ 0.04
3.06	Cadmium	In mg/l	≤ 0.002	≤ 0.004	≤ 0.05	≤ 0.1	≤ 0.5	≤ 0.002
3.07	Copper	In mg/l	≤ 0.05	≤ 0.2	≤ 1	≤ 5	≤ 10	≤ 0.05
3.08	Nickel	In mg/l	≤ 0.04	≤ 0.04	≤ 0.2	≤ 1	≤ 4	≤ 0.05
3.09	Mercury	In mg/l	≤ 0.0002	≤ 0.001	≤ 0.005	≤ 0.02	≤ 0.2	≤ 0.0002
3.10	Zinc	In mg/l	≤ 0.1	≤ 0.4	≤ 2	≤ 5	≤ 20	≤ 0.1
3.11	Chloride[11)]	In mg/l	≤ 10	≤ 80	≤ 1,500[12)]	≤ 1,500[12)]	≤ 2,500	≤ 10[13)]
3.12	Sulfate[11)]	In mg/l	≤ 50	≤ 100[14)]	≤ 2,000[12)]	≤ 2,000[12)]	≤ 5,000	≤ 50[13)]
3.13	Cyanide, easily released	In mg/l	≤ 0.01	≤ 0.01	≤ 0.1	≤ 0.5	≤ 1	
3.14	Fluoride	In mg/l		≤ 1	≤ 5	≤ 15	≤ 50	
3.15	Barium	In mg/l		≤ 2	≤ 5[12)]	≤ 10[12)]	≤ 30	
3.16	Chrome, total	In mg/l		≤ 0.05	≤ 0.3	≤ 1	≤ 7	≤ 0.03
3.17	Molybdenum	In mg/l		≤ 0.05	≤ 0.3[12)]	≤ 1[12)]	≤ 3	
3.18a	Antimony[15)]	In mg/l		≤ 0.006	≤ 0.03[12)]	≤ 0.07[12)]	≤ 0.5	
3.18b	Antimony – C_o value[15)]	In mg/l		≤ 0.1	≤ 0.12[12)]	≤ 0.15[12)]	≤ 1.0	
3.19	Selenium	In mg/l		≤ 0.01	≤ 0.03[12)]	≤ 0.05[12)]	≤ 0.7	

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3.20	Water-soluble component (evaporation residue) of dry residue of original substance[11)]	In % by mass	≤ 0.4	≤ 0.4	≤ 3	≤ 6[16)]	≤ 10[16)]	
3.21	Electrical conductivity	In µS/cm						≤ 500

1) Point 1.01 may be applied equivalently to point 1.02.
2) Excessive TOC and ignition loss values shall be permissible with the approval of the competent authority if the excessive TOC and ignition loss values are caused by elementary carbon or if

a) the allocation value in question is satisfied for DOC, in each case with due regard to Footnotes 7, 8 or 9,
b) the biological degradability of the dry residue of the original substance does not reach 5 mg/g (determined as AT_4 respirometric activity) or 20 l/kg (determined as the gas formation rate in the GB_{21} fermentation test) and
c) the gross calorific value (H_o) does not exceed 6,000 kJ/kg.

Soil (waste codes 17 05 04 and 20 02 02 according to the Annex to the Waste Catalogue Ordinance) and dredging spoil (waste code 17 05 06 according to the Annex to the Waste Catalogue Ordinance) may contain no more than five percent by volume extraneous substances. The excessive TOC values provided for in the first sentence of this footnote shall be permissible at class 0 landfill sites up to max. six percent by mass.
3) The allocation value shall not apply for ashes from lignite fuel and wastes or landfill replacement construction materials derived from high-temperature processes, in particular wastes from the processing of slag, raw slag, dusts and sludges from the purification of waste gases from sintering installations, blast furnaces, shaft furnaces and steelworks in the iron and steel industry.
4) Where there are PAH levels of more than 3 mg/kg, a column test shall be used to demonstrate that a value of 0.20 mg/l will not be exceeded in the leachate that is to be anticipated.
5) Shall not apply to asphalt-based road rubble. The limitation set out in the third sentence of point 2 of this annex shall not be applicable.
6) Divergent pH values alone shall not represent an exclusion criterion. Where pH values are too high or too low, the cause shall be examined.
7) The allocation value for DOC shall also be satisfied if the waste or the landfill replacement construction material fails to satisfy the allocation value at its own pH value, but does satisfy the allocation value at a pH value between 7.5 und 8.0.
8) Shall not apply to wastes or gypsum-based landfill replacement construction materials, except where they are deposited or deployed jointly with biodegradeable or hazardous wastes.
9) Excessive values of DOC up to max. 100 mg/l shall be permissible if exclusively non-hazardous wastes or landfill replacement construction materials have been deposited or deployed on the landfill site or section of a landfill site since 16 July 2005.
10) With the approval of the competent authority, excessive values of DOC up to 200 mg/l shall be permissible if the public welfare is not impaired and up to max. 300 mg/l if they are based on inorganically bound carbon.
11) No. 3.20 may be applied equivalently to nos. 3.11 und 3.12.
12) The allocation value shall not be valid if exclusively non-hazardous wastes or landfill replacement construction materials have been deposited or deployed on the landfill site or section of a landfill site since 16 July 2005.
13) Analysis only where there is soil material with extraneous mineral components (max. ten percent by volume).
14) Excessive sulfate values up to 600 mg/l shall be permissible if the C_o value of the percolation test does not exceed 1,500 mg/l where the liquid/solid ratio = 0.1 l/kg.
15) Antimony values that exceed the values given in no. 3.18a shall be permissible if the C_o value of the percolation test provided for in no. 3.18b is not exceeded.
16) Shall not be valid for ashes from wood-combustion plants provided for in the Ordinance on Small and Medium-Sized Combustion Plants and in accordance with point 1.2(2)(a) and point 8.2 of the Annex to the Ordinance on Facilities Subject to Licensing, with the exception of cyclone and filter ashes.

Annex 4:

Guidelines on sampling (taking of samples, preparation of samples and analysis of wastes and landfill replacement construction materials) (re Section 6[2], Section 8[1], [3] and [5], Section 23)

1. Technical competence and accreditation

Samples shall be taken by persons who possess the technical competence required in order to take samples. Contrary to the first sentence of this point, technical skill on the part of the person who takes the sample shall be sufficient for the taking of samples when wastes are delivered at landfill sites. The sample analyses shall be carried out by independent testing laboratories accredited according to DIN EN ISO/IEC 17025, August 2005 edition, Corrigendum 2, May 2007, *General requirements for the competence of testing and calibration laboratories*, or by bodies that have been revocably licensed by the competent authority, with due regard to the requirements set out in point 3.

2. Taking of samples

Samples for the conduct of analyses shall be taken in accordance with *LAGA PN 98 – Richtlinie für das Vorgehen bei physikalischen, chemischen und biologischen Untersuchungen im Zusammenhang mit der Verwertung/Beseitigung von Abfällen*, Joint Working Group of the Länder on Waste, 2002, ISBN: 978-3-503-07037-4. The taking of samples shall be logged. The sampling logs shall be held in safe-keeping for five years and presented to the competent authority on request.

3. Determination of total contents in solid substance and elutable component

The allocation values listed in Annex 3 shall be determined using the following procedures. Equivalent procedures that comply with the state of the art shall be permissible with the approval of the competent authority. In so far as other parameters not specified below are to be analysed, the competent authority shall stipulate the analytical procedure. In this respect, the decision limit of a chosen analytical procedure shall be lower by at least a factor of three than the value of the corresponding parameter. The detection and determination limits shall be calculated according to DIN 32645, November 2008 edition (*Chemical analysis – Decision limit, detection limit and determination limit under repeatability conditions – Terms, methods, evaluation*).

3.1 Determination of total contents in solid substance

3.1.1 Preparation of samples

The sample of solid waste is prepared in accordance with DIN 19747, December 2006 edition (*Investigation of solids – Pre-treatment, preparation and processing of samples for chemical, biological and physical investigations*) by means of quartering, breaking and grinding in such a way that a homogeneous sample of 1,000 g is extracted from an initial sample of 5 to 50 kg. The sample of paste-like, sludgy waste is prepared by means of pan-grinding such that a homogeneous sample of 1,000 g is extracted from an initial sample of 5 to 50 kg. The dry mass of the sample is determined in accordance with DIN EN 14346 (March 2007 edition, *Characterization of waste. Calculation of dry matter by determination of dry residue or water content*). The preparation of the samples shall be logged.

