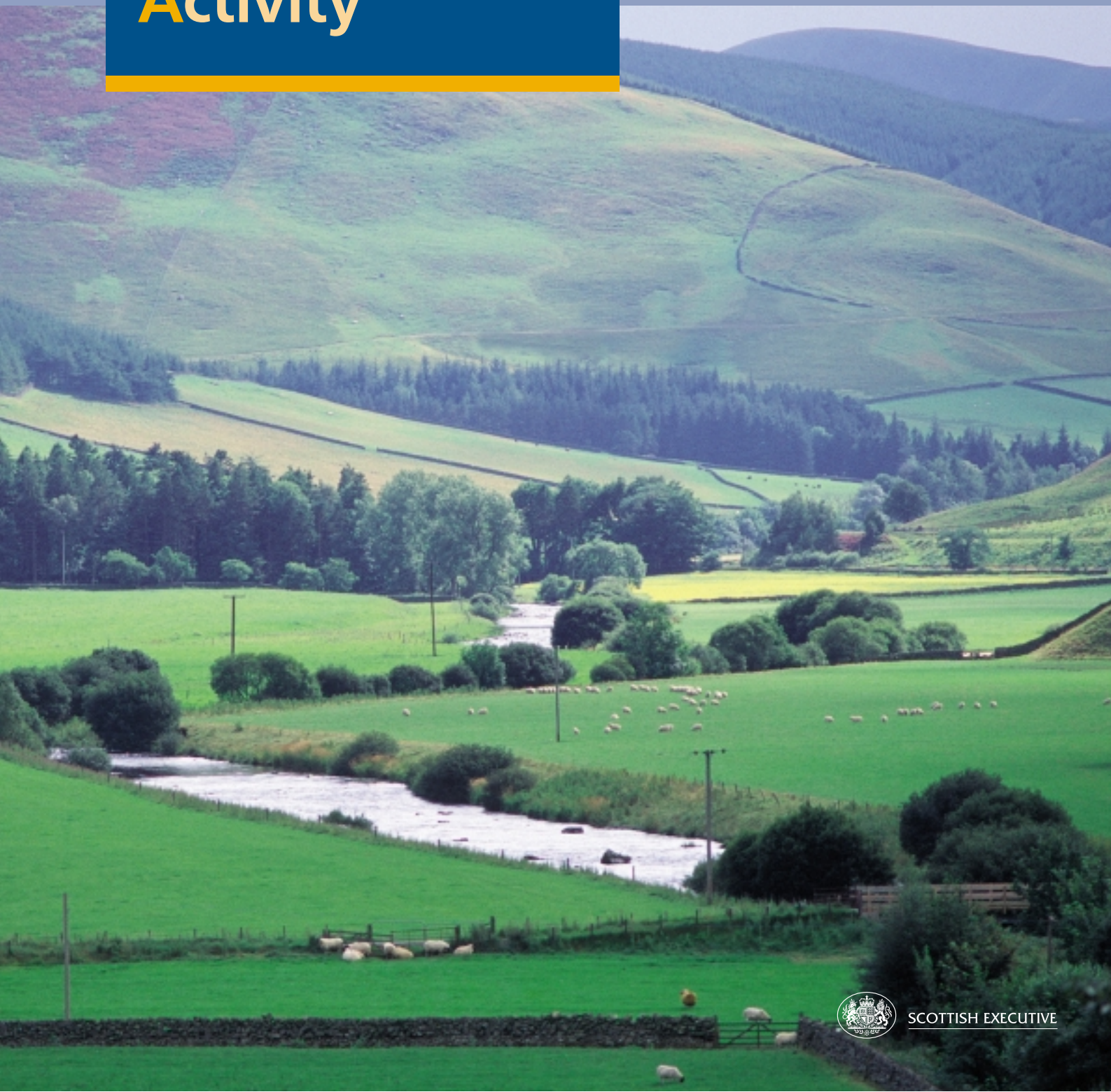


Prevention of Environmental Pollution From Agricultural Activity



Prevention of Environmental Pollution From Agricultural Activity

A CODE OF GOOD PRACTICE

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INTRODUCTION

1.1 The purpose of this Code is to provide practical guidance for farmers and those involved in agricultural activities, including farm advisers, on minimising the risks of environmental pollution from farming operations. Each section has been designed to be read separately. This should allow readers quicker access to the particular information which they require.

1.2 Many common agricultural practices pose a potential risk to the environment. This can be increased where poor standards of operation are in place. For example, the majority of reported farm pollution incidents are due to the escape of silage effluent or slurry. Of the incidents caused by structural failure, about half are related to silage clamps and silage effluent tanks. This Code builds upon the messages set out in the previous (1997) version, and also those in the shorter “DOs and DON’Ts Guide” published in 2002. It expands and updates these messages, and has been designed to identify the principal risks and to offer straightforward practical solutions for use on farm.

1.3 Slurry, silage, agrochemicals and waste products can and do have a serious impact on air, water and soil quality unless they are stored, used and disposed of correctly. In some cases, there may also be human health implications, particularly from the effects of pesticides and sheep dips. All pesticides and sheep dip should be used in accordance with the label conditions and farmers should be aware of the statutory controls affecting use. The farming industry is a signatory to the “Voluntary Initiative” (a programme of measures aimed at promoting best practice and minimising the environmental impact of pesticides in the UK), and a range of guidance materials and best practice measures is being delivered under this

programme, to complement the advice in this Code.

1.4 In the right place at the right time, livestock manures and slurries are a valuable source of nutrients, can improve soil quality and can save farmers money. In the wrong place, however, they can be highly polluting – for example they can cause the death of fish and invertebrates many kilometres down-stream from the pollution source. They can also be associated with microbiological contamination of surface waters and groundwaters and give rise to potential health risks to the public if insufficient precautions are taken.

1.5 At the start of sections 2 to 13 of this Code are boxes summarising DOs and DON’Ts. The steps highlighted in **red are mandatory** for all farm businesses affected by the relevant legislation. Complying with the steps highlighted in **amber is a requirement for receipt of the Single Farm Payment** (Paragraph 1.9 refers). The steps in **green are voluntary**, but if implemented will help minimise the risk of environmental pollution and, in many cases, will improve the quality of our environment.

Statutory requirements

1.6 It is a statutory offence to pollute “controlled” waters. This means all inland and coastal waters including lochs, ponds, rivers, other watercourses and groundwater. There is also a range of controls applicable to waste management activities on farms, which seeks to promote beneficial recycling and ensure that waste management operations do not pose a risk to the environment or to human health. Scottish Water also has byelaws to prevent water pollution, and these generally contain provisions relating to farming activities.

1.7 *As far as the Code relates to preventing pollution of water, relevant sections have a statutory base under Section 51(1) of the Control of Pollution Act 1974 (as amended). This means that although contravention of this Code does not in itself give rise to any criminal or civil liability, it may be taken into account in any legal proceeding involving a water pollution offence. Compliance with the Code, however, will not operate as a defence in the event of water pollution. Other sections of the Code have a statutory basis in relation to other environmental or waste management legislation.*

1.8 The Scottish Environment Protection Agency (SEPA) is mainly responsible for enforcing the environmental legislation highlighted in this Code, with the principal exception of nitrates legislation which is currently enforced by the Scottish Executive Environment and Rural Affairs Department (SEERAD). SEPA, and agricultural advisers, can also offer advice on practical steps that can be taken to minimise the pollution risks from agricultural activities and on the design and siting of certain farm storage facilities, for example slurry stores, silos and sheep dipping facilities. Annex B has details of SEPA offices.

In the event of a pollution emergency your first point of contact should be SEPA – The Emergency Hotline Number is 0800 80 70 60

Cross Compliance

1.9 Reform of the Common Agricultural Policy (CAP) will give farmers greater freedom to decide what crops and livestock to produce. However, it is recognised that farmers in receipt of subsidy have important responsibilities towards the protection of the environment, as well as to animal health and welfare and to public health. The CAP

Reform Agreement therefore requires farmers to observe certain conditions in return for receipt of the new Single Farm Payment. This requirement is known as “Cross Compliance”.

1.10 The two aspects of Cross Compliance are:

- 1 Compliance with a range of “Statutory Management Requirements” covering the environment, food safety, animal and plant health and welfare. These comprise a set of laws which are already in force throughout the EC. There are three laws which are of particular relevance to this Code and which must be complied with to be eligible for the Single Farm Payment. These are:
 - (a) Articles 4 and 5 of the EC Groundwater Directive (implemented by the Groundwater Regulations 1998);
 - (b) Article 3 of the EC Sewage Sludge Directive (implemented by the Sludge (Use in Agriculture) Regulations 1989 (as amended)); and
 - (c) Articles 4 and 5 of the EC Nitrates Directive.
- 1 Compliance with a requirement to maintain the land in “Good Agricultural and Environmental Condition” (GAEC). GAEC standards relate to addressing soil erosion, soil organic matter, soil structure and minimum level of maintenance. Where relevant, GAEC requirements are highlighted in amber in this Code. Please see section 3 in particular.

Further details are available from SEERAD .

Good Farming Practice

1.11 Farmers and crofters who enter into an agri-environment commitment and those in receipt of LFASS payments are required to adhere to at least the standard

of Good Farming Practice in relation to the whole farm or croft. Good Farming Practice comprises verifiable standards and a range of legislative requirements which are already in force. The legislative requirements include the following:

- 1 The Control of Pollution Act 1974
- 1 The Groundwater Regulations 1998
- 1 The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003
- 1 The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2003

General Environmental Conditions

1.12 The General Environmental Conditions apply to all agri-environment scheme participants. The conditions include a requirement to follow the guidance approved by Scottish Ministers for the avoidance of pollution.

Nitrates Directive

1.13 While this Code deals with advice on the minimisation of pollution of water, air and soil, it also acts as the relevant Code of Practice for the purposes of the Nitrates Directive. The Directive requires areas to be designated as Nitrate Vulnerable Zones (NVZs) where nitrate levels in surface water or groundwater exceed, or are likely to exceed, 50mg/l or where waters are or could become eutrophic. Section 6A of this Code sets out the measures that should be adopted by farmers within NVZs, with the mandatory measures set out in red.

1.14 Further, more detailed, guidance on what farmers need to do to comply with the NVZ “Action Programme” measures has been issued to every farming business within NVZs. Any questions relating to these should be addressed to the local SEERAD Area Office (See Annex A for details of local offices). The guidance is also available via the website www.scotland.gov.uk.

Odour Nuisance

1.15 In addition to the pollution risk, some farming practices are likely to give rise to strong odours which can spoil the public enjoyment of the countryside. In recent years this has been a growing concern. Every effort should be made to avoid creating an odour nuisance. Local authorities have powers to determine whether an agricultural activity represents a statutory nuisance. Where they believe this to be the case, they can serve an abatement notice requiring the cessation of the nuisance (or prohibiting or restricting its reoccurrence).

General

1.16 This Code is based on the best information available at the time of writing.

Short Guide

1.17 A shortened version of the main points of this Code has been prepared for farmers to refer to in the workplace. It is entitled the PEPFAA “Dos and Don’ts Guide”, and has been distributed without charge to all agricultural holdings in Scotland. Copies are also available via the website www.scotland.gov.uk.

DIFFUSE AGRICULTURAL POLLUTION

2

DOs

1. All cropped land over the following winter must, where soil conditions after harvest allow, have either: crop cover, grass cover, stubble cover, ploughed surface or a roughly cultivated surface. Fine seedbeds must only be created very close to sowing. *[GAEC measure 1]*
2. Protect your soil by following the guidance in this Code regarding preventing damage and erosion.
3. Follow “The 4 Point Plan”, which offers guidance on how to:
 - 1 reduce dirty water around the farm;
 - 1 improve nutrient use;
 - 1 carry out a land risk assessment for slurry and manure;
 - 1 manage your water margins.
4. Use buffer strips and other measures to reduce surface run-off from fields.
5. Carefully plan all storage and handling arrangements for livestock slurries and manures, animal feedstuffs, silage effluent, agricultural fuel oil, dirty water, fertilisers, veterinary medicines, chemicals and pesticides at your farm.
6. Maintain a suitable distance from any watercourse including ditches (e.g. 10m) or drinking water supplies (e.g. 50m), especially when handling or applying fertilisers, organic wastes, pesticides or other chemicals.
7. Think about ways to protect and enhance your local environment, and how to minimise the impacts of diffuse agricultural pollution of water, land and air.
8. Account for every input, especially of nutrients, pesticides and other chemicals through careful planning.

DON'Ts

1. Don't allow the runoff from roads, farmyards, hard standings and ring feeder areas used by stock to discharge directly to a watercourse.
2. Don't allow livestock to have access to watercourses. Instead, provide water at drinking troughs wherever possible.
3. Don't employ any agricultural contractor or company involved in spreading organic waste to land unless they are competent and suitably trained, aware of legal requirements and are willing to follow the guidance in this Code.
4. Don't use pesticides, veterinary medicines or chemicals unless there is an identified need.
5. Don't allow the rainwater from poultry buildings that are ventilated to the roof to discharge directly to a watercourse.
6. Don't directly overspray a watercourse when using pesticides.
7. Don't hesitate to get involved in catchment partnerships to address diffuse agricultural pollution.
8. Don't forget that over-abstraction of irrigation water from watercourses can cause downstream water pollution.

DOs (cont.)

- 9.** Ensure that any biobed, reedbed, wetland or infiltration system installed to reduce the risk of diffuse pollution is discussed with SEPA before it is constructed.
- 10.** Obtain specialist advice when considering using wetlands, ponds or infiltration systems to treat contaminated roof or dirty yard run-off at the farm steading.
- 11.** Adopt “good housekeeping” and waste minimisation practices that aim to prevent pollution at source.
- 12.** Minimise the area of farmyard and roads over which animals can excrete and over which equipment transporting slurry is moved. Take steps to control the run-off from these areas.
- 13.** Ensure sprayer operators are fully trained and possess certificates of competence and that sprayers are properly maintained and regularly tested.

What is diffuse agricultural pollution?

2.1 For the purposes of this Code, diffuse agricultural pollution is contamination of the soil, air and water environments resulting from farming activities. This pollution tends to arise over a wide geographical area and is dependent on what happens on the surface of the land. Although individually minor, such pollution on a catchment scale can be significant, considering the cumulative effect which these separate discharges can have on the environment. Activities such as ploughing, seedbed preparation, crop spraying, fertiliser spreading and applying slurry may all contribute to diffuse pollution. Run-off from farm roads and yards, the surface of fields and dusty roofs after rainfall are all potential sources of pollution. There is therefore a wide range of potential diffuse pollution sources which are associated

with farming practices and which can harm the environment.

Why is it important?

2.2 Maintaining a high quality environment in Scotland is essential for marketing high quality agricultural products. This link is one of Scotland’s strengths and should be at the heart of every successful farming business.

2.3 Water quality in Scotland is generally good, and adherence to good agricultural practice is on the increase. Nevertheless, there are areas of concern. SEPA considers that diffuse agricultural pollution is now the most significant cause of poor river quality in certain parts of Scotland and that it will continue to be unless appropriate action is taken at individual farm and catchment level to turn the situation around.

2.4 Losses of nutrients or agrochemicals to land or water represent not only a financial loss to farming but can also damage the environment. By applying these inputs in the right amounts and at the right time both farmers and the environment can benefit. Excess nutrients, such as nitrogen and phosphorus, can harm soils, rivers, lochs and estuaries by causing algal blooms and by changing the natural balance of plants, insects and other life. In the wrong place, pesticides can kill river insects and fish and can remain in river sediments for many years. Run-off from dirty yards, roads and grazing fields or land that has been spread with livestock slurries can also contribute to the bacterial contamination of inland and coastal waters and the failure of environmental quality standards. Fellow farmers downstream may experience poor quality water or incur extra expense in dealing with the effects of diffuse pollution including the possibility of disease transmission. In addition, groundwater (i.e. water held below the surface of the land; an important source of drinking water in rural areas) can be put at risk as a result of the leaching or percolation of nutrients and pesticides from the surface of the land. Groundwater is also important in maintaining river flow and for other aquatic environments. If it becomes polluted, surface waters are also at risk.

