

# SOUTH AUSTRALIAN BIOSOLIDS GUIDELINES

FOR THE SAFE HANDLING, REUSE OR DISPOSAL OF BIOSOLIDS



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## **GLOSSARY**

### **Application Site**

The area over which the biosolids are applied.

### **Approved Use**

A category for reuse of biosolids where specific approval is required from the EPA. This category includes application to agricultural crops, forests, site rehabilitation and landfill. Information to the effect that biosolids have been applied to the land will be retained on a database maintained by EPA and this information will be available through section 7 searches.

### **Batch**

A quantity of biosolids assumed to be homogeneous, that has been or is to be sampled for analysis, and assigned a Contaminant and a Stabilisation Grade.

### **Beneficial Use**

The use of biosolids to improve soil properties and nutrient levels.

### **Biosolids**

Any product consisting totally or in part of organic matter that results from a wastewater treatment process (previously referred to as sewage sludge) or septic tank sludge.

### **Biosolids Depot**

Depot for the receiving, drying and stockpiling of biosolids.

### **Blending**

The mixing of biosolids with other materials which alters the concentration of the potentially toxic elements in the biosolids but has little impact on the reduction of pathogens.

### **Buffer Zone**

A designated strip of land between a biosolids depot and residential areas to minimise the impact of noise, dust and odours.

### **Classification**

The process of assigning biosolids into classes based on their quality.

### **Composting**

The aerobic decomposition of organic constituents at elevated temperatures to produce a highly stable humus-like material. Several composting techniques may be used.

### **Composting–Windrow Method**

This composting process involves stacking the mixture to be composted in long windrows which are frequently aerated by mechanical turning and mixing to keep an adequate supply of oxygen available to the microorganisms.

**Contaminants**

Potentially toxic elements occurring in biosolids which may affect plant or animal growth or human health.

**Contaminant Grade**

A grading method used to describe the quality of a biosolids batch according to the concentration of potentially toxic elements contained therein.

**Digestion**

Mesophilic anaerobic digestion typically at 30—35°C for 20—30 days.

**EPA**

South Australian Environment Protection Authority.

**Incorporation**

Cultivation to a depth of at least 75 mm of land to which either liquid or dried biosolids have been applied so that the biosolids are thoroughly mixed with the topsoil.

**Land Disposal**

Application of biosolids where beneficial use is not an objective and normally at rates which exceed the nutrient requirements of crops/pastures or plants, or the requirement for organic matter.

**Land Application**

Spraying or spreading of biosolids on to the land surface or their injection below the land surface.

**Landfill**

A waste disposal area that has been approved for the purpose and licensed by the EPA.

**Landfill Depot**

Solid waste disposal area licensed by the EPA.

**Landscaping**

A category for reuse of biosolids as soil conditioner in which the biosolids can only be applied to plantings that do not enter the animal or human food chain. These sites will usually be parklands, recreation reserves or roadside embankments with minimal control of public access to the reuse site.

**Pathogens**

Microorganisms such as bacteria and viruses, helminths (worms), and protozoan parasites such as Giardia, Entamoeba and Cryptosporidium, which can cause disease in humans and animals.

**Public Contact Site**

Public places on which biosolids have been applied (eg parks, golf courses and racecourses).

**SAHC**

South Australian Health Commission.

## **Section 7 Searches**

A search conducted under section 7 of the *Land and Business (Sales and Conveyancing) Act 1995* to determine information relating to a property title that would be of interest to prospective purchasers. Commonly used by property conveyancers.

## **STEDS**

Septic Tank Effluent Drainage Scheme—a common drainage system for the collection of effluent from septic tanks in townships.

## **Stabilisation**

The processing of biosolids to reduce or eliminate the potential for putrefaction and which as a result reduces pathogens, vector attraction and potential to generate offensive odours.

## **Stabilisation Grade**

A grading method used to describe the quality of a batch of biosolids according to the microbiological activity contained therein, potential for vector attraction and potential to give off offensive odours.

## **Stockpile**

A secure pile of dried biosolids from a drying lagoon, left for at least three years to reduce pathogens.

## **Surface Land Disposal**

Waste disposal area (licensed and approved by the EPA) in which the biosolids are not buried but applied to the surface at rates which exceed the requirements of beneficial land application or where the application has no intended beneficial use.

## **Unrestricted Urban Use**

A category for reuse of biosolids as a soil conditioner or replacer where there is no control in the urban environment over the crops grown, the amount of biosolids applied or access to the site. Approval for use of biosolids with this classification for use in irrigated agriculture (including irrigated vegetables) is still required.

## **Urban Landscaping**

A method of using biosolids for beneficial use of soils on land which will not be used for food production.

## **Vectors**

Insects and animals, such as flies, mosquitos and rodents, which are attracted to the putrescible organic material in biosolids and which may spread pathogens.

## **Wastewater Treatment Plant**

The processing facility that treats wastewater to render it acceptable for discharge to the environment and which as a result produces biosolids and minor residuals.

## **INTRODUCTION**

Municipal wastewater treatment essentially separates dissolved and particulate organic waste material from the water used to carry it to the treatment facility.

These residues are referred to as biosolids. Provided adequate stabilisation prevents transfer of pathogenic organisms, biosolids, which contain organic material and nutrients, can be beneficial when applied to productive soil.

However, the widespread use of household cleaning chemicals, disposal of industrial wastes to sewerage systems and the impact of metal pipes and fittings in the water supply system, mean that biosolids also contain contaminants which may, if applied in sufficiently large quantities, have a deleterious effect on soils, plants, animals and human health.

These guidelines have been published to ensure that beneficial reuse of biosolids from municipal wastewater can be safely and sustainably practised in South Australia. The primary objective of the guidelines is to protect public health and the environment. They were prepared by people with expertise in public health, engineering, soil and water science, the environment, treatment facility operation, contracting, catchment management and local government. The guidelines were also subject to public notification and consultation.

Guidelines A refer to large wastewater treatment plants which may receive industrial as well as domestic wastewaters. Guidelines B refer to smaller domestic wastewater treatment plants and septic tanks.

The guidelines are intended to remain current for a period of up to three years from the date of publication. At this time, they will be reviewed and updated to take into account Australian and international research into beneficial uses of biosolids.

# GUIDELINES A

FOR THE SAFE HANDLING, REUSE OR DISPOSAL OF BIOSOLIDS

PRODUCED FROM:

- Wastewater treatment plants for populations greater than 1000
  - Smaller plants that receive industrial wastes



**Rehabilitation of a landfill site at Garden Island in Adelaide.  
The soil mix included Biosolids from Bolivar Wastewater Treatment Plant.**

# GUIDELINES A

## A1 SCOPE

Guidelines A provides a framework for the safe handling and use of biosolids produced from:

- • wastewater treatment plants for populations greater than 1000 persons
- • smaller plants that also receive industrial waste.

Guidelines A is intended for the use of:

- • **Operators** such as South Australian Water Corporation, their contractors and councils who operate wastewater treatment plants.
- • **Reprocessors** who process biosolids by blending or composting prior to resale of a final product containing biosolids.
- • **End users** who use biosolids or products containing biosolids such as householders, landscapers, farmers or councils.

Restrictions apply to all uses of biosolids (see table A1). More stringent restrictions apply to some uses and are presented in later sections of Guidelines A.

**Table A1** Site characteristics restricting the use of biosolids.

Site Characteristic	Restriction
Surface Waters and Shallow Groundwaters	Biosolids shall not be applied to land in such a way that they could have an adverse impact on ground or surface waters.
Poor Drainage	Biosolids shall not be applied to waterlogged soil.
Rocky Ground	Biosolids shall not be applied to rocky ground.
Sloping Land	Preventive measures must be taken to ensure that the risk of runoff and erosion is avoided.
High Nutrient Levels	Application of biosolids to sites where there is a risk of the applied nutrients being leached from the rootzone must be avoided.

## A2 CLASSIFICATION

### A2.1 OUTLINE

Three Biosolids Reuse Classifications have been established and are defined by specifications detailing minimum treatment processes for the control of pathogens and maximum concentration of heavy metals in the biosolids. They are:

- • UNRESTRICTED URBAN USE
- • LANDSCAPING
- • APPROVED USE.

All biosolids or biosolids products must be subjected to a grading process before being used within any of the three classifications.

Grading for classification is a twofold process:

- • A **Stabilisation Grade** is assigned according to the treatment that the batch of biosolids has undergone to reduce pathogens and vector attraction, and control odours.
- • A **Contaminant Grade** is assigned according to the concentration of a range of potentially harmful metals present in the biosolids.

All biosolids must be assigned a Stabilisation Grade and a Contaminant Grade before being used for any purpose. Two Stabilisation and three Contaminant grades are specified in these guidelines.

The reprocessor of the biosolids must ensure that each batch is correctly graded and classified, and that the end user is given this information. Records of sampling, analysis and assignment of grades must be maintained by the reprocessor and be made available at random inspections by the EPA or its agents.

Written approval is required from the EPA for biosolids to be applied to an agricultural crop. Approval depends upon the actual concentration of metals in the biosolids to be used (as opposed to maximum permitted levels for grading purposes) and the existing level of contamination (from whatever source) in the soil of the receiving site. Approval will generally permit annual applications of biosolids to a site over a period of 10 years. The user must ensure that the maximum application rate of contaminants to the land is not exceeded each year.

EPA approval is also required for application to forests or for site rehabilitation and some landscaping uses (see table A2).

Approval for use of biosolids for agriculture, forestry or site rehabilitation will be recorded on a database maintained by EPA and this information will be available through searches conducted under section 7 of the *Land and Business (Sales and Conveyancing) Act 1995*.

There are also general restrictions on the characteristics of sites permitted to receive biosolids, and on the handling and storage of biosolids after removal from the wastewater treatment plant.

## A2.2 CLASSIFICATION REQUIREMENTS

Table A2 summarises the requirements of each of the three Biosolids Reuse Classifications for the Stabilisation and Contaminant grades that must be achieved and the restrictions on uses within each classification. More detailed information concerning the use within each classification is included in the following subsections.

The requirements for grading and for seeking approval for the use of biosolids in the Approved Use classification are explained in detail in section A5.

**Table A2** Stabilisation and Contaminant grade requirements for particular uses of biosolids.

Classification	Minimum Grade		Permitted Uses without EPA Approval	Uses Requiring EPA Approval
	Stabilisation	Contaminant		
Unrestricted Urban	A	A	Home Garden Urban Landscaping Agriculture (non-irrigated) Forestry Site Rehabilitation	Irrigated agriculture
Landscaping	A	B	Urban Landscaping Forestry Site Rehabilitation	Agriculture
Landscaping	B	B		Urban Landscaping Agriculture Forestry Site Rehabilitation
Approved Use	B	C		Agriculture Forestry Site Rehabilitation

Note: Any of the above biosolids classifications can be taken to a licensed landfill site.