3.1.2 Digestion procedure

DIN EN 13657, January 2003 edition
Characterisation of waste. Digestion for subsequent determination of aqua regia soluble portion of elements

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3.1.3 Organic component of dry residue in original substance

3.1.3.1 Ignition loss

DIN EN 15169, May 2007 edition
Characterization of waste. Determination of loss on ignition in waste, sludge and sediments

3.1.3.2 TOC (total organic carbon)

DIN EN 13137, December 2001 edition
Characterisation of waste. Determination of total organic carbon (TOC) in waste, sludges and sediments

3.1.4 BTEX (benzene, toluene, ethyl benzene, o-, m-, p-xylene, *s*tyrene, cumene)

DIN 38407-9, May 1991 edition
German standard methods for the examination of water, waste water and sludge; substance group analysis (group F); determination of benzene and some of its derivatives by gas chromatography (F 9)

Alternatively:
Hessian Agency for the Environment and Geology, 'Handbuch Altlasten', vol. 7, *Analysenverfahren*, 'Teil 4 – Bestimmung von BTEX/LHKW in Feststoffen aus dem Altlastenbereich', 2000 edition

3.1.5 PCBs (polychlorinated biphenyls – sum of 6 PCB congeners after Ballschmiter, PCB-28, -52, -101, -138, -153, -180)

DIN EN 15308, May 2008 edition
Characterization of waste. Determination of selected polychlorinated biphenyls (PCB) in solid waste by using capillary gas chromatography with electron capture or mass spectrometric detection

Alternatively:
DIN 38414-20, January 1996 edition
German standard methods for the examination of water, waste water and sludge – Sludge and sediments (group S) – Determination of six selected polychlorinated biphenyls by gas chromatography (S 20)

3.1.6 Petroleum hydrocarbons (C10 to C40)

DIN EN 14039, January 2005 edition
Characterization of waste. Determination of hydrocarbon content in the range of C10 to C40 by gas chromatography

In conjunction with
LAGA Communication 35, *Bestimmung des Gehaltes an Kohlenwasserstoffen in Abfällen – Untersuchungs- und Analysenstrategie* (*KW/04*), Joint Working Group of the Länder on Waste, 16 November 2004, ISBN: 978-3-503-08396-1

3.1.7 PAHs (Polycyclic aromatic hydrocarbons)

DIN EN 15527, September 2008 edition
Characterization of waste. Determination of polycyclic aromatic hydrocarbons (PAH) in waste using gas chromatography mass spectrometry (GC/MS)

3.1.8 Density

DIN 18125-2, August 1999 edition
Soil investigation and testing - Determination of density of soil - Part 2: Field tests

3.1.9 Gross calorific value

DIN EN 15170, November 2006 edition
Characterization of sludges. Determination of calorific value

3.2 Determination of contents in eluate

3.2.1 Preparation of eluate

3.2.1.1 Preparation of eluate with 10/1 liquid/solid substance ratio

DIN EN 12457-4, January 2003 edition
Characterisation of waste. Leaching. Compliance test for leaching of granular waste materials and sludges. One stage batch test at a liquid to solid ratio of 10 l/kg for materials with particle size below 10 mm (without or with size reduction)

In derogation of the instructions given in DIN EN 12457-4, the material is first broken up as of a particle size of 40 mm. The weighing for the eluate procedure is carried out following DIN EN 12457-4. The phases are separated in accordance with the method described in Annex E of DIN EN 12457-4. Should the coarse particles be mechanically stable under deposition conditions in the case of lumpy materials with particle size > 40 mm, the eluate is prepared in accordance with *LAGA EW 98 – Richtlinie für das Vorgehen bei physikalischen und chemischen Untersuchungen von Abfällen, verunreinigten Böden und Materialien aus dem Altlastenbereich*, chap. 4 ('Trogverfahren, EW 98 T'), Joint Working Group of the Länder on Waste, 2002, ISBN 978-503-07038-1, where necessary.

3.2.1.2 Preparation of eluates with constant pH values of 4 and 11/acid neutralisation capacity

Joint Working Group of the Länder on Waste, *LAGA EW 98 – Richtlinie für das Vorgehen bei physikalischen und chemischen Untersuchungen von Abfällen, verunreinigten Böden und Materialien aus dem Altlastenbereich*, chap. 5 ('Bestimmung der Eluierbarkeit mit wässrigen Medien bei konstantem pH-Wert'), 2002, ISBN 978-3-503-07038-1.

3.2.2 Up-flow percolation test

DIN CEN/TS 14405, September 2004 edition
Characterization of waste. Leaching behaviour tests. Up-flow percolation test (under specified conditions)

Alternatively:
DIN 19528, July 2007 edition
Leaching of solid materials - Percolation method for the joint examination of the leaching behaviour of organic and inorganic substances for materials with a particle size up to 32 mm – Basic characterization using a comprehensive column test and compliance test using a quick column

3.2.3 pH value

DIN 38404-5, August 2005 edition
German Standard Methods For The Examination Of Water, Waste Water And Sludge – Physical And Physico-chemical Characteristics (group C) – Part 5: Determination Of Ph Value (c 5)

3.2.4 DOC (dissolved organic carbon)

3.2.4.1 DOC

DIN EN 1484, August 1997 edition
Water analysis. Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC)

3.2.4.2 DOC at pH value between 7.5 und 8

Joint Working Group of the Länder on Waste, *LAGA EW 98 – Richtlinie für das Vorgehen bei physikalischen und chemischen Untersuchungen von Abfällen, verunreinigten Böden und Materialien aus dem Altlastenbereich*, chap. 5 ('Bestimmung der Eluierbarkeit mit wässrigen Medien bei konstantem pH-Wert'), 2002, ISBN: 978-3-503-07038-1

3.2.5 Phenols

DIN 38409-16, June 1984 edition
German standard methods for the examination of water, waste water and sludge; general measures of effects and substances (group H); determination of the phenol index (H 16)

3.2.6 Arsenic

DIN EN ISO 11969, November 1996 edition
Water quality. Determination of arsenic. Atomic absorption spectrometric method (hydride technique)

Alternatively:
DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

Alternatively:
DIN EN ISO 15586, February 2004 edition
Water quality. Determination of trace elements using atomic absorption spectrometry with graphite furnace

Alternatively:
DIN EN ISO 17294-2, February 2005 edition
Water quality. Application of inductively coupled plasma mass spectrometry (ICP-MS). Determination of 62 elements

3.2.7 Lead

DIN EN ISO 15586, February 2004 edition
Water quality. Determination of trace elements using atomic absorption spectrometry with graphite furnace

Alternatively:
DIN EN ISO 17294-2, February 2005 edition
Water quality. Application of inductively coupled plasma mass spectrometry (ICP-MS). Determination of 62 elements

Alternatively:
DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

3.2.8 Cadmium

DIN EN ISO 15586, February 2004 edition
Water quality. Determination of trace elements using atomic absorption spectrometry with graphite furnace

Alternatively:
DIN EN ISO 17294-2, February 2005 edition
Water quality. Application of inductively coupled plasma mass spectrometry (ICP-MS). Determination of 62 elements

Alternatively:
DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma optical emission spectrometry

3.2.9 Copper

DIN EN ISO 15586, February 2004 edition
Water quality. Determination of trace elements using atomic absorption spectrometry with graphite furnace

Alternatively:
DIN EN ISO 17294-2, February 2005 edition
Water quality. Application of inductively coupled plasma mass spectrometry (ICP-MS). Determination of 62 elements

Alternatively:
DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

3.2.10 Nickel

DIN EN ISO 15586, February 2004 edition
Water quality. Determination of trace elements using atomic absorption spectrometry with graphite furnace

Alternatively:
DIN EN ISO 17294-2, February 2005 edition
Water quality. Application of inductively coupled plasma mass spectrometry (ICP-MS). Determination of 62 elements

Alternatively:
DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

3.2.11 Mercury
DIN EN 1483, July 2007 edition
Water quality. Determination of mercury. Method using atomic absorption spectrometry

Alternatively:
DIN EN ISO 17852, April 2008 edition
Water quality. Determination of mercury. Method using a combined preservation and digestion step followed by atomic fluorescence spectrometry

3.2.12 Zinc

DIN EN ISO 15586, February 2004 edition
Water quality. Determination of trace elements using atomic absorption spectrometry with graphite furnace

Alternatively:
DIN EN ISO 17294-2, February 2005 edition
Water quality. Application of inductively coupled plasma mass spectrometry (ICP-MS). Determination of 62 elements

Alternatively:
DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

3.2.13 Chloride

DIN EN ISO 10304-2, November 1996 edition
Water quality. Determination of dissolved anions by liquid chromatography of ions. Determination of bromide, chloride, nitrate, nitrite, orthophosphate and sulfate in waste water

Alternatively:
DIN 38405-1, December 1985 edition
German standard methods for the examination of water, waste water and sludge; anions (group D); determination of chloride ions (D 1)

Alternatively:
DIN EN ISO 15682, January 2002 edition
Water quality. Determination of chloride by flow analysis (CFA and FIA) and photometric or potentiometric detection

3.2.14 Sulfate

DIN EN ISO 10304-2, November 1996 edition
Water quality. Determination of dissolved anions by liquid chromatography of ions. Determination of bromide, chloride, nitrate, nitrite, orthophosphate and sulfate in waste water

Alternatively:
DIN 38405-5, January 1985 edition
German standard methods for the examination of water, waste water and sludge; anions (group D); determination of sulfate ions (D 5)

3.2.15 Cyanides, easily released

DIN 38405-14, December 1988 edition
German standard methods for the examination of water, waste water and sludge; anions (group D); determination of cyanides in drinking water, and in groundwater and surface water with low pollution levels (D 14)
Where wastes contain sulphides, determination is carried out in accordance with DIN 38405-13, November 2006 edition, *German Standard Methods for the Analysis of Water, Waste Water and Sludge; Anions (Group D); Determination of Cyanides (D 13)*

3.2.16 Fluoride

DIN 38405-4, July 1985 edition
German standard methods for the examination of water, waste water and sludge; anions (group D); determination of fluoride (D 4)

Alternatively:
DIN EN ISO 10304-1, April 1995 edition

Water quality. Determination of dissolved anions by liquid chromatography of ions. Determination of fluoride, chloride, nitrite, orthophosphate, bromide, nitrate and sulfate ions. Method for water with low contamination

3.2.17 Barium

DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

3.2.18 Chrome, total

DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

Alternatively:
DIN EN ISO 15586, February 2004 edition
Water quality. Determination of trace elements using atomic absorption spectrometry with graphite furnace

Alternatively:
DIN EN ISO 17294-2, February 2005 edition
Water quality. Application of inductively coupled plasma mass spectrometry (ICP-MS). Determination of 62 elements

3.2.19 Molybdenum

DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

3.2.20 Antimony
DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

Alternatively:
DIN EN ISO 15586, February 2004 edition
Water quality. Determination of trace elements using atomic absorption spectrometry with graphite furnace

Alternatively:
DIN 38405-32, May 2000 edition
German standard methods for the examination of water, waste water and sludge – Anions (group D) – Determination of antimony by atomic absorption spectrometry (D 32)

Alternatively:
DIN EN ISO 17294-2, February 2005 edition
Water quality. Application of inductively coupled plasma mass spectrometry (ICP-MS). Determination of 62 elements

3.2.21 Selenium

DIN EN ISO 11885, April 1998 edition
Water quality. Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy

Alternatively:
DIN EN ISO 17294-2, February 2005 edition
Water quality. Application of inductively coupled plasma mass spectrometry (ICP-MS). Determination of 62 elements

3.2.22 Water-soluble component of dry residue of original substance determined from dry filtrate residue of eluate

DIN EN 14346, March 2007 edition
Characterization of waste. Calculation of dry matter by determination of dry residue or water content

3.2.23 Conductivity of eluate

DIN EN 27888, November 1993 edition
Water quality. Method for the determination of electrical conductivity

3.3 Biological degradability of dry residue of original substance
3.3.1 Respirometric activity, determined over four days in laboratory test (AT_4):

3.3.1.1 Test equipment:

AT_4 is determined with a sapromat, a respiromat or an equivalent device. All deviations from the method set out below are to be documented.