2.5 The total effect of a number of individually minor sources of contamination can be highly significant over an entire catchment area. If the sources of water for a river are predominately contaminated, then the whole river is likely to be polluted. Small watercourses, with little dilution, are more likely to be adversely affected by diffuse pollution than larger rivers. Over abstraction of irrigation water from watercourses can exacerbate this problem by lessening the potential for dilution. However, diffuse sources of nutrients can

also affect groundwater or large water bodies, especially lochs which have low levels of plant nutrients naturally.

2.6 Measures to reduce the risk of pollution at the farm steading (for example, improved collection and storage of silage effluent, slurry, fuel oil and pesticides) have successfully reduced the risk of direct discharges to rivers. Attention is now increasingly being focused on the activities being carried out in the fields.

What legislation must be complied with?

2.7 The Water Framework Directive was agreed in December 2000 and a comprehensive and co-ordinated programme has begun to be implemented to protect and improve the water environment in Scotland. This Directive dovetails with the requirements of those Directives that are not repealed by it, such as the EC Nitrates Directive. The Directive was transposed into Scottish primary legislation through the Water Environment and Water Services (Scotland) Act 2003. Secondary legislation, the Water Environment (Controlled Activities) (Scotland) Regulations, is being developed under this Act to give effect to the range of controls necessary to protect the water environment.

2.8 The new regime will be underpinned by a participative river basin management planning process, under which the full range of potential threats to the aquatic environment will be considered. A series of risk-based controls will be gradually introduced during 2006 and 2007 which will address diffuse pollution; point-source pollution; abstraction; impoundment and river engineering. Many of the standards that farmers will be expected to follow will be based on existing Codes, such as this PEPFAA Code, and on recognised good practice.

What types of diffuse agricultural pollutants are there?

2.9 Diffuse agricultural pollution is principally associated with:

- 1 soil particles;
- 1 pesticides and other potentially toxic chemicals, including veterinary medicines;
- 1 nutrients, principally nitrogen and phosphorus;
- 1 pathogens, for example, bacteria from livestock slurries and manures spread on land and run-off associated with intensive grazing practices;
- 1 gases such as ammonia.

Soil particles

2.10 Soil is effectively a non-renewable resource due to the time it takes to be formed. It should therefore be protected from damage or loss in order to sustain agricultural production, as well as for the life it supports in itself. In addition, soil and water quality are very closely linked. Eroded soil from grazed or cultivated land, muddy run-off from farm roads or yards and via field drains can cause environmental problems such as destroying gravel riffles on the bed of watercourses. These riffles are an essential habitat requirement for many aquatic insects and provide spawning areas for fish.

2.11 Soil particles are also important because they can carry more serious pollutants. For example, some pesticides bind firmly onto soil particles and are therefore liable to contaminate watercourses when soil is lost from fields. Similarly, mud on farmyards and roads may carry oily residues. Phosphorus can be lost from farmland to water and can cause pollution. In excess, certain trace elements transported with the soil can also damage the aquatic environment. It should also be remembered that erosion very often involves the loss of the most fertile soil from a field.

Pesticides, sheep dips and other toxic chemicals

2.12 Pesticides can exert damaging effects on river habitats and water resources.

Should pesticides be required, seek specialist advice on the options that are available. Once it is determined that a pesticide is to be applied, the label recommendations must be followed. The adoption of Crop Protection Management Plans (CPMPs) or precision farming can assist in optimising inputs and minimising risks.

2.13 If poorly managed or controlled, pesticides in tank rinse waters from the cleaning of protective clothing, or from residues in bags or containers, can cause pollution. Due to the particular risks that arise during pesticide handling and washdown operations, consideration should be given to the installation of a purpose-built or specially designed area that drains to, or that is situated directly over, a biobed. Guidance on the design of such areas is available from the Crop Protection Association (CPA) under “The Voluntary Initiative” (VI).

2.14 It is also essential to avoid spraying pesticides in conditions or circumstances where drift can occur. Buffer strips or unsprayed headlands should be considered prior to spraying fields bordered by watercourses or ditches. Farmers and contractors should never directly overspray watercourses. Farmers must carry out a “Local Environmental Risk Assessment for Pesticides” (LERAP) if they want to reduce the 5m aquatic buffer strip. This is dependent upon:

- 1 the size of the watercourse bordering the land being sprayed (in respect of horizontal boom sprayers);
- 1 the pesticide being applied using certain nozzle types and/or reduced doses; and
- 1 whether the product qualifies for the LERAP scheme.

2.15 A very wide range of chemical compounds are used as pesticides and each of these interacts with soils and water differently. Some will move through soil quite easily and enter groundwater. Such water may then be abstracted for use in public or private drinking water supply, or in food processing etc. Once present in groundwater, pesticides can be present for many years and are very costly to remove. It is therefore important that such chemicals are prevented from entering groundwater in the first place.

2.16 The chemicals used in sheep dip are also highly toxic, and can have potentially devastating effects on aquatic life over large distances. They can also pollute groundwaters. Each aspect of the dipping operation must be planned in advance, all possible pollution risks must be identified and action must be taken to minimise these risks as far as possible. Farmers should take note of the guidance on good sheep flock management given in section 8 of this Code. Staff should be suitably trained in the correct use of dips and dipping practice. SEERAD has issued guidance for those involved in dipping sheep, in the form of “The Sheep Dipping Code of Practice for Scottish Farmers, Crofters and Contractors” under the Groundwater Regulations 1998 (available from SEERAD and also via the Scottish Executive’s website). Waste sheep dip disposal may only be undertaken in accordance with an authorisation issued by SEPA. It is also possible for dip to be disposed of off farm, through a licensed waste contractor. Note that the Groundwater Regulations 1998 must be complied with to be eligible for the Single Farm Payment.

2.17 Sewage sludge or industrial wastes can contain potentially toxic substances such as heavy metals and persistent organic chemicals which may contaminate soil and pollute rivers. Certain precautions

must be taken and statutory obligations complied with. Analysis of the waste before use, assessing the land suitability prior to spreading, calculation of the growing crop requirements, soil sampling and nutrient budgeting can all reduce the risk of diffuse agricultural pollution occurring. The waste producer or their contractor may carry out some, or all, of this work for farmers. Anyone wishing to apply industrial wastes to agricultural land must demonstrate in advance, and to SEPA’s satisfaction, that such an application will result in benefit to agricultural or ecological improvement. Note that the statutory controls on the application of sewage sludge to agricultural land must be complied with to be eligible for the Single Farm Payment.

2.18 Particular risks may arise when organic wastes are injected into drained land, especially over gravel backfill.

Nutrients

2.19 If leached in excessive amounts, nutrients such as nitrogen (N) and phosphorus (P) can cause severe problems for rivers, lochs, estuaries and coastal waters by, for instance, contributing to the development of toxic algal blooms or foul smelling mats of algae on our coastline. Nutrients can be lost from manures and slurries as well as from other organic wastes spread on land, and significant losses can also be associated with fertilisers and soil. Advice must be tailored to the particular farm and catchment area in order to prevent such losses and reduce the risk of pollution.

2.20 Nitrogen-based fertilisers are used in significant amounts in both arable and livestock farming. Water passing through the soil dissolves salts, nutrients and organic substances. When these materials are carried out of root range by water draining through the soil, they are said to have “leached”. Nitrate (from inorganic nitrogen fertilisers or derived from organic

manures) is leached especially rapidly because it is very soluble. This is particularly the case during rainfall if nitrogen fertiliser has been over-applied and the soils themselves are free draining. In areas where there are sandy soils overlying permeable rocks, there are particular risks of nitrate leaching into groundwater.

2.21 The key to preventing diffuse pollution by nitrate is to ensure that all inputs are carefully accounted for and that any applications are made to meet the requirements of the growing crop. Farmers in the Nitrate Vulnerable Zones (NVZs) are obliged to comply with an Action Programme, including limits on nutrient applications, adherence to closed periods and record keeping. These requirements must also be complied with to be eligible for the Single Farm Payment.

2.22 Soil erosion is usually the major contributory factor to losses of phosphorus (P) to freshwater. Phosphorus can also reach rivers as dissolved P from field drains and as suspended solids in some soils. It is important therefore not to allow soils to become excessively high in this nutrient. Soil sampling is recommended to assess P levels prior to determining the application rate of fertilisers and manures.

Manures and slurries

2.23 Livestock slurries and manures, and other organic wastes, are valuable materials for improving soil fertility and can save on fertiliser costs. However, they are highly polluting if spread at the wrong time or in the wrong place. They can also be associated with the microbiological contamination of rivers and groundwater if insufficient precautions are taken.

2.24 Adverse effects can also arise from allowing livestock access to watercourses by direct excretion and damage to riverbanks by poaching. This could affect

the health of your fellow farmers' livestock downstream if they drink this contaminated water. Wherever possible, install water troughs and fence off watercourses to eliminate this problem. It is essential to ensure that public and private drinking water supplies are protected from grazing animals and landspreading activities.

2.25 Field middens must also be sited at least 10 metres from a watercourse and not where they can contaminate field drains.



2.26 The area of farmyard and roads over which animals can excrete, and equipment operates to transport slurry, should be minimised.

2.27 In vulnerable locations, the drainage from stored manures and slurries or the seepage from housed livestock units can be highly polluting to surface and groundwaters.

2.28 Apart from the nutrient content and high organic loading, the possibility of microbiological contamination can threaten rivers, bathing waters and individual groundwater sources and affect compliance with environmental quality standards often associated with EC Directives.

2.29 To address all of the pollution risks associated with manures, slurries and grazing animals, it is essential to follow the guidance in “The 4 Point Plan”, the individual components of which are:

- 1 minimising dirty water around the steading;
- 1 better nutrient use;
- 1 a risk assessment for manure and slurry; and
- 1 managing water margins.

2.30 Guidance on “The 4 Point Plan” is available from the existing farm advisory network and copies are available free from SEERAD Area Offices (see Annex A).

2.31 Contractors or companies involved in spreading organic manure and slurry to land should be employed only if they are competent and suitably trained, are aware of their legal obligations and are willing to follow the guidance in this Code and adhere to “The 4 Point Plan”. Always work closely with your contractor.

Air emissions

2.32 The saying “*what goes up, must come down*” is very appropriate in respect of livestock farming. Agriculture is the dominant source of ammonia emissions in the UK, mainly arising from the storage and application of manures and slurries. Ammonia emissions from livestock slurries and poultry manures, once re-deposited on land, can add excess N making soils more acidic. This can lead to “eutrophication” of water (“eutrophication” is described in the Nitrates Directive as “the enrichment of water by nitrogen compounds, causing an accelerated growth of algae and higher

forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned”). Rainwater from poultry buildings that are ventilated to the roof should never be allowed to discharge directly to a watercourse (due to the deposition of dust, feed residues and animal/bird excreta).

2.33 Once emissions to air have been prevented, for example by covering a slurry store (if safe and practicable), it is essential that effective use is then made of the increased nutrient content of the slurry without increasing the risk to rivers and groundwater from application to land. Intensive pig and poultry installations exceeding the thresholds in the Pollution Prevention and Control (Scotland) Regulations 2000 as amended (the PPC Regulations) will require a permit from SEPA.

Treatment systems

2.34 Normally, the practices described in this section should be sufficient to prevent or at least minimise the risk of diffuse agricultural pollution. In some cases, however, it may be necessary to consider the installation of some form of treatment system near the source of potential pollution. It may be possible, for example, to install a wetland, pond or infiltration system to deal with contaminated roof or dirty yard run-off at the farm steading. Specialist advice should be sought on the selection, design and installation of such systems and SEPA must be consulted beforehand to ensure that the requirements of environmental and waste management legislation will be complied with. Treatment of non-agricultural waste to reduce the pathogens, or bacteria, present may be necessary to reduce the risk of microbiological contamination of nearby watercourses.

What can you do to prevent diffuse pollution?

2.35 The key to minimising diffuse pollution is to ensure effective control of the use and fate of potential pollutants. This can be achieved in a number of ways. Detailed advice on particular farming activities is provided in subsequent sections of this Code. Key measures include:

- 1 undertaking “good housekeeping” and waste minimisation practices that aim to prevent pollution at source;
- 1 carefully planning all storage and handling arrangements for livestock slurries and manures, animal feedstuffs, silage effluent, agricultural fuel oil, dirty water, fertilisers, veterinary medicines, pesticides and other chemicals on your farm;
- 1 distancing the potentially polluting farming activity from a watercourse by using a buffer strip (for example, a grass or woodland strip between the field and the watercourse); and
- 1 if you are employing an agricultural contractor, make sure that they are suitably trained, qualified and competent to carry out the operation for which they are employed. Make sure that they are aware of the legal requirements, and are prepared to follow the guidance in this Code. Make sure that you provide the contractor with all the essential information specific to your site.

2.36 Soil erosion on susceptible fields can be minimised by using minimum tillage systems, diversion systems and grass buffer strips, and also by adapting field activities according to local risks. Cultivated soils which are light textured should not be left without a crop or stubble cover during the autumn and winter period.

2.37 Where sedimentation ponds can be provided for run-off from problem fields, it is essential that accumulations of soil and

settled particles are removed periodically and returned to the fields. Where sheet erosion is a problem, grass filter strips may be sufficient, and advice should be sought on suitable seed mixes to establish a strip and their subsequent maintenance.

2.38 Limiting the risk of diffuse pollution may involve the creation or use of field margins or other landscape features. These need to be carefully planned and may attract grant assistance on which SEERAD staff can advise. If a wetland treatment system is proposed professional advice should be sought and any potential discharge to a watercourse should be discussed with SEPA.

2.39 A buffer strip between field operations and watercourses is likely to reduce the risk of diffuse agricultural pollution but must also go hand in hand with other good management practices. Design of buffer strips will depend on local circumstances. The detailed design of a buffer strip will be closely related to the problem to be tackled, and specialist advice on the best way forward is recommended. A small margin is still going to be better than none.

2.40 The presence of field drains may allow diffuse pollutants to by-pass a buffer strip, and intercepting the drains might be the only way to achieve a significant reduction in risk. In certain cases, intercepting drains could result in the creation of wetlands or ponds. Such areas may attract grant assistance due to the provision of new habitat for wildlife.

2.41 A range of multi-agency guidance is available which will assist with the identification of diffuse pollution risks and the selection of Best Management Practices (BMPs) to address these risks. Further information can be obtained by e-mailing: **diffuse.pollution@sepa.org.uk**

2.42 Adhering to the good practices contained in this Code will help to prevent diffuse pollution from farming activities. The impacts associated with this form of pollution can be difficult to solve, however, and practical answers should be developed between farmers, SEERAD, SEPA, agricultural and conservation advisers. Often, the activities in a catchment area as a whole will need to be considered together and farmers should not hesitate to get involved in the increasing number of partnership initiatives being established throughout Scotland. By collectively doing a little to improve management, and to reduce risks, there is the potential to change a lot for the benefit of our environment.

SOIL PROTECTION AND SUSTAINABILITY

Note: of the amber points below, the “Do” numbered 2 relates to Soil Organic Matter, and the “Dos” numbered 3 to 8 relate to Soil Erosion. The “Don’t” numbered 3 relates to Soil Structure.