### **A2.2.1 Unrestricted Urban Biosolids Products**

Unrestricted Urban biosolids products are those that have been assigned both Contaminant Grade A and Stabilisation Grade A.

Classification records must be retained by the reprocessor and be made available upon request at random inspections by the EPA or its agents.

Biosolids classified as Unrestricted Urban may be:

- • produced only by a reprocessor approved by the EPA;
- • used on any type of crop without restriction on the amount applied except on commercial, irrigated agricultural crops, in which case it is necessary to seek specific approval from EPA;
- • used without the user needing to retain records;
- • sold in bulk provided that the buyer is given information stating that the product contains biosolids;
- • bagged and sold through retail outlets provided that each bag is specifically labelled stating that the product contains biosolids.

### **A2.2.2 Landscaping Biosolids Products**

Landscaping biosolids products are normally those that have been assigned a Stabilisation Grade A and a Contaminant Grade B, however, Stabilisation Grade B is acceptable if the specific application has been approved for this purpose by the EPA. Stabilisation Grade B biosolids are likely to be approved for uses where workers can be informed of the potential risks of handling the material and there is minimal risk of the general public having contact with the biosolids because they are incorporated into the subsoil or a complete vegetative cover is established. Stabilisation Grade B biosolids will not be approved for applications such as for flower beds and border plantings.

Classification records must be retained by the reprocessor and be made available upon request at random inspections by the EPA or its agents.

Biosolids classified as Landscaping may:

- • be produced only by a reprocessor approved by the EPA;
- • be sold in bulk quantities to users only if it is to be used in a non-domestic situation in sites such as parklands, recreation reserves or roadside embankments;
- • not be used for the landscaping of domestic gardens;
- • not be used when use would contravene the general site restrictions detailed in table A1;
- • be used only for the production of agricultural food crops with site specific approval of the EPA and in compliance with restrictions on the use of biosolids in the Approved Use classification (table A5);
- • be used for landscaping without maintenance of records by the user.

### **A2.2.3 Approved Use Biosolids and Biosolids Products**

Approved Use biosolids are those biosolids or biosolids products assigned Stabilisation Grade B which do not have sufficiently low concentrations of contaminants to be assigned Contaminant Grade A or B. All biosolids produced from the metropolitan treatment plants are by default assigned Contaminant Grade C unless shown to be acceptable for a higher grade.

Analysis and classification data must be retained by the producer and be made available upon request at random inspections by the EPA or its agents.

Users should retain records of application to demonstrate compliance with the conditions of approval

Information stating that biosolids have been used on the property will be retained on a database maintained by the EPA and the information will be available through searches conducted under section 7 of the *Land and Business (Sales and Conveyancing) Act 1995*.

Biosolids classified as Approved Use:

- • must not be used on sites in contravention of the restrictions specified in tables A1 and A5;
- • must not be used on domestic gardens;
- • must not be used for urban landscaping;
- • can only be used following written approval from the EPA in response to a site specific application from the user;
- • can only be used in accordance with the conditions specified in the written approval from the EPA.

### **A2.3 BLENDING BIOSOLIDS WITH OTHER PRODUCTS**

Biosolids can be blended with other materials to produce a product that has more desirable characteristics or properties for reuse than the 100% biosolids product. Biosolids are usually blended with other materials to dilute the concentration of contaminants such as metals in the biosolids. Blending therefore increases the opportunities for reuse by allowing the batch to be classified to a higher Contaminant Grade or allows the maximum application rate to be increased. Blending can also increase the concentration of nutrients in the final product or alter the moisture content by simply blending the components together or by composting. In either case any product which contains biosolids cannot be used for any purpose without being assigned both a Stabilisation and a Contaminant Grade according to these guidelines. Specific approval from the EPA for use on agricultural crops is also required for all products containing biosolids.

Biosolids treated to Stabilisation Grade A may become recontaminated if blended with other material whose Stabilisation Grade is unknown. Blended biosolids must be retreated by an approved Stabilisation A process. Alternatively, sampling of the batch may be undertaken in accordance with the requirements of section A4.1.

### **A3 STABILISATION GRADING OF BIOSOLIDS**

Biosolids, when produced from a wastewater treatment plant, contain pathogenic bacteria, viruses, helminths, protozoa and other parasites that pose a threat to the health of humans and animals. Pathogens can be transmitted through direct contact with the biosolids or indirectly through transmission by vectors such as birds or rodents. The numbers of these pathogenic organisms can be substantially reduced by appropriate treatment processes.

Stabilisation grading classifies biosolids according to the extent of treatment they have been subjected to for the reduction of pathogenic organisms, and the potential to attract vectors and reduce offensive odours.

Two Stabilisation grades have been defined, Stabilisation Grade A and Stabilisation Grade B. Biosolids not conforming to either of these grades will be treated as unstabilised and not suitable for use. A copy of the 'Biosolids Analysis Sheet for Producers' which must be completed for each batch of biosolids, can be found in appendix A1. These records must be made available at random inspections by the EPA or its agents.

Unstabilised biosolids may only be removed from the production site for further processing at a site previously approved by EPA for this purpose.

#### **A3.1 STABILISATION GRADE A**

Stabilisation Grade A is the highest (most stable) grade. The biological activity in a batch of biosolids with this classification is considered to be sufficiently low to have a negligible increase in the risk of transmission of pathogens from the biosolids compared with unmodified topsoil. Stabilisation Grade A biosolids are suitable for use in places where uncontrolled human contact is likely such as domestic gardens, and parks and recreational areas.

Biosolids must have been assigned Stabilisation Grade A to be used in the classification groups Unrestricted Urban or Landscaping.

There must be no further blending of biosolids that have been assigned Stabilisation Grade A to avoid reintroduction of pathogens into an environment favourable for their growth unless the product is retreated in accordance with section A2.3.

Biosolids will be classified as Stabilisation Grade A if they have been subjected to one of the following treatment process after drying/dewatering presently approved by the EPA.

## **Ageing**

The biosolids must age for a period of not less than 3 years following digestion either by air drying in a lagoon or by stockpiling at the treatment plant.

## **Composting**

Through the windrow composting method, the solid waste must attain a temperature of 55°C or more for at least 15 days during the composting period. During the high temperature period the windrow must be turned at least five times.

## **Lime Stabilisation**

The pH of the biosolids must be raised to at least pH 12 and remain above pH 12 for at least 72 hours. During at least 12 hours of the 72 hour period, the temperature of the biosolids product must be greater than 52°C. After 72 hours the biosolids product must be air dried to a solids content of more than 50%.

## **Pasteurisation**

All of the biosolids must be maintained for at least 60 minutes at a minimum temperature of 70°C. Final per cent dry solids shall be at least 75% if the biosolids had previously been digested otherwise the final per cent dry solids shall be 90%.

Temperature records are to be maintained using suitably calibrated probes and these records are to be available for inspection by EPA officers upon request.

## **Other Processes**

Processes other than composting and pasteurisation may be acceptable if it can be demonstrated to the satisfaction of the EPA that pathogen reduction is equivalent to that of the approved processes.

## **Sampling and Analysis**

Stabilisation Grade A may be established by a sampling and analysis programme. The programme will be required to demonstrate that in 50 grams of processed biosolids there remains:

- • less than one salmonella
- • less than one helminth ovum
- • less than one PFU total virus
- • less than one cyst or oocyst of Cryptosporidium and Giardia.

The methodology for obtaining representative samples from each batch of biosolids is given in section A4.1.2.

## **Moisture Control**

If, after being graded as Stabilisation Grade A following treatment by a process other than composting, the biosolids become wet for example by significant rainfall then the batch must be downgraded to Stabilisation Grade B until such time as it has redried to its original moisture content. The biosolids must be dried for at least one month to achieve Stabilisation Grade A if the solids content is less than:

- • 50% following treatment by lime stabilisation
- • 75% following treatment by ageing or pasteurisation following digestion
- • 90% following treatment by pasteurisation of undigested biosolids.
-

### A3.2 STABILISATION GRADE B

A batch of biosolids will be classified as Stabilisation Grade B if it can be shown that, following digestion and drying by evaporation in a lagoon, the dried biosolids have been stockpiled for not less than 1 year. If the biosolids have not been digested then stockpiling must be for a period not less than 3 years. Final per cent dry solids shall be at least 75% for digested biosolids and 90% for undigested biosolids.

Other processes that achieve an equivalent pathogen reduction may be used subject to the approval of the EPA.

Stabilisation Grade B biosolids are suitable for use in those situations where there will be a minimal risk of uncontrolled human contact. Those persons likely to be at risk from the transmission of pathogens from the biosolids (such as machinery operators and farm workers) must be educated in safe handling procedures and take sufficient action to reduce the risk to themselves to an acceptable level.

Biosolids classified as Stabilisation Grade B can only be used in the Approved Use classification for urban landscaping, agriculture, forestry or site rehabilitation following written approval from the EPA. All other uses will require classification as Stabilisation Grade A.

### A3.3 RESPONSIBILITY FOR STABILISATION GRADING

An analysis sheet provided by the wastewater treatment plant with each batch of biosolids will state whether the biosolids are Stabilisation Grade A or B or unstabilised as a result of ageing at the plant.

Regrading as a result of further ageing or reprocessing will be the responsibility of the reprocessor.

Evidence used for grading purposes such as age of the biosolids or reprocessing data must be maintained by the reprocessor. These records must be made available at random inspections undertaken by the EPA or its agents.

## A4 CONTAMINANT GRADING OF BIOSOLIDS

All biosolids are contaminated to some extent by elements potentially toxic to humans, animals or plants such as heavy metals or organic chemicals such as pesticides. Much of this contamination is the result of industrial wastes discharged to sewers but some can be attributed to products used in the domestic environment such as cleaning products or to corrosion of components in the water supply reticulation system. Sewage treatment processes concentrate these elements in the biosolids. All South Australian biosolids are air dried in lagoons and the inherent ageing and low original concentrations in the sewage are sufficient for the organic chemicals to be below levels of concern. However, the metals remain.

The objective of contaminant grading is to avoid using biosolids in a manner that would risk excessive uptake of metals by crops or ingestion by humans or animals either by using biosolids of an inappropriate quality as a large single application to a site or by repeated applications to a site. Maximum permissible concentrations (MPCs) have been set for the concentration of contaminants in soils used for the production of food crops for human and animal consumption (table A3). For irrigated crops, these MPCs may not be applicable. In these cases, the EPA should be contacted for advice.