3.3.1.2 Temperature:

20 ± 1 °C in a temperature-controlled water bath or conditioned room.

3.3.1.3 Storage of samples:

The preparation of the samples must be completed, and the test started, within 48 hours after they have been taken. During this period, temperatures over 4 °C are permissible for a maximum of 24 hours. If it is not possible to guarantee this procedure can be followed, the sample is to be frozen at -18 to -20 °C within 24 hours after the sample has been taken. The freezing of the sample is to be documented when the evaluation is carried out. The sample should be thawed gently over a period of no more than 24 hours, during which the temperature may not exceed 20 °C.

3.3.1.4 Preparation of samples:

The original sample, in its entirety, is wet-crushed to a particle size less than or equal to 10 mm. If necessary, interfering substances (glass, stones and metals) may be removed prior to crushing. The proportions of the total mass that they constitute shall be taken into consideration when the test is evaluated.

3.3.1.5 Adjustment of water content:

300 g of the prepared sample is moistened with 300 ml tap water and transferred into the apparatus shown in Figure 1. Once the lid and seal have been attached, a negative pressure of approx. 100,000 Pa (water aspirator vacuum) is applied and maintained for 30 minutes. The volume of water filtered out is to be determined and deducted from the 300 ml tap water that has been added. The mass of water calculated in this manner is to be added to the part of the sample that is placed in the test apparatus.

If the water content of the sample to be deployed is greater than the water content that has been calculated, the sample is to be transferred, without further moistening, into the apparatus shown in Figure 1, subjected to negative pressure for 30 minutes in the vacuum nutsche and placed in the test apparatus.

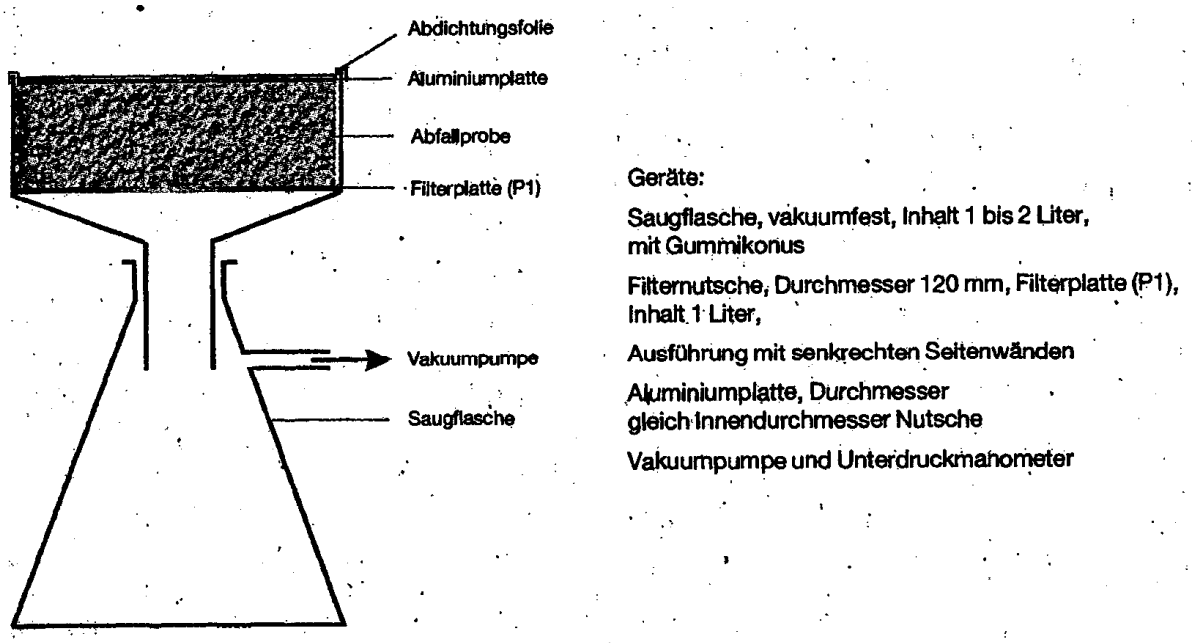

Bild 1: Apparatur zur Einstellung des Wassergehaltes

Bild 1: Apparatur zur Einstellung des Wassergehaltes = Figure 1: Apparatus for the adjustment of water content

Abdichtungsfolie = Foil seal
Aluminiumplatte = Aluminium plate
Abfallprobe = Waste sample
Filterplatte (P1) = Filter plate (P1)
Vakuumpumpe = Vacuum pump
Saugflasche = Suction flask
Geräte = Equipment
Saugflasche, vakuumfest, Inhalt 1 bis 2 Liter, mit Gummikonus = Suction flask, vacuum-tight, volume of 1 to 2 litres, with rubber cone
Filternutsche, Durchmesser 120 mm, Filterplatte (P1), Inhalt 1 Liter = Nutsche filter, diameter of 120 mm, filter plate (P1), volume of 1 litre
Ausführung mit senkrechten Seitenwänden = Design with vertical sidewalls
Aluminiumplatte, Durchmesser gleich Innendurchmesser Nutsche = Aluminium plate, diameter equal to internal diameter of nutsche filter
Vakuumpumpe und Unterdruckmanometer = Vacuum pump and negative pressure manometer

3.3.1.6 Quantity of sample:

A 40 g sample that has been adjusted to the water content determined as described above is deployed.

3.3.1.7 Number of parallel batches:

The samples are analysed in three parallel batches.

3.3.1.8 Test duration and evaluation:

The evaluation period is four days and commences following the initial lag phase. The lag phase is terminated if the mean oxygen consumption, expressed as a three-hour mean, is 25 percent of the value that is found as a three-hour mean during the greatest rise in oxygen consumption within the first four days.

The mass of the oxygen consumed during the lag phase is deducted from the mass of the oxygen consumed over the entire duration of the test (lag phase plus four days) and may amount to no more than ten percent of the total value. Otherwise, the figure determined may not be evaluated.

The measured values are to be recorded hourly.

The analytical function and the three-hour means are depicted by entering the test duration (in days) on the x axis and the cumulated gas volumes (in sl/kg dry mass) on the y axis.

3.3.1.9 Reporting of the result:

The result is given to two significant places in mg O_2 per g dry mass. The mean and the standard deviation are to be given. If one of the three values that are determined deviates by more than 20 percent from the mean, this value is to be eliminated as an outlier. The new mean is to be calculated from the two remaining values.

3.3.2 Gas formation, determined over 21 days in laboratory test (GB_{21}):

3.3.2.1 General remarks:

The fermentation test is carried out on the basis of DIN 38414-8, June 1985 edition, *German standard methods for the examination of water, waste water and sludge; sludge and sediments (group S); determination of the amenability to anaerobic digestion (S 8)* with modifications (see points 3.3.2.4 to 3.3.2.11). All deviations from the method set out below are to be documented.

3.3.2.2 Test structure and gas measurement:

The apparatus shown in Figure 2 is used to conduct the test. 'It consists of an eudiometer tube (B) that has a volume of 300 to 400 ml and is graduated from the upper part down (scale graduation intervals of 5 ml) and that is placed on the storage bottle (A) (which has a volume of about 500 ml) via a ground-glass connection. A connecting tube (C), which enables the fermentation gas that has developed in the storage bottle to enter the measuring tube, passes through the bottom of the eudiometer tube. The connecting tube is held in position (E) by glass rods on four sides. The lower end of the eudiometer tube has a glass hose-coupling from which a sufficiently long hose connection (F) leads to a levelling bulb (G) made of glass or plastic (volume of at least 750 ml). The upper end of the eudiometer tube is fitted with a conical stopcock (H) for removal of gas samples and for adjusting the zero point (D).' (DIN 38414-8, p. 3, June 1985 edition)
'Sealing liquid: 30 ml sulphuric acid, H_2SO_4 (p = 1.84 g/ml), are added to 1 l of distilled water; this mixture is warmed gently and 200 g of sodium sulphate(VI) decahydrate, $Na_2SO_4 * 10\ H_2O$, are dissolved in it. The solution is then coloured red-orange by adding several drops of a methyl orange solution (0.1 g of methyl orange sodium salt, dissolved in 100 ml of distilled water). The sealing liquid is to be kept at room temperature. At low temperatures, sodium sulphate can crystallise out, and must then be brought back into solution via warming of the mixture.' (DIN 38414-8, p. 3, June 1985 edition)