DOs	DON'Ts
<p>1. Comply with the Sludge (Use in Agriculture) Regulations 1989 (as amended) if sewage sludge is to be applied to prevent contamination with Potentially Toxic Elements (PTEs).</p>	<p>1. Don't strip or remove topsoil for sale, as this is an offence unless you have planning permission.</p>
<p>2. On arable land:</p> <p>(i) use suitable break crops in an arable rotation ; or</p> <p>(ii) optimise the use of organic materials by basing rates of application on soil and crop needs. Where break crops are not used, a record should be kept for 5 years of organic materials and the quantities applied to arable land. <i>[GAEC measure 7]</i></p>	<p>2. Don't apply non-agricultural wastes to agricultural land without obtaining the necessary permit or exemption from SEPA.</p>
<p>3. Follow the latest edition of the Muirburn Code. <i>[GAEC measure 6]</i></p>	<p>3. Do not carry out any cultivations if water is standing on the surface or the soil is saturated. <i>[GAEC measure 9]</i></p>
<p>4. All cropped land over the following winter must, where soil conditions after harvest allow, have either: crop cover, grass cover, stubble cover, ploughed surface or a roughly cultivated surface. Fine seedbeds must only be created very close to sowing. <i>[GAEC measure 1]</i></p>	<p>4. Don't apply inorganic fertilisers or organic manures without taking account of soil nutrient status and crop requirements.</p>
<p>5. (i) Maintain functional field drainage systems, including clearing ditches, unless environmental gain is to be achieved by not maintaining field drainage systems. (ii) Where environmental gain is to be achieved, this must be declared on the IACS return. <i>[GAEC measure 5]</i></p>	<p>5. Don't leave the bed or banks of ditches bare, as this may lead to erosion and inhibit filtration.</p>
	<p>6. Don't clear out entire lengths of ditch at one time. Clear only one side of the ditch or leave vegetation breaks within the ditch to maintain wildlife corridors.</p>
	<p>7. Don't allow soils to become contaminated with PTEs.</p>
	<p>8. Don't position access points and gateways at the lowest point of a field (to reduce the potential for channelling surface water run-off and to cut off the route for any eroded soil particles).</p>
	<p>9. Don't carry out significant excavation works in watercourses without consulting with SEPA.</p>
	<p>10. Don't erect physical barriers in watercourses, as these can cause serious erosion.</p>

DOs (cont.)

6. In areas prone to wind erosion you must take steps to reduce the risk of soil loss in spring by maintaining crop cover, using coarse seedbeds, shelter belts or nurse crops, or use other appropriate measures with an equivalent effect.

[GAEC measure 2]

7. On sites where capping is a problem you must form a coarse seedbed or break any cap that forms to avoid erosion.

[GAEC measure 3]

8. (i) Prevent erosion of land, particularly, banks of watercourses, watering points and feeding areas from overgrazing, heavy trampling or heavy poaching by livestock.

(ii) Where this occurs, reduce stock until the land has recovered. All problems should be rectified at any time during the next growing season after the period that the problem has occurred.

(iii) This measure does not apply to areas within 10m of a gateway and 3m of farm tracks necessarily used during wet periods.

[GAEC measure 4]

9. Inspect soils routinely for loss of structure, signs of damage, capping and erosion.

10. Identify and protect vulnerable soils prone to erosion and leaching.

11. Ensure effective use of chemical and organic fertilisers by basing rates of application on soil analysis and identified crop needs.

12. Maintain soil structure and avoid over-working and compaction.

13. Correct deep soil compaction by carrying out subsoiling on suitable soils with satisfactory drainage.

DOs (cont.)

- 14.** When irrigating, ensure water application is uniform and rates are not too high or droplets too large. This will avoid sealing the soil surface and minimise run-off and soil erosion.
- 15.** Alleviate compaction and rutting as soon as practical after late harvested crops such as maize or potatoes to reduce run-off.
- 16.** Leave vegetated buffer strips adjacent to watercourses, wetlands and waterbodies to trap sediment.
- 17.** Incorporate chopped straw evenly.
- 18.** Carefully plan the movement and feeding of livestock on your farm. The inappropriate location of tracks or ring feeders can lead to significant soil erosion.
- 19.** Understand the capabilities and limitations of the soil you are managing.
- 20.** Sample and analyse soil, approximately every five years, and apply lime to achieve target pH for crop or grass growth.
- 21.** Divert track run-off to buffer strips or vegetated areas to remove sediment.

Introduction

3.1 Soil quality and husbandry is fundamental to the sustainability of agriculture, landscapes and biodiversity. Soils not only form the basis of agricultural production, but also filter and buffer pollutants. Good soil management practices will help ensure that the requirements of Good Agricultural and Environmental Condition (GAEC) are met with regard to soil erosion, soil organic matter, soil structure and minimum levels of soil maintenance. Good soil management also plays a significant role in minimising diffuse pollution.

3.2 Soil is a finite resource which should be well managed to meet the needs of the

present without compromising the ability of future generations to meet their own needs. The stripping or removal of soil for sale is an offence unless you have planning permission. Full details of the main pressures and impacts on soils in Scotland associated with all land uses are available in the Soil Quality Report published by SEPA in 2001. The Environmental Impact Assessment (Uncultivated Land and Semi-Natural Areas) (Scotland) Regulations 2002 were introduced to ensure that proposals which could lead to significant effects on the environment are given proper consideration. Further information about the Regulations can be obtained via www.scotland.gov.uk

Soil Quality and Nutrient Status

3.3 Soil fertility and structure are key factors affecting healthy plant growth, which are particularly important in agricultural soils and are dependent on good soil husbandry as well as the appropriate application of lime and nutrients.

3.4 The quality of soil and its inherent fertility depends upon:

- 1 the nutrient content and its balanced supply to plants;
- 1 organic matter content;
- 1 soil pH
- 1 biological activity; and
- 1 the physical condition of the soil.

3.5 Plants require adequate supplies of N, P, K, magnesium, calcium, sulphur and trace elements to grow satisfactorily. These are generally supplied from soil reserves, supplemented particularly for N, P and K by organic manures and inorganic fertilisers. Soils should be sampled and analysed approximately every five years, and apply the appropriate type of lime to achieve the correct balance between nutrients and target pH for crop or grass growth.

3.6 As long as the soil pH and organic matter are maintained at appropriate levels, N, P, K and sulphur inputs and/or soil reserves can meet most plant nutrient requirements. Excessive soil nutrient levels (particularly N and P) should be avoided as leaching or erosion of nutrient rich soils to watercourses can cause pollution and promote algal growth (i.e. eutrophication).

3.7 Applications of inorganic fertilisers, livestock manures and other organic wastes should match crop requirements calculated by nutrient planning, for example by following the farm nutrient component within “The 4 Point Plan”. The individual components of the Plan (copies

of which are available from SEERAD Area Offices) are as follows:

- 1 minimising dirty water around the steading;
- 1 better nutrient use;
- 1 a risk assessment for manure and slurry; and
- 1 managing water margins.

3.8 Non-agricultural wastes should not be applied to agricultural land unless they are beneficial to the soil or growing crop and should be applied only when ground and weather conditions are suitable. All proposed applications of non-agricultural wastes to agricultural land must be registered with SEPA.



Acidification

3.9 The majority of Scottish soils are naturally acidic and are subject to natural acidification processes from fertiliser and manure use, plant growth and rainfall, to local deposition of ammonia from farming and to other pollutants from industry. Soil susceptibility depends on soil type and cropping. The result is a reduction in the soil pH level over time unless the soil is naturally calcareous or regular applications of an appropriate type of lime are made. For most arable crops, the pH of mineral soils should be maintained at pH 6.3, while for lowland grassland the soil pH should be maintained at 5.8. The reduction in lime application is

resulting in more acid soils. This will reduce crop yield as well as support a more limited range of crops. Acidic soils will produce acidic drainage and may therefore result in a deterioration in water quality. It is equally important not to over-lime soils as this will reduce the chemical availability and uptake of some trace elements resulting in reduced plant growth.

Organic Matter

3.10 Organic matter in the topsoil influences its physical, chemical and biological behavior, particularly its structural stability, ease of cultivation, water retention capacity and nutrient availability to plants. Most soils have a reasonable supply but if the organic matter in a soil falls, it can impair its ability to support plant growth. Where organic matter levels are lower than is desirable, they can usually be increased by sowing a grass ley or by incorporating crop residues or organic manures over several years. Incorporate any organic manures and chopped straw evenly. The incorporation of crop residues can maintain organic matter levels in arable soils. This is a requirement of Good Agricultural and Environmental Condition (GAEC).

Biological Activity

3.11 The natural soil biological processes, which are vital for healthy soils, are dependent on soil organisms ranging from bacteria and fungi to earthworms. Soil management and the presence of contaminants affect the activities of these organisms. Heavy metals, excessive fertiliser and organic chemical loadings (including pesticides) can suppress such biological activity. Good soil husbandry, nutrient planning and careful use of pesticides combined with a well-managed crop rotation will maintain good biological activity.



Physical Condition

3.12 Soil structure has a major influence on the rooting potential, drainage, water-holding capacity, strength and consistency of soils. Any degradation of structure will result in limited land use and agricultural potential.

3.13 Over-compaction, due to damage caused by machinery and high stocking densities, is an increasing problem. Compaction restricts root growth and limits soil drainage which in turn results in increased run-off, more frequent flooding, increased erosion and the transfer of potential pollutants to surface waters. In compacted, wet soils, aeration is reduced resulting in poor root growth and reduced availability of plant nutrients. To avoid the degradation of soil structure ensure land drainage systems are maintained, avoid the use of heavy machinery and livestock poaching when soils are soft or saturated and select appropriate cultivation techniques for different soil types.

3.14 Preventing compaction is easier than correcting it and regular soil profile inspections should be made, particularly on headlands and tramlines, to assess soil

conditions. 3.11, 3.12 and 3.13 are all requirements of GAEC.

Restoration of Disturbed Soils

3.15 Agricultural activity can be disrupted due to soil disturbance by extraction of minerals, pipeline installation, landfilling and other civil engineering works. This can result in severe soil degradation problems if soils are not stripped, stored and reinstated by appropriate methods.

Farmers should seek to ensure that before site works start the developer or operator has provided a detailed inventory of the quality of the land and the condition of both topsoil and subsoil and a detailed specification and method statement.

Contamination of Soils

3.16 To protect the long-term productivity of the soil it is necessary to be aware of the many potential sources of contamination, to assess their significance and then take the necessary steps to prevent, limit or remedy their effects.

3.17 Soil contamination may affect:

- 1 soil processes – (physical, chemical and biological) leading to degradation of soil quality;
- 1 plant growth;
- 1 human or animal health, by uptake of pesticides or Potentially Toxic Elements (PTEs) into plants resulting in entry of toxins into the food chain; or
- 1 watercourses by run off, leaching or erosion from contaminated land.

3.18 Although a wide range of PTEs may contaminate soils, in practice problems usually arise from a relatively small number of elements. The following PTEs may cause problems due to the presence of excessive amounts in soils: zinc, copper, lead, cadmium, arsenic, fluorine, nickel, chromium, mercury, selenium and molybdenum. While the presence of essential trace elements such as zinc and

copper is necessary for plant and animal nutrition, excessive concentrations under certain pH conditions can affect the health of plants, animals and humans. The most likely source of such PTEs is from the application of sewage sludge and non-agricultural waste. Copper and zinc may also be added to soils from pig slurry or poultry manures. Industrial organic chemicals, oils and solvents and persistent pesticides can also contaminate soil.

3.19 The assessment of the suitability of a waste and the receiving soil for disposal to agricultural land should take account of:

- 1 waste degradation rates and the release of nutrients and other substances during its breakdown;
- 1 the chemical form of the element and its likely interaction with the soil, given the pH values and the existing "background" concentration of the element in the receiving soil;
- 1 the effect of the element upon soil organisms and processes;
- 1 the timing of application;
- 1 the effects upon plant growth;
- 1 the possibility of uptake of potentially harmful substance to edible parts of plants;
- 1 the effects upon livestock, by consumption of stored and conserved crops, grazing herbage or direct ingestion of contaminated soil; and
- 1 the possible effects on the human food chain.

3.20 Where there is any uncertainty about the current level of soil contamination or where a new potentially contaminating waste is to be introduced to farmland, then the farmer should seek professional guidance to determine if land application is legally permissible and, if so, at what rate. It is necessary to comply with the Sludge (Use in Agriculture) Regulations 1989 (as amended) if sewage sludge is to be applied to agricultural land.

Oil Spillage

3.21 If a loss of oil to land occurs, specialist advice and assistance may be necessary. SEPA should be notified of any loss that might cause pollution.

Flooding

3.22 Agricultural land that is used for flood management has an increased risk of the deposition of contaminated sediments, spoils or wastes in certain locations. Carrying out significant excavation works or erecting physical barriers to watercourses can cause flooding or serious erosion problems to adjacent agricultural land. Before undertaking such work SEPA, SNH and local authorities should be consulted. It should also be borne in mind that a new set of risk-based controls on river engineering operations is due to be introduced as from the end of 2005. SEPA should be contacted to discuss how any proposed engineering operations short-term measures following the event, such as controlling grazing to reduce the exposure of stock to contaminating materials. In the medium term, site investigation should be carried out to establish the extent and significance of any contamination.

3.23 Appropriate action to deal with a surface accumulation might include cultivating the soil, mixing the contaminant in order to dilute and disperse it or where the contaminating material is considered to have potentially harmful effects, its removal, if feasible, may be justified.

3.24 The deposition of inert material can cause structural deterioration of the soil, such as sealing and blockage of pipe drainage systems, which may lead to surface ponding and secondary effects upon soil processes due to reduced aeration. The impairment of soil strength can lead to greater risks of damage by livestock and machinery, which may be overcome by remedial soil cultivation or sediment removal.

3.25 Land management techniques, such as the direction in which fields are ploughed, can help to reduce any flood risk on adjacent land.

Soil Erosion

3.26 Soil erosion is a natural process, caused by the action of both wind and water, though it can be exacerbated by inappropriate management. Certain soils are more susceptible to erosion than others and inappropriate soil and water management can increase the degree of risk. Loss of agricultural soils through erosion can affect productivity and profitability and result in off-site problems in water pollution, flooding and road blockage. GAEC sets the minimum standard for protecting agricultural soils from erosion and provides a number of measures that must be taken as a requirement of cross-compliance.

Wind Erosion

3.27 In Scotland significant wind erosion is normally confined to exposed expanses of sandy and peaty soils. This results in the loss of valuable topsoil as well as potential damage to crops and archaeological sites, and can be a public nuisance. The extent of wind erosion can be controlled by measures aimed at reducing wind velocity at ground level, stabilizing the soil surface and/or trapping the soil particles already moving. Such measures can include:

- 1 rows of trees and hedges planted to provide shelter for crops grown in their lee. Effective protection normally extends for a distance of 20 times the height of the shelter;
- 1 leaving crop stubble uncultivated or leaving coarse seed beds over winter;
- 1 mulches such as organic manures and sewage sludge applied to sands;
- 1 minimal cultivation techniques for sandy soils by ploughing and rolling in one operation with the crop sown at right angles to the direction of rolling;

- 1 the sowing of permanent or semi-permanent grassland as a cover crop; or
- 1 sand dunes stabilized by planting species such as marram grass to prevent windblown sand being deposited on agricultural land.

Water Erosion

3.28 Soil loss by water erosion occurs from sloping arable and rotational grassland, particularly on sandy and loamy soils. Water erosion may occur whenever rainfall intensity exceeds the infiltration rate of the soil surface and the surface run-off is heavy and fast enough to move soil particles. When losses from parts of fields are in excess of about 3 tonnes/ha, irreversible loss of fertility is likely to occur. Bare soils, fine seedbeds, potato drills and ridged beds are particularly at risk from water erosion.