A copy of the 'Biosolids Analysis Sheet for Producers' which must be completed for each batch of biosolids, can be found in appendix A1. These records must be made available at random inspections by the EPA or its agents.

**Table A3** Maximum permissible concentration of contaminants in soils.

Contaminant	Soils Used For Food Production (mg/kg)
Arsenic	20
Cadmium	3
Copper	200
Lead	200
Mercury	1
Nickel	60
Zinc	250

Note: The significance of chromium is being monitored. In the future maximum concentrations may be specified for chromium VI.

Three Contaminant Grades have been established for biosolids and are shown in table A4.

Threshold concentrations of metals for Grade A biosolids have been set equivalent to the MPCs for soils used for food production. This means that biosolids assigned Contaminant Grade A are suitable for use as a soil replacement in those situations where food crops are grown. However, if Grade A biosolids are used for irrigated commercial food crops EPA approval will still be required.

Contaminant Grade B biosolids can be used as a soil replacement on sites where food crops will not be grown either now or in the future.

Contaminant Grade C is the lowest (most contaminated) grade. All biosolids and their products from Adelaide's metropolitan wastewater treatment plants are, by definition, Contaminant Grade C unless blended or composted with other materials to dilute the concentration of contaminants.

The amount of biosolids that can be applied to a site annually for commercially grown food chain crops (human or animal), is also restricted. This amount depends upon the actual concentrations of the contaminants in the biosolids and the background soil contamination. The maximum application rate and any other restrictions will be specified in writing following application to the EPA. The requirements for obtaining approval are explained in section A5. EPA approval is also required for application of biosolids to forests and for site rehabilitation.

The limiting concentrations for each of the Contaminant grades are summarised in table A4.

**Table A4** Upper limit of metal concentrations for contaminant classification of biosolids.

Contaminant	Grade A (mg/kg)	Grade B (mg/kg)	Grade C (mg/kg)
Arsenic	20	20	>20
Cadmium	3	11	>11
Copper	200	750	>750
Lead	200	300	>300
Mercury	1	9	>9
Nickel	60	145	>145
Zinc	250	1400	>1400

The grade of a biosolids batch will be equivalent to the lowest grade determined for any of the contaminants in that batch. For example if in a biosolids product all contaminants except for copper are below the threshold concentration for Contaminant Grade B but the concentration of copper exceeds the Grade B threshold concentration, then the product must be assigned Contaminant Grade C.

#### A4.1 GRADING PROCEDURE

##### A4.1.1 Responsibility for Contaminant Grading of Biosolids

In general all biosolids from wastewater treatment plants have concentrations of contaminants such that they can only be assigned Grade C without dilution with other materials. The operators of the wastewater treatment plant undertake the sampling and analyses required to provide sufficient information about the concentration of contaminants as the biosolids are removed from the drying pan. If the biosolids are to be used in the Approved Use classification, such as on agricultural crops then this information must be given to the EPA. Reprocessors also use these analyses to estimate how much other waste must be blended with the biosolids before they can assign a Contaminant Grade higher than Grade C to the batch.

If the biosolids are further processed by blending or composting with other materials before use, the reprocessor must resample the combined product to determine the final contaminant grade before reuse.

The reprocessor is required to maintain records of sampling and analyses undertaken as part of the contaminant grading process. A copy of the 'Biosolids Analysis Sheet for Reprocessors' which must be completed by the reprocessor can be found in appendix A2. These records must be made available at random inspections undertaken by officers of the EPA or its agents.

If the biosolids are to be used on an agricultural crop then the analysis of the biosolids batch must be submitted to EPA by the user (or on behalf of the user) with the other required information (see section A5.1) after first obtaining it from the wastewater treatment plant operator.

##### A4.1.2 Sampling Procedure

Each drying pan will be considered to produce a single batch of biosolids. For each batch of biosolids a minimum of three samples is analysed. For large lagoons one sample is collected for every 500 cubic metres (approximately) of spadeable biosolids, however, up to five samples may be bulked prior to analysis if preferred.

It is important that all biosolids samples collected for analysis are as representative as possible of the batch as a whole. If the biosolids are allowed to weather in a stockpile for a considerable period of time there may be a wide variation in the analyses of the material collected because weathered fines of the biosolids have different characteristics to larger material. Similarly it is possible that surface material will have different properties to

material buried within the stockpile. In an effort to overcome this problem but still retain some flexibility, two sampling procedures are proposed:

- I. Samples can be collected from the drying pan immediately before removal by driving through the biosolids over a regular grid pattern.
- II. Samples can be collected from the stockpiled biosolids within one month of its removal from the lagoon. Samples should be collected from the surface and from within the pile.

In either case the sampler must make every effort to ensure that the samples are as representative as possible of the batch.

The maximum batch size for sampling and analysis for blended or composted biosolids is 500 cubic metres. A minimum of three samples should be analysed from each batch.

#### **A4.1.3 Analysis of Samples**

All analyses must be performed by National Association of Testing Authorities (NATA) registered laboratories.

All analyses (including sample preparation, storage and preservation) should be based upon relevant United States EPA methods or alternative methods that have been shown to give equivalent or better results and are approved by the EPA.

#### **A4.1.4 Representative Element Concentrations**

For the purpose of defining the concentration of each element in a biosolids batch the concentration is taken to be equivalent to the mean plus one standard deviation of all the analyses of the element for that batch. This applies to both biosolids as they are removed from the drying pans and to composted or blended biosolids.

### **A5 APPROVED USE OF BIOSOLIDS**

Each use within this classification requires written approval from the EPA.

Before seeking approval from the EPA potential users should satisfy themselves that the area intended to receive biosolids will not be affected by the restrictions listed in table A5. These restrictions complement the general restrictions listed in table A1.

**Table A5** Restrictions on the use of biosolids–Approved Use Classification.

Feature	Restriction
Irrigated Land	Biosolids are unlikely to be approved for application to any irrigated land that is or is likely in the future to be used for food production for animals or humans
Acidic soil	Biosolids shall not be applied to soil that has a pH of less than 5.5 (ratio 1:2.5 soil / 0.01M CaCl <sub>2</sub> )
Sloping Land	Biosolids shall not be applied to land with a slope in excess of 5% without approval of the EPA
Buffer Zones	The following buffer widths are recommended minima; approval from the EPA will be required for lesser distances.
	Watercourse 100 metres
	Farm Drives 5 metres
	Property Boundaries and Public Roads 50 metres
	Dwellings on adjoining properties 100 metres
	Due consideration needs to be given in each case to the potential for nuisance resulting from odour or dust originating from the use of biosolids

Each of the approved uses is discussed separately below.

#### A5.1 AGRICULTURE

Written approval from the EPA is required prior to the application of biosolids to agricultural crops which enter the human or animal food chains. This includes applications using biosolids that by treatment are better than the minimum Stabilisation Grade, or by blending or composting with other materials have been shown to be less contaminated than the minimum contaminant grade specified for use in agriculture.

Irrigation with water of moderate salinity increases the risk of mobilisation of certain heavy metals.

Application of biosolids to land that is or is likely to be used for the production of irrigated crops in the future is therefore unlikely to be approved.

Applications will usually be made by or on behalf of the owner of the land to which the biosolids will be applied. The EPA needs the following information to consider an application for use of biosolids in the Approved Use category:

- • an analysis of the concentration of metals in the batch of biosolids to be applied (obtained from the producer or reprocessor);
- • the Stabilisation Grade of the batch of biosolids to be applied (obtained from the producer or reprocessor);
- • the section number, hundred and ownership of the property that will receive the biosolids;
- • a map or sketch marked to show where on the property the biosolids will be applied;
- • the results of recent soil analyses undertaken on the land that will receive the biosolids–soil sampling and analysis to be undertaken according to the methodology and requirements detailed in section A5.1.1 below;
- • a declaration that the proposed application will not contradict the general restrictions on the use of biosolids listed in tables A1 and A5 of these guidelines;
- • acknowledgment that if approval is granted for use of biosolids this information will be retained on a database maintained by the EPA and will be available through section 7 searches.

A copy of the 'Application for Approval to Apply Biosolids to Land Used for the Production of Agricultural Crops' can be found in appendix A3.

After evaluation of the application, the EPA will advise the applicant in writing of the conditions attached to approval of the use of biosolids.

Once written approval has been granted annual applications of biosolids may be made to the site for a period of up to 10 years without reapplication to the EPA. Users must estimate the appropriate loading rate for each batch of biosolids from the data on the analysis sheet provided to them at the time of collection/delivery of the biosolids. This ensures that the maximum annual contaminant loading approved for that site is not exceeded.

#### **A5.1.1 Soil Analysis**

The results of a soil analysis for the site intended to receive the biosolids need to be submitted to the EPA together with the approval application so that background soil contaminant levels can be assessed. In general this is only required before the initial application of biosolids and ten years following the first analysis of the soils on the site.

Sampling of the site for soil analysis should be as representative as possible. Samples should be collected from the top 100 mm of soil. One sample should represent no more than 1 hectare but up to 40 samples may be bulked for analysis.

The composite samples should be analysed for:

- • pH (calcium chloride)
- • total arsenic
- • total cadmium
- • total copper
- • total lead
- • total mercury
- • total nickel
- • total zinc.

#### **A5.1.2 Acceptable Agricultural Crops**

It is unlikely that irrigated agricultural crops will be approved to receive biosolids because the chloride in the irrigation water increases the availability of metals (cadmium in particular).

#### **A5.1.3 Management Practices**

Applications of biosolids to sites must be incorporated into the topsoil within one month of application to the land. This effectively means that applications to permanent pasture can only occur during renovation or establishment.

#### **A5.1.4 Biosolids Application Rate**

The amount of biosolids that can be applied to a site in any year and the number of years that it can be applied will be advised by the EPA in their letter of approval. This information is calculated from the analysis of the biosolids supplied with the approval application and the background contamination on the site as shown by the site soil analysis. A maximum annual biosolids application rate is set so that the amount of contaminants applied to the site does not exceed the values specified in table A6. This minimises the risk of high concentrations of available metals being present in the soil at any time and being taken up by crops.

**Table A6** Limiting amounts of heavy metals which can be annually applied to soils.

Contaminant	Limiting Value (kg/ha/a)
Arsenic	0.7
Cadmium	0.15
Copper	12.0
Lead	15.0
Mercury	0.1
Nickel	3.0
Zinc	30.0

It is the responsibility of users to ensure that, in subsequent years when different batches of biosolids are used, the loading rate is recalculated to ensure that annual loading of metals is not exceeded

Once the concentration of metals in a batch of biosolids and the background soil contamination are known, users can estimate for themselves the maximum likely application rate of the biosolids that will be permitted by EPA by completing the worksheet in appendix A4. This is also the form that they will need to complete to calculate the acceptable biosolids loading rate in subsequent years.

