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Interested committees:

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 8228

Sludge/biosolids ecotoxicological evaluation and classification for land application

ICS: 13.030.20

ISO/TC 275

Secretariat: **AFNOR**

Voting begins on:
2025-09-22

Voting terminates on:
2025-12-15

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 275, *Sludge recovery, recycling, treatment and disposal*, WG 4, *Land application*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Sludge/biosolids is a kind of organic-based material originating from wastewater treatment, rich in humic substances, nitrogen, phosphorus and other trace nutrients, and its application to land is a significant pathway for nutrient cycling and improving soil fertility. However, sludge/biosolids also contains various toxic pollutants, including heavy metals, organic pollutants, pathogenic bacteria and emerging pollutants. These contaminants are raising significant environmental and health concerns, with potential toxicity to humans and the ecosystem. Therefore, ecotoxicological evaluation is essential to ensure their safe and beneficial reuse.

This standard provides guidance on ecotoxicological evaluation, classification, and determination methods for sludge/biosolids. It establishes a two-step evaluation procedure. The first step is to analyze the concentrations of heavy metals and harmful organic pollutants. If the concentration of any pollutant exceeds the limit of the standard, the sludge/biosolids will not be recommended for land application. If the concentrations of all contaminants below their respective concentration limits, a second step of ecotoxicological evaluation is performed, including seed germination test of higher plants and reproduction toxicity test of earthworms.

Based on ecotoxicological evaluation results, this standard classifies sludge/biosolids into three distinct grades—Class I, II, and III to determine the appropriate land application pathway. Class I, the lowest toxicity level, with inhibition ratios for both seed germination and earthworm reproduction at or below 10 %, suitable for land application in human-accessible areas. Class II, inhibition ratios up to 20 %, suitable for landscaping in human-accessible areas. Class III, a higher toxicity level with inhibition ratios up to 30 %, is restricted to landscaping in human-inaccessible areas, such as sandy land rehabilitation, and mine rehabilitation.

Sludge/biosolids ecotoxicological evaluation and classification for land application

1 Scope

This document provides guidance on toxicological evaluation, classification, sampling methodologies, and determination methods of sludge/biosolids for land application, and suitable land application pathways:

- 1) Land application for Human-accessible areas, such as land for feed and crops, etc.
- 2) Landscape for Human-accessible areas, such as public parks and green spaces, etc.
- 3) Landscape for Human-inaccessible areas, such as sandy land rehabilitation and mine rehabilitation, etc.

2 Normative references

The following documents are referred to in the text in such a way that some or all their content constitutes the requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15799:2019, *Soil quality — Guidance on the ecotoxicological characterization of soils and soil materials*

ISO 26218-1:2019, *Soil quality — Leaching procedures for subsequent chemical and ecotoxicological testing of soil and soil-like materials — Part 1: Batch test using a liquid to solid ratio of 2 L/kg dry matter*

ISO 18763:2016, *Soil quality — Determination of the toxic effects of pollutants on germination and early growth of higher plants*

ISO 11268-2:2023, *Soil quality — Effects of pollutants on earthworms — Part 2: Determination of effects on reproduction of *Eisenia fetida*/*Eisenia andrei* and other earthworm species*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 sludge

mixture of water and solids originating from various types of wastewaters during natural and artificial treatment.

3.2 biosolids

organic-based materials from industrial or municipal wastewater sludge and their derived products, in the solid, semi-liquid (pasty), and liquid forms which have been treated to meet jurisdictional standards, guidelines or requirements including the reduction of pathogens, vector attraction and contaminant criteria.

3.3**heavy metal**

metal with relatively high density as a natural constituent of the environment, commonly detected in air, water and soil.

Note 1 to entry: Note to entry: It mainly refers to mercury, zinc, cadmium, lead, copper, chromium, arsenic, nickel and other metallic elements in this document.

3.4**persistent organic pollutants**

chemical substances that persist in the environment, bio-accumulate through the food web, pose a risk of causing adverse effects to human health and the environment, and can be subject to long range transport away from its original source

3.5**toxicological evaluation**

process of estimating the toxic effects and toxicity levels of substances on cells, blood and biological functions, including cytotoxicity tests, systemic acute toxicity tests, etc.

Note 1 to entry: adapted from the term evaluation.

Note 2 to entry: the first phrase has been deleted and replaced by the words “process of estimating”

3.6**toxic exposure test**

test that determines the toxic effects of pollutants on animals and plants exposed in different ways and over different time periods to detect various toxicity endpoint experiments to assess the toxicity level of pollutants and provide important information for safety evaluation or risk evaluation.

the experimental animals and plants are poisoned in different ways and in different time periods to detect various toxicity endpoint experiments. Its purpose is to assess the toxicity level of pollutants and provide important information for safety evaluation or risk evaluation.

