NOVA SCOTIA
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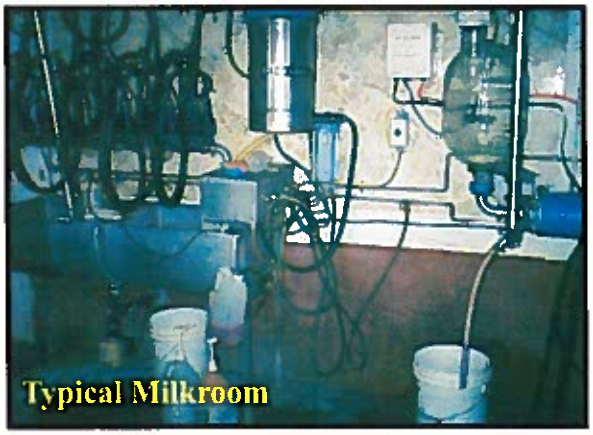
VEGETATED INFILTRATION AREAS FOR THE MANAGEMENT OF MILKHOUSE WASTEWATER

INTRODUCTION

Environmental Regulations prohibit the release of any "deleterious substance" to watercourses. Wastewater generated from the daily cleaning of milking pipelines and milk tanks on dairy farms has the potential to negatively impact the environment. Milkhouse wastewater contains suspended solids, a large biochemical oxygen demand (BOD > 1000 mg/l) and high concentrations of phosphorus (P > 100 mg/l). Typical dairy farms can produce from 500 to 1500 litres (130 to 400 gallons) of wastewater daily depending on cleaning practices.

Dairy farms that manage manure as a liquid and have adequate capacity for manure storage are able to incorporate the milkhouse waste waters into their manure management system. Farm operations that handle their manure as a solid waste or do not have storage capacity to accommodate the extra wastewater must implement alternative management systems. Septic systems has been used for milkhouse wastewater disposal, but with limited success.


Typical Milkroom

Milk fats, which may not be completely degraded in the septic tank, clog soil pores in the leachfield, resulting in hydraulic failure of the system.

VEGETATED INFILTRATION AREAS

Applying milking center wastewater to the surface of a vegetated area and allowing the wastewater to infiltrate into the ground can be a relatively inexpensive wastewater management option. Vegetated infiltration areas (VIA) rely on the soil environment for wastewater treatment in a manner similar to septic systems.

The majority of the nutrient removal in infiltration systems takes place in the soil profile. As the wastewater enters the soil a combination of chemical, physical and biological processes remove pollutants. Suspended material is deposited on the ground surface as the wastewater moves slowly through the dense vegetation. The vegetation and soil provide growth media for bacteria that degrade the organic material that is deposited on the ground surface.

Managing a strip to maintain an aerobic soil profile will allow for quick and odour free breakdown of organic material.

SITE REQUIREMENTS

Site conditions will determine whether a VIA treatment system is a suitable alternative. Available land area, topography, soil type and local surface and subsurface hydrology should all be considered before constructing a VIA treatment system.

Slope: Vegetated infiltration areas should be built on sites possessing slopes between 2 to 8%. Slopes below 2% may cause ponding, while slopes greater than 8% could make the system susceptible to surface runoff and poor treatment.

Soils and Geology: Soils ranging from a sandy loam to a clay loam have been shown to provide adequate P removal. The saturated hydraulic conductivity of the slowest layer in the soil profile should be between 0.5 to 5 cm/h. The depth to bedrock should be at least 2 m (6')below the surface.

Hydrology: An infiltration area should not be sited in areas where the ground is often saturated or the water table is close to the ground surface (<2 m or 6 ft). The treatment area should be downgradient and 30 m (100') from drinking water wells and the outlet on the infiltration area should be 30 m (100') from any watercourse.

SYSTEM DESIGN

Pretreatment: Without pretreatment milk solids will clog distribution systems and soil pores. A septic tank with baffled inlets and outlets is required to provide screening of larger solids and debris, primary sedimentation, floatation of solids, and some aerobic and anaerobic degradation of organics. A trap and breather should also be installed prior to the settling tank to prevent gases from traveling from the pretreatment system to the milkhouse (Fig. 1).

