

Provincial standards and on-farm management ensure sewage biosolids are applied safely.

Municipal wastewater treatment plants receive raw sewage from residential, industrial and commercial sources. Bylaws regarding municipal sewer-use do much to control the quality of the raw sewage received at sewage treatment plants. However, treated biosolids may still contain some chemicals that are not beneficial to crops, but pose minimal risk to the environment when applied to land in accordance with the Regulation.



The Regulation was developed to ensure that any biosolids being used are of benefit to crops, and are applied to land so as not to degrade the natural environment or pose harm to human or animal health.

The Regulation set out criteria for:

- concentrations of 11 elements of concern
- amount, method and timing of application
- separation distances from sensitive areas
- suitable soil types and topography.

The key to successful sewage biosolids utilization is **management**, which is a combination of:

- proper application methods
- best management practices
- nutrient management planning.



Wise management will get the most benefit from the applied biosolids, while minimizing the risk to the environment and the health of people and animals.

A farm-specific NASM nutrient management plan balances crop requirements, land base, and available nutrients.

Improperly applied, nutrients can be deleterious to soil and water resources. For example:

- excessive nutrient applications can pollute surface and ground water
- nitrate nitrogen is very dynamic and excessive soil nitrate at the end of the growing season can leach into ground water, posing a risk to human and animal health
- phosphorus binds to soil, and can move with eroded soil to rivers and lakes, degrading water quality and harming fish and wildlife habitat.

Over application of nutrients is also a waste of money.

As nutrient sources, sewage biosolids should only be applied in accordance with nutrient management planning principles – meaning that total available nutrients applied should not exceed what the crop can use.

The three commandments of nutrient management planning:

1. *Know what you have.*
2. *Know what you need.*
3. *Know how much you are applying.*

Other off-farm generated materials may also benefit crop production or soil quality.

Some industrial processes produce organic and inorganic residuals that may benefit crop production, such as food processing by-products and paper mill biosolids.

As with sewage biosolids, application of some of these residuals to agricultural land is regulated under 267/03; others must be reviewed by the Director who will establish the parameters for testing the material and determining land application restrictions. For more information about unlisted material, or land application of materials other than sewage biosolids, contact the nearest office of the Ontario Ministry of the Environment or the Ontario Ministry of Agriculture, Food and Rural Affairs.

Roles and responsibilities

The success of a biosolids land application program depends on:

- communication
- management
- all parties being aware of their responsibilities.

ROLE RESPONSIBILITIES

ROLE	RESPONSIBILITIES
MUNICIPALITY (as generator of the biosolids) have requirements with their C of A:	<ul style="list-style-type: none"> • must keep records of: <ul style="list-style-type: none"> - biosolids quality also under O. Reg. 267/03 - location of all application sites - volumes applied to each site • is also responsible for: <ul style="list-style-type: none"> - ensuring land-applied biosolids meet the criteria in the O. Reg. 267/03 - providing alternative destinations if biosolids don't meet the criteria or can't be applied due to weather or field conditions

ROLE	RESPONSIBILITIES
HAULER/ APPLICATOR	<ul style="list-style-type: none"> • is responsible for: <ul style="list-style-type: none"> - uniform land application that does not exceed the maximum application rate - timely application that is mutually beneficial for the hauler and the farmer • must provide the farmer with a report indicating the fertilizer equivalent values of the land-applied biosolids <ul style="list-style-type: none"> - this is essential for the farmer to make sound nutrient management decisions



ROLE	RESPONSIBILITIES
FARMER	<ul style="list-style-type: none"> • has the right to: <ul style="list-style-type: none"> - request flexibility in the land application program - stop or refuse biosolids application at any time • is responsible for: <ul style="list-style-type: none"> - ensuring that biosolids are land-applied at times that are beneficial for crop

ROLE RESPONSIBILITIES

ROLE	RESPONSIBILITIES
FARMER (cont'd)	<ul style="list-style-type: none"> production, but not disruptive to normal farming practices - ensuring that all waiting periods (as outlined in the Regulation) between biosolids application and harvesting or grazing are observed - utilizing best management practices in order to optimize the benefit and minimize the risk of sewage biosolids land application - having an approved NASM plan before the application of sewage biosolids to any field . - ensuring soil application sites meet the requirements of Regulation 267/03.