4 Procedure for sludge toxicity evaluation

The evaluation procedure for sludge/biosolids follows a systematic two-step approach. Initially, chemical analysis is conducted to determine the concentrations of heavy metals, persistent organic pollutants and other organic compounds concerned. When all chemical contaminants in the sludge/biosolids are below their respective concentration limits- ([Table 1](#)), the sludge/biosolids may be used for subsequent land application. When the concentration of any pollutant exceeds the concentration limit in this standard, it is not recommended that the sludge be used for subsequent land application. Subsequently, comprehensive toxicity exposure tests are performed to evaluate the overall toxicity levels. Based on these test results, the sludge/biosolids are classified into appropriate classes as shown in [Table 2](#), to ensure compatibility with specific land application types.

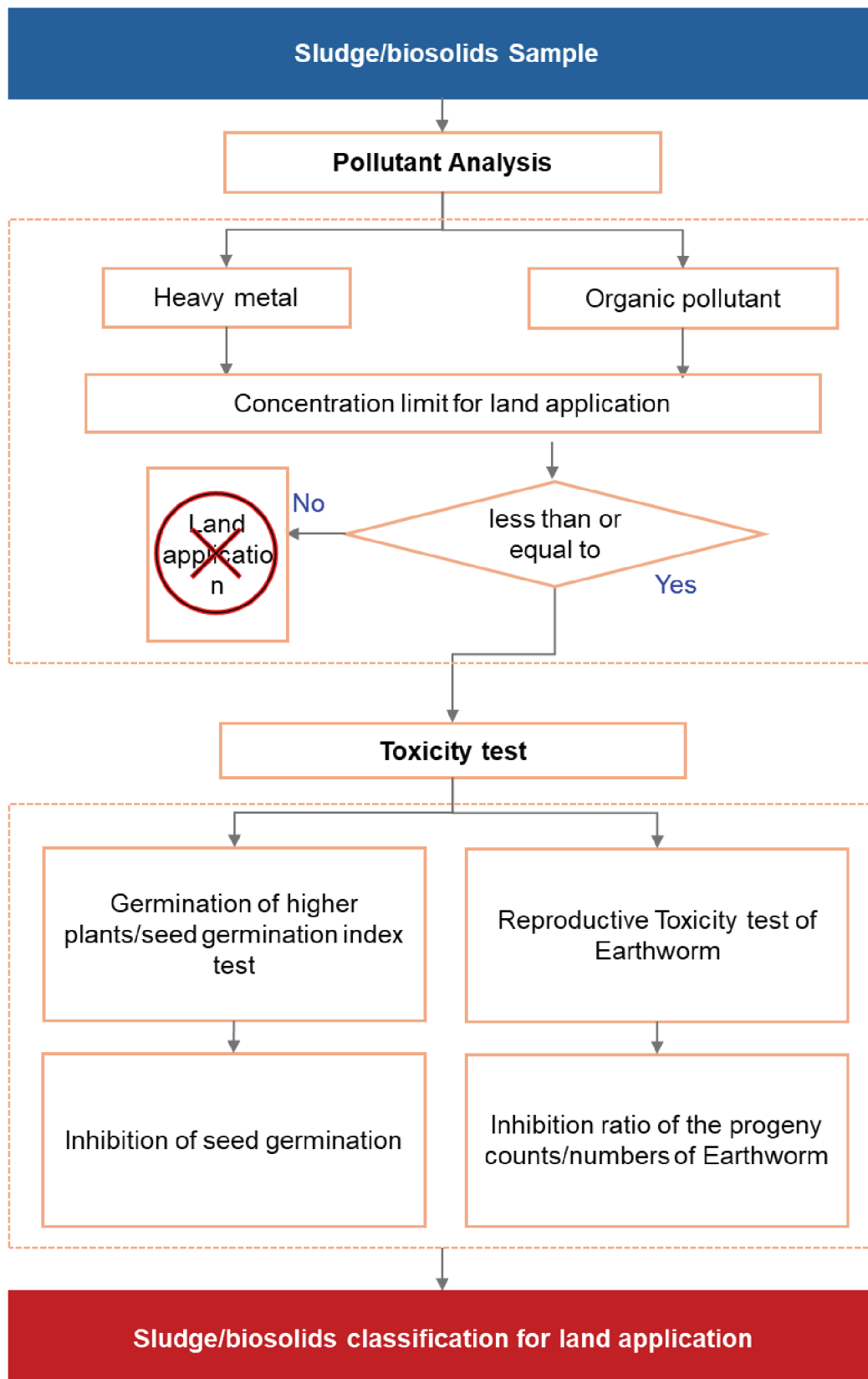


Figure 1 — Sludge/Biosolids toxicity evaluation procedure