'The storage bottle (A) is […] filled with the listed' amount of the sample, inoculation sludge and water; 'the air in the bottle is displaced with nitrogen and the eudiometer tube (B) is applied. With the help of the levelling bulb (G), and the stopcock (H) of the eudiometer tube open, the level of the sealing liquid is set to the 0 mark. During this process, under no circumstances may

sealing liquid […] flow over […] into the connecting tube (C) and thus into' the space that contains the sample. 'The levelling bulb should still be filled about one-quarter full. Then, the stopcock (H) is closed. The storage bottle (A) with the' sample mixture 'is to be kept in the dark. The generated volume of gas is then read off whenever the sealing liquid is at the same level as the eudiometer tube and the levelling bulb, after the contents of the storage bottle (A) have been carefully swirled.' (DIN 38414-8, p. 5, June 1985 edition)

'Upon every readout of the gas volume in the eudiometer tube, the temperature and air pressure must be measured, to permit conversion of the gas volume to the standard state. The level of the sealing liquid is set to 0 after each readout, or after several readouts – depending on how much gas is generated – with the stopcock (H) open; in the process, air must not be sucked in through the stopcock (H).' (DIN 38414-8, p. 5, June 1985 edition)

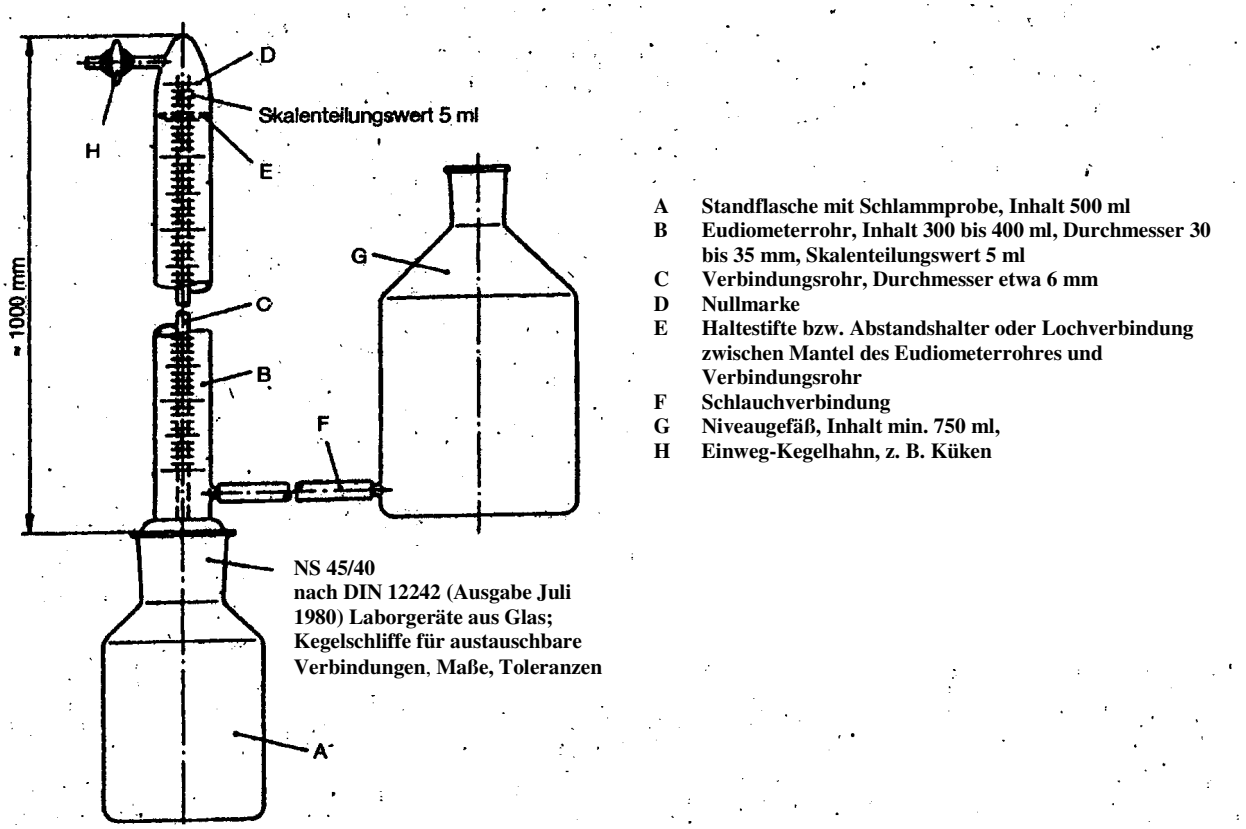

Figure 2: Test apparatus for the determination of the fermentation behaviour of sludges, after DIN 38414-8, p. 6, June 1985 edition

A Storage bottle with sludge sample, volume of 500 ml
B Eudiometer tube, volume of 300 to 400 ml, diameter of 30 to 35 mm, scale graduation interval of 5 ml
C Connecting tube, diameter of about 6 mm
D Zero mark
E Retaining pins or separators or hole connection between the cover of the eudiometer tube and the connecting tube
F Hose connection
G Levelling bulb, volume of at least 750 ml
H One-way conical stopcock, e.g. plug
NS 45/40, see DIN 12242 (July 1980 edition), *Laboratory glassware; interchangeable conical ground joints, dimensions, tolerances*

3.3.2.3 Temperature:

35 ± 1 °C in a temperature-controlled water bath or conditioned room (after DIN 38414-8, June 1985 edition).

3.3.2.4 Storage of samples:

The preparation of the samples must be completed, and the test started, within 48 hours after they have been taken. During this period, temperatures over 4 °C are permissible for a maximum of 24 hours. If it is not possible to guarantee this procedure can be followed, the sample is to be frozen at -18 to -20 °C within 24 hours after the sample has been taken. The freezing of the sample is to be documented when the evaluation is carried out. The sample should be thawed gently over a period of no more than 24 hours, during which the temperature may not exceed 35 °C.

3.3.2.5 Preparation of samples:

The original sample, in its entirety, is wet-crushed to a particle size less than or equal to 10 mm. If necessary, interfering substances (glass, stones and metals) may be removed prior to crushing. The proportions of the total mass that they constitute shall be taken into consideration when the test is evaluated.

3.3.2.6 Inoculation sludge:

'Digested sludge from a municipal wastewater-treatment facility that has not been subjected to any measurable retardation during fermentation, and that has been kept for about one month under the conditions described below, is suitable as inoculation sludge. The sludge must not contain any coarse components and should develop a minimum amount of gas. It is useful to keep a considerable volume (about 10 l) of the inoculation sludge, with about 5 % dry residue, under anaerobic conditions in the closed system at 35 ± 1 °C, in order to make it possible to carry out a large number of tests simultaneously. In such cases, it must be ensured that the surrounding temperature does not fluctuate widely (for example by covering the apparatus with a hood, etc.). A small percentage by volume (about 0.1 %) of fermentable substances, in the form of raw sludge' may be added 'every two weeks to the inoculation sludge […] during further storage. […] The raw sludge must be free of toxic substances and should not contain any coarse components. After every such addition, the mixture should be thoroughly mixed. This inoculation sludge may not be used for the test batch until 1 week after the last addition of raw sludge.' (DIN 38414-8, p. 4, June 1985 edition)

3.3.2.7 Mass of the sample:

50 g of the prepared sample is used in the test apparatus. The samples are mixed with 50 ml of inoculation sludge, and the batch topped up with tap water to 300 ml.

3.3.2.8 Reference batch:

Microcristalline cellulose is deployed to control the formation of gas by the inoculation sludge. For this purpose, 1 g of cellulose is mixed with 50 ml of the inoculation sludge, and the batch topped up with tap water to 300 ml. The reference batch may be stirred throughout the entire duration of the test.

The reference batch must reach at least 400 sl/kg; otherwise, the results are to be disregarded and the test conditions and the inoculation sludge must be reviewed.

3.3.2.9 pH value:

The pH value of the test batch must be measured at the beginning and end of the test.

If the pH value is less than 6.8 or higher than 8.2, the figure determined may not be evaluated. If the pH value is already lower or higher than these values at the beginning of the test, and if the

pH value is adjusted using an alkalising agent (caustic soda lye or caustic potash solution), or if hydrochloric acid is used to lower the pH value, this is to be documented when the result is reported.

3.3.2.10 Number of parallel batches:

The samples are analysed in three parallel batches.

The inoculation sludge and cellulose are analysed in two parallel batches.