Distribution System: The objective of the distribution system is to provide an even sheet flow of wastewater over the width of the filter strip. Maintaining a shallow, even flow is essential to the success of the treatment system. The most commonly used system in seasonally cold regions is the gravel filled distribution trench with a wooden spreader (Fig. 2).

A trench across the entire width of the top of the strip is filled with clean washed gravel. A pressure treated 50 mm x 250 mm x 3 m (2"x10"x10') plank is placed across the front of the trench anchored by 10 cm x 10 cm (4"x4") posts placed 3 m (10') on center (Fig. 2). The posts must be placed below the frost line to protect against heaving and then backfilled on both sides. The wooden spreaders usually survive heaving in the winter and can

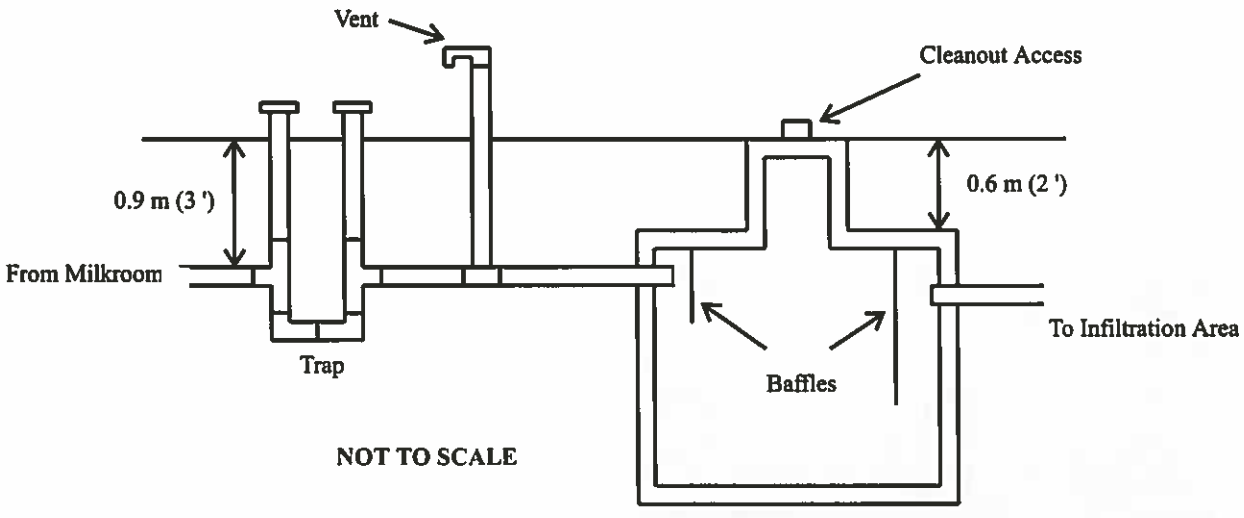


Figure 1 - Septic tank pretreatment with a trap and vent to prevent odours from traveling back to milkroom.

