

ISO 19698:2020 (E)

Sludge recovery, recycling, treatment and disposal — Beneficial use of biosolids — Land application

Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms and definitions
4	Benefits of biosolids land application
5	Nutrients in biosolids
5.1	General
5.2	Nitrogen
5.2.1	General
5.2.2	Nitrogen content and availability in biosolids
5.2.3	Determination of biosolids application rate according to nitrogen content
5.3	Phosphorus
5.4	Potassium
5.5	Calcium
5.6	Sulfur
6	Nuisance and risks associated with biosolids land application
6.1	General
6.2	Odours
6.3	Vector attraction
6.4	Pathogens
6.4.1	General
6.4.2	Viruses
6.4.3	Bacteria
6.4.4	Protozoa
6.4.5	Helminths
6.5	Trace elements
6.6	Organic compounds
6.6.1	General
6.6.2	Source control of potential contaminants
6.7	Environmental considerations
6.7.1	General
6.7.2	Climate and season
6.7.3	Topography
6.7.4	Protection of water sources
6.7.5	Identification of sensitive uses and associated setbacks
6.8	Biosolids treatment
6.8.1	General
6.8.2	Foreign matter
6.8.3	Odour reduction
6.8.4	Vector attraction reduction
6.8.5	Pathogen reduction
6.8.5.1	General
6.8.5.2	Conventional treatments
6.8.5.3	Advanced treatments
6.9	Biosolids quality criteria — Groups of biosolids

- 6.9.1 General
 - 6.9.2 Group 1 biosolids
 - 6.9.3 Group 2 biosolids
 - 6.10 Potential uses
 - 6.11 Biosolids and soil monitoring
 - 7 Biosolids application programme development and management
 - 7.1 General
 - 7.2 Community consultation
 - 7.2.1 Involving the community
 - 7.2.2 Consultation principles
 - 7.2.2.1 Knowing the community
 - 7.2.2.2 Timing consideration
 - 7.2.2.3 Transparency and open mindedness
 - 7.2.2.4 Dissemination of information
 - 7.2.2.5 Consultation process
 - 7.3 Programme development
 - 7.3.1 General
 - 7.3.2 Programme design and decision considerations
 - 7.4 Programme management
 - 7.4.1 General
 - 7.4.2 Programme management considerations
 - 7.4.3 Biosolids and soil monitoring
 - 7.4.3.1 Biosolids sampling and analyses
 - 7.4.3.1.1 Frequency of sampling
 - 7.4.3.1.2 Sample handling
 - 7.4.3.1.3 Biosolids analyses
 - 7.4.3.1.4 Chemical analyses
 - 7.4.3.1.5 Biological analyses
 - 7.4.3.2 Soil sampling
 - 7.4.4 Continuous improvement
 - 7.4.5 Voluntary agreement and quality assurance
- 8 Objectives of agricultural land application
 - 8.1 General
 - 8.2 Agronomic considerations
 - 8.2.1 Nitrogen management — General
 - 8.2.2 Nitrogen in biosolids
 - 8.2.2.1 General
 - 8.2.2.2 Determination of biosolids application rate according to nitrogen content
 - 8.2.2.3 Net nitrogen
 - 8.2.2.4 Plant available N
 - 8.2.2.5 Biosolids mineralization rates for the year of application
 - 8.2.2.6 Mineralization rates for years following application
 - 8.2.2.7 Volatilization of ammonia
 - 8.2.2.8 Nitrogen based biosolids application rate (BAR–N)
 - 8.3 Phosphorus management
 - 8.3.1 General
 - 8.3.2 Determination of biosolids application rate according to phosphorus content
 - 8.4 Annual biosolids application rate
- 9 Storage, staging, fencing and signage
 - 9.1 General
 - 9.2 Signage
- 10 Haulage and field deliveries
- 11 Application techniques
- 12 Specific pathogen mitigation measures for agricultural land application
- 13 Record keeping
 - 13.1 General
 - 13.2 Spreading records