3.3.2.11 Test duration and evaluation:

The volumes of gas generated are determined analogously to DIN 38414-8, No. 10, June 1985 edition:

Table 1 provides the model for the collection of data and the calculations concerning each batch. The following equation is used to calculate the volume of gas generated under standard conditions during the individual periods of time:

$$V_O = V \cdot \frac{(P_L - P_W) \cdot T_O}{P_O \cdot T}$$

Formula 1 after DIN 38414-8, p. 8, June 1985 edition

V_O Gas volume, in ml

V Volume of generated gas, in ml

P_L Air pressure at the time of the readout, in mbar

P_W Vapour pressure of the water at the temperature of the surrounding room, in mbar

T_o Standard temperature, T_o = 273 K

P_o Standard pressure, P_o = 1,013 mbar

T Temperature of the gas or of the surrounding room, in K

Table 1:
Model for the evaluation of the test (after DIN 38414-8, p. 9, June 1985 edition)

1	2	3	4	5	6	7
Date	Time	Volume of generated gas V ml	Temperature T K	Vapour pressure of the water P_W mbar	Air pressure P_L mbar	Standard volume V_0 sml

The test log based on Table 1 is to be kept for each started mixture from the sample ($V_O \equiv V_P$), the reference batch ($V_O \equiv V_R$) and the inoculation sludge ($V_O \equiv V_{IS}$). The volume of gas generated is cumulated progressively in the sequence of the readouts. Changes in the dead volume, due to changes in temperature and pressure conditions between the readouts, are insignificant and may therefore be disregarded (DIN 38414-8). For the further calculations, the volumes of gas from the sample and the inoculation sludge (as the arithmetical mean of the double batch) are to be entered in Table 2. The net volume of gas (V_N) from the sample is found as the difference between the volumes of gas from the sample and the arithmetical mean of the double batch for the inoculation sludge over equal test periods. The specific gas formation V_S from the sample during the test is calculated progressively from readout to readout using the following equation:

$$V_S = \frac{\sum V_n \cdot 10^2}{m \cdot W_T}$$

Formula 2 after DIN 38414-8, p. 8, June 1985 edition

V_S Specific volume of gas formed relative to dry mass during the test duration, in l/kg
$\sum V_n$- Net volume of gas formed during the test duration, in ml
m Mass of the weighed sample, in g,
W_T Dry mass of the sample, in percent

Table 2:
Model for the determination of gas formation relative to dry mass (after DIN 38414-8, p. 10, June 1985 edition)

1	2	3	4	5
Test duration	Sum of standard volumes	Proportional standard volume developed from the inoculation sludge	Net gas volume of the sample (column 2 – column 3)	Specific gas formation, relative to dry mass
	V_P	V_{IS}	V_N	V_S
d	sml	sml	sml	sl/kg

The reference variable for gas formation is the dry mass of the sample (sl/kg dry mass).

The evaluation period lasts 21 days and commences after the initial lag phase. The lag phase is terminated if the mean gas formation, expressed as a three-day mean, is 25 percent of the value that is found as the three-day mean during the greatest increase in the gas-formation function within the first 21 days.

The volume of gas formed during the lag phase is deducted from the volume of gas formed throughout the entire duration of the test (lag phase plus 21 days) and may not be greater than ten percent of the total value. Otherwise, the figure determined may not be evaluated.

Readouts should be taken each working day until the maximum gas formation rate has been reached.

The analytical function and the three-day means are depicted by entering the test duration (in days) on the x axis and the cumulated gas volumes (in sl/kg dry mass) on the y axis.

3.3.2.12 Reporting of the result:
The result is given to two significant places in sl/kg dry mass. Both the mean and the standard deviation of the three figures determined are to be given. If one of the three values determined deviates from the mean by more than 20 percent, this value is to be eliminated as an outlier. The new mean is then calculated from the two remaining values.

The result for the reference batches is also to be given.

4. Evaluation of the measurement results

For control analyses, the allocation values set out in Annex 3(2) of this Ordinance shall be considered to be satisfied if the values determined do not deviate from the values of the fundamental characterisation by more than the tolerances shown in the table and the median of all measured values satisfies the corresponding allocation criterion for the landfill site stipulated in the official decision provided for in Section 21 of this Ordinance.

Parameter from Annex 3(2)	Maximum tolerance*)
Ignition loss	100 percent
TOC	100 percent
Gross calorific value (H_o)	1,000 kJ/kg

Other criteria for solids	100 percent in each case
pH value	1.0 pH unit
Criteria for eluates	100 percent in each case
Further parameters: Criteria for eluates Total solid content	100 percent in each case
AT_4 and GB_{21}	50 percent in each case

*) For parameters that are given in percent: relative possible deviation

In derogation of the first sentence of this point, the allocation values for the following parameters shall still be deemed to be satisfied in control analyses of mechanically and biologically treated wastes if a parameter exceeds the allocation value in question given below, but this allocation value is not exceeded by the percentile value P_{80} of all measured values and the median of all measured values satisfies the corresponding allocation criterion stipulated for the landfill site in the official decision provided for in Section 21 of this Ordinance:

1. TOC: = 21 percent by mass
2. DOC: = 600 mg/l
3. AT_4: = 10 mg/g
4. GB_{21}: = 30 l/kg
5. Gross calorific value (H_o): = 7,000 kJ/kg.

5. Publications issued by expert bodies

The publications issued by expert bodies that are specified in this Annex are archived and preserved at the German Patent and Trade Mark Office in Munich. The following publications are available:

1. ISO standards, EN standards and DIN standards, published by Beuth Verlag GmbH, Berlin.
2. Joint Working Group of the Länder on Waste, LAGA Communication 32, *LAGA PN 98 – Richtlinie für das Vorgehen bei physikalischen, chemischen und biologischen Untersuchungen im Zusammenhang mit der Verwertung/Beseitigung von Abfällen*, 2002, Erich Schmidt Verlag, ISBN: 978-3-503-07037-4.
3. Joint Working Group of the Länder on Waste, LAGA Communication 33, *LAGA EW 98 – Richtlinie für das Vorgehen bei physikalischen und chemischen Untersuchungen von Abfällen, verunreinigten Böden und Materialien aus dem Altlastenbereich – Herstellung und Untersuchung von wässrigen Eluaten*, chap. 5 ('Bestimmung der Eluierbarkeit mit wässrigen Medien bei konstantem pH-Wert, EW 98 p)', 2002, Erich Schmidt Verlag, ISBN: 978-3-503-07038-1.
4. Joint Working Group of the Länder on Waste, LAGA Communication 35, *Bestimmung des Gehaltes an Kohlenwasserstoffen in Abfällen – Untersuchungs- und Analysenstrategie* (*KW/04*), 16 November 2004, Erich Schmidt Verlag, ISBN: 978-3-503-08396-1.
5. Hessian Agency for the Environment and Geology, 'Handbuch Altlasten', vol. 7, *Analysenverfahren*, 'Teil 4 – Bestimmung von BTEX/LHKW in Feststoffen aus dem Altlastenbereich', 2000 edition.

Annex 5:

Information, documentation, controls, operation (re point 2 of the first sentence of Section 4, Section 9, Section 10[2], Section 11[2], Section 12[1] to [3], Section 13[1] to [3] and [5], Section 17[2], the first sentence of Section 23)

1. Information and documentation

1.1 Operational regulations

The operational regulations shall contain the provisions required for safe and orderly operation. They shall apply to users of the landfill site and must be displayed prominently at a suitable point in the entrance area of the landfill site.

1.2 Operating manual

The operating manual shall stipulate:

1. measures required for normal operations, maintenance and operational disruptions that shall be coordinated with the alarm and emergency plans in order to ensure that the disposal of waste is compatible with the public welfare and ensure the operational safety of the landfill site,
2. measures provided for in Section 12(4) that shall be carried out when the trigger levels are exceeded,
3. the functions and areas of responsibility assigned to personnel, job instructions, control and servicing measures and information, documentation and safe-keeping duties.

1.3 Waste inventory

A class I, II or III landfill site or section of a landfill site shall be divided into grid squares, which may be 2,500 square metres in area at most for wastes of varying composition. Larger grid squares shall be permissible for wastes that remain of the same composition. With regard to a class IV landfill site in a mine, the landfill site or section of a landfill site shall be subdivided into deposition chambers. With regard to a class IV landfill site in a cavern, the landfill site shall be divided into vertical grid squares, which may have a height of at most 10 m for waste of varying composition.
The landfill site operator shall at least document the following information concerning the deposited wastes or landfill replacement construction materials in each grid square or each deposition chamber in the waste inventory:

1. the mass, waste code and waste designation according to the Annex to the Waste Catalogue Ordinance, origins of the waste,
2. the place of deposition/emplacement (giving grid numbers or disposal chamber numbers),
3. the type of deposition/emplacement,
4. the time of deposition/emplacement.

1.4 Operating journal

The operating journal shall contain all essential data concerning the landfill site, in particular:

1. the waste inventory,
2. the fundamental characterisation of the wastes or landfill replacement construction materials delivered and the key parameters stipulated,
3. the logs or declarations provided for in Section 8(3),
4. details of the acceptance control provided for in Section 8(4),
5. the results of the control analysis provided for in Section 8(5) and details of the measures taken where the waste or landfill replacement construction material is

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inconsistent with the data in the fundamental characterisation or, where control analyses are waived as provided for in Section 8(5), the declaration from the waste producer,
6. details of the type, quantity and origins of rejected wastes or landfill replacement construction materials,
7. the logs of the inspection of the facilities required for the disposal operation,
8. special occurrences, in particular operational disruptions that may have impacts on orderly deposition, including possible causes and remedial measures that are carried out,
9. the results of other controls of facilities and materials (in-house and external controls).

In order to fulfil the requirements set out in the first sentence of this point, it is possible to have recourse to the records and registers provided for in the Ordinance on Waste Recovery and Disposal Records and records of the kind provided for in the Ordinance on Specialised Waste Management Companies, in so far as these contain the requisite information. The operating journal shall be created as a secure document. It must be possible for it to be consulted at any time by the competent authority.

2. Annual report

The annual report shall comprise:
1. the master data (point 2.1)
2. an evaluation of the measurements and controls, as well as a presentation of their results (point 2.2)
3. a declaration concerning the behaviour of the landfill site (point 2.3)
4. an evaluation of the wastes accepted and deposited (point 2.4)

2.1 Master data

The master data shall comprise:

1. the name, address, telephone number, fax number and email address of the landfill site, the landfill site operator, the owner of the landfill site (where not identical), the contact person and the operator of auxiliary facilities on the landfill site,
2. the designation of the location of the landfill site and the approved catchment area,
3. operating lives and capacities,
4. the approved waste types with designations and waste codes, approved landfill replacement construction materials, where applicable,
5. the geological barrier and base liner and, where applicable, subsequent technical improvements or a vertical liner,
6. cases in which landfill replacement construction materials have been deployed,
7. installed surface seals, temporary coverings and final coverings,
8. leachate and surface water gathering and treatment facilities,
9. measuring stations and measuring facilities provided for in point 3.1,
10. landfill gas gathering and treatment or recovery facilities,
11. waste treatment plants and temporary storage facilities,
12. auxiliary facilities (e.g. gas flares, block-type thermal power stations),
13. other infrastructure facilities (e.g. rail connection, weighbridge, tank farm),
14. a brief description of the approvals for the operation of the landfill site that have been granted, applied for and, where applicable, planned with the dates and types of the decisions,
15. a site plan showing all relevant monitoring facilities and the direction of the groundwater flow.