For more information

- For more information or to obtain a ministry publication call the **Ontario Ministry of Agriculture, Food and Rural Affairs** Agricultural Information Contact Centre at 1-888-466-2372 from within Ontario.

- Call the OMAFRA nutrient management line at 1-866-242-4460 or email: nman.omafra@ontario.ca

- Contact the nearest **ServiceOntario centre or office of the Ministry of the Environment**

Publications can be ordered through ServiceOntario Online at www.publications.serviceontario.ca

By phone through the ServiceOntario Contact Centre Monday to Friday, 8:30 am to 5:00 pm

416-326-5300

416-325-3408 (TTY)

1-800-668-9938 Toll-free across Canada

1-800-268-7095 TTY Toll-free across Ontario

In person at **ServiceOntario Centres** located throughout the province or at any Ministry of Agriculture, Food and Rural Affairs Resource Centre.

Additional OMAFRA Resources

- Agronomy Guide for Field Crops, Publication 811
- Soil Fertility Handbook, Publication 611
- Best Management Practices books
 - Soil Management BMP 06
 - Water Management BMP 07
 - Nutrient Management Planning BMP 14
 - Application of Municipal Sewage Biosolids to Cropland BMP 23



© Queen's Printer for Ontario, 2009
AF135 12-09-1-5M

Aussi disponible en français



Sewage Biosolids

Managing Urban Nutrients Responsibly for Crop Production

Sewage biosolids result from municipal wastewater treatment.

The treatment of municipal wastewater produces:

- effluent that is discharged to a nearby watercourse
- sewage biosolids, which are high-organic solid, semi-solid, or liquid materials that are retained for further treatment and processing.

Sewage biosolids are then treated by methods such as digestion or addition of lime to reduce the pathogen content and odour-producing potential. Once treated, biosolids can be applied to land in liquid form, or be dewatered and applied as a solid material following provincial requirements.

Sewage biosolids contain nutrients.

Biosolids contain nutrients and organic matter that are important to plant growth, such as:

- mineral and organic nitrogen, and phosphorus
- micronutrients such as zinc, magnesium and copper.

They may also contain trace amounts of other elements such as arsenic, lead and mercury. Concentrations of these elements in land-applied sewage biosolids are regulated under the Nutrient Management Act, 2002, and the Environmental Protection Act.

Crop production can be enhanced by biosolids.

When applied according to the General Nutrient Management Regulation, sewage biosolids will:

- improve soil fertility – offsetting the need for commercial fertilizers
- add organic matter – enhancing soil structure, moisture retention and permeability, while reducing the potential for wind and water erosion.

Applying biosolids to agricultural land benefits urban and rural communities alike.

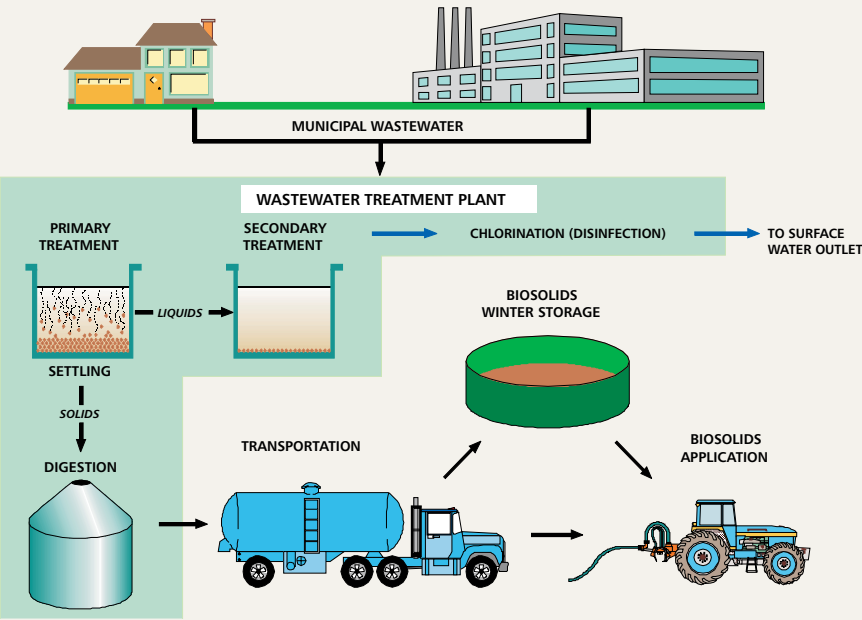
Sewage biosolids have been utilized on agricultural land in Canada, the United States and Europe for more than 30 years. Applying sewage biosolids to farmland is an important means of recycling nutrients in the environment. As such, the process offers economic and environmental advantages to society at large.