3.29 Careful management can substantially reduce the risk of this occurring. The following measures might apply:

- 1 maintain field drainage systems, outlets and ditches in good operating condition to minimize ponding and run-off. Surface water should be channelled away from areas prone to erosion, e.g. long slopes, by using interceptor ditches;
- 1 reduce run-off by increasing surface drainage using subsoilers or mole ploughs;
- 1 encourage topsoil stability by using organic manures; avoid over-cultivation and over-deep working of the land;
- 1 avoid soil compaction by minimizing the weight on each wheel and by spreading the load over as large an area as possible by using dual and/or flotation tyres;
- 1 establish crops as early as possible;
- 1 sow autumn crops early enough to establish cover over winter;
- 1 use minimal cultivation techniques for susceptible soils e.g. by ploughing and rolling in one operation with the crop sown at right angles to the direction of rolling;
- 1 use permanent grass buffer strips both within fields and between fields to control the impact on watercourses;
- 1 avoid overgrazing and poaching on banks of watercourses, particularly watering points and feeding areas;
- 1 encourage regeneration of trees, shrubs and vegetation which help to stabilize the borders adjacent to flowing water;
- 1 sow permanent grass if repetitive water erosion which cannot be controlled by changes in husbandry or cropping; or
- 1 when irrigating, ensure water application is uniform and rates are not too high or droplets too large. This will avoid sealing the soil surface and minimize run-off and soil erosion.

THE COLLECTION, STORAGE AND APPLICATION TO LAND OF LIVESTOCK SLURRIES AND MANURES

DOs

1. Comply with the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003.
2. Notify SEPA at least 28 days before bringing into use any new, substantially enlarged or substantially reconstructed slurry storage facility, which together with existing storage capacity should provide 6 months storage unless otherwise agreed with SEPA.
3. Maintain a freeboard of at least 0.3m for above-ground slurry stores and 0.75m for slurry lagoons.
4. Collect all 'seepage' from farmyard manure and high-level slatted buildings as this is classed as 'slurry' under the 2003 Regulations.
5. Prepare and implement a Manure Management Plan (also known as a Farm Waste Management Plan). *This is mandatory if specified by SEPA in the terms of a Notice served under the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003.*
6. (i) Incorporate livestock manures within 2 weeks after spreading on stubbles. (ii) In areas prone to wind erosion, incorporation of livestock manures can be delayed. [GAEC measure 8]

DON'Ts

1. Don't allow effluent to escape from middens, byres, high-level slatted buildings or roads used by livestock, as this is an offence under the Control of Pollution Act 1974 (as amended).
2. Don't allow dairy washings, parlour or byre drainage, or slurry spilled during handling, to enter clean water drains or watercourses.
3. Don't site any part of a slurry storage tank within 10m of any inland or coastal waters.
4. Don't store slurry or semi-solid manure in middens.
5. Don't forget that slurries and manures are a valuable resource and, if properly utilised, will save you money as well as protecting the environment.
6. Don't spread livestock slurries:
 - 1 within 10m of a watercourse or within 50m of a drinking water supply;
 - 1 to steeply sloping fields, when the soil is wet or waterlogged, when there is a flooding risk or when heavy rainfall is forecast;
 - 1 when the soil has been frozen for 12 hours or longer in the preceding 24 hours or is covered in snow;
 - 1 at a rate that fails to account for the overall suitability of the land. In any case, the rate should never exceed either 50m³/ha (normal rate 25-30m³/ha or 2,200-2,700 gallons/acre) for surface spreading.

DOs (cont.)

- 7.** Follow “The 4 Point Plan”, which offers guidance on how to:
- 1 reduce dirty water around the farm;
 - 1 improve nutrient use;
 - 1 carry out a land risk assessment for slurry and manure;
 - 1 manage your water margins.
- 8.** Consult SEPA if you are planning to use a waste treatment plant on your farm as it may require a consent, authorisation or permit to be sought.
- 9.** Keep clean water and dirty water separate.
- 10.** Minimise unroofed collection yards, feed passages etc.
- 11.** Repair or replace roof gutters and downpipes that are broken or missing.
- 12.** Regularly check effluent tanks, slurry tanks and slatted tanks to avoid overflow.
- 13.** Ensure proper maintenance and repair of all slurry storage tanks, pipework and valves.
- 14.** Be a ‘good neighbour’ and:
- 1 avoid spreading close to domestic or public buildings;
 - 1 avoid spreading at weekends or public holidays;
 - 1 spread livestock slurries and manures when the wind direction is away from public/residential areas and areas designated for their conservation value;
 - 1 avoid, where possible, spreading in the hours of darkness.
- 15.** Locate any field heap of farmyard manure:
- 1 at least 10m away from any clean surface water or field drain or watercourse and at least 50m from any spring, well or borehole; and
 - 1 as far away from residential housing as possible.

DON'Ts (cont.)

- 7.** Don’t cause direct and indirect entry of livestock slurry into the drainage system, especially with soil injection into fields with gravel backfilled drains.
- 8.** Don’t mix slurry with silage effluent in confined spaces, as dangerous fumes can be fatal.
- 9.** Don’t enter a tank unless all recommended safety procedures have been followed.
- 10.** Don’t spread when fields have been pipe or mole drained, or subsoiled over existing drains within the last 12 months.
- 11.** Don’t apply manures or slurries to any statutory conservation sites or other areas with a conservation, archaeological or historic value without prior notification to Scottish Natural Heritage (SNH) or Historic Scotland as appropriate.
- 12.** Don’t build a woodchip corral without carrying out a detailed assessment of pollution risks to surface and ground waters. Consult with SEPA about the site selection.

DOs (cont.)

16. Spread livestock slurries and manures only when field and weather conditions are suitable to prevent water pollution.

17. Ensure that any agricultural contractor or company employed by you to spread farm manures and slurries on your land is suitably trained and competent to do so.

Introduction

4.1 Livestock slurries and farmyard manure (“FYM”) are valuable sources of organic matter and major nutrients such as nitrogen (N), phosphorus (P), potassium (K) and sulphur. They also contain magnesium and trace elements. Taking account of these nutrients can often result in considerable savings in inorganic fertiliser use. However, nutrients can be lost from manures and slurries during storage and spreading, posing a water pollution risk. Very rapid and severe oxygen depletion of the water can result, leading to fish and invertebrate mortalities for many miles downstream. Manure and slurry can also be associated with the microbiological contamination of inland and coastal waters and groundwater, potentially affecting compliance with environmental quality standards specified in EC Directives.

What legislation must be complied with?

4.2 The entry of slurry, manure or effluent from middens, byres, high-level slatted buildings or roads used by livestock to a watercourse or field tile is an offence under environmental legislation.

4.3 Farms at which slurry is produced are subject to the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 (“the SSAFO Regulations”). For new, substantially enlarged or substantially reconstructed

slurry storage systems, the Regulations require the provision of six months storage capacity for the farm as a whole. SEPA may accept a lesser period of storage but only where it can be demonstrated by a Farm Waste Management Plan (“FWMP”) that this will not cause harm to the environment nor lead to a significant risk of pollution of the water environment.

4.4 Farmers operating within areas that have been designated as a Nitrate Vulnerable Zone (“NVZ”) must also implement the mandatory measures contained in Section 6 as well as adhering to the requirements of the Action Programme Regulations relevant to their area. Further details are given in Guidelines for Farmers in NVZs produced by SEERAD in 2003. A summary of the statutory requirements of the Action Programme Regulations if you are farming within an NVZ is as follows:

- 1 prepare and implement a fertiliser and manure plan;
- 1 ensure that adequate records are kept for land within NVZs relating to livestock numbers and use of inorganic fertiliser and organic manures;
- 1 organic manure application must not result in the nitrogen applied exceeding permitted rates in the NVZ Action Programme Regulations; and
- 1 inorganic nitrogen fertilisers must not be applied during the closed periods specified in the NVZ Action Programme Regulations;

- 1 slurry or poultry manures must not be applied to sandy or shallow soils during the closed periods specified in the NVZ Action Programme Regulations.

Fertiliser and Manure Plan

4.5 The Fertiliser and Manure Plan required for all farms in NVZs should:

- 1 establish the quantities of livestock manures produced on the farm;
- 1 demonstrate sufficient storage capacity and land available for spreading;
- 1 contain an assessment of the nitrogen quantity available to grass and crops following application of organic manures; and
- 1 contain an assessment of crop and grass requirement for nitrogen fertiliser in each field taking account of nitrogen supply from soil organic matter, crop residues and organic manures.

4.6 A permit is required from SEPA for the operation of certain intensive pig and poultry installations to control the potential impact of manures and slurries on the environment. Further details are given in Section 13 of this code.

4.7 Establish from the local authority whether an Environmental Impact Assessment (“EIA”) is required. If storage of manure on uncultivated or semi natural land is intended, which could lead to significant effects on the environment, an application under the Environmental Impact Assessment (Uncultivated Land and Semi-Natural Areas) (Scotland) Regulations 2002 may be required. If in doubt your local SEERAD Office will be happy to advise or further information can be obtained from **www.scotland.gov.uk**.

4.8 There are important health and safety issues and you should include the handling, storage and application of farm manures

within the farm’s Control of Substances Hazardous to Health (“COSHH”) assessments. Further guidance is available in Health and Safety Executive publications.

What can you do to prevent pollution?

4.9 To address all of the pollution risks associated with manures, slurries and grazing animals, particularly in bathing water catchments, it is essential to follow the guidance in “The 4 Point Plan”, the individual components of which are as follows:

- 1 minimising dirty water around the steading;
- 1 better nutrient use;
- 1 a risk assessment for manure and slurry; and
- 1 managing water margins.

4.10 Following “The 4 Point Plan” will also help to maximise the nutrient value of manures and slurries. Guidance on adhering to the Plan can be obtained from the existing agricultural advisory network in Scotland. Copies of the Plan are available free from SEERAD Area Offices (listed in Annex A).

4.11 Pollution risk can occur at all stages of handling livestock slurry and manures, including collection, storage, transport and land application. At all times, the quantity of material requiring to be collected, stored and applied to land should be minimised. The risk of pollution occurring is usually higher with liquid systems than with solid based systems. Minimise the unroofed steading areas to which stock have access, or alternatively roof these areas where practical. Always separate uncontaminated water (for example, roof water) from dirty water and prevent it from entering the handling system. Repair or replace roof gutters and downpipes that are broken or missing.

4.12 Many farms have existing drainage systems to allow roofwater and run-off from roads and yards to discharge to local watercourses. This drainage can carry silt, chemicals, Faecal Indicator Organisms [FIOs] and other materials, thereby causing a risk of pollution. It may be possible to make use of properly sited and designed ponds to deal with this currently uncollected drainage and minimise pollution risks. SEPA should be consulted for further information.

Manure Management Plans (also known as Farm Waste Management Plans)

4.13 Farmers should draw up a Manure Management Plan (known for the purposes of the SSAFO Regulations as a Farm Waste Management Plan (FWMP)) and, if necessary, seek professional advice. In any event, there is a requirement under the SSAFO Regulations for all storage facilities to have 6 months slurry storage capacity, unless it can be demonstrated to SEPA's satisfaction through a detailed FWMP that 6 months is not necessary. It is recommended that details of all field applications be recorded including the site, rate, total volume and date of application. A Manure Management Plan or FWMP will establish the quantities of slurry and manure produced and safe methods of collection, storage and land spreading, and should include the following steps:

- 1 establish the slurry and manure production schedule;
- 1 prepare a land availability schedule and field risk assessment for land application;
- 1 match slurry and manure production to land availability schedule; and
- 1 calculate size of store required.

4.14 There can be financial and practical benefits as well as environmental ones in having adequate storage capacity on farms. Slurries and manures can be stored until growing crops are best able to utilise the

available nutrients and when soil conditions are most suitable. In this way the risk of run-off and leaching will be minimised.

Types of slurry, manure and effluent

4.15 Livestock slurry and manure are classified by the type of stock that produces it and the physical characteristic of the slurry and manure. Manures can be in the form of solids, semi-solids or liquids. Solid manures can be stacked but can produce effluent due to drainage and the leaching effect of rainfall. Liquids are materials, which flow readily, and semi-solid manures can be difficult to stack and tend to slump.

4.16 In the SSAFO Regulations, "slurry" is defined as:

- 1 excreta, including any liquid fraction, produced by livestock whilst in a yard or building;
- 1 a mixture consisting wholly of or containing such excreta, bedding, feed residues, rainwater and washings from a building or yard used by livestock, dungsteeds or middens, high-level slatted buildings and weeping wall structures, or any combination of these, provided such excreta is present; and
- 1 of a consistency that allows it to be pumped or discharged by gravity at any stage in the handling process.

4.17 It is important to understand this definition as it determines the regulatory requirements within the Regulations. For example, solid manure stores, dungsteeds and middens are excluded but the liquid draining from these, as well as drainage from high level slatted buildings and weeping wall structures, is defined as slurry and must be collected and handled in accordance with the SSAFO Regulations.

Animal housing

4.18 The type of livestock housing system affects the physical characteristics of the manure or slurry. For instance, solid FYM is produced by the addition of straw or use of other bedding materials. Slurry is produced where housing and feeding systems use little or no additional bedding materials, and where excreta is scraped from solid floors or trodden into slats. Some systems such as straw courts use a separate scraped feed area to reduce straw use and these produce a combination of both FYM and slurry. All liquids produced from where livestock are housed must be drained or scraped to a suitable collection system. These liquids include drainage from passages and aprons used by livestock or where slurry is scraped, contaminated wash water from milking parlours and washdown (dairy, pig and poultry buildings), and drainage from traditional byres.

4.19 Drainage from high-level slatted buildings is included within the SSAFO Regulations definition of slurry, whereas the solid manure itself is not. Such drainage is therefore covered by the Regulations and must be suitably collected and stored prior to land spreading.

Woodchip corrals and stand-off pads

4.20 Woodchip corrals and stand-off pads are outside, uncovered, enclosures using fist-sized woodchips as a bedding layer. They are typically used to over winter beef cattle and, occasionally, dairy cows. Farmers are using such systems as an alternative to out-wintering and housing. Once in place, woodchip corrals and stand-off pads may be used to take cattle off pasture during wet weather so as to prevent damage to soil by treading.

4.21 Woodchip corrals are unsealed systems and are intended to drain freely to the soil / subsoil. As there is no intention to

collect the drainage at the base of the woodchips, they are considered to have significant potential to cause pollution. Whether they do or not is dependent on where they are sited, their design, the prevailing weather and how they are managed. The principal pollution risks are to groundwater and local watercourses. Pollution of rivers occurs most commonly where field drains have been left beneath the corral or where run-off occurs due to build up of effluent in the corral itself. On free-draining sites, pollution of groundwater is of particular concern and the impacts are hidden from view.

4.22 Stand-off pads are sealed systems which rely on proactive management of the effluent produced at the base of the woodchip layer. The potential for discharges to reach groundwater should therefore be much lower than for woodchip corrals. In general, it is considered better that stand-off pads be sited on impermeable soils which can act as a barrier to the escape of effluent from the system. It is necessary to ensure effluent collection drains are installed for stand-off pads together with a tank that meets the requirements of the SSAFO Regulations.

4.23 Feeding arrangements for corrals and stand-off pads vary considerably. Given that feeding areas will be associated with most dunging and urinating by the animals, consideration will need to be given to the management of slurry and dirty water at these locations. Concrete yards will normally require a slurry storage facility that conforms with the SSAFO Regulations. For stand-off pads, this may provide an opportunity to collect the effluent from the base of the system.

4.24 Based on the above, stand-off pads are the preferred design in terms of specifically addressing pollution risks. SEPA may use a variety of legislation to prevent

pollution from corrals or stand-off pads. This will depend on the risks at each particular location. The risks to groundwater may require existing woodchip corrals to be converted to stand-off pads and for advice to be sought on how best to do so.

4.25 Neither system should be constructed without carrying out a detailed assessment of pollution risks to surface and ground waters. Consultation with SEPA is advisable in most circumstances.

Livestock yards

4.26 Yards used for the collection and dispersal of livestock, together with feed areas, will become contaminated with slurry, bedding and feed residues. Whether these areas are roofed or unroofed, they must be designed so that all contaminated drainage is collected and contained. It is important that clean drainage from roofs and aprons is not allowed to enter the slurry collection system in order to reduce the volume of slurry to be applied to land. Avoid large unroofed areas and keep rainwater out of dirty areas.