The annual report shall contain the master data provided for in subpoints 1 to 15 of the first sentence of this point for landfill sites in classes 0, I, II and III, and the master data provided for in subpoints 1 to 5 and 9 (groundwater measuring stations only), and 11 to 15 of the first sentence of this point for class IV landfill sites. Where changes have occurred since the

previous year, only the updated master data shall be included; otherwise, reference may be made to the master data given in the previous year's report.

2.2 Evaluation of measurements and controls and presentation of results

The operator of a class I, II or III landfill site shall evaluate the data gathered as provided for in point 3.2 and Table 1 and, when doing so, take into consideration and present at least the following criteria and interrelations broken down by location, time and, where applicable, deposition procedure:

1. quantities of precipitation – quantities of leachate
2. quantity and composition of leachate, including estimated load
3. groundwater quality – satisfaction of trigger levels
4. characteristic cross-sections of the landfill site with current and approved emplacement heights and the previous year's heights; determination of remaining volume
5. temperature profiles at the base
6. settling processes, deformations and gradient of the dewatering pipes at the landfill base
7. settling processes and settling speed of the landfill surface and, where applicable, the landfill body
8. quantities and qualities of gas gathered
9. emissions through the landfill surface and gas concentrations in the immediate vicinity of the landfill site
10. results of the camera inspection of the leachate pipes/shafts.

The first sentence of this point shall apply to the operator of a class 0 or IV landfill site, provided that only the criteria and interrelations set out in subpoint 3 of this point are to be taken into consideration and represented.
The evaluation of the data shall be intended to allow the chronological progression of the landfill behaviour to be represented from the commencement of the deposition phase on and compared with the assumptions made in the approval under waste legislation. In derogation of this provision, with regard to a landfill site that is in its deposition phase on 16 July 2009, the previous period represented may be limited to the last six years prior to this date.

2.3 Declaration concerning the behaviour of the landfill site

On the basis of the criteria and interrelations evaluated in point 2.2, the landfill site operator shall assess the condition of the landfill site and declare that the condition of the landfill site is as planned. Otherwise, they shall set out whether and what measures are required or have been initiated or taken.

2.4 Evaluation of accepted and deposited wastes

The landfill site operator shall draw up an evaluation broken down by type, quantity and origins of the sum of the quantities of wastes accepted and deposited during the report year, in each case categorised by their six-figure waste codes according to the Annex to the Waste Catalogue Ordinance. The evaluation shall be differentiated using the following criteria:

1. wastes deposited on the landfill site,
2. wastes recovered on the landfill site as part of construction measures,
3. wastes deposited for recovery,
4. wastes deposited for disposal.

3. Measuring facilities, measurements and controls

3.1 Measuring facilities

The operator of a class 0, I, II or III landfill site shall install at least the measuring facilities required for the measurements and controls listed in subpoints 1 to 6 of this point, the operator of a class IV landfill site shall install the measuring facilities required for the measurements and controls listed in subpoint 1 of this point, maintaining them in a functioning state or securing the provision of data:

1. Groundwater monitoring with at least one measuring station in the upstream groundwater and a sufficient number of measuring stations, and at least two measuring stations, in the groundwater downstream from the landfill site; the groundwater measuring stations must supply information about the groundwater body that could be impaired by the deposition of wastes (does not apply to class 0 landfill sites on which only uncontaminated soil is deposited).
2. Monitoring of settling processes and deformations of the landfill liner systems required by Annex 1.
3. Monitoring of settling processes and deformations, as well as the backfill conditions within the landfill body. It is possible to have recourse to the results of the evaluation of data from airborne or satellite monitoring.
4. Quantity and quality of leachate gathered in a drainage layer constructed in accordance with Annex 1 and other gathered waste water that originates from surface areas (surface water). Should the recording of the quantity of surface water not represent a proportionate expense, it is possible for this to be waived with the approval of the competent authority.
5. Recording of the following meteorological data:
   a) precipitation,
   b) temperature,
   c) wind direction and speed,
   d) evaporation.
   It is possible to have recourse to the data recorded by meteorological measuring stations at a comparable location in the surrounding area.
6. Monitoring of landfill gas and landfill gas emissions in accordance with point 7.

In so far as, on the basis of Regulation (EC) No. 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC (OJ L 33 of 4 February 2006, p. 1), an emission declaration concerning the pollutant emissions that emanate from the landfill site is to be submitted and the emissions have been determined on the basis of measurements, the landfill site operator shall take note of this when putting in place and maintaining the preconditions set out in the first sentence of this point.

3.2 Measuring and control programme

The operator of a class 0, I, II or III landfill site shall carry out or arrange to have carried out the controls and measurements specified in nos. 1 to 5 of the table in this point with the frequency specified in the table, the operator of a class IV landfill site shall carry out or arrange to have carried out the controls und measurements specified in nos. 3 and 6 of the table in this point with the frequency specified in the table, in so far as these measurements and controls are prescribed in accordance with this Ordinance. The persons entrusted with carrying out the controls and measurements must possess the requisite technical skills and technical competence. With the approval of the competent authority, variations in the extent and frequency of the controls and measurements provided for in the first sentence of this point may be stipulated at landfill sites or sections of landfill sites.

Table

No.	Measurement/Control	Frequency/representation	
		Deposition and closure phase	**Aftercare phase**
1	**Meteorological data**		
1.1	Quantity of precipitation	Daily, as cumulative daily value	Daily, cumulated to monthly values
1.2	Temperature (min., max., at 14:00 hrs CET/15.00 hrs CEST)	Daily	Monthly average
1.3	Wind direction and speed of	Daily	Not required

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	prevailing wind		
1.4	Evaporation	Daily	Daily, cumulated to monthly values
2	**Emissions data**		
2.1	Quantity of leachate	Daily, as cumulated daily values	Six-monthly
2.2	Composition of leachate[1)]	Quarterly	Six-monthly
2.3	Quantity and composition of surface water[1)]	Quarterly	Six-monthly
2.4	Quantity and composition of actively gathered gas (CH_4, CO_2, O_2, N_2, selected trace gases)	Quantity of gas daily, as cumulated daily value; composition once monthly; selected trace gases once every six months	Quantity of gas weekly, as cumulated six-monthly value; composition once every six months
2.5	Controls on effectiveness of degasification[2)]	Weekly or six-monthly	Six-monthly
2.6	Odour emissions	Where odour problems occur	Where odour problems occur
3	**Groundwater data**		
3.1	Groundwater levels	Six-monthly[3)]	Six-monthly[3)]
3.2	Groundwater quality/control of trigger levels[4)]	Quarterly	Six-monthly
4	**Data on the landfill body**		
4.1	Measurements of settling processes and stability analyses[5) 6)]	Annually	Annually
4.2	Structure and composition of the landfill body[7)]	Annually	
5	**Liner systems**		
5.1	Deformation of the base liner system[6) 8)]	Annually	Annually
5.2	Examination of drainage pipes and associated shafts by means of camera inspection	Annually	Annually
5.3	Temperatures in the landfill base liner system[9)]	Frequency specific to location	Frequency specific to location
5.4	Functionality and deformation of the surface sealing system[5) 6)]	Annually[2)]	Annually
5.5	Leak detection system	Quarterly	Quarterly
6	**Underground landfill site** Height of upper edge of backfill column provided for in Annex 2(3.2)	Not relevant	Annually[10)]

1. The parameters to be measured shall be stipulated in the landfill site approval. With the exception of the frequency of the controls, LAGA Communication 28, *Technische Regeln für die Überwachung von Grund-, Sicker- und Oberflächenwasser sowie oberirdischer Gewässer bei Abfallentsorgungsanlagen – WÜ 98 Teil 1: Deponien*, Joint Working Group of the Länder on Waste, 1999, revised February 2008, Erich Schmidt Verlag, 10785 Berlin, ISBN 978-3-503-05094-9, shall be observed.
2. Organoleptic controls shall be carried out weekly by the landfill site operator on still open sections of landfill sites. At temporarily or finally covered or sealed sections of landfill sites or landfill sites, the landfill site operator shall control the effectiveness of any degasification or oxidation of residual gas every six months by means of measurements using a flame ionisation detector, laser adsorption spectrometry or other equivalent procedures on the surface of the landfill and at gas monitoring wells in the immediate vicinity of the landfill site.
3. Groundwater levels shall be measured at least every time a sample is taken to determine groundwater quality. Where the groundwater table fluctuates significantly, measurements shall be carried out more frequently.

4. A baseline measurement that encompasses at least the parameters of the leachate that is to be anticipated shall be carried out prior to the commencement of the deposition phase. Subsequently, the parameters to be measured shall be determined on the basis of the composition of the leachate and the groundwater quality. The *Technische Regeln für die Überwachung von Grund-, Sicker- und Oberflächenwasser sowie oberirdischer Gewässer bei Abfallentsorgungsanlagen – WÜ 98 Teil 1: Deponien*, Joint Working Group of the Länder on Waste, 1999, revised February 2008, ISBN 978-3-50305094-9, shall be observed.
5. Measurements of settling processes shall be carried out on representative cross-sections of the landfill site.
6. It must also be possible for the results of the measurements to be compared with each other and represented as time series of the contours if there is a change in the measurement procedure. Where there are major deviations from the forecast progress of settling processes, the causes shall be clarified and the forecasts corrected.
7. Data for the stock plan of the landfill site in question: area that is covered with wastes, volume and composition of the wastes, types of deposition, timing and duration of deposition, calculation of remaining capacity still available at the landfill site.
8. Measurements of the height of the drainage pipes in the drainage system or pipes specially laid for this purpose.
9. Continuous temperature profiles of the pipe material measured at the highest point of the drainage pipes; every six months until the pipes are covered to a depth of 5 m, subsequently only when events occur that bring about a significant warming of the landfill body such as landfill fires, landfill aeration.
10. After 20 years without notable findings, five-yearly controls shall be sufficient.