On September 18, 2009 the General Nutrient Management Regulation (O. Reg 267/03), under the Nutrient Management Act, 2002, (NMA), was amended to make changes to the regulatory framework for non-agricultural source materials (NASM). The purpose of these changes is to remove duplicate requirements under the NMA and the Environmental Protection Act (EPA) and to introduce quality-based standards for the agricultural land application of NASM. These standards enhance environmental protection by strengthening and clarifying the rules around the beneficial use of this material.

The requirements will take effect in two stages. Stage 1 changes will take effect immediately upon filing of the regulation and consists of general requirements that establish the framework. The general requirements are needed to transition to the requirements of the new system for managing NASM which take effect at Stage 2 on January 1, 2011. Transition periods are also outlined within the regulation to assist in moving from the current framework of approvals to the new requirements.

NASM includes pulp and paper biosolids, other food processing residuals and sewage biosolids. The change from two regulations to one regulation will be complete by January 1, 2016 (when no more Certificates of Approval for land application will exist). Environmental quality, food safety, and human health issues and concerns are addressed in both Regulations and supporting land application publications of the Ontario Ministry of Agriculture, Food and Rural Affairs and the Ontario Ministry of the Environment. In addition, each farm site receiving sewage biosolids must have a NASM plan approved by the Ministry of Agriculture, Food and Rural Affairs or a C of A (waste disposal site) under the EPA prior to January 1, 2016.

Municipal wastewater treatment



Metal concentrations in sewage biosolids

Metal	Maximum Concentration (mg/kg solids)	Typical Concentration (mg/kg solids)
Arsenic	170	4.3
Cadmium	34	3.4
Cobalt	340	6.5
Chromium	2800	80
Copper	1700	550
Mercury	11	1.4
Molybdenum	94	6.5
Nickel	420	12
Lead	1100	48
Selenium	34	2.7
Zinc	4200	506

Source: 2002 Survey of Municipal Sewage Biosolids Quality (Ontario Ministry of Agriculture, Food and Rural Affairs and the Ministry of the Environment)

Typical sewage biosolids characteristics

Type of Sewage Biosolids	Total Solids (% wet weight)	Total Nitrogen (% dry weight)	Fertilizer Equivalent Nitrogen		Total Phosphorus (% dry weight)		Fertilizer Equivalent Phosphate (P ₂ O ₅)	
			kg/m ³ (wet wt.)	Lbs/1000 gal (wet wt.)	kg/m ³ (wet wt.)	Lbs/1000 gal (wet wt.)	kg/m ³ (wet wt.)	Lbs/1000 gal (wet wt.)
Aerobic Liquid	1.6	5.1	0.25	2.5	2.7	0.4	4	
Anaerobic Liquid	3.0	6.5	1.07	10.7	3.6	1.0	10	
Anaerobic Semi-solid (Dewatered)	26	4.0	3.98	8.0	2.7	6.45	13	
				Lbs/ton			Lbs/ton	