Middens

4.27 Drainage from middens is included within the SSAFO Regulations definition of slurry, whereas the solid manure itself is not. Such drainage must be suitably collected and stored prior to land spreading. Escape of effluent from middens and airdle tanks to watercourses and field tiles is an offence under SSAFO. Slurry or semi-solid manure should not be stored in middens.

Feed storage and preparation areas

4.28 Drainage from feed areas is likely to be highly polluted and must not be discharged to a watercourse. Although this material does not normally contain manure or slurry, it can add to the volume of manure and slurry collected.

4.29 Unroofed areas pose a high risk of pollution during periods of rainfall. Where it is not feasible to direct and collect effluents into existing storage facilities, a separate tank should be provided. Tanks must always be appropriately sized, constructed and installed with regard to the type of effluent being stored.

Parlours and dairies

4.30 The drainage from parlour standings and the parlour pit must be collected and contained. Washings from these areas will be contaminated with milk residues, livestock excreta and cleaning chemicals. If included in the slurry system, the volumes produced must be taken into account in any calculation of the slurry storage capacity and land availability for spreading.

4.31 There can be occasions when it becomes necessary to dispose of milk on the farm. This can occur when bad weather prevents uplifting of milk or if milk becomes contaminated (antibiotics, chemicals, blood etc) or colostrum has to be disposed of from newly calved cows. Ideally, waste milk may be fed to livestock but it is advisable to first consult a veterinary surgeon, especially where the milk is contaminated or where large quantities are involved. Similar precautions should be taken before spreading contaminated milk on grazing land.

4.32 Milk is a highly polluting substance and should never be allowed to enter a watercourse. Waste milk should be diluted with water or slurry before disposing of to agricultural land. Dairy washings should be collected and stored in suitable stores. As the act of mixing milk and slurry may give rise to lethal or explosive gases, only small quantities of waste milk should be disposed of to the slurry system.

4.33 Milk should not be applied on sites with a high run-off risk. On suitable sites, the milk should be diluted 1:1 with water

before application or mixed with slurry. The application rate should not exceed 50m³/ha (4500 gallons/acre) of diluted milk. The applications should be carried out in accordance with the principles set out later in this section.

Slurry reception tanks and channels

4.34 Where possible, keep the distance between the animal housing and slurry storage to a minimum.

4.35 Slurry can be transferred from where it is produced to the main storage tank either directly (via slats to storage tank) or via a suitable reception tank or channel from where it can be pumped or flow by gravity into the main tank. The system used will depend on the site, relative levels, type of slurry and storage used.

4.36 The SSAFO Regulations require that a reception tank is large enough to hold the maximum volume that could be produced over a 2-day period. This should include allowance for any washings, dirty water run-off and rainfall. Good management is essential to prevent overflow. To reduce the risk of overflow and ease operational management, a larger tank may be better. Tanks should be sited to minimise pollution risk in the event of overflow: they must be sited more than 10m from any inland or coastal waters and should be at least 50m from any spring, well or borehole.

4.37 Where slurry is scraped directly to the store, open areas of apron which can be contaminated should be minimised.

4.38 A freeboard of at least 300 mm must be maintained in all tanks (below and above ground). The freeboard on earth-banked lagoons/compounds must be at least 750 mm. Slurry should never be allowed to rise to rim levels as this is in breach of the SSAFO Regulations.

Choosing a storage facility

4.39 The type of storage facility required will depend on:

- 1 type and volume of material to be stored;
- 1 topography, ground conditions and site area;
- 1 choice of constructional type; and
- 1 cost.

4.40 Storage capacity is determined by ensuring those periods of the year which are unsuitable for spreading are avoided. This should normally not be less than 6 months as required by the SSAFO Regulations.

4.41 The calculation of the minimum size for any slurry storage facility must include provision for:

- 1 all livestock excreta produced during housed periods or at other times of the year (e.g. for dairy cattle);
- 1 all other effluents directed to the system including dairy wash water, contaminated yard areas and any silage or draff effluent; and
- 1 rainfall and freeboard on the storage tank(s).

4.42 Storage tanks can be constructed below or above ground. Below ground tanks may be open topped such as lagoons, above ground slurry stores or within a building and slatted.

4.43 Open-topped tanks and lagoons installed below ground must have appropriate protection to prevent access and risk of drowning in accordance with Health and Safety requirements. A childproof safety fence to a suitable height with lockable access gates will be necessary. Safe locations should be installed for access to agitate and remove slurry from the store. Permanent pipes can be installed to allow tanker emptying from outwith safety fencing and reduce risk to operators.

4.44 All slurry stores and reception tanks constructed after 1st September 1991 must be constructed and installed to the appropriate standard as referred to in the SSAFO Regulations. SEPA also has powers to ensure that all existing structures conform if they pose a significant risk of pollution or if they otherwise fail to comply with the requirements of the Regulations. It is strongly recommended that SEPA be consulted at an early stage when planning a system to establish any specific requirements. SEPA must be informed at least 28 days prior to the use of a new slurry store whether above or below ground. A Building Warrant Application must be made. The Planning Authority should be consulted in all cases to verify any specific requirements.

Design

4.45 The design and installation must comply with Schedule 2 of the SSAFO Regulations and to the constructional standards described by BS 5502 on Buildings and Structures for Agriculture (Part 50).

4.46 The base and walls of the slurry storage tank, any effluent tank, channels and reception pits, and the walls of any pipes must be capable of withstanding characteristic loads, shall be protected against corrosion and, with proper maintenance, must satisfy the requirements of the SSAFO Regulations.

4.47 Where a channel or reception pit connects by pipe to another container of lesser capacity which can overflow, two valves must be fitted in the pipe to minimise the risk of overflow should a blockage occur preventing closure of one valve. These valves must be kept locked when not in use and should be spaced at least 1m apart to minimise the risk of both valves becoming jammed open at the same time. Valves should be checked regularly and maintained in full working order. All

channels and reception pits must be covered or fenced. Access openings for pumps and pipes should be guarded to prevent accidents. Covers must be designed to carry the loads to which they will be subjected. Access covers which can be easily opened or lifted should be kept locked.

Siting the storage facility

4.48 In selecting the site, consider all of the following:

- 1 ensuring that the risk of pollution is minimised if slurry or effluent accidentally escape, including the risk to public and private water supply sources in the locality;
- 1 locating the storage facility at least 10m away from any inland or coastal water;
- 1 locating the facility in close proximity to the point of production of the manure or slurry;
- 1 making best use of relative ground levels for loading and unloading the store;
- 1 providing good access for handling equipment;
- 1 ensuring the safety of personnel and stock;
- 1 avoiding siting on 'made-up' ground;
- 1 causing a potential odour nuisance; and
- 1 minimising the visual impact, including considering the potential for screening.

Construction

4.49 To satisfy the standards set by the SSAFO Regulations, a high standard of workmanship is required. The contractor must be experienced in the use of concrete and other materials used in the construction process. The relevant design requirements are listed in sections BS 5502, BS 8007 and BS 8110. When considering substantially enlarging or reconstructing storage tanks, the resulting structure must satisfy the standards set by

the SSAFO Regulations. It will therefore be essential to seek professional guidance prior to making a commitment to any work. In some instances, upgrading may be impractical due to the lower design criteria used in the original structure. SEPA may allow for substantial reconstruction of an exempt structure where the risk of pollution will be reduced. This is a matter for SEPA to determine on a site to site basis.

Temporary field heaps

4.50 Any temporary field heap of farmyard manure must be at least 10m away from any field drain or watercourse and at least 50m from any spring, well or borehole. Field heaps should not be sited on hardstandings, tarmac or disused roads.

System management

4.51 The person having custody or control of the management of any facility for the handling and storage of livestock manures and slurries must ensure:

- 1 good operational standards are adopted (e.g. maintaining required freeboard); and
- 1 maintenance is carried out to retain the minimum performance requirements for at least 20 years (or the operational life of the store) as specified in the SSAFO Regulations.

Maintenance

4.52 Practical and safe methods must be employed to allow all facilities to be inspected regularly for any signs of failure e.g. damage to surface coatings on steel and concrete structures, damage and failure of store walls and floor, leakage in pipes, connections and fittings. **Note that harmful gases are generated at slurry stores and these have been responsible for both human and animal deaths in Scotland.** It is essential that controls for pumps be situated so that they can be started and stopped without the operator entering buildings which may contain harmful gases. Stock or humans

must not access buildings until appropriate actions have been taken to prevent risk of harmful effects. Such buildings should be well ventilated before entering. If it is absolutely essential to enter an area which may be contaminated by gas, operators should wear either an approved self-contained or airline breathing apparatus. Full training must be given in the use of this equipment before it is used. A notice should be erected at slurry stores warning of the danger of poisonous gas and that stores should not be entered without taking the recommended precautions. The following is a suggested procedure which should be carried out at least at annual intervals:

- 1 clean any internal tank walls and floors. Be aware of the danger of toxic gases - use breathing equipment;
- 1 inspect walls and floors for cracking and surface erosion. Only the exposed external surfaces of slurry tanks should be inspected (see above);
- 1 inspect all drains and channels for damage or deterioration;
- 1 check that all channels and pipes are free flowing;
- 1 check all safety arrangements;
- 1 list all repairs required and prepare a timetable to execute the work. This may involve diverting materials to other storage or providing temporary arrangements; and
- 1 SEPA must be consulted with regard to any proposed substantial enlargement or reconstruction.

Operational management

4.53 The following operational actions should be carried out with all systems:

- 1 check tank storage levels at a frequency appropriate to its capacity, especially those receiving drainage from contaminated yards or uncovered silos where rainfall can fill the tank very quickly;

- 1 carry out regular spot checks at points where leakage may occur, such as joints in pipework connected to pumps;
- 1 check that external drains are running freely and are not contaminated;
- 1 check automatic pumping systems and carry out routine maintenance. Pumping systems which can be removed from a tank for inspection are most convenient and essential in situations where poisonous gas may be present;
- 1 check freeboard in tanks particularly after periods of heavy rain;
- 1 check parts of systems which may freeze during cold spells;
- 1 check tanks for the separation of contents which may lead to the build up of solids and loss of storage capacity. Above ground tanks require regular attention where surface drying can cause crust formation; and
- 1 check all safety hatches after handling operations. Empty and inspect all tanks (taking appropriate safety measures) prior to animal housing.

4.54 Persons having custody or control of slurry are responsible for informing those individuals who act on their behalf of the precautions to be taken to avoid overflow or spillage and the consequences of causing pollution.

4.55 SEPA must be contacted in the event of a pollution incident on its 24 hour pollution report line [Tel. 0800 807060](tel:0800807060). All farm staff must be aware of the action to take in any emergency.

4.56 Appropriate training in the proper use of facilities and associated equipment is essential. The dangers likely to be encountered from moving parts on equipment and the presence of poisonous gases particularly from tanks within buildings during mixing of slurry must be emphasised. In slatted courts, livestock housed over the

slats should be removed and the building well ventilated prior to and during slurry agitation. If possible, within buildings avoid the storage of silage effluent and slurry in the same tank at the same time as this can increase the risk of poisonous gases.

Land application and utilisation of livestock manures and slurries

4.57 Livestock manures and slurries are a valuable asset and should be applied to agricultural land in accordance with the principles set out in this section. The surface application rate should never exceed 50m³/ha (4500 gallons/acre) although normal application rates should seldom exceed 30m³/ha (2,700 gallons/acre) and any repeat application should not be made within 3 weeks. All applications should take into account the soil conditions and the amount of rain forecast so as to minimise the risk of run off and entry to a field drainage system.

4.58 Although the risk of causing pollution by spreading solid manures is lower than for slurries, surface run-off can still occur if rain falls shortly after an application. Surface application rates for solid manures should never exceed 50 tonnes/ha (20 tons/acre), and should be lower where soil and weather conditions are likely to increase the risks of pollution. Poultry manures should not be spread at rates exceeding 5-15 tonnes/ha (2-6 tons/acre) depending on nitrogen content.

4.59 The amount and frequency of applications should not be more than the nutrient requirements of the growing crop and take account of time of application and the residual value in the soil from the previous application.

4.60 Table 1 shows the maximum surface application rates which can be applied when soil and weather conditions are suitable to avoid run-off and minimise pollution. The rate applied in the normal

course of slurry spreading in suitable conditions is generally between 25-30m³/ha (2,200-2,700 gallons/acre).

Table 1: Surface application rates in optimum conditions*

Material	Maximum application rate*	Normal application rates
Slurry	50 m ³ /ha	25-30m ³ /ha
Manure (FYM)	50 tonnes/ha	30-50 tonnes/ha
Poultry Manure	15 tonnes/ha	5 to 15 tonnes/ha
Contaminated Water	50 m ³ /ha	25-30m ³ /ha

*Lower rates should be used in the event of inappropriate or difficult conditions and may also be required to ensure that crop nutrient requirements are not exceeded.

4.61 Repeat applications should not be made for a period of at least 3 weeks. This is a necessary requirement to allow the crop to utilise the available nutrients. Soil microbes breakdown and assist in incorporation of slurry and manure. More frequent applications would smother herbage and saturate the soil, increasing the chances of leaching and run-off.

4.62 Where there is insufficient suitable land for application on the farm, alternative options, such as waste treatment or the use of other suitable land close by, will require to be considered. Specific regulations may apply if slurry or FYM is to be transported from one farm to another.

Nutrient content

4.63 Livestock slurries and manures are a valuable resource. If correctly applied, they can save you money as well as protecting the environment.

4.64 Manure nutrient composition is affected by a number of factors including the type and age of livestock; livestock diet; method of manure handling and storage; extent of slurry dilution; and the type and amount of litter in FYM. Typical amounts of nutrients which are in a readily available form (i.e. can be taken up by crops and grass during the growing season following application) are given in Table 2 below.

Table 2: Typical values of total NPK and available PK contained in slurry and manure

	Potential total nutrients				Potential available nutrients	
	% dry matter	N	P ₂ O ₅	K ₂ O	P ₂ O ₅	K ₂ O
Slurry (kg/m³)						
Dairy cattle	10	4	2.3	4.3	1.2	3.6
Young cattle 250 kg	10	5	2.3	4.3	1.2	3.6
Finishing cattle	10	3.5	2	3.8	1	3
Pigs	10	6	4	3	2	2.5
Manure (kg/tonne)						
Cattle (fresh)	25	5.5	3.5	8	2	5
Pig (fresh)	25	7	7	6	4	4
Poultry Manure (kg/tonne)						
Broiler/layer litter	70	24	22	14	11	10
Deep litter	70	17	18	13	9	10
Battery (fresh)	30	15	14	7	7	5

Note – for the purposes of this information P₂O₅ and K₂O are used as units to describe P and K values in fertilisers and manures

4.65 Further gradual releases of nitrogen and phosphorus from manures will occur in the years following application. A typical application of slurry in the spring will also usually supply sufficient sulphur for one cut of silage.

4.66 The available nutrient figures in the table indicate the nutrient content available to the crop grown following application. The N values in the table are a guide to the amount of N available for crop uptake when the manure or slurry is applied in the spring. Less N will be available if the manure or slurry is applied in the autumn or winter. The availability of N is variable and is affected by the rate and timing of application, the weather after spreading and the speed of incorporation into the soil.

4.67 The nutrient value of manure or slurry should be estimated from published data or supported by representative sampling and analysis of the manures and slurries from time to time. Dilution from rainfall, washings and bedding materials must be taken into account. The Fertiliser Series Technical Notes, produced by SAC, provide detailed information on the nutrient requirements of crops and grass, as well as the fertilising value of different types of manures and slurries and chemical fertilisers.

4.68 Livestock manures and slurries should be applied in amounts such that the nutrient content, particularly of N and P, can be utilised by growing crops. Excessive application rates can result in high N and P concentrations in the soil and an increased risk of water pollution. Soil analysis for pH, N, P and K should be carried out every 5 years or so to assess the nutrient needs of the soil.