4. Deposition of wastes at a class 0, I, II or III landfill site

The operator of a class 0, I, II or III landfill site shall at least ensure the following:

1. Wastes or landfill replacement construction materials that release significant amounts of dust shall be handled in such a way that no significant emissions emanate from them. Guidance on the reduction of dust emissions is given in Guideline VDI 3790 Part 2, *Environmental meteorology: Emissions of gases, odors and dusts from diffuse sources: Landfills*, Association of German Engineers (VDI), December 2000, Beuth Verlag, Berlin.
2. Unpackaged wastes that contain hazardous mineral fibres must be sufficiently watered before any of the fibres are able to disperse. They shall be covered with suitable materials prior to each compaction procedure, and at least every working day.
3. Packaged wastes that contain asbestos and packaged wastes that contain hazardous mineral fibres shall be covered with suitable materials prior to each compaction procedure, and at least once a week. Subpoint 2 of this point shall apply to wastes in damaged packaging *mutatis mutandis*.
4. The landfill site shall be structured in such a way that no adverse reactions occur among the wastes or landfill replacement construction materials or between the wastes or landfill materials and the leachate. In particular, care shall be taken that developments in the temperature of the landfill body do not result in impairments of the landfill-engineering facilities. Where necessary, areas that are to be separately drained or separately degasifed shall be established for wastes in regard to which there are grounds for concern about reactions of the kind specified in the first sentence of this subpoint.
5. If paste-like, sludgy and pulpy wastes are deposited, care shall be taken that the wastes drain and consolidate or solidify under deposition conditions so that, with due regard to the structure of the landfill site, there are no grounds for concern that the stability of the landfill body will be impaired and the function of the drainage system of the base liner is not impaired.
6. The wastes or landfill replacement construction materials shall be emplaced in the landfill site with a minimum of voids. Emplacement shall be carried out in such a way that only minor settling processes are to be anticipated in the landfill body over the long term.
7. The landfill body must be stable in itself and in relation to its surroundings, whatever the backfill conditions. To this end, the landfill site operator shall keep a stability record. In so far as the stability of seal components depends on the effect of construction materials that are not permanently stable, the record must also allow it to be ascertained how long the stability that has been recorded will continue. The

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correctness of the planning assumptions, in particular the technical characteristics of the wastes for the stability record, shall be reviewed regularly.

5. Deposition of wastes at a class IV landfill site

The operator of a class IV landfill site shall at least ensure the following:

1. Wastes that release dust shall be handled and deposited in such a way that no emissions emanate from them.
2. If wastes are conveyed into the deposition area in a pumpable state, they are to be conditioned in such a way that they reach the required consistency following deposition.
3. In order to guarantee unimpeded conveying operations, suitable precautions shall be taken against any blockage of the pipeline.
4. There may be no reactions among the wastes following deposition. If reactions are possible or cannot be ruled out, the different wastes shall either be deposited in separate cavities or separate sections shall be created in the cavities by means of constructional measures. This provision shall also apply to wastes that are deposited in receptacles.

6. Leachate

The landfill site operator shall keep the amount of leachate that arises as low as possible in accordance with the state of the art. Should a drainage layer be constructed as provided for in Annex 1(2.2), Table 1, no. 4, the landfill site operator shall gather the leachate that arises and control it in accordance with nos. 2.1 and 2.2 of the table in point 3.2. Gathered leachate and any residues from leachate cleaning shall be managed in an orderly fashion, with due regard to Annex 51 of the Waste Water Ordinance, except where the leachate is infiltrated into the landfill body as provided for in Section 25(4).

7. Landfill gas

Should landfill gas be generated in relevant quantities on a landfill site due to biological degradation processes, the operator of a class I, II or III landfill site shall gather and treat this landfill gas as early as the deposition phase or, where possible, recover it in order to generate energy. Landfill gas shall be gathered, treated and recovered in compliance with the state of the art. The quantity and quality of the landfill gas shall be analysed as provided for in no. 2.4 of the table in point 3.2. In derogation of the first sentence of this point, the landfill site operator may, with the approval of the competent authority, waive the gathering of minor residual emissions of landfill gas. In this case, they shall demonstrate to the competent authority that the methane contained in the landfill gas is oxidised to the greatest possible extent prior to its discharge into the atmosphere.

8. Nuisances and hazards

The landfill site operator shall take measures to minimise the following nuisances und hazards that emanate from the landfill site:

1. odour and dust emissions,
2. fires,
3. formation of aerosols,
4. birds, vermin, insects,
5. noise and traffic.

The landfill site shall be operated in such a way that any contamination of public roads and the surrounding areas is avoided. Nevertheless, should there be cases of contamination, the landfill site operator shall ensure their rectification without delay.

9. Professional development courses for management personnel

The professional development courses for management personnel shall provide instruction in at least the following subject areas:

1. the provisions of waste legislation and other areas of environmental legislation that apply to activities under waste legislation,
2. landfill site construction, operation, closure and aftercare,
3. environmental impacts and other hazards and nuisances that may emanate from landfill sites, and measures to prevent or rectify them,
4. the type, properties, behaviour and reactions of wastes,
5. links to dangerous goods legislation,
6. provisions concerning corporate liability, and
7. occupational health and safety.

10. Criteria for the determination of the completion of the aftercare phase

In dependence on the landfill class in question, the following criteria in particular shall be taken as the basis for the determination of the completion of the aftercare phase:

1. Conversion or reaction processes and biological degradation processes have largely abated.
2. Gas formation is not taking place or has slowed down to such an extent that no active degasification is required, residual gases that are discharged are sufficiently oxidised, and harmful impacts on the surrounding area due to gas migration may be ruled out. Sufficient methane oxidation of the residual gas shall be demonstrated.
3. Settling processes have abated to such an extent that settling-induced damage to the surface sealing system may be ruled out in future. To this end, the development of settling processes over the last ten years shall be evaluated.
4. The surface sealing system is in a functioning, stable condition that cannot be impaired by current and planned usage; it shall be ensured that this is also guaranteed when changes of use occur.
5. The landfill site is permanently stable as a whole.
6. The upkeep of structural installations and technical facilities is no longer required; they shall be demolished/dismantled where applicable.
7. The leachate discharged into an overground body of water satisfies the concentration values set out in Appendix 51(C)(1) and (D)(1) of the Waste Water Ordinance without treatment.
8. The leachate that percolates into the substrate does not cause the trigger levels to be exceeded at the groundwater measuring stations stipulated in Section 12(1), and there are no grounds for concern that the trigger levels will be exceeded in future either.
9. Should wastes that contain asbestos or wastes that contain hazardous mineral fibres have been deposited on the landfill site, suitable measures must be taken in order to prevent the possibility of humans coming into contact with this waste.

11. Publications issued by expert bodies

The publications issued by expert bodies specified in this annex are archived and preserved at the German Patent and Trade Mark Office in Munich.

Article 2

Ordinance implementing Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC
(Extractive Waste Ordinance – GewinnungsAbfV)

Section 1 Scope of application

(1) This Ordinance applies to
1. the construction, operation, closure and aftercare of a disposal facility for extractive wastes in operations that are not subject to mining supervision,
2. the storage and deposition of extractive wastes for the purposes of disposal, and
3. the recovery of extractive wastes for construction and restoration purposes in excavation operations.

(2) This Ordinance applies to
1. the producer of extractive wastes and
2. the operator of a disposal facility for extractive wastes.

(3) The Ordinance does not apply to
1. disposal facilities for extractive wastes,
   a) that were closed prior to 1 May 2008 or
   b) at which the acceptance of extractive wastes was terminated prior to 1 May 2006, that were in their closure phases on 1 May 2008 and that are finally closed on 31 December 2010 at the latest,
2. the storage of extractive wastes in temporary storage facilities, in so far as this involves
   a) hazardous wastes that are generated unexpectedly and their storage continues no longer than six months,
   b) non-hazardous wastes with the exception of inert wastes and their storage continues no longer than one year,
   c) non-hazardous wastes that are generated during prospecting and their storage continues no longer than three years,
   d) wastes from the extraction, processing and storage of peat and their storage continues no longer than three years or,
   e) inert wastes or uncontaminated soil and their storage continues no longer than three years.

Section 2 Definitions

The following definitions shall apply for the purposes of this Ordinance:
1. Extractive wastes:
   Wastes that are generated directly during the prospecting, extraction and processing of mineral resources, as well as the storage of mineral resources associated with these activities.
2. Disposal facility for extractive wastes:
   A facility for temporary storage or permanent deposition in which exclusively extractive wastes are stored or deposited with the objective of disposal.
3. Category A facility:
   Disposal facility for extractive wastes that is classified as such in accordance with the criteria set out in Annex III of Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC (OJ L 102 of 11 April 2006, p. 15).