In practice, the concentration of potentially toxic elements in all the metropolitan biosolids, limits applications of unblended material to about 5–10 t/ha (depending upon the source of the biosolids). Loading rate could also be limited further by existing contamination in the soil. More precise information will be provided with the written approval issued by EPA.

#### **A5.1.5 Storage of Biosolids**

When biosolids are stored at sites other than those approved for reprocessing prior to application to land the following precautions must be taken:

- • Locate the stockpile at least 300 metres away from the nearest dwelling.
- • Ensure that the stockpile will not be subject to erosion by wind.
- • Ensure that the stockpile will not be accessible to stock.
- • Locate the stockpile on level ground away from areas subject to flooding.
- • Do not store biosolids on the property for longer than four months.

#### **A5.2 FORESTRY**

Application of biosolids to forests will be in accordance with the restrictions referred to in these guidelines. In addition loading will probably be limited by nutrient uptake of the trees which in turn will be influenced by the species and maturity. Seek advice from the Department of Primary Industries (Forests) in these cases.

Information stating that the land has received biosolids will be retained on a database maintained by the EPA and the information will be available through section 7 searches.

#### **A5.3 SITE REHABILITATION**

Written approval from the EPA is also required before biosolids may be applied to land requiring rehabilitation. Each application will be given individual consideration, however, it will be necessary to provide sufficient evidence to show that the proposed practice will not be detrimental to the environment.

Information stating that the land has received biosolids will be recorded in a database maintained by the EPA and this information will be available for retrieval through section 7 searches.

## **A6 BIOSOLIDS HEALTH AND SAFETY PRECAUTIONS**

As biosolids may contain microorganisms that could be harmful to people who come into contact with the material, sensible care should be exercised when handling biosolids products. The following practices are suggested as minimum care:

- • Wash hands and scrub nails well with soap before eating, drinking or smoking, and at the end of the working day.
- • Do not consume food or drink nor smoke while working with biosolids.
- • Wear a suitable change of clothing during work and wear footwear and gloves to protect against injury from sharps.
- • Make showering facilities available to employees.
- • Ensure eye protection is worn consistent with good work practice to avoid problems with dust.
- • Wear masks conforming with the Australian Standard to prevent inhalation if dust or aerosols are considered to be a problem.
- • Exercise extra care in handling material rewetted by significant rainfall, in case of regrowth of bacteria.

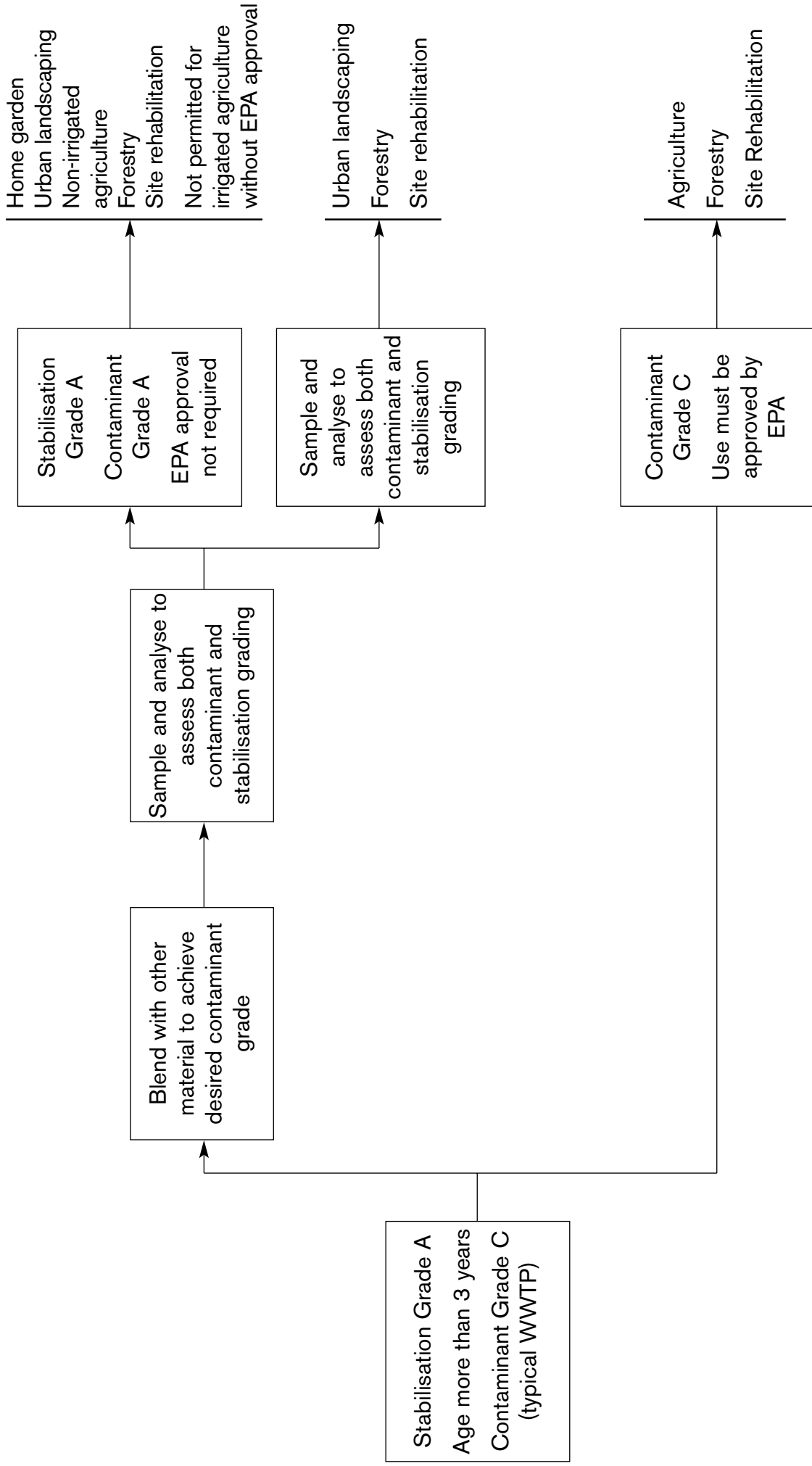
### **A6.1 TRANSPORT OF BIOSOLIDS**

When transporting biosolids on a public road the load must be covered to prevent the loss of fine material. If the biosolids are not air dried then precautions must be taken to ensure that no drainage from the load escapes from the vehicle whilst in transit.

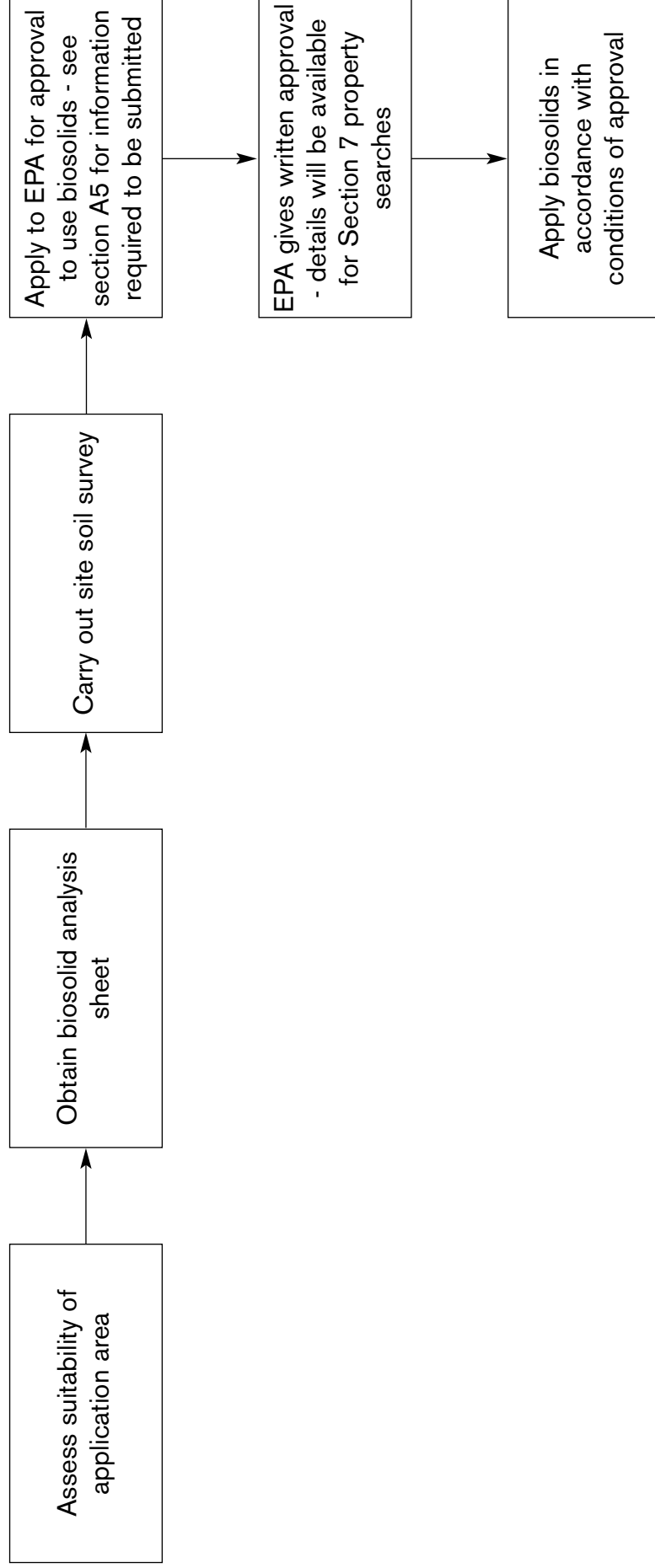
Vehicles used to transport biosolids must be cleaned in a location such that washdown water cannot enter the urban stormwater system, preferably only at wastewater treatment plants or at sites approved by EPA for the reprocessing of biosolids, in an urban environment.

When washing vehicles after delivery of a load of biosolids to an Approved Use site a location with no risk of surface runoff must be selected. Vehicles should not be cleaned while parked on farm drives or on other compacted areas where there is a risk that the washdown water will remain ponded on the surface for any significant time.