Pathogenic micro-organisms

4.69 Manures can contain pathogenic micro-organisms (e.g. *E. coli* O157, *Salmonella*, *Listeria*, *Campylobacter*,

Cryptosporidium and *Giardia*) which may cause food-borne illness. Factors such as the age, diet and management of animals, as well as regional and seasonal influences, affect the number of micro-organisms in manures.

4.70 The management and handling of farm manures, particularly the length of time they are stored, are important factors in the survival of micro-organisms. The method and timing of manure applications to land can affect the length of time that pathogens survive in the soil, and the likelihood of their getting onto food crops. In order to reduce any risks of food-borne illness resulting from the use of farm manures, there is a need for due diligence.

4.71 To reduce the risk of transferring disease to healthy stock, pasture should not be grazed for at least one month after spreading slurry or manure or until all visible signs of the solids have disappeared.

4.72 Pathogenic micro-organisms usually die out over time. The rate at which this happens depends on environmental conditions. In some conditions, they can survive for several months following the spreading of farm manures or deposition during grazing. They may also be present in dirty water, yard runoff and leachates from stored manures.

4.73 Pathogens can be killed either in the manure itself or after application to land. The main factors that will lead to a reduction in numbers are:

- 1 temperature;
- 1 sunlight;
- 1 soil pH;
- 1 drying;
- 1 time; and
- 1 soil microbes.

Slurry and manure production schedule

4.74 All sources of manure and slurry should be identified to determine the type,

quantity and nutrient content so that a schedule of slurry and manure production can be established. Sources include:

- 1 livestock excreta and bedding;
- 1 contaminated washings;
- 1 run off and drainage from contaminated aprons;
- 1 silage effluent and feed residues;
- 1 dairy washings and rejected milk; and
- 1 all other wastes which may be imported (e.g. sewage sludge, etc.).

“The 4 Point Plan” can help you with this.

Quantity of slurry and manure produced

4.75 Quantities of each type of slurry and manure and the time of production is calculated from current published data relevant to the farming system (see Appendices 1, 2 and 3 at the end of this section).

Prepare a land availability schedule

4.76 An annual schedule for application on available land should be prepared based on the annual cropping programme, land suitability and meteorological data.

Annual cropping programme

4.77 The annual cropping and land use programme determines when land may be available for the application of livestock slurries and manures. Consideration must be given to potential crop nutrient uptake, access periods and other effects of application (e.g. non-grazing periods following application).

Land suitability and field risk assessment

4.78 The land suitability for application of livestock manures and slurries is determined by topography, soil type and conditions as well as land use. A field risk assessment should be completed for each area intended to be used for application (An example is shown in Appendix 4 at the

end of this section). All factors outlined below must be considered:

- 1 the proposed application site must be inspected before work commences to ensure it is in a suitable condition;
- 1 during and after application, frequent inspections must be made to ensure that ponding or run-off is not occurring; and
- 1 it is also advisable that all drain outfalls be checked before, during and after application.

Proximity of watercourses

4.79 An untreated strip at least 10m wide should be left beside all watercourses, to reduce the risk of direct contamination by run-off. Field dirty water irrigation systems should be operated so that there is no possibility of the spread pattern reaching within 10m of a watercourse. This distance may have to be increased on certain sites to reduce risk e.g. from wind blow or field slope.

Public health concerns

4.80 There are serious public health risks if harmful chemicals and micro-organisms (such as *E. coli* O157, *Cryptosporidium*) enter into water supplies. Application sites for livestock manures and slurries in proximity to public water supply sources, either surface or underground, may be restricted by Scottish Water byelaws preventing pollution of the water source. [Contact details for Scottish Water are in Annex C.] Private water supply sources should also be taken into account. An area is also unsuitable for application of livestock slurry and manure if it drains into a water supply channel or aqueduct, or where it lies in close proximity to an enclosed storage tank. Springs, wells and boreholes for drinking should be adequately fenced to prevent faecal contamination from grazing livestock.

Risk of flooding

4.81 Flooding of low-lying fields adjacent to watercourses can occur at certain times of the year. Application to these areas should be avoided when there is a risk of flooding, consideration should be given to previous flood patterns.

Groundwater

4.82 Applications to land can pollute water below the ground. The risk applies to any field where permeable soils directly overlie water-bearing rock formations, especially where there is a high water table or where the underlying rock formation is fissured. Note there are mandatory requirements in nitrate vulnerable zones (see Section 6).

Field drains

4.83 Drainage systems can present a risk of pollution as, under some conditions, liquid slurry can gain direct entry to the drains and from there to watercourses. There is a higher risk if the drainage system has only recently been installed, and in particular when permeable backfill has been used. It is important that all field and storm water drain positions and depth are known, in order to minimise the risks of direct entry of slurry and contaminated water.

4.84 Other recent soil disturbance such as moling or subsoiling also increases the risk of pollution via the drainage system. Slurry and contaminated water should not be applied to any areas where recent disturbance has occurred until the land surface has settled and the risk of direct entry of slurry and/or contaminated water to drains is reduced. An assessment should be made prior to making any land application and operators instructed to avoid the area if it is unsuitable.

4.85 Watercourses which may receive drainage containing slurry or contaminated water must be checked before, during and after any application. All pollution should be reported to SEPA.

Soil conditions

4.86 The quantity of liquid slurry that can be applied to an area without causing surface run-off is dependent on soil type and conditions including structure, moisture content, infiltration rate and surface gradient. As the permeability and infiltration rate of a soil decrease and the surface gradient increases, the risk of surface run off is increased. To minimise this risk, liquid slurry should not be applied at rates greater than the infiltration capacity of the soil and at no time during periods when a soil is waterlogged. This applies to both surface application and soil injection methods. The use of heavy, fully laden tankers in wet conditions increases the risk of soil compaction and damage, which will reduce the infiltration capacity of the soil and increase the potential for run-off.

4.87 Spreading slurries and manures at a time when conditions are not ideal also costs money later, in terms of remedial works to overcome compaction/tracking and the associated crop yield reduction or reseeded requirement.

Meteorological data

4.88 The design of any livestock storage system must take into account rainfall that enters the system and contributes to the volume to be handled. Both 'long term' and 'short term storm' rainfall events should be taken into account, to ensure adequate storage provision. This is to ensure that land application takes place when field conditions are suitable and the risk of pollution from the operation is minimised. Conditions which will minimise pollution risk also minimise field damage.

4.89 Full account should be taken of the weather (particularly prolonged wet weather) prior to any intended application being made and to the consequent field conditions. Effect on the risk assessment should be considered. A field that is

normally suitable for slurry application and is a low pollution risk could become unsuitable and a high pollution risk following heavy rainfall.

4.90 Check local weather forecasting information prior to proposed application.

Frozen ground conditions

4.91 The application of liquid and semi-liquid livestock slurries to ground which is frozen to a depth of more than 50mm should be avoided. Ground that is frozen to a greater depth presents a high risk of run-off, especially on slopes. Application should not be carried out if the soil has been frozen for 12 hours or longer in the preceding 24 hours.

Periods of snow

4.92 Liquid and semi-liquid livestock slurries should not be applied to ground with snow cover, as there is a high risk of run-off during the subsequent thaw.

Wind direction and force

4.93 Wind direction and force will dictate days when spreading should be avoided to prevent air pollution from drift and odour affecting residential and other sensitive areas.

Proximity to sensitive habitats and features

4.94 Species-rich grassland, field margins and hedgerows are important habitats that need to be protected from manures and slurries. Buffer strips may act as a nutrient sink and this may reduce their wildlife interest. The effective width of the uncultivated margin will depend on topographical and/or soil characteristics. Farm manures and slurries should not be applied to Sites of Special Scientific Interest (including all National Nature Reserves and sites designated under European legislation) without prior notification to Scottish Natural Heritage (see Annex C for contact details).

4.95 Farmland may also contain sites of archaeological interest, some of which may be protected as Scheduled Ancient Monuments, and all of which are of conservation interest. Advice should be sought from local authority archaeologists and, especially for Scheduled Ancient Monuments, from Historic Scotland (see Annex C for contact details).

Rough grazing land

4.96 Many farms will have areas of rough grazing which may not be suitable for application of livestock manures and slurries. Many of these rough areas provide valuable habitats for wildlife and some have a rich and diverse mix of plants.

4.97 Such areas might include unimproved pasture, moorland, wet grasslands, machair, hay meadows, uncultivated field headlands and mires. Given the possible nature conservation value of such areas and the terms of the Environmental Impact Assessment (Uncultivated Land and Semi-Natural Areas)(Scotland) Regulations 2002 (EIA Regulations), advice should be sought from Scottish Natural Heritage before using them for the application of livestock slurry and manure. Rough grazing land that is of conservation value or is unsuitable for land-spreading equipment, or is considered as 'high risk', should be excluded from the available area.

4.98 Spreading of manures and slurries with the view to introducing intensive production on unimproved land requires an application to SEERAD under the EIA Regulations. The routine spreading of manures and slurries, where no change of land use was planned does not, however, require SEERAD approval under these Regulations.

Sloping ground

4.99 The application of slurry and manure on sloping ground should be carried out with care to prevent the risk of run off

entering a watercourse. Also safe-working practices associated with vehicle operation on slopes must be followed at all times.

Factors to consider include:

- 1 presence of watercourse at bottom of slope;
- 1 soil type and condition;
- 1 gradient;
- 1 weather conditions (before, during and after application);
- 1 application rates;
- 1 buffer areas must be used and sized to reduce risk of run off; and
- 1 avoid spreading manure on neighbouring fields if runoff will be a potential source of contamination of growing crops.

Proximity of domestic dwellings and public buildings

4.100 Air pollution from livestock manures and slurries must be considered whenever there is a risk of public nuisance caused by odours or a potential risk to public health from harmful organisms. This applies to fixed installations such as slurry stores and middens, as well as to land spreading operations. When spreading, use low trajectory equipment. A 'good neighbour' policy should be adopted at all times.

4.101 Spreading of livestock slurry and manures should not be carried out:

- 1 close to domestic or public buildings;
- 1 at weekends or public holidays;
- 1 when the wind direction is towards public/residential areas;
- 1 in areas designated for their conservation value;
- 1 during the hours of darkness, unless this is not practical;
- 1 close to public access areas, footpaths, picnic areas; or
- 1 on windy days.

4.102 Further information on air pollution is given in Section 13.

Overhead electricity lines

4.103 Never spread slurry near or under mains electricity power lines. The conductivity of liquid manure and effluent is very much higher than clean water, **and any electrical leakage down a jet of slurry from a tanker sprinkler or irrigator could prove fatal.** The direction and strength of the wind and its effect on the spreading pattern will determine the clearance required between the spreading swath and the power line. Consult the local electricity company to establish a safe distance for broadcast spreading. Slurry may be applied near or under electricity wires by methods which do not involve the slurry being ejected into the air, e.g. gravity feed, slurry injection or a similar safe technique where there is no risk of slurry contacting or coming dangerously close to electrical conductors. Care should be taken in moving transfer pipe to avoid the dangers of direct contact with overhead lines.

Matching slurry and manure production pattern to land availability

4.104 The land availability schedule is matched to the slurry and manure production schedule. An account of slurry (and/or manure) collected is compared to that which can be viably spread taking account of all crop, stock and field constraints as outlined above.

Calculate storage capacity required

4.105 Adequate storage capacity is required to cover periods of the year which are unsuitable for spreading or land area which is not immediately available due to cropping and stocking programmes.

4.106 The amounts to be spread, the provisional periods at which spreading can take place and area available for spreading need to be determined.

4.107 Storage capacity requirement is calculated on the balance of slurry being collected versus the slurry able to be applied at periods throughout the year. The minimum storage requirement equates to the maximum accumulation of slurry at any time.

4.108 The store size calculated must include allowance for all rainfall onto the store (and any areas which drain into the storage system) during the storage period.

4.109 The overall storage capacity must enable a viable handling system to be operated and satisfy the requirements of the SSAFO Regulations.

Land application systems

4.110 Popular systems for spreading slurry and effluent are shown below:

- 1 tankers;
- 1 umbilical feed systems;
- 1 irrigation; and
- 1 injection.

Tanker systems

4.111 Tanker systems must never be over-filled to avoid risk of spillage during filling, transit and unloading. Closure of valves should be checked after filling and emptying to prevent leakage during travel. The operator must determine and set the application rate taking full account of all the factors identified above.

4.112 The discharge system should produce a low trajectory-spreading pattern which will improve application accuracy, minimise the risk of odour nuisance and losses of ammonia to the environment. Excessive soil compaction by the tanker will be reduced by minimising the payload on each wheel and by fitting larger tyres to spread the load. Avoid spreading when the soil is wet and at risk of being compacted or rutted.

Umbilical systems

4.113 The umbilical system allows pumpable material (slurry and effluents) to be transferred without transport trafficking from the storage site to the field applicator. The system can effectively 'transport' slurry and effluent at high handling rates to a tractor mounted applicator in the field. Application rates can be controlled just as for a tanker by adjusting forward speed and pump flow rate. High handling rates do not mean high application rates. Application rates should be set as for tanker operation and can be as low as required and never higher than rates given in Table 1.

4.114 Effective systems must allow reliable control of slurry flow and transfer to the field via a pipe system which is both robust and reliable. Pipe routing and materials should be selected to reduce risk to watercourses in case of failure.

4.115 Careful planning of the operation is required in order to minimise risk as large volumes can be handled relatively quickly. A risk assessment should be carried out and full account taken of this for land application and for pipe routing from store to field.

4.116 Any water used for flushing should be treated in the same manner as the slurry and manure.

4.117 The system should be used to improve handling efficiency when field and weather conditions are appropriate. It should not be used to gain access to fields for land application when it would be otherwise unsuitable for tankers to operate.

Irrigation

4.118 Irrigation systems (including low rate irrigation systems) require regular checking to ensure automatic movement and speed of mobile irrigators is correct to avoid over-application. Application rate

must be selected taking account of field conditions and crop cover. It is difficult and/or often impractical to achieve low enough application rates with static irrigators.

4.119 The responsibility for operation of the system must be given to a competent person who must check the field for signs of over-application, e.g. ponding, run-off, etc. Mobile irrigators must shut off automatically at the end of each run. Any water used for flushing should be treated in the same manner as the slurry and manure. Operators must be aware of potential odour nuisance and take any necessary action to minimise this.

Soil injection

4.120 Injectors can be supplied by tanker or umbilical systems. Soil type and structure, stones, slope and stage of crop growth will often limit the circumstances when and where injection can be successfully carried out. Applications of injected slurry should take account of the soil conditions and N required. Avoid injection into the backfill or infill over drainage systems, the subsoil below root depth, or into very light gravel soils. Work the injector across the slope, rather than up and down.

Use of contractors

4.121 You should only employ agricultural contractors to spread slurry and manure to land if they are competent and appropriately trained, aware of legal requirements and are prepared to follow the guidance in the PEPFAA Code. Always agree beforehand what responsibilities and measures the contractor will need to take to avoid pollution and odour nuisance and provide them with all essential information specific to your site.

Waste treatment

4.122 Normally the practices described in this Section should be sufficient to prevent or at least minimise environmental pollution and waste treatment systems will not be required. On some farms however, slurry handling and storage problems may be eased by separation of the solid and liquid fractions of slurries by using mechanical separators such as screen or belt presses, vibrating screens or centrifuges. However, a waste treatment system (such as constructed reedbeds, aerobic or anaerobic digestion or mechanical separation) may be necessary to deal with specific or severe problems.

4.123 The cost of providing and operating treatment systems can be high. Before deciding if these technologies are cost effective and are a practical solution for your farm, professional and specialist technical advice should be sought and also SEPA consulted as it may require a consent or authorisation.