Section 3 Construction, operation, closure and aftercare

A disposal facility for extractive wastes shall be constructed, operated and closed, and aftercare measures taken on the site in such a way that the public welfare is not impaired. This shall be guaranteed by means of a suitable choice of location and suitable measures for the protection of the soil and groundwater that comply with the state of the art. In dependence on the potential hazards and the type of facility, the criteria set out in Annex 1 of the Landfill Ordinance of 27 April 2009 (*BGBl.* I, p. 900) may be drawn on for this purpose. Section 3(3), Section 4, Section 7(1), Sections 8, 9, 11, 12 and 13 of the Landfill Ordinance shall apply *mutatis mutandis* to the other requirements that the public welfare not be impaired by the facility as set out in Section 10(4) of the Closed Substance Cycle and Waste Management Act.

Section 4 Stability record

If the producer of extractive wastes deploys them for construction or restoration purposes in excavation operations, they shall take suitable measures, by means of which

1. the stability of the extractive wastes shall be ensured at the place of their deployment,
2. any contamination of bodies of water and soil shall be prevented and
3. the orderly deployment of the wastes shall be controlled.

Section 5 Waste management plan

The producer of extractive wastes shall draw up a waste management plan for the management of extractive wastes as provided for in Annex 1 and notify the competent authority of the plan in good time by presenting it two weeks prior to the assumption of activities at the latest. They shall review and adjust the waste management plan every five years in so far as the operation of the facility, the deposition procedure or the extractive waste have changed substantively. All adjustments provided for in the second sentence of this section shall be notified to the competent authority.

Section 6 Prevention of major accidents and information

(1) Prior to the commissioning of a category A facility, the operator of the facility shall draw up a written concept for the prevention of major accidents that covers the factors set out in Annex I(1) of Directive 2006/21/EC. In order to implement the concept, they shall introduce a safety management system. The concept shall be reviewed every three years and updated as necessary. The concept shall be kept available to the competent authority at all times.

(2) Prior to the commissioning of a category A facility, its operator shall draw up an internal emergency plan that at least contains the information set out in Annex I(2) of Directive 2006/21/EC. They shall review the internal emergency plan every three years. In so far as the review finds that significant impacts may arise with regard to the measures for the prevention of major accidents, the operator shall update the internal emergency plan without delay. They shall provide their employees with instruction concerning the rules of conduct contained in the emergency plan before the employees first enter into employment with them and then subsequently at regular intervals, consulting the employees for this purpose.

(3) The operator of a category A facility shall appoint a waste officer, who shall in particular monitor the orderly implementation, review and updating of the concept provided for in paragraph 1 of this section, as well as the drafting and updating of the internal emergency plan and the instruction of employees as provided for in paragraph 2 of this section.

(4) Should it be possible for a category A facility to have significant impacts in another state or should another state that will possibly be significantly affected by such impacts request this, the competent authority shall inform the authorities nominated by the other state at the same time and to the same extent as the authorities to be consulted as provided for in Section 73(2) of the Administrative Procedures Act.

(5) The operator of a category A facility shall make the information provided for in paragraph 2 of this section accessible to the competent authority for the drafting of external emergency plans.

(6) In the case of a major accident, the operator of a category A facility shall make all information necessary in order to minimise the consequences of the accident for the public welfare available to the competent authority without delay.

Section 7 Provision of security

Prior to the commencement of the storage or deposition phase, the operator of a category A facility shall provide a security to the competent authority for the fulfilment of the restrictions and conditions that are ordered with the approval of the operation. The competent authority may require the operator of a facility for the disposal of extractive waste that is not a Category A facility to provide a security if there are grounds for concern that restrictions and conditions concerning the recultivation of the facility that are ordered with the approval of the operation will not be fulfilled. Section 18 of the Landfill Ordinance shall apply to the security *mutatis mutandis*.

Section 8 Application, notification

(1) The operator shall submit a written application to the competent authority for the construction, operation and substantive modification of the operation of a disposal facility for extractive wastes. The application must include the waste management plan. Furthermore, Section 19(1) of the Landfill Ordinance shall apply with regard to the scope of the information and documents *mutatis mutandis*.

(2) The operator shall notify the competent authority in writing of the closure of a facility for the disposal of extractive wastes at least one year prior to the intended end of the storage or deposition phase. The first, fourth and fifth sentences of Section 19(1) of the Landfill Ordinance shall apply to the notification *mutatis mutandis*, limited to the information that relates to the closure.

(3) The competent authority shall review decisions concerning the construction, operation or closure of a disposal facility for extractive wastes every four years to ascertain whether further conditions, restrictions or time limits need to be ordered or amended in order to ensure compliance with the state of the art.

Section 9 Administrative offences

An administrative offence within the meaning of Section 61(1)(5) of the Closed Substance Cycle and Waste Management Act shall be deemed to have been committed by any person who wilfully or negligently,

1. in contravention of Section 4(1) or (2), fails to take a measure or fails to take a measure in good time,
2. in contravention of the second sentence of Section 5, fails to review the waste management plan, fails to review the waste management plan in good time, fails to adjust the waste management plan or fails to adjust the waste management plan in good time,
3. in contravention of the first sentence or third sentence of Section 6(2), fails to draw up an internal emergency plan, fails to draw up an internal emergency plan correctly, fails to draw up an internal emergency plan completely, fails to draw up an internal emergency plan in good time, fails to update an internal emergency plan or fails to update an internal emergency plan in good time or,
4. in contravention of Section 6(6), fails to make information available, fails to make information available correctly, fails to make information available completely or fails to make information available in good time.

Section 10 Transitional provisions

Disposal facilities for extractive wastes that were approved on 1 May 2008 or that are in operation until this time must fulfil the requirements set out in Sections 3 to 6 on 1 May 2012 at the latest and the requirements set out in Section 7 by 1 May 2014.

Annex 1

Waste management plan **(**re Section 5)

1. The producer of extractive wastes shall draw up the waste management plan for the management of extractive wastes with due regard to the principle of sustainability and the objectives listed in point 2. The plan shall set out all substantive aspects of the generation and management of extractive wastes and the precautions and measures foreseen for the protection of the environment and human health. In so far as information required for the waste management plan is a component of an excavation licence, other official procedures or other documents drawn up on account of legal provisions, reference may be made to them in the waste management plan.
2. The objectives of the waste management plan shall be to minimise the generation of wastes and their pollution potential, to promote the recovery of extractive wastes and to ensure their orderly disposal. To this end, waste management should be taken into consideration as early as the planning phase and with regard to the choice of procedures for extraction and processing, the impacts above ground, the backfilling of excavations and the deployment of less harmful substances during processing.
3. With regard to the disposal of extractive wastes, a concept should be chosen as early as the planning phase that
   a) prevents or at least as far as possible reduces the negative impacts of the facility for the disposal of extractive waste over the long term,
   b) ensures the geotechnical stability of the facility until the end of the aftercare phase,
   c) ensures that, as far as possible, no aftercare measures are required at the closed facility.
4. The waste management plan must at least contain:
   a) the characterisation of the extractive wastes provided for in Annex II of Directive 2006/21/EC and the total quantity of extractive wastes expected to arise during the operational phase,
   b) the procedures during which these wastes are generated, and any posttreatment to which they are subjected,
   c) details of the location of the disposal facility for extractive wastes and a survey of the properties of the surface terrain affected by the facility,
   d) a description of possible adverse impacts on the environment and human health due to the deposition of extractive wastes and the precautions to be taken in order to minimise environmental impacts, in particular due to contaminated water, leachate, water and wind erosion, during operation and following closure with due regard to the geological, hydrological, hydrogeological, seismic and geotechnological conditions of the location of the facility,
   e) measures for the protection of bodies of water, soil and air, in particular by means of the monitoring of the facility's physical and chemical stability, for example by means of measuring and monitoring devices that are constantly ready for deployment, and the regular cleaning of overflow channels and spillways,
   f) control and monitoring measures taken by responsible persons,
   g) a conception for the closure of the facility, including rehabilitation, aftercare and monitoring,

h) the classification of the facility according to the criteria set out in Annex III of Directive 2006/21/EC, including the necessary information concerning decisive facts and grounds for the classification,
i) precautions and measures to limit major accidents, including the information required for the drafting of internal emergency plans as provided for in Section 6 at category A facilities,
j) an estimation of possible hazards due to accidents at facilities that are not to be classified in category A.

Article 3
Amendment of the Ordinance on Biological Waste Treatment Plants

The Ordinance on Biological Waste Treatment Plants of 20 February 2001 (*BGBl.* I, p. 317) shall be amended as follows:

1. In the first sentence of Section 1(1), the words 'within the meaning of Section 2(1) and (2) of the Ordinance on Environmentally Compatible Storage of Waste from Human Settlements and in Biological Waste-Treatment Facilities' shall be deleted.
2. In Section 16, the words 'Annex 4(2.5) of the Ordinance on Environmentally Compatible Storage of Waste from Human Settlements and in Biological Waste-Treatment Facilities of 20 February 2001 (*BGBl.* I, p. 305)' shall be replaced with the words 'Annex 4(3.3.1) of the Landfill Ordinance of 27 April 2009 (*BGBl.* I, p. 900)'.

Article 4
Entry into force, abrogation

This Ordinance shall enter into force on 16 July 2009. At the same time, the following Ordinances shall be abrogated:

1. the Landfill Ordinance of 24 July 2002 (*BGBl.* I, p. 2807), most recently amended by Article 2 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860),

2. the Ordinance on Environmentally Compatible Storage of Waste from Human Settlements and in Biological Waste-Treatment Facilities of 20 February 2001 (*BGBl.* I, p. 305), most recently amended by Article 1 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860),

3. the Landfill Recovery Ordinance of 25 July 2005 (*BGBl.* I, p. 2252), amended by Article 3 of the Ordinance of 13 December 2006 (*BGBl.* I, p. 2860).

The Bundesrat has given its consent.

Berlin, 27 April 2009

The Federal Chancellor

Dr. Angela Merkel

The Federal Minister
for the Environment, Nature Conservation and Nuclear Safety

Sigmar Gabriel