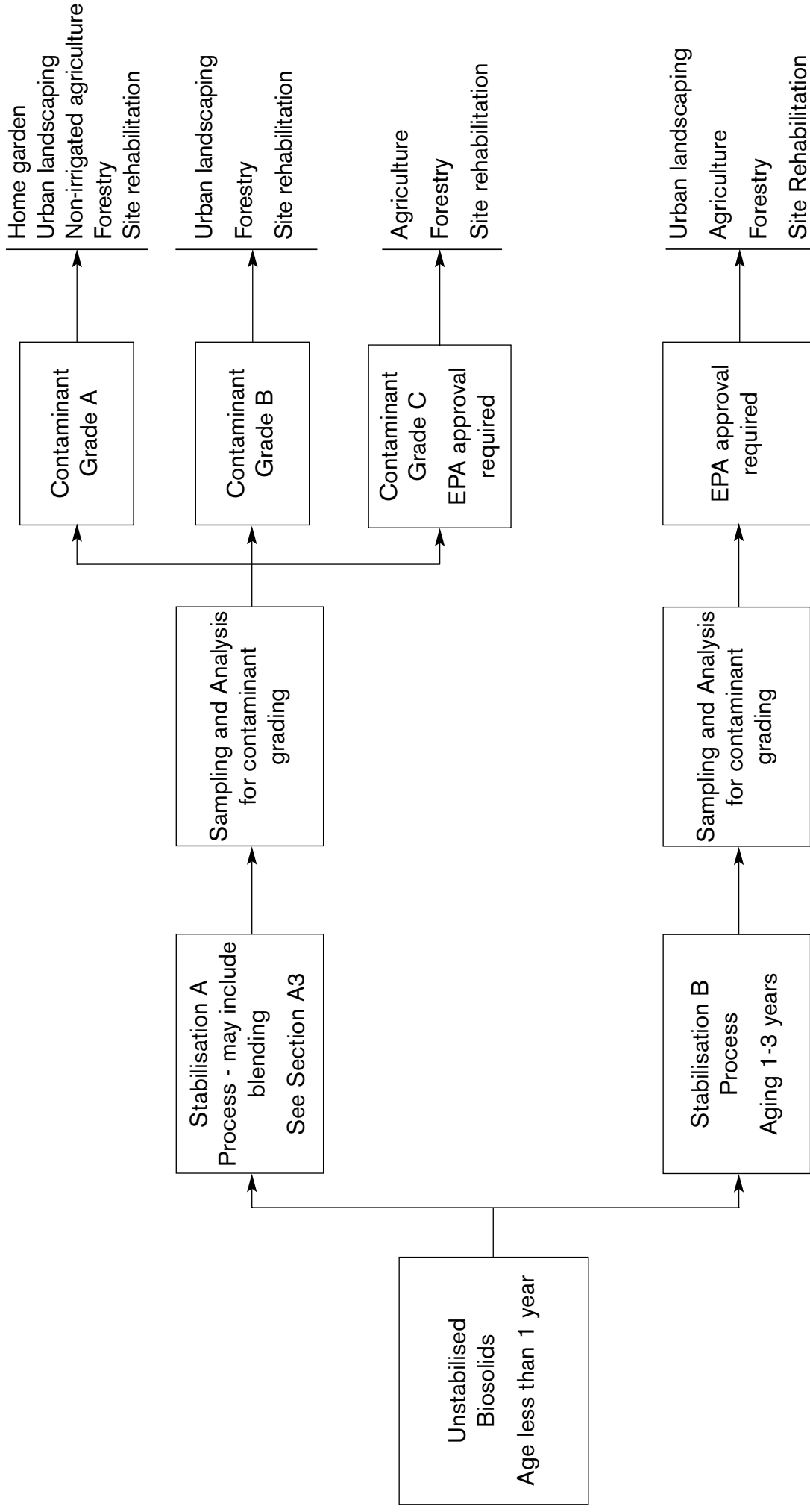
# FLOWCHART FOR BIOSOLIDS STABILISATION GRADE A



# FLOWCHART FOR EPA APPROVAL FOR AGRICULTURAL USE OF BIOSOLIDS



# FLOWCHART FOR UNSTABILISED BIOSOLIDS



## APPENDICES

## APPENDIX A1 BIOSOLIDS ANALYSIS SHEET FOR PRODUCERS

This sheet is to be completed for all batches of biosolids before the biosolids can be reprocessed or used in accordance with the Biosolids Guidelines A. A copy must be retained by the producer and be available for random inspection by officers of the EPA or its agents. A copy should also be provided to persons receiving biosolids from that batch.

WASTEWATER TREATMENT PLANT THAT PRODUCED THE BIOSOLIDS

.....

BATCH IDENTIFIER

(Use a unique code for each batch)

.....

BATCH SIZE

.....(cubic metres)

DATE DRYING LAGOON TAKEN

OFF LINE (use the latest date)

.....

DATE REMOVAL FROM LAGOON COMPLETED

(use the latest date)

.....

STABILISATION GRADE (at date of completion of this form).....

RESULTS OF CONTAMINANT ANALYSIS (mg/kg)

Contaminant	No. of Samples	Mean (m)	Standard Deviation (s)	m+s
Arsenic				
Cadmium				
Copper				
Lead				
Mercury				
Nickel				
Zinc				

Person supplying information.....

Date.....

Position.....

**APPENDIX A2 BIOSOLIDS ANALYSIS SHEET FOR REPROCESSORS**

This sheet is to be completed for all batches of biosolids after reprocessing. This information should be retained by the reprocessor and made available for inspection to officers of the EPA upon request. A copy should also be provided to purchasers of material from this batch on request.

WWTP BATCH CODE  
(from biosolids analysis sheet provided by WWTP) .....

REPROCESSORS BATCH CODE  
(original code to identify the batch)  
.....

BATCH SIZE  
(after reprocessing)  
.....(cubic metres)

**STABILISATION GRADE**

This batch of biosolids has been stabilised by (tick as appropriate)

**Ageing**

**Composting**

**Other Method**

It has met the requirements to be graded as Stabilisation Grade A B (circle one)

If the product has been blended the results of the microbiological testing must be attached.

**CONTAMINANT GRADE**

This batch of biosolids has been combined with other materials before grading Yes / No  
(circle one)

**RESULTS OF CONTAMINANT ANALYSIS (mg/kg)**

Contaminant	No. of Samples	Mean (m)	Standard Deviation (s)	m+s
Arsenic				
Cadmium				
Copper				
Lead				
Mercury				
Nickel				
Zinc				

This batch has met the requirements to be graded as Contaminant Grade

A B (circle one)

**BIOSOLIDS CLASSIFICATION**

This batch of biosolids is suitable for use in the following classifications

Unrestricted Urban

Landscaping

Person supplying information.....Date.....

Position.....

Company.....

**APPENDIX A3 APPLICATION FOR APPROVAL TO APPLY BIOSOLIDS TO LAND USED FOR THE PRODUCTION OF AGRICULTURAL CROPS**

This application form must be submitted prior to the first application of biosolids to any agricultural site. Once approval to use biosolids has been received annual applications to the same site may continue in accordance with the conditions detailed in the letter of approval for a period of 10 years.

A new application is required if the biosolids are to be applied on another location on the same property.

This application must be accompanied by the following additional information:

**Land Ownership**

If the applicant is not the owner of the land then written authority from the owner to apply biosolids to the land in question must be attached to this application.

**Application Area**

Attach a map or sketch that identifies where on the property the biosolids will be applied. Mark on the map distances from property boundaries.

**Soil Analysis**

Attach a copy of the results of a soil survey conducted on the land to receive the biosolids, in accordance the methodology described in section A5.1.1 of *Biosolids Guidelines A*.

**Biosolids Analysis Sheet**

This sheet contains details on the age of the biosolids and the concentration of metals in the particular batch to be used for the first application. It must be obtained from the supplier of the biosolids (either the producer or the reprocessor, whichever is appropriate).

APPLICANT.....

**Property to Receive Biosolids**

SECTION No. .... HUNDRED.....

REGISTERED OWNER OF THE LAND .....

**DECLARATION**

I declare that application of biosolids to the land described in this application will not contravene the restrictions on the use of biosolids as detailed in tables A1 and A5 of Guidelines A.

I understand that, if permission is granted to apply biosolids to the land in question, this information will be recorded on a database maintained by EPA and will be available as the result of section 7 searches.

If approval to use biosolids is granted I agree to apply it in accordance with the conditions and at the rate stated in the letter of approval.

SIGNED.....

DATE.....

**APPENDIX A4      CALCULATION SHEETS FOR ESTIMATING BIOSOLIDS  
APPLICATION RATE TO AGRICULTURAL CROPS**

- a) Example calculation of maximum application rate
- b) Calculation sheet to estimate biosolids application rate in the years following the first application

**APPROVED USE CLASSIFICATION - AGRICULTURAL CROPS**

**INITIAL APPLICATION OF BIOSOLIDS TO A SITE EXAMPLE CALCULATION OF THE MAXIMUM BIOSOLIDS APPLICATION RATE**

Contaminant	(1) Biosolids Contaminant Concentration mg/kg <i>from WWTP</i>	(2) Maximum Permissible Soil Concentration mg/kg <i>(guideline values)</i>	(3) Existing Concentration in the Soil mg/kg <i>from analysis</i>	(4) Available Assimilative Capacity of Soil mg/kg <i>(2) - (3)</i>	(5) Annual Assimilative Capacity of Soil (10 yrs) kg/ha/a <i>(4) x 10</i>	(6) Maximum Permissible Annual Contaminant Load kg/ha/a <i>from Guidelines</i>	(7) Is ANY Annual Assimilative capacity Greater than Maximum Permissible Load <i>(5)&gt;(6) Yes or No</i>	(8) Annual Biosolids Application Rate t/ha/a <i>If (7)=Yes (6)x1000/(1) If (7)=No (5)x1000/(1)</i>
Arsenic	8.93	20	0.6	19.4	2.59	0.7	yes	78.4
Cadmium	7.97	3	0.27	2.73	0.36	0.15	yes	18.8
Copper	1645	200	12	188	25.06	12	yes	7.3
Lead	203	200	18	182	24.26	15	yes	73.9
Mercury	3	1	0.4	0.6	0.08	0.1	no	33.3
Nickel	147	60	8	52	6.93	3	yes	20.4
Zinc	1316	250	18	232	30.93	30	yes	22.8

Maximum annual application rate for this batch of biosolids (minimum value column (8)) = 7.3 tonnes/ha

**Assumptions**

Soil bulk density = 1.333 tonnes/m<sup>3</sup>

Incorporation depth = 100 mm

**APPROVED USE CLASSIFICATION - AGRICULTURAL CROPS**

**CALCULATION SHEET TO ESTIMATE THE BIOSOLIDS APPLICATION RATE IN THE YEARS FOLLOWING THE FIRST APPLICATION**

	(1) Biosolids Contaminant Concentration mg/kg  <i>from WWTP</i>	(2) Annual Assimilitive Capacity of Soil (10 yrs) kg/ha  <i>from EPA approval first year</i>	(3) Maximum Permissible Annual Contaminant Load kg/ha  <i>from guidelines</i>	(4) Is ANY Annual Assimilative capacity Greater than Maximum Permissible Load  <i>(2)&gt;(3) Yes or No</i>	(5) Annual Biosolids Application Rate t/ha  <i>If (4)=Yes (3) x 1333 / (1) If (4)=No (2) x 1333 / (1)</i>
Arsenic			0.7		
Cadmium			0.15		
Chromium			15		
Copper			12		
Lead			15		
Mercury			0.1		
Nickel			3		
Zinc			30		

Maximum Application rate for this batch of biosolids (minimum value column (5)) = ..... tonnes/ha

# GUIDELINES B

FOR THE SAFE HANDLING, REUSE OR DISPOSAL OF BIOSOLIDS

## PRODUCED FROM:

- Domestic septic tanks
- Municipal wastewater treatment plants for populations of less than 1000

## GUIDELINES B

### B1 SCOPE

Guidelines B has been prepared for the safe handling and disposal of biosolids derived from:

- • septic tanks which treat wastewater from domestic premises;
- • municipal wastewater treatment plants for connected populations of less than 1000 which do not receive industrial wastes.