APPENDIX 1**TYPICAL VALUES OF UNDILUTED SLURRY OR MANURE PRODUCED BY HOUSED CATTLE, PIGS AND POULTRY PER DAY (adapted from the NVZ Guidelines)**

		Typical volume of slurry/ manure produced per day (m ³)
Cattle (per animal)	% dry matter	
Dairy cow (650 kg)	10	0.064
Dairy cow (550 kg)	10	0.053
Beef cow (500 kg)	10	0.032
Calf (100 kg)	10	0.007
Store cattle (400 kg)	10	0.026
Finishing cattle (500 kg)	10	0.032
Pigs (per animal)		
Maiden gilt (90-130 kg)		0.007
1 sow (130-225 kg) & litter		0.011
Weaner (7-18 kg)		0.001
Growers, dry meal (18-35 kg)		0.002
Light cutter, meal fed (35-85 kg)		0.004
Baconers, dry meal fed (35-105 kg)		0.004
Baconers, liquid meal fed at 4:1 (35-105 kg)		0.007
Poultry (per 1,000)		
Laying hens (2,200 kg)		0.112
Broiler places (2,200 kg)		0.045
Broiler breeders (3,400 kg)		0.167
Replacement pullets (1,600 kg)		0.021
Sheep (per animal)		
Adult ewe		0.004
Lamb (kept for 6 months)		less than 0.001

APPENDIX 2**TYPICAL AMOUNTS OF BEDDING MATERIAL USED PER ANIMAL IN LIVESTOCK HOUSING SYSTEMS**

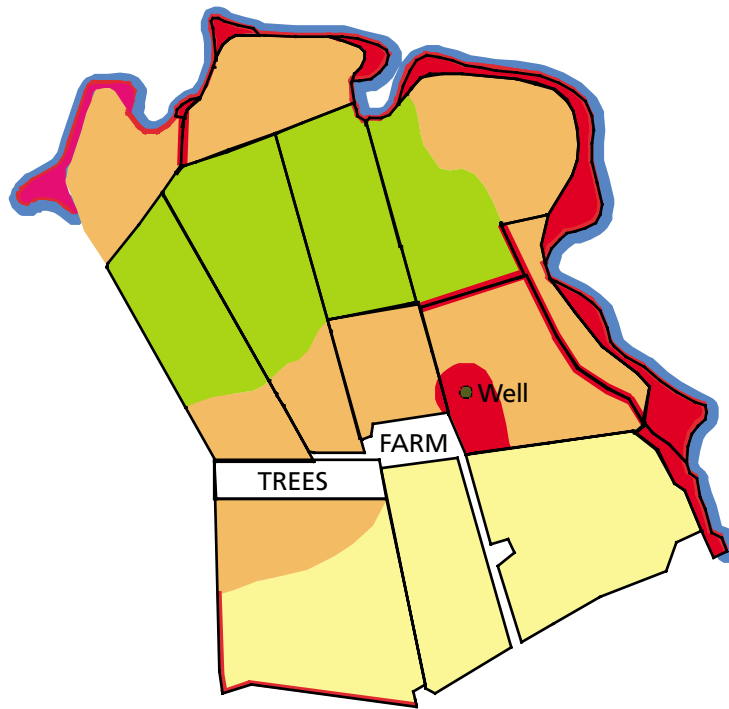
Livestock	Housing system	Litter used	Typical amount used in 180 days (kg)
Dairy cows	Cubicles	Chopped straw	120
		Sawdust, wood wastes	150
Dairy cows } Beef Cattle }	Loose housing	Straw	530
			Typical amount used per year (kg)
Pigs	Pens	Straw	102
Poultry	Deep litter	Wood shavings	1.0
		Straw chopped 38-50mm	
		Chopped straw	
Broilers	Deep litter	Chopped paper	0.5 (per bird per batch)

APPENDIX 3**QUANTITY OF CLEANING WATER USED BY LIVESTOCK (QUANTITIES IN LITRES)**

Livestock type	Cleaning system	Range per animal/day	Typical per animal/day
Dairy cows	Cleaning milking parlour equipment, washing udders etc		
	Without a power hose	14-22	18
	With a power hose	27-45	35
		Range per batch	Typical per batch
Pigs	Cleaning out pens after each batch (10 pigs per pen)	16-24	18

APPENDIX 4

Example of a Risk Assessment for Manures and Slurries (RAMS)



LAND CLASSIFICATION

- NO SPREADING (at any time)
- NO SPREADING within 10m of water (at any time)
- HIGH RISK, spreading should only take place in ideal soil and weather conditions. Access days limited.
- MODERATE RISK, particularly following heavy rainfall, care required.
- LOW RISK, year round applications may be possible, access days good.

NON-AGRICULTURAL WASTES AND OTHER IMPORTED ORGANIC WASTES

This section is primarily relevant for producers of non-agricultural waste, and contractors. It has been updated to reflect recent changes in legislation (e.g. on Animal By-Products and on Waste Management Licensing). The Scottish Executive is considering revising the 1989 Sludge (Use in Agriculture) Regulations, so that the safeguards provided by the “Safe Sludge Matrix” are given statutory force.

DOs

- 1. Comply with the Sludge (Use in Agriculture) Regulations 1989 (as amended) by:**
 - 1 Analysing sludge and soil prior to spreading.
 - 1 Avoiding applying sewage sludge to soils with a pH of less than 5.0.
 - 1 Following all mandatory stock grazing, cropping and harvesting restrictions.
- 2. Comply with the Waste Management Licensing Regulations 1994, as amended, by:**
 - 1 Proving to SEPA that land treatment activities benefit agriculture or improve ecology.
 - 1 Providing supporting information to SEPA .
 - 1 Keeping appropriate records for 2 years.
- 3. Ensure that non-agricultural waste is stored:**
 - 1 At a distance more than 10m from any inland or coastal water.
 - 1 50m from any well, borehole etc for the purpose of any water supply (except domestic water supply).
 - 1 250m from any well, borehole or other source of domestic water supply.
- 4. Treat blood, or mixtures of blood and gut contents, before spreading on agricultural land:**

DON'Ts

- 1. Don't store non-agricultural wastes unless such storage is secure and conforms to legal requirements.**
- 2. Don't permit any non-agricultural wastes to be applied without first knowing the analysis, as required by the WMLR 1994, as amended.**
- 3. Don't employ any waste contractor or company involved in spreading wastes unless you are satisfied they are competent and fully trained.**
- 4. Don't spread gut contents or mixtures of blood and gut contents from abattoirs on pastureland.**
- 5. Don't spread liquid sewage sludge and other liquid organic wastes:**
 - 1 within 10m of a watercourse or 50m of a drinking water supply;
 - 1 to steeply sloping fields, when the soil is wet or waterlogged, when there is a flooding risk or when heavy rainfall is forecast;
 - 1 when the soil has been frozen for 12 hours or longer in the preceding 24 hours or is covered in snow;
 - 1 at a rate that fails to account for the overall suitability of the land. In any case, the rate should never exceed 50m³/ha for surface spreading;
 - 1 when fields have been pipe or mole drained, or subsoiled over existing drains within the last 12 months.
 - 1 to land which has been poached or compacted.

DOs (cont.)

- 5.** Pre-notify SEPA of the start and finish dates of spreading. Annual renewal of registration required.
- 6.** Note that SEPA charge a fee to facilitate site inspections and assessment of registration notifications.
- 7.** Note that SEPA can refuse to register/remove from the register an exemption under certain circumstances, provided reasons are given.
- 8.** Keep records of any operations carried out on farm for period of two years (and make them available to SEPA).
- 9.** Assess the risk of pollution and land suitability for the application of non-agricultural wastes to land.
- 10.** Prevent direct and indirect entry of the waste into drains, especially with soil injection into fields with gravel backfilled drains.
- 11.** Ensure that wastes stored while waiting to be applied to land, and wastes being applied to land, do not cause a nuisance (e.g. obnoxious smells).
- 12.** Check with the Safe Sludge Matrix (an agreement between the UK water industry and the British Retail Consortium on sludge use), your farm quality assurance schemes and your produce buyer before using non-agricultural wastes. Use of such material may have commercial consequences for acceptability of produce to retailers and processors.
- 13.** Follow the guidance that exists in the Code of Practice for Agricultural Use of Sewage Sludge and the Code of Practice for the Management of Agricultural and Horticultural Waste.
- 14.** Account for non-agricultural waste when implementing a Manure Management Plan (Farm Waste Management Plan) and check on how safely the waste can be used in your farm system.

DON'Ts (cont.)

- 6.** Don't apply wastes at nutrient application rates greater than crop rotation requirements.
- 7.** Don't apply raw or untreated sewage sludge on land for food production.
- 8.** Don't encourage the spreading of non-agricultural wastes on your land outwith daylight hours.
- 9.** Don't apply imported wastes to any statutory conservation sites (e.g. SSSIs or NNRs) or other areas with a conservation, archaeological or historic value without prior notification to Scottish Natural Heritage (SNH).

DOs (cont.)

- 15.** Establish and agree what responsibilities and measures the waste provider or contractor will need to take to avoid pollution and odour nuisance.
- 16.** Leave an untreated strip a minimum of 10m wide beside all watercourses and at least 50m from any spring, well or borehole.
- 17.** Avoid the risk of surface run-off. Consider contour injection where there is a risk of injected wastes running out of the injection slots on sloping land.
- 18.** Prepare and implement a nutrient plan for the land treated and reduce inorganic fertiliser use by allowing for the available nutrients in the waste.
- 19.** Seek professional advice if in doubt about how to manage imported wastes on your farm.
- 20.** Spread non-agricultural wastes only when field and weather conditions are suitable, to prevent soil and water pollution.

Introduction

5.1 The main non-agricultural organic wastes applied to agricultural land arise from sewage treatment, paper mills, compost producers, creameries, distilleries and food processors. Although many of these wastes potentially have valuable fertilising and soil conditioning properties, their application under unsuitable conditions or at inappropriate rates can give rise to pollution and contamination of soil, water or air.

5.2 This section recommends management practices for waste producers, contractors and farmers so as to avoid or minimise the risk of pollution, while enabling sustainable agricultural practices to continue. **Application to agricultural land should be carried out as a method of beneficially recycling nutrients to the soil and not as a cheap method of waste disposal.** Several serious pollution incidents occur

each year due to inadequate precautions being taken when spreading non-agricultural waste to land. **Contractors carrying out spreading activities on farm should be suitably trained, qualified and competent to carry out the operation for which they are employed. Farmers and contractors should be aware of legal requirements and willing to follow the guidance in this Code.**

5.3 All applications of imported wastes spread on farmland should be included in the calculations within the Manure Management Plan (Farm Waste Management Plan). This is mandatory for Fertiliser and Manure Plans in Nitrate Vulnerable Zones (NVZs).

What legislation must be complied with?

5.4 There are several pieces of legislation relating to the spreading of non-

agricultural waste on land, and any resulting discharge to surface water and groundwater. These are reviewed later in this section. The Waste Management Licensing Regulations (WMLR) 1994 (as amended) allow certain non-agricultural wastes to be applied to agricultural land. The operations do not need a waste management licence, but are controlled under exemptions registered with SEPA. Waste spreading operations must be carried out in a way that does not endanger human health or harm the environment. The non-agricultural wastes to which this exemption from licensing applies are given in Appendix 4. The WMLR include requirements for record keeping, risk assessment, a certificate from a technically competent person describing the agricultural benefit or ecological improvement expected, and waste analysis in relation to application for registration of an exemption. Any non-agricultural wastes not listed in Appendix 4 would require a waste management licence in respect of spreading to land.

Maximum application rates

5.5 The exemption from licensing depends upon not more than 250 tonnes/ha/yr of any of the specified wastes being spread in any 12-month period. Where more than one type is applied, the quantities must be combined within this tonnage limit. In the case of dredgings from inland waters only, a higher limit of 5,000 tonnes/ha/yr applies. These limits are maximum ceilings. **On most land, and for most wastes, the annual application rates will need to be considerably lower than this.** The exemption only applies where the spreading or associated storage of the waste results in a benefit to agriculture or ecological improvement.

Pre-notification requirements and transport of wastes

5.6 Only registered waste carriers can transport the waste to agricultural land. The contractor or farmer must provide full details to SEPA before spreading can take place. Transporters of non-agricultural waste must be registered with SEPA as a registered waste carrier. Farmers are, however, able to transport their own wastes without registration.

5.7 Forms to register exemptions and guidance are available from local SEPA offices.

Storage

5.8 The exemption from licensing has been extended to include the temporary storage of not more than 1250 tonnes of non-agricultural wastes on the farm where they are to be spread. All storage must be on land intended to be used for spreading. Waste should be stored in a secure container or lagoon on the farm where it is to be spread. Stores should not be filled to more than 90% capacity. They should not be sited within 10m of any inland or coastal waters, or within 50m of a well or borehole that supplies water for non-domestic use, or 250m from any well, borehole or other source used for a domestic water supply. The site should be fenced to exclude livestock and should be located a suitable distance away from houses. It is a statutory requirement under the WMLR that wastes stored while waiting to be applied to land (and waste being applied to land) do not cause a nuisance such as obnoxious smells.

Vegetable wastes

5.9 There is a risk of introducing pests and diseases, such as potato brown rot, potato ring rot and potato cyst nematode, through the spreading of waste derived from imported agricultural or horticultural produce to arable land. The Plant Health (Great Britain) Order 1993 and The Potatoes Originating in Egypt (Scotland)

Regulations 2001 include statutory controls on waste from certain imported products which may pose a risk to domestic plant health. Guidance on methods to minimise plant health risks by the management of waste from the commercial handling of certain types of plant produce is provided in the Code of Practice for the Management of Agricultural and Horticultural Waste.

Animal processing wastes

5.10 Under the TSE (Scotland) Regulations 2002, it is an offence for any protein derived from specified risk material to be moved without a licence. These regulations also ban the use of fertilisers containing mammalian meat and bone meal. The Animal By-Products (Scotland) Regulations 2003 prohibit livestock from gaining access to unprocessed waste food which contains or has been in contact with animal by-products (including blood). The Regulations also prohibit the land-spreading of unprocessed abattoir waste, including blood.

Sewage sludge

5.11 Use of sewage sludge on farmland is controlled by the Sludge (Use in Agriculture) Regulations 1989 (as amended), also known as “The Sludge Regulations”, which control the build-up of Potentially Toxic Elements (PTEs) in soil and restrict the planting, grazing and harvesting of certain crops following the application of sludge. The statutory controls on the application of sewage sludge to agricultural land must be complied with in order to be eligible for the Single Farm Payment. Sludge producers (in Scotland this generally means Scottish Water or their contractors) are required to analyse field soils and sludges prior to application and to maintain detailed records of applications of all sludge to farmland. Further guidance and requirements are given in the UK-wide Code of Practice for Agricultural Use of

Sewage Sludge (amended 1996 and due to be amended again soon) and also in “The Safe Sludge Matrix 2001” (an agreement between the UK water industry and the British Retail Consortium on sludge use). Further information is given in Appendix 3 to this section.

5.12 Responsibility rests with the producer for compliance with The Sludge Regulations in regard to the analytical testing of the sludge. Farmers should not allow spreading without this having been done.

5.13 In addition, the UK Code of Practice recommends limits for molybdenum, selenium, arsenic, and fluoride. These limits have been set to take into account possible toxic effects on plants and animals and toxicity to the food chain and on soil processes. The UK Code of Practice also provides recommendations for the maximum concentration of contaminants in soils under grass which should be sampled to a depth of 7.5cm.

Composting

5.14 The WML Amendment Regulations 2004 detail the types and quantities of wastes that can be composted on farm under an exemption. It is possible to chip, shred and compost a wide range of biodegradable materials, providing that the total quantity of waste stored and treated (including maturation) does not exceed 400 tonnes. The storage of raw materials is permitted at a site where the composting does not take place, but this must not exceed 10 tonnes at any time and storage is limited to a maximum of 48 hours.