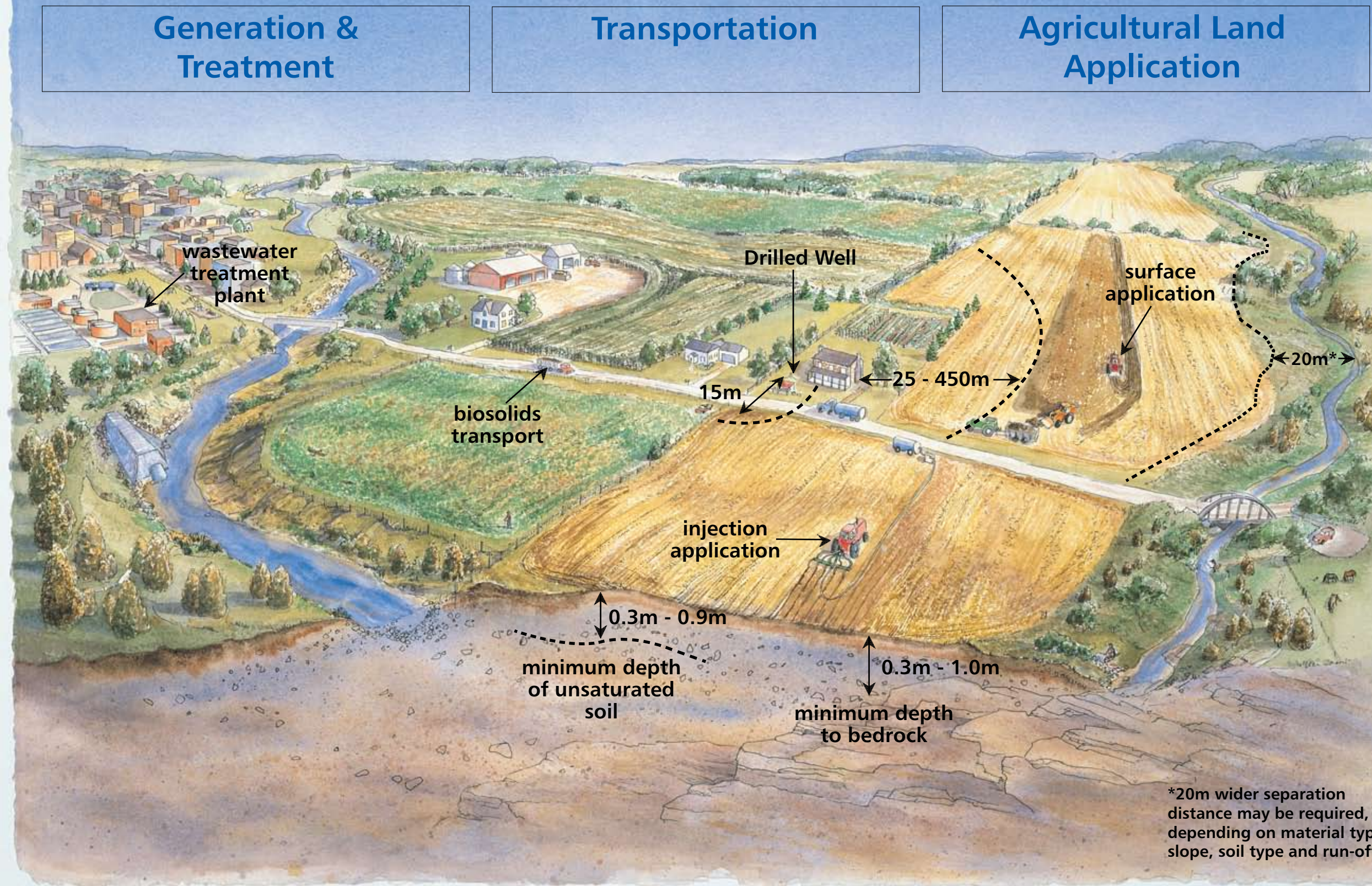
- Nitrogen Fertilizer equivalent is the sum of the inorganic nitrogen plus 30% of the organic nitrogen applied. It is assumed that no nitrogen is lost during application.
- Phosphate Fertilizer equivalent assumes 40% phosphorus availability in the year of application.