These guidelines do not cover the handling and disposal or reuse of biosolids or sludges from:

- • wastewater treatment plants which accept industrial wastes
- • septic tanks connected to commercial or industrial premises
- • grease traps
- • water treatment plants.

Biosolids from these sources may contain contaminants which are hazardous to beneficial reuse and public health, and must be handled in accordance with Guidelines A and other relevant codes of practice or disposed of to depots licensed by the Environment Protection Authority (EPA).

Read Guidelines B in conjunction with:

- • Guidelines A (for the safe handling, disposal or reuse of biosolids produced from wastewater treatment plants for populations greater than 1000 and for smaller plants that receive industrial wastes);
- • SA Health Commission (SAHC): *Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia* (Septic Tank Standard).

Biosolids covered by Guidelines B may be beneficially used for activities such as agriculture (excluding intensive horticulture for food production), landscaping and domestic gardens without reference to the SA Health Commission or the EPA **provided** that the recommendations of these guidelines are observed.

### B2 SAFE HANDLING OF LIQUID BIOSOLIDS

Liquid biosolids derived from septic tanks are human wastes and naturally must be handled with due care and in a manner that ensures the health and safety of the community and protection of the environment.

#### B2.1 SAFE HANDLING OF SEPTIC TANK BIOSOLIDS

Handling and disposal of biosolids from septic tanks (also known as septic tank sludge or septage) in accordance with these guidelines will ensure that public health is protected and environmental harm will be prevented.

Keep biosolids derived from industrial or commercial sources separate from domestic biosolids and handle them in accordance with Guidelines A or take them to a depot licensed by the EPA to receive that type of waste.

If a vehicle is used to transport both industrial and domestic biosolids, the mixed load must be considered as industrial waste.

## **B2.2 PERIOD FOR CLEANOUT**

Septic tanks and/or the septic components of aerobic wastewater treatment systems must be desludged in accordance with the SAHC Septic Tank Standard. Septic tank systems for single and multiple residential dwellings are required to be desludged regularly at least every four years.

Septic tanks for industrial and commercial premises are designed to allow a period of 1—4 years between desludging. Obtain specific advice from the local council or the SAHC, or refer to the SAHC Septic Tank Standard.

## **B2.3 UNCOVERING AND SEALING**

It is desirable for inspection openings and septic tank access covers to be extended to surface level. Access openings must be finished in accordance with the SAHC Septic Tank Standard. Tank lids must be sealed to the satisfaction of the local council when they are replaced after pump out to prevent entry of surface water.

## **B2.4 ADVICE OF CLEANOUT**

The contractor must keep adequate records to the satisfaction of the local council including details of dates when premises have been desludged and where the biosolids have been disposed of. Further details are found in section B7.

Any contract for desludging of a Septic Tank Effluent Disposal Scheme (STEDS) should contain provision for a program agreed between the council and the contractor indicating location of properties where septic tanks are to be desludged and proposed dates of desludging.

If a licensed contractor is not available to pump out a septic tank, permission for desludging by householders may be obtained from the local council. Permission will normally include direction for disposal of the liquid biosolids.

## **B2.5 APPLICATION OF LIQUID BIOSOLIDS TO AGRICULTURAL LAND**

### **B2.5.1 Application**

The spreading of liquid biosolids from domestic septic tanks to agricultural land has long been practised in South Australia and, provided the recommendations in these guidelines are observed, may continue. For the purpose of these guidelines, ‘agricultural land’ includes land used for pasture, cereal and tree crops, and viticulture. Spreading of liquid biosolids on land used for intensive horticulture for food production is not permitted under these guidelines.

Spreading of liquid biosolids from industrial or commercial sources on agricultural land is not covered by these guidelines. EPA approval must be obtained before considering any such spreading.

### **B2.5.2 Suitability of Land**

Apply liquid biosolids only to land which is well drained and not steeply sloping. If biosolids are applied to sloping land, take preventive measures to avoid runoff, erosion and environmental harm, and risks to public health. Do not apply biosolids to land in such a way that it could impact adversely on ground or surface waters and ensure the minimum distance between any biosolids application area and any open surface watercourse is at least 100 metres. Do not apply biosolids to rocky or waterlogged ground.

### **B2.5.3 Management of Land Application**

Apply biosolids at rates that allow the biosolids to dry rapidly, preventing odour generation and minimising vector attraction (eg birds, flies, mosquitos, rodents). Incorporate biosolids applied to agricultural land by cultivation into the soil as soon as possible after application and at most, within seven days.

Do not apply liquid biosolids to sites where there is a risk of nutrients from the biosolids being leached from the root zone into groundwater.

#### **B2.5.4 Exclusion of Stock**

Grazing of cattle or pigs on land to which liquid biosolids have been applied is not permitted under regulation 58 of the *Stock Act 1990* because of the risk of infection of stock.

However, once the biosolids have been incorporated into the soil and the pasture has been reestablished, grazing of stock including cattle and pigs is permitted.

#### **B2.5.5 Exclusion of the Public**

It is essential that land to which liquid biosolids are applied is adequately fenced to prevent access by the public.

#### **B2.5.6 Buffer Zone**

Do not apply liquid biosolids within 400 metres of any dwelling on neighbouring properties or town boundaries. Pay due regard to weather conditions at the time of application to prevent odour transmission to any residence.

### **B3 BIOSOLIDS DEPOTS**

#### **B3.1 STORAGE AND DRYING OF SEPTIC TANK BIOSOLIDS**

A biosolids depot may be established to provide a safe, effective and relatively inexpensive method of receiving, drying, composting, mixing or processing biosolids from sources covered in these guidelines. Such a depot would need to be approved in accordance with the *Development Act 1993* and licensed by the EPA.

The use of existing licensed landfill depots for sludge processing may be permitted subject to the approval of the EPA. The biosolids depot may also be established at an existing lagoon or wastewater treatment plant site, provided sufficient land is available and buffer distance requirements can be met. Location of a biosolids depot on land which is already being used for landfill or wastewater treatment may comply with existing use and therefore does not require development approval.

The operation of the biosolids depot should consider the following aspects.

#### **B3.2 Location**

Do not locate depots containing drying beds and biosolids stockpiles within 100 metres of any watercourse.

Provide a buffer zone of at least 400 metres between a biosolids depot and residential areas. When siting the depot, consider the direction of prevailing winds and subsequent impact of odour and emissions on residents.

Design the area used for drying beds and stockpiles to prevent entry of surface stormwater. Collect stormwater runoff and dispose of it properly without harming the environment.

#### **B3.3 Design**

Ensure drying beds are adequately sized for the population they serve. The volume should be sufficient to take 80 litres of liquid biosolids per person per year. The base of the drying beds should be level, well compacted and trafficable for removal of dried biosolids and sealed with a clay lining as designed by a geotechnical consultant or other approved equivalent lining method to prevent seepage into groundwater.

The recommended maximum depth of liquid biosolids is 300 mm to facilitate drying within a twelve month period.

Figures B1—B3 show the components of a well designed biosolids depot.

Locate drying beds and stockpiles away from low lying or flood prone areas. Depth to groundwater should be not be less than 3 metres.

Fence the biosolids drying beds and stockpiles to prevent unauthorised entry. Health warning signs should be erected so that they are clearly visible.

Construct and maintain access roads to minimise dust emission. Use trees and shrubs to screen the biosolids depot to preserve as much as possible the amenity of the area.

### **B3.4 Burial of Liquid Biosolids**

Liquid biosolids may be buried within a biosolids depot. However, drying and reuse or disposal is preferred under these guidelines.

If burial is contemplated, the burial site should comply with the same buffer distance, public health and environment protection provisions as defined above for drying beds. When backfilling, cover liquid biosolids to a minimum depth of 600 mm and make the site secure by fencing and warning signs to prevent accidental uncovering.

### **B3.5 Vector Control**

The responsibility to control vectors such as birds, wildlife, rodents, dogs, cats and insects should rest with the person who is appointed to be in charge of the biosolids depot (the depot manager).

Liquid biosolids should be distributed evenly in drying beds to prevent pooling and mosquito breeding sites. A programme of monitoring and vector control management measures should be set up by the depot manager to the satisfaction of the local council.

### **B3.6 Monitoring**

Establish a monitoring programme (incorporated into the depot management plan) to assess any impact of the facility on the environment.