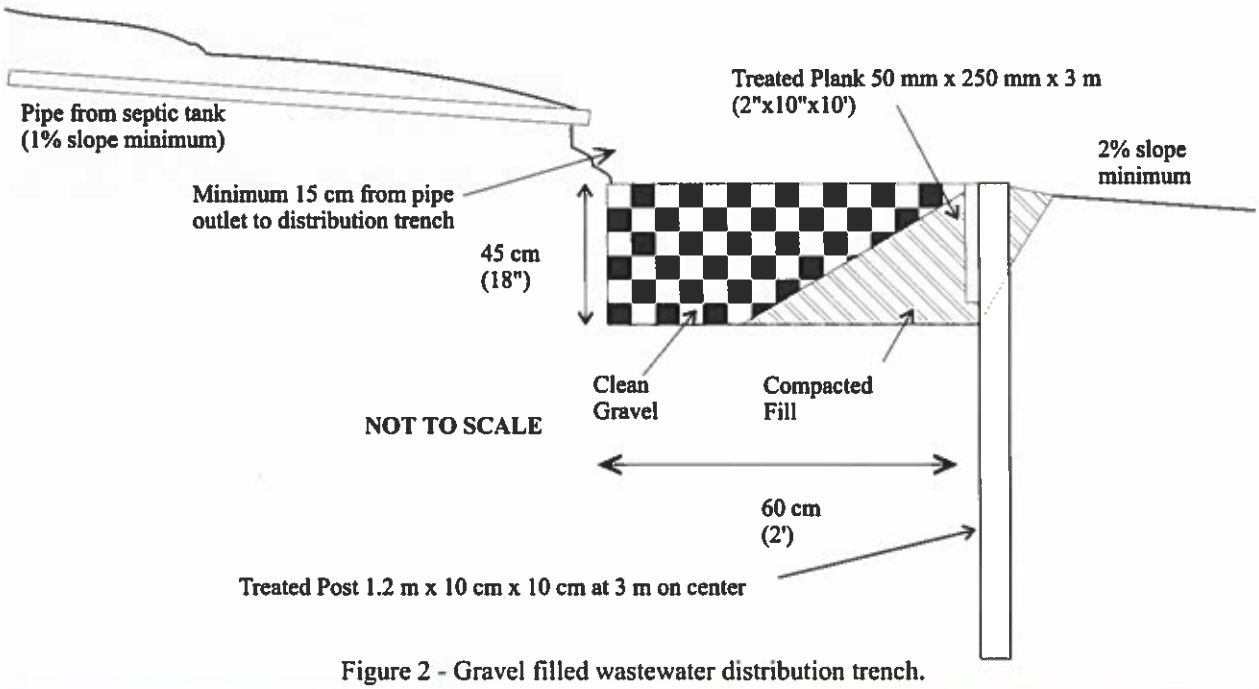


Figure 2 - Gravel filled wastewater distribution trench.

be easily adjusted if they do get out of level. The outlet of the pipe from the septic tank should be at least 15 cm (6 “) above the gravel trench (Fig. 2). To help prevent the pipe outlet from freezing a 90° elbow, directed down towards the trench, could be placed at the end of the pipe. If short-circuiting is a problem another distribution trench can be placed halfway down the infiltration area to redistribute the wastewater.

Infiltration Area: The size of the infiltration area will be dependent on the volume of wastewater being produced and the hydraulic properties of the treatment area soils.

Table 1 provides approximate infiltration area requirements for different soils types and wastewater production rates. The width of individual infiltration strips should be no more than 7 m (20'). It is difficult to produce an even wastewater distribution over widths greater than 7 m.

A shallow ditch and berm should surround the infiltration area and distribution system to prevent surface runoff from entering. The vegetation in the VIA should be a dense sod forming grass that will prevent erosion. Tall Fescue and Timothy are commonly recommended species for vegetative infiltration areas. A mixture of grass seeds should be used because there will likely be nutrient and moisture differences down the slope length. A mixture will ensure that the system will have a good grass cover under all environmental conditions.

Table 1. Size of infiltration area required based on soil type and daily wastewater production.

Soil Type	Area Required (m^2) Based on Daily Wastewater Production	
	500 litres	1000 litres
Sandy	45	90
Silty	45	90
Silty Clay	65	130
Clay	90	180

MANAGEMENT

It is important to incorporate rest periods into the cycle of wastewater application. Allowing the VIA to dry out will ensure survival of vegetation and introduce air into the soil profile. This will hasten the breakdown of organic material and help prevent the gravel trench and filter area surface from clogging with milk solids. It is recommended that two separate infiltration areas be used, so that the farmer can alternate wastewater loading between the two filters.

Provisions should be made to keep livestock off the filter area. Other management considerations would include septic tank pumping and vegetation harvesting. Settling tanks receiving only milkhouse wastewater, and not great quantities of manure, typically need to be pumped out once or twice a year. Vegetation should be cut at least twice per growing season. Cut vegetation should be removed from the infiltration area. Vegetated Infiltration Areas are not recommended for the treatment of manure runoff. A VIA treating manure runoff would have to be carefully managed to ensure that nitrogen loading to the infiltration area did not exceed the nutrient requirements of the vegetation being grown on the strip. Manure could also clog pipes and plug up the gravel in the distribution trench. There is some risk associated with using infiltration systems in our climate because of possible surface discharges during adverse weather conditions. Specific site variables must be assessed in order to characterize this risk.

A VIA being monitored in Pictou Co., NS

VIA system located in Pictou Co., NS

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