- 13.3 Field inspection
- 14 Objectives of land reclamation
 - 14.1 General
 - 14.2 Site management
 - 14.2.1 General
 - 14.2.2 Soil/substrate properties
 - 14.3 Environmental considerations
 - 14.3.1 Climate and season
 - 14.3.2 Topography
 - 14.3.3 Protection of water sources
 - 14.3.4 Identification of sensitive uses and associated buffer zones
 - 14.4 Operations management
 - 14.4.1 Site preparation
 - 14.4.2 Biosolids batch management and transport
 - 14.4.3 Substrate sampling
 - 14.4.4 Substrate analysis
 - 14.5 Biosolids applications equipment and considerations
 - 14.6 Determination of biosolids application rate
 - 14.6.1 General
 - 14.6.2 Biosolids application rates based on agronomic nitrogen application rate
 - 14.6.3 Biosolids application rates based on maximum nutrient loads
 - 14.6.4 Biosolids application rates based on target carbon to nitrogen ratio (C:N)
 - 14.6.5 Biosolids application rates based on target organic matter
 - 14.6.6 Biosolids application rates based on target pH adjustment
 - 14.7 Revegetation
 - 14.8 Environmental post application monitoring
 - 14.8.1 General
 - 14.8.2 Soil monitoring
 - 14.8.3 Water monitoring
 - 14.8.4 Foliage monitoring
 - 14.9 Quality assurance
- 15 Nuisance and risk management for biosolids use for land reclamation
- 16 Biosolids treatment
 - 16.1 Biosolids quality criteria
 - 16.2 Pathogens
 - 16.3 Vector attraction
 - 16.4 Odour
 - 16.5 Fencing and signage
 - 16.6 Record keeping
- Annex A (informative) Soil carbon dynamics
 - A.1 Biosolids for soil carbon storage
 - A.2 Estimation of soil carbon storage from biosolids amendment
- Annex B (informative) Benefits of biosolids land application
 - B.1 General
 - B.2 Effects of biosolids on increased soil organic matter
 - B.3 Soil biological activity
 - B.4 Soil porosity and bulk density
 - B.5 Soil water infiltration rate
 - B.6 Aggregate stability and soil erosion
 - B.7 Cation exchange capacity
 - B.8 Effects of land application of lime stabilized biosolids on soil pH
 - B.9 Effects of land application of biosolids on overall nutrient recovery and nutrient cycle
 - B.10 Effects of land application of biosolids on soil carbon sequestration and greenhouse gas emissions
- Annex C (informative) Average concentrations of organic matter and plant macronutrients in biosolids
- Annex D (informative) Comparative pathogen and indicator limits for Group 1 biosolids

- Annex E (informative) Source of trace elements in wastewater and biosolids and examples of trace elements standards in biosolids and in soil after biosolids application**
- Annex F (informative) Standards for maximum concentration of organic compounds in biosolids**
- Annex G (informative) Organic compounds**
- Annex H (informative) Setbacks (buffer zones) in different regions**
- Annex I (informative) Biosolids quality based on treatment method**
- Annex J (informative) Determination of plant available phosphate**
- Annex K (informative) Determination of maximum biosolids application rates based on trace elements**
 - K.1 General**
 - K.2 Trace element concentration in biosolids**
 - K.3 Cumulative trace element loading rate limits in biosolids (maximum mass applied — dry mass basis)**
 - K.4 Maximum trace element loading over 365 days**
 - K.5 Annual trace element loading rate (ATELR)**
 - K.6 Annual biosolids application rate (ABAR)**
 - K.7 Limit values for concentration of trace elements in soils (Soil end point concentration method)**
- Annex L (informative) Examples of source control/pollution prevention tools and regulating industrial discharges**
 - L.1 General**
 - L.2 Industrial discharge to the sewer**
 - L.3 Bans and voluntary phase-outs**
 - L.4 Stakeholder education/outreach initiatives**
- Annex M (informative) Biosolids sampling frequencies**
- Annex N (informative) Soil and biosolids tests and methodologies**
- Annex O (informative) Community consultative workshop**
 - O.1 Stakeholder and community dialogue/workshops structure**
 - O.2 Workshop design considerations**
 - O.3 Workshop outcomes**
- Annex P (informative) Benefits and value of biosolids use in rehabilitation**
- Annex Q (informative) Examples of restricted activities and withholding periods for Group 2 biosolids**
- Annex R (informative) Revegetation**

Page count: 91