### **B3.7 Health and Safety**

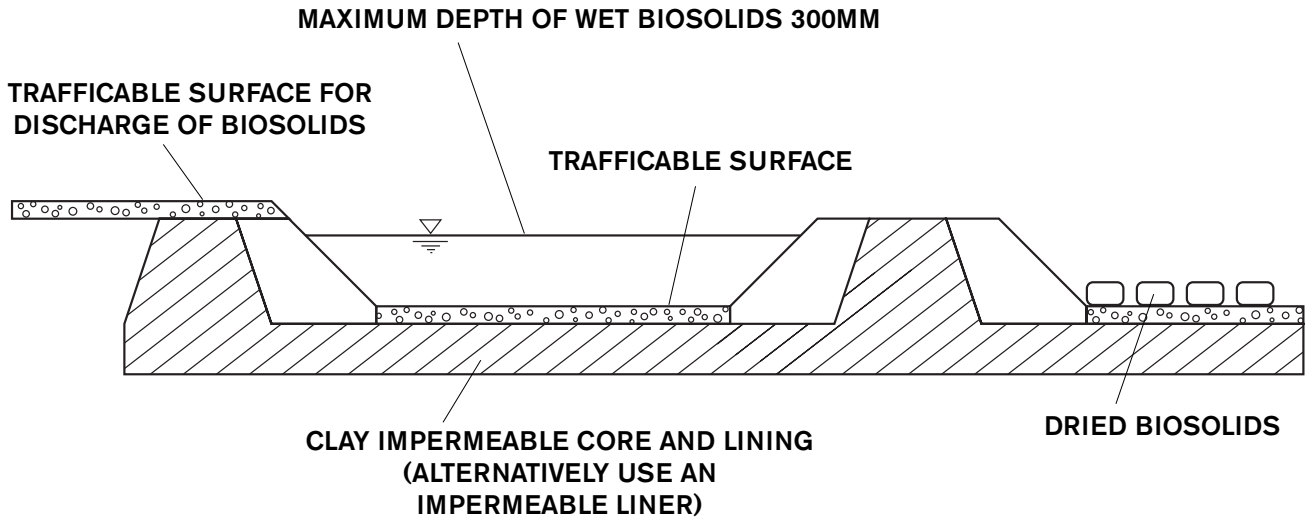
Contractors, site operators and management in the industry should abide by the requirements of the *Occupational Health, Safety and Welfare Act 1986* and have policies in place to protect the health and safety of employees.

Vehicles used for transport of liquid biosolids should be fitted with handwashing facilities for the benefit of operators and employees. Hands should be washed thoroughly with soap and water before eating, drinking or smoking and on completion of work for the day. It is desirable for good facilities including showers to be provided for staff involved in the handling of biosolids.

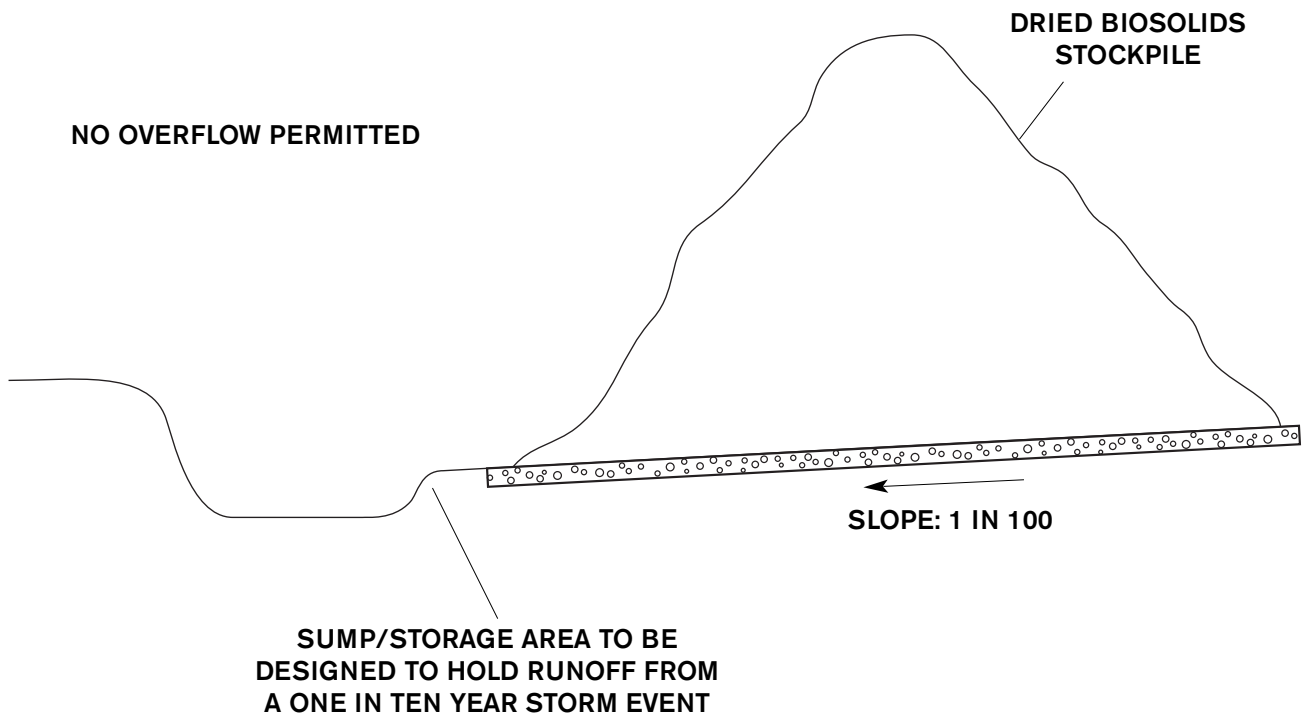
Adequate immunisation cover, especially for Hepatitis A and Tetanus, should be provided for any persons routinely in contact with biosolids,.

Adequate protective clothing should be worn, including eye protection, rubber gloves and boots where appropriate. When working in a dusty environment, masks or respirators should be worn.

**Figure B1** Section through drying lagoons.

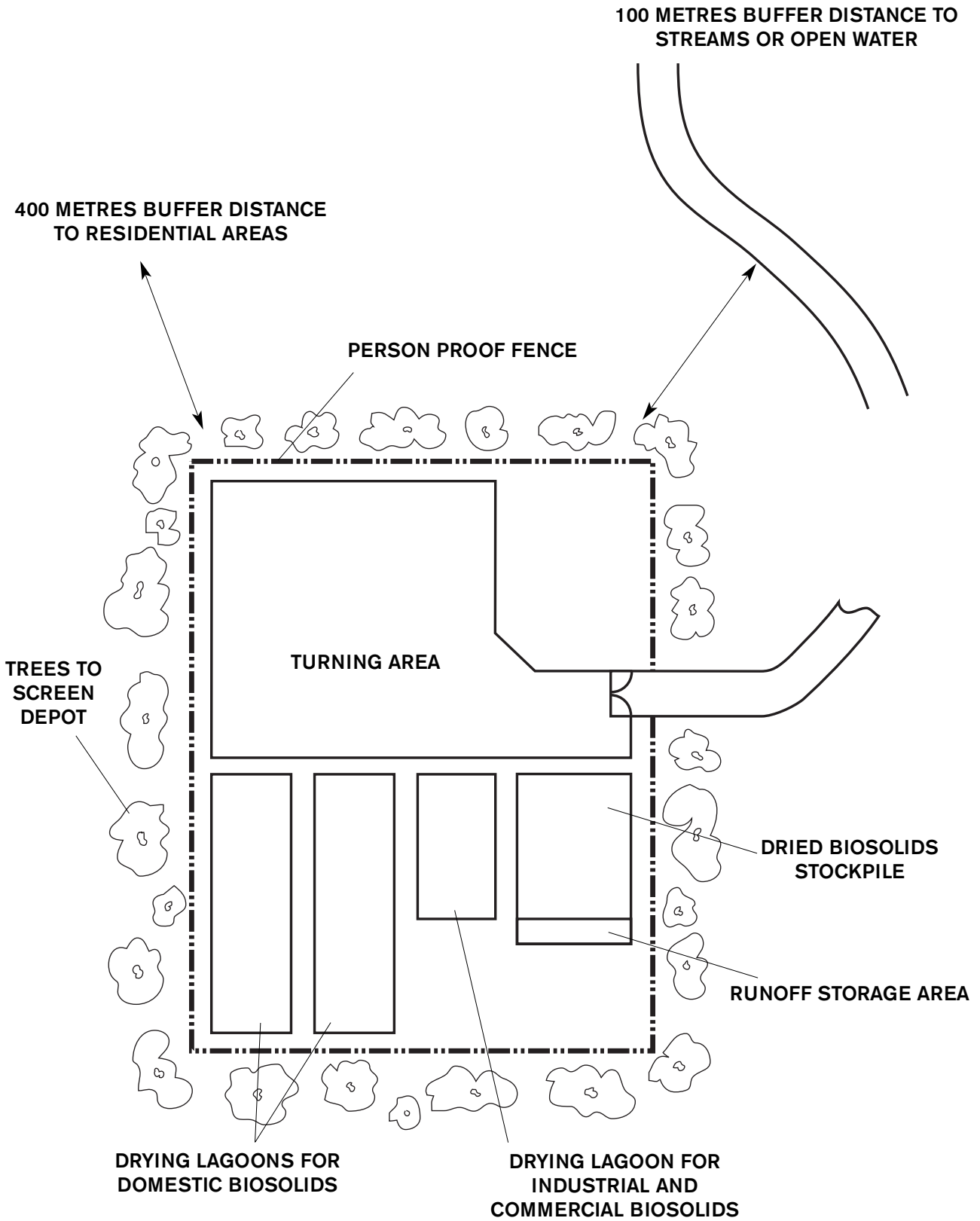


**Figure B2** Section through dried biosolids stockpile.



**Figure B3**

*Site plan of biosolids depot showing essential features and buffer distances.*



## **B4 SAFE HANDLING OF DRIED BIOSOLIDS**

### **B4.1 COMPOSTING**

Composting, that is, mixing of dried biosolids with suitable materials (eg paper, green wastes) is an acceptable way of preparing biosolids for beneficial use within a biosolids depot.

Store biosolids and composted material on a suitably compacted trafficable base with provision for the collection of surface runoff and leachate so that no harm is caused to the environment.

The depot manager should regularly monitor the compost for fly breeding and odours to the satisfaction of the local council.

Maintain composting temperatures in accordance with Guidelines A to ensure adequate pathogen reduction before removal from the area for disposal or beneficial use.

### **B4.2 MANAGEMENT OF STOCKPILED BIOSOLIDS**

Biosolids must be air dried and stockpiled on site within a biosolids depot for a minimum period of three years in accordance with Guidelines A to ensure adequate pathogen reduction.

Store the dried sludge on a well drained impervious surface and in such a way as to prevent pooling and runoff of surface water. Direct leachate and stormwater runoff to a suitable area for disposal so that no harm is caused to the environment and there is no danger to public health.

Bund the stockpile storage areas to retain stormwater runoff and prevent stormwater from outside the storage area from entering it. For drying purposes, it is desirable for the storage area to have a minimum slope of at least 2% to a drainage sump. Design the storage area and sump to hold at least the runoff from a 1 in 10 year return period storm event.

Construct the sump to prevent escape of leachate by soakage, and equip it with pumps or pipework to direct runoff water to an evaporation pan, STEDS lagoon or wastewater treatment plant. If pumps are installed they should operate automatically to prevent overflow.

The depot manager should control fly and mosquito breeding, odours and dust.

Monitoring of sludge contaminants may be required by the local council. If this is the case, the council should keep the records of contaminants of each stockpile.