Suitable crops for biosolids land application

CROP	COMMENTS
Field corn, hay, haylage, pasture, and commercial sod	These crops are well-suited to using nitrogen supplied by biosolids. Nutrients such as nitrogen should be applied within crop recommendations.
Cereals	Nitrogen management is critical to avoid over application that may result in crops falling over before harvest.
Perennial legumes and soybeans	Soybeans and hay crops containing more than one-half legumes do not require added nitrogen but will use added nitrogen rather than fix nitrogen from the atmosphere. Biosolids that supply phosphorus, and/or organic matter can be of benefit to these crops. Some materials may cause management concerns. For example, viable tomato seeds if present in sewage biosolids can pose a weed problem in a soybean crop.
Tree fruits and grapes	Some biosolids may be applied in late fall. However, as is the case for other crops, nitrogen management is critical to avoid over or under application that may cause poor fruit quality, delayed hardening of trees or vines, or winter injury.

- Notes:**
- The maximum application rate per hectare for sewage biosolids must not exceed the maximum rate specified in a NASM plan, Certificate of Approval or as determined by the Nutrient Management Plan, whichever is most restrictive.
 - Nitrogen application rates for individual crops should not exceed recommended rates. Refer to Ontario Ministry of Agriculture, Food and Rural Affairs Publications 811 – *Agronomy Guide for Field Crops*, 360 – *Fruit Production Recommendations*, and 363 – *Vegetable Production Recommendations*, for recommended nutrient application rates.
 - The Ontario Ministry of Agriculture, Food and Rural Affairs nutrient management computer program, *NMAN*, can be used for the determination of suitable application rates.

Sewage Biosolids: From Generation to Beneficial Reuse



Separation distances

FEATURE	DISTANCE (m)
Bedrock	0.30 - 1.0
Unsaturated soil depth at the surface	0.30 - 0.90
Residence	25 - 450
Residential area	50-900

- 0.30 - 1.0 - separation distance to bedrock varies according to the type of material (i.e. solid or liquid nutrient) and the proposed application rate. In general, liquid nutrients and high application rates require greater separation setbacks to bedrock. For more specific distances, refer to section 50 of O.Reg. 267/03.
- 0.30 - 0.90 - the minimum depth of unsaturated soil at the surface of the application site varies according to the quality of the material and soil type, which may also affect the maximum application rate. For more specific distances, refer to sections 48 and 49 of O.Reg. 267/03.
- 25 - 450 - Setback to dwellings vary according to the odour classification of the material to be land applied and the method of application (surface applied, surface applied and incorporated within 6 or 24 hours, or injected). For more specific information, refer to section 47 of O.Reg. 267/03.
- 50 - 900 - Setback to residential areas or commercial, community or institutional uses vary according to the odour classification of the material to be land applied and the method of application (surface applied, surface applied and incorporated within 6 or 24 hours, or injected). For more specific information, refer to section 47 of O.Reg. 267/03.

As with spreading manure, applying biosolids may produce odours. And as with manure, odours can be reduced by timely incorporation into the soil. When planning biosolids application, it is of utmost importance to follow O.Reg 267/03 and use best management practices, which help to maximize benefit by conserving nitrogen, while minimizing odour. The Odour Guide as part of the regulation under the NMA, establishes which category the biosolids will fall into and then O. Reg. 267/03 establishes the setbacks that must be followed for land application of the material. Some discretion is afforded for the director to assign a different odour category to the material. The procedures to do this are set out in the Odour Guide.

WATERCOURSES

Regulation 267/03 under the Nutrient Management Act, 2002, requires a minimum 20m separation distance between the top of the nearest bank of a surface watercourse and the area of application of municipal sewage biosolids. Greater separation distances may be required depending on the soil type, the slope of the land and the application method used in the area near the watercourse. Separation distances are determined on a case by case basis as part of NASM plan.

***20m wider separation distance may be required, depending on material type, slope, soil type and run-off**