### **B4.3 MARKING OF STOCKPILES**

The depot manager should clearly mark the age of stockpiles of stored biosolids to prevent removal of fresh material. Stockpiles of biosolids which have been composted or mixed with other material should be clearly marked.

### **B4.4 REMOVAL OF BIOSOLIDS**

The depot manager should ensure the security of the depot and loading machinery at all times to prevent unauthorised removal of biosolids. The depot manager should be held accountable for control of removal of biosolids and to ensure only properly aged biosolids are removed for use.

#### B4.5 RECORDS

Keep records for liquid biosolids being brought into a depot, as follows:

- • name of licensed contractor and driver
- • date
- • volume of load
- • origin of biosolids—domestic or industrial.

Keep records for dried biosolids, as follows:

- • date of deposition on stockpile area
- • where the biosolids came from (ie which drying bed).

When biosolids are removed from the depot, the depot manager should record the following:

- • name of person taking biosolids
- • location and nature of end use
- • volume removed
- • age of biosolids
- • nature of treatment eg stockpiled, composted, mixed with green wastes.

#### B4.6 REPORTS TO EPA

Each treatment plant or STED scheme licensed by the EPA should include management of biosolids in a monitoring program or environment management system. Annual reporting of the treatment and disposal of biosolids will be required to be submitted to the EPA.

Specific reporting requirements are:

- • total biosolids volume held
- • summary of processing to date
- • summary of volumes removed and end use of treated biosolids.

#### B4.7 DISPOSAL OF DRIED BIOSOLIDS

Dried biosolids derived from domestic septic tanks and municipal wastewater treatment plants covered by Guidelines B are suitable for use in the home garden, urban landscaping, forestry and site rehabilitation.

Use of biosolids for adding to soil used for food cultivation is not permitted unless specifically approved by the EPA.

The depot manager should ensure that persons who take the biosolids are provided with information about the material and guidelines for safe handling.

#### B4.8 DUST CONTROL

Dust should be controlled at each biosolids depot by:

- • wetting the stockpile and access roads
- • minimising drop heights to vehicles when loading
-

- • developing and using wind breaks
- • using organic caking agents on stockpiles.

Dust masks or respirators should be used by personnel working in the vicinity of dust from stockpiles if they are not working in airconditioned machines.

#### B4.9 TRANSPORT

Locate the stockpile site as close as possible to the drying site to avoid unnecessary transportation. Cover transported loads using industry standard dust control procedures such as tarpaulins or fibreglass covers.

Private loads (trailers) should be supervised by the depot manager and adequately covered.

### B5 USE ON HOME GARDENS

#### B5.1 GENERAL

Biosolids adequately treated in accordance with these guidelines may be added to soil in home gardens.

Typical municipal wastewater treatment biosolids contain nutrients and trace elements as shown in table B1.

**Table B1** Nutrient and trace element concentration of municipal sewage biosolids.

Nutrient or Trace Element	Concentration mg/kg dry solids
Nitrogen	19.0
Total Phosphorus	18.0
Available Phosphorus	6.0
Available Potassium	10.0
Magnesium	10.0
Zinc	1.0
Copper	0.2
Manganese	0.2
Cobalt	0.01
Molybdenum	0.006

#### B5.2 APPLICATION

It is undesirable to apply liquid biosolids direct from septic tanks to home gardens because of health risks. Dried and stockpiled biosolids used for the home garden should be incorporated into the soil as soon as possible (within 48 hours). The recommended maximum yearly application rate is 50 mm and this should be incorporated into the top 150 mm of soil.

General advice on good soil practice can be obtained from the Soils Officer at the local office of Primary Industries SA.

### B5.3 HEALTH AND SAFETY

Although biosolids may appear inoffensive after composting or stockpiling, it should be remembered they are derived from human wastes and must be treated with care. Adequate protective clothing should be worn by persons handling biosolids including:

- • eye protection
- • rubber gloves
- • boots
- • dust masks if working in a dusty environment.

After handling biosolids, thoroughly wash your hands with soap and water. Do not smoke, eat or drink when handling biosolids.

## B6 OTHER USES OF BIOSOLIDS

### B6.1 AGRICULTURE

Dried and stockpiled biosolids can be applied to agricultural land for grazing, cereal and tree cropping, and viticulture, subject to restrictions covered in section B2.5 of these guidelines. However, use for intensive horticulture for food production is not permitted without EPA approval. Refer to Guidelines A for further information.

### B6.2 URBAN LANDSCAPING

Dried biosolids for urban landscaping can be used under these guidelines. Records must be kept by contractors and the local council environmental health officers as covered in sections B7 (contractors) and B8 (environmental health officers).

### B6.3 FORESTRY

Liquid and dried biosolids for forestry can be used under these guidelines. Records as detailed in section B4.5 above must be maintained. Precautions must be taken as for application to agricultural land to prevent harm to the environment or risks to public health.

### B6.4 LANDFILL DISPOSAL

Disposal of dried biosolids at EPA licensed landfill depots is permitted. Surface land disposal is also permitted within the boundaries of wastewater treatment plants.

### B6.5 SITE REHABILITATION

Dried biosolids may be used for rehabilitation of contaminated sites.

## B7 CONTRACTORS

### B7.1 LICENSING OF CONTRACTORS

Transport of liquid septic tank wastes is listed in schedule 1, clause 3(6)(b) of the *Environment Protection Act 1993* as an activity for which a licence is required. Transport of liquid biosolids is **not permitted** except by a person licensed by the EPA. Please direct enquiries concerning waste transport licences to the senior licensing officer at the EPA on tel (08) 8204 2000.

## B7.2 RESPONSIBILITIES

Contractors or operators of vehicles used in the transport of liquid biosolids are responsible for providing on request to local council environmental health officers records of:

- • address of property
- • date of desludging
- • type of biosolids (eg domestic or industrial)
- • where disposed
- • sketch of location of septic tank openings and cover, with distances from boundaries or distinguishing features clearly marked.

Depot managers of biosolids depots are responsible to local council environmental health officers for providing a monthly summary of:

- • volume of biosolids received
- • origin of biosolids (domestic or industrial)
- • disposal site (drying lagoon)
- • volume of biosolids taken from depot and destination (eg home garden, landscaping)
- • names of pumpout contractors.
- 

Contractors or operators of vehicles used in the transport of any dried biosolids for uses other than home gardening and including spreading of liquid biosolids must advise local council environmental health officers of the volume of material taken and where it has been applied. Submit this information to the environmental health officer as part of the monthly summary.

Contractors and persons responsible for the transport of liquid and dried biosolids should ensure that all employees are trained and provided with health and safety information on handling of biosolids (see sections B2 and B3).

## B7.3 RELATIONSHIP WITH ENVIRONMENTAL HEALTH OFFICERS

Environmental health officers employed by local councils are responsible for administration of certain aspects of the *Public and Environmental Health Act 1987*, the *Environment Protection Act 1993*, council bylaws and regulations with respect to public health. Because the handling of biosolids involves material with the potential to be hazardous to public health, all contractors and personnel involved with the transport of liquid or dried biosolids must provide information as required by these guidelines to environmental health officers. Failure to do so may lead to the EPA being advised and, ultimately, to cancellation of the EPA licence to transport waste.

## B7.4 OBLIGATIONS TO PURCHASERS OF BIOSOLIDS

Contractors and personnel involved with the transport of dried biosolids should inform users of limitations for its use as defined in these guidelines. The type of information communicated to purchasers should be agreed to with the local council environmental health officer.

## B7.5 EQUIPMENT STANDARD AND MAINTENANCE

All vehicles and equipment should be maintained in a sound condition to prevent spillage and leakage. Vehicles must be maintained in a clean condition. Wash down of vehicles shall be at a site designed to enable collection of wastewater.

## **B8 ENVIRONMENTAL HEALTH OFFICERS**

### **B8.1 RESPONSIBILITIES OF ENVIRONMENTAL HEALTH OFFICERS**

Environmental health officers should be familiar with Guidelines B to ensure the safe handling of liquid and dried biosolids derived from septic tanks and small wastewater treatment plants. Further useful information is contained in Guidelines A.

It is expected that environmental health officers will be responsible to councils for the safe handling and disposal of biosolids in their council area. This will include ensuring that council employees and contractors involved in the pumping, collection, treatment and disposal or reuse of liquid or dried biosolids are aware of the existence of these guidelines and familiar with their requirements.

### **B8.2 RECORDS**

Concise records of the pumping, collection, treatment and disposal of liquid or dried biosolids should be kept by the council, or the contractor on behalf of the council. It is recommended that a copy of all contractors' records be lodged and maintained by council.

Records for a desludging program should include:

- • date of desludging
- • address of premises
- • nature of premises (domestic/industrial/commercial)
- • where the biosolids are taken (depot/land spreading/sewage treatment plant).

Records of movement of biosolids into and out of a depot including records of ages of stockpiles should also be maintained.

### **B8.3 RELATIONSHIP WITH THE EPA**

Records of biosolids management for STED schemes licensed by the EPA must be provided by council to the EPA in accordance with licence conditions. Records should still be maintained on unlicensed STED schemes or wastewater treatment plants, to demonstrate compliance with general environmental duty as described in section 25 of the *Environment Protection Act 1993*.

Depots for the receipt and management of biosolids must be licensed by the EPA. Information about the operation and licensing of depots can be obtained from the key adviser on solid wastes at the EPA on tel (08) 8204 2000.

### **B8.4 SAMPLING AND ANALYSIS**

If biosolids are handled and disposed of or reused in accordance with these guidelines, there is no need to take samples for analysis of biosolids constituents.

If, in the opinion of the environmental health officer, a load of liquid biosolids is suspected of being contaminated by industrial wastes or from a previous contaminated load and may cause environmental harm, a sample may be taken and forwarded for analysis. The cost should be recouped from the contractor if the analysis confirms contamination of the load.

Samples must be collected and analysed by a NATA registered laboratory and a sample log must be kept to identify the sample source, date, time and identity of sampler.

## B8.5 FURTHER ADVICE

Environmental health officers may obtain advice on the administration and reuse of liquid and dried biosolids from the following sources.

### **Environment Protection Authority**

- • Licensing of transport operators and waste depots
- • Surface and groundwater contamination
- • Sludge treatment and wastewater treatment plant licensing

### **South Australian Water Corporation**

- • Trade waste discharges and pretreatment

### **Department of Environment and Natural Resources Water Resources Group**

- • Catchment management practices advice
- • Landcare programme

### **SA Health Commission**

- • Public health issues

### **Department of Primary Industries**

- • Agricultural use of biosolids
- • Forestry
- • Soil and irrigation water contamination

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US EPA 40 CFR Part 503 *Sewage Sludge Regulations* November 1992

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