Water pollution

5.15 Farmers and contractors who neglect their duty to prevent pollution of waters (e.g. as a result of run-off) may be liable to enforcement action.

General

5.16 Establish and agree what responsibilities and measures the waste provider or contractor will need to take to avoid pollution, odour and other statutory nuisances. Regulations made under the Environmental Protection Act 1990 confer a Duty of Care upon producers, carriers and disposers of waste to ensure that:

- 1 waste is not kept, treated or disposed of illegally;
- 1 an adequate written description of waste accompanies the transfer of waste;
- 1 the waste is held securely and does not escape; and.
- 1 the waste is only passed to persons authorised to receive it.

If you are unclear about any of the requirements, contact your local SEPA office.

DETERMINING THE SUITABILITY OF WASTES FOR LAND APPLICATION

Manure Management Plan (also known as a Farm Waste Management Plan)

5.17 Every livestock farm should draw up a Manure Management Plan (also known as a Farm Waste Management Plan) to establish the quantities of animal manures produced and the available nutrient content. This should be used to demonstrate that the application of inorganic fertilisers, livestock manures and slurries and non-agricultural wastes matches the nutrient requirements of the rotation and crops being grown. Before agreeing to accept non-agriculturally derived organic wastes, a farmer must carefully assess whether these additional nutrient inputs can be utilised effectively to give a “benefit to agriculture or ecological improvement” without causing a pollution threat.

5.18 All applications of waste materials to soils should be in quantities and at frequencies which convey positive benefits without causing pollution. Factors to take into consideration are the type and category of wastes, land and crop. Properly qualified advice should be sought on what application rate is appropriate for each waste material, each soil and each site. The WMLR Amendments 2003 now specifically require submission of a certificate describing how the treatment will result in benefit to agriculture or ecological improvement prepared by or based on advice from a person with appropriate technical or professional expertise. The WMLR 2004 restricts to 50 hectares the area of land on a farm that can be treated by non-agricultural wastes (excluding sewage sludges) under a single exemption.

Fertilising

5.19 Those farming within an NVZ should be aware that non-agricultural waste used as an organic material will contribute to the overall N from organic sources applied to the land. There are mandatory measures in NVZs to control the application of nitrogen, which must be followed by all farmers as a Cross Compliance requirement. Wastes which contain significant quantities of nutrients may have valuable fertilising properties. The rate and timing of application of waste must be matched to the nutrient requirements of the crop. If this is exceeded then the operation will be classed as waste disposal rather than fertilisation. To be of fertiliser value, at least part of the nutrient content should be available or become available for plant uptake within 3 years. Some non-agricultural wastes contain other important nutrients (e.g. sulphur and magnesium) or a range of trace elements. If however a trace element deficiency has been diagnosed, it is important to apply a specific treatment because the trace element content of most non-agricultural wastes is generally insufficient to correct a deficiency.

5.20 The Fertiliser Series Technical Notes, produced by SAC, provide detailed information on the nutrient requirements of crops and grass, as well as the fertilising value of different types of manures and slurries and inorganic fertilisers.

5.21 Chemical analyses of the waste usually measure the total quantities of nutrients. However, the effectiveness or availability of these nutrients for crop uptake must be assessed before the fertiliser value of the imported waste can be calculated. Certain wastes with a high C: N ratio may not initially release any of its nitrogen for plant uptake as a result of a temporary locking-up of plant available N (immobilisation).

Liming value and pH

5.22 Wastes such as lime sludge can have a high liming (neutralising) value which makes the waste a useful liming material for acid soils. Care must be taken however to avoid raising the soil pH too high through excessive applications as this may lock-up some trace elements. The Regulations prohibit the spreading of sewage sludge on soils with a pH less than 5.0.

Soil conditioning

5.23 Certain non-agricultural wastes can act as a soil conditioner and may also add useful amounts of organic matter to the soil which may improve soil structure and increase the water holding capacity. However such improvements to soil conditions will only be significant if regular and well managed dressings of bulky and highly organic wastes are made to a low organic matter soil. Cross Compliance/GAEC requires that soil organic matter levels are maintained through appropriate practices, including optimising the use of organic manures by basing rates of application on soil and crop needs.

HAZARDS

5.24 The amount of PTEs, organic contaminants and pathogens, and environmental risks of any particular waste type can vary greatly from one waste producer to another. There can also be great variability in the analysis on a monthly basis for any particular waste producer. Farmers should seek up-to-date and representative analysis from the waste producer (or waste contractor) and seek agronomic and environmental advice. It is important that accurate records of the type of waste and rate of application are kept for each field.

5.25 Check with “The Safe Sludge Matrix”, your farm quality assurance schemes and your produce buyer before using non-agricultural wastes, as there may be commercial consequences in acceptability.

Potentially Toxic Elements (PTEs)

5.26 Certain wastes such as those from sewage works, distilleries, textile plants and paper mills can have high levels of metals and must be used with caution. It is strongly recommended that application of non-agricultural wastes should be made at a rate which does not exceed the levels specified for heavy metal loadings as given in The Sludge Regulations (see Appendix 1 to this Section). Particular care should be taken with dredgings from urban rivers, as these may contain high levels of toxic metals, oils and other PTE's.

Pathogens

5.27 Some non-agricultural wastes can contain high levels of pathogens and it is essential that this be assessed before application. It is recommended that these wastes are not used on farmland unless it can be clearly demonstrated that there is minimal risk of pathogen transmission. The WMLR 2003 and the Animal By-Products (Scotland) Regulations 2003 require that blood or a mixture of blood and gut contents be treated in accordance with the

EC Animal By-Products Regulation 1774/2002 before spreading to agricultural land.

Organic contaminants

5.28 Wastes from some industrial processes may contain significant quantities of other potentially toxic organic substances, antibiotics or residual pesticides and must not be applied to agricultural land. It is, therefore, essential that full details of the source of the waste is assessed and a comprehensive analysis is carried out to determine if application to land is safe.

Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD)

5.29 Wastes with a high BOD or COD will be highly polluting if allowed to enter a watercourse by seepage or run-off. Application of such wastes can also result in a temporary soil oxygen depletion leading to poor plant growth. The WMLR 2003 require details of waste BOD and COD before a land treatment exemption can be registered.

Acidity and salinity

5.30 The application of wastes which have a high level of salinity or acidity can result in damage to soils and crops as well as causing water pollution.

RECOMMENDED APPLICATION CRITERIA

5.31 There are a number of factors to be taken into consideration before, during and after the application of any non-agricultural wastes.

Assess land suitability

5.32 The land suitability for the application of non-agricultural wastes follows the same criteria as for farmyard manures and slurries. These are determined by field factors and proximity to watercourses, soil type and weather conditions. Discourage the spreading of non-agricultural wastes on farmland outwith daylight hours. You will be helping to protect the environment by ensuring better supervision and control of field operations if you adopt this policy and any off-site impacts such as pollution of local watercourses will not go unnoticed.

Assess the soil capability/fertility

5.33 Having identified suitable sites for application of non-agricultural wastes, the next step is to obtain an analysis to determine the current status of the soil in terms of pH, nitrogen, phosphorus, potassium, magnesium and PTE content. PTEs may include copper, zinc, cadmium, chromium, lead, mercury, nickel and any others appropriate to the source of the waste. The nutrient requirement of the growing crop should then be calculated taking into account the soil nutrient status and nutrient residues from previous cropping and manurial practice.

5.34 The WMLR 2003 restrict the total nitrogen applications from wastes to 250kg/hectare in any 12-month period.

Analyse the waste

5.35 The waste should be first analysed for nitrogen, ammonium-nitrogen, phosphorus and potassium, BOD, COD, pH, dry solids and salinity. The waste may also require (under the WMLR 2003)

analysis of PTEs, oils and fats, prescribed substances, C:N ratios, pathogens and neutralising value (analysis depending on waste type and possible hazards). A bioassay (a controlled plant growth experiment) or similar trial should ideally be obtained from the contractor to determine the effects of the waste on plant growth. If these tests are shown to be satisfactory, land application can be considered.

Assess the application rate

5.36 Using the waste analysis, the application rate can be calculated to match the nutrient requirements of the crop and/or the maximum acceptable application of PTEs (whichever is lower).

5.37 In all cases, application rates should not exceed the nutrient requirements of the crop or rotation. Surface applications of liquid wastes should not exceed 50 m³/ha at any single dressing. Solid wastes or injected wastes may be applied at higher rates provided there is no risk of pollution and crop nutrient requirements are not exceeded (whichever is lowest).

5.38 There are other mandatory requirements if the holding is in an NVZ. See Section 6 for further details.

Assess the application method

5.39 Some soil types are suitable for injection of non-farm liquid wastes. Injection of liquid non-farm wastes directly into soil not only eliminates smell and unsightliness of surface application but also prevents surface run-off, crop taint and transfer of pathogens in pasture. In addition, soil injection loosens the soil, reduces losses of ammonia and allows application to land near housing. Use of an umbilical system and low ground pressure tyres will reduce wheelslip and soil compaction during injection. When soil conditions are suitable and the operation is correctly carried out, soil injection is a very

suitable technique for liquid waste application. **However, great care is required where field drainage has been installed, especially if it has gravel backfill, since wastes may run through into the drains themselves or the drains may become damaged by equipment. The WMLR Amendments 2003 require that a risk assessment of pollution be carried out and submitted to SEPA before an exemption can be registered by SEPA. Such a risk assessment would need to consider the effects of field drains on pollution.** Injection into recently drained, moled or subsoiled soils can result in water pollution as liquid waste moves rapidly from soil cracks into field drains and into watercourses.

5.40 Poorly managed injection can result in several other problems. Anaerobic conditions can form in the injection cavity if too high a sludge rate is applied, particularly if the soil becomes waterlogged. Injection into sloping fields can result in seepage of liquid waste from the injection cavity onto the surface at the base of the slope. Variable yields in crops can be caused by non-uniform distribution of wastes.

5.41 When grassland is very dry, injection can cause excessive surface disturbance and crop root damage leading to dieback. Rolling as soon as the land is trafficable will help minimise the problem and will settle any residual soil uplift. If the injection of untreated organic wastes is not carried out correctly, the normal three-week interval before animals are allowed to graze will need to be substantially increased to protect their health.

5.42 Adequate precautions must be taken during spreading to protect the health and safety of the operator.

Post-application measures

5.43 Care is always required to ensure that spreading does not result in ponding, run-off or seepage into field drainage systems. Watercourses which could be reached by waste run-off should be inspected at least daily following spreading and, if pollution is found, SEPA should be notified and immediate action taken to terminate the discharge. After the application of any non-agricultural waste, the planting, grazing and harvesting requirements given in The Sludge Regulations should be followed to minimise any pathogen risks.

SEWAGE SLUDGE

5.44 To minimise the risk to human and animal health and damage to plants, sludge applications should be co-ordinated with planting, grazing and harvesting operations. Constraints which must be taken into account are set out in Appendices 1 and 2 to this Section.

5.45 The Safe Sludge Matrix should also be followed (see Appendix 3). The Matrix does not allow raw or untreated sewage sludge to be used on agricultural land for food production. Undigested sludge or septic tank sludge should therefore not be used on land used for food crops.

ANIMAL PROCESSING WASTES

5.46 The WMLR 2003 and the Animal By-Products (Scotland) Regulations 2003 now require that blood, and blood and gut contents from abattoirs under WMLR 2003, be treated prior to land application to minimise pathogen content and also to reduce pollution risks. The treatment processes should be designed to ensure that at least 99% of pathogens have been destroyed.

5.47 Blood or blood and gut contents when mixed have an extremely high BOD, and will be highly polluting if they should inadvertently enter a watercourse by seepage or run-off, and could result in a

temporary soil oxygen depletion leading to poor plant growth. Treated blood should be soil injected at rates not exceeding the nitrogen requirement of the crop. To keep within the mandatory limit of 250 kg/ha per annum of attributable nitrogen to land from the use of the waste, the annual application should not exceed 14m³/ha of undiluted(treated) blood. Great care is always required to ensure that spreading does not result in ponding, run-off or seepage into field drainage systems. Do not inject treated blood and gut contents when the soil is wet or waterlogged or when heavy rain is forecast. Applications should be carried out in accordance with the principles set out in Section 4.

5.48 The following precautions should be undertaken when spreading:

- 1 the material should be injected, not surface applied;
- 1 do not apply treated blood and gut contents to grassland;
- 1 never apply treated blood and gut contents to fields which grow ground crops for human consumption or crops which may be eaten raw by humans and animals.

Appendix 1

Sludge (Use in Agriculture) Regulations 1989, as amended: **Maximum permissible concentrations of potentially toxic elements (PTEs) in soil (0-25 cm)¹ after application of sewage sludge waste and maximum annual rates of addition**

Potentially Toxic Element (PTE)	Maximum permissible concentration of PTE in soil (mg/kg dry solids)				Maximum permissible average annual rate of PTE addition over a 10 year period (kg/ha)
	pH ³ 5.0-5.5	pH 5.5-6.0	pH 6.0-7.0	pH >7.0	
Zinc (Zn)	200*	250*	300*	450*	15
Copper (Cu)	80 (130)	100 (70)	135 (225)	200	7.5
Nickel (Ni)	50 (80)	60 (100)	75 (125)	100	3
	for pH 5.0 and above				
Cadmium (Cd)	3				0.15
Lead (Pb)	300				15
Mercury (Hg)	1 (1.5)				0.1
Chromium ² (Cr)	400 (600)				15
Molybdenum ² (Mo)	4				0.2
Selenium ² (Se)	3 (5)				0.15
Arsenic ² (As)	50				0.7
Fluoride ² (F)	500				20

Footnotes

1. The maximum permissible concentration for grassland soils sampled to a depth of 7.5cm is the same except where given in brackets.
 2. These are recommended, not regulatory limits.
 3. Application of sludge to soils with a pH less than 5.0 is prohibited.
- * The UK Code of Practice for Agricultural Use of Sewage Sludge (amended 1996) set precautionary limits of 200 mg/kg for Zn (300 mg/kg pH>7.0) and this has been accepted by the water industry and is recommended.

Appendix 2

Sludge (Use in Agriculture) Regulations: **acceptable uses of treated sludge in agriculture and horticulture (see also the Safe Sludge Matrix)**

When applied to growing crops	When applied before planting crops
Cereals, oilseed rape Grass ¹ Turf ² Fruit trees ³	Cereals, grass, fodder, sugar beet, oilseed rape, etc. Fruit trees Soft fruit ³ Vegetables ⁴ Potatoes ^{4,5} Nursery stock ⁶

¹ No grazing or harvesting within 3 weeks of application.

² Not to be applied within 3 months before harvest.

³ Not to be applied within 10 months before harvest.

⁴ Not to be applied within 10 months before harvest if crops are normally in direct contact with soil and may be eaten raw.

⁵ Not to be applied to land used, or to be used, for a cropping rotation that includes seed potatoes or seed potatoes for export.

⁶ Not to be applied to land used or to be used for a cropping rotation that includes basic nursery stock or nursery stock (including bulbs) for export.

Appendix 3

Safe Sludge Matrix

1. CROP GROUP	UNTREATED SLUDGES	CONVENTIONALLY TREATED SLUDGES	ENHANCED TREATED SLUDGES
FRUIT	8	8	4
SALADS	8	8 (30 month harvest interval applies)	4
VEGETABLES	8	8 (12 month harvest interval applies)	4
HORTICULTURE	8	8	4
COMBINABLE & ANIMAL FEED CROPS	8	4	4
– GRAZED	8	8	4
GRASS & FORAGE		(Deep injected or ploughed down only)	
– HARVESTED	8	4	4
		(No grazing in season of application)	

4 All applications must comply with “The Sludge Regulations” and UK Code of Practice for Agricultural Use of Sewage Sludge (to be revised).

8 Applications not allowed (except where stated conditions apply)

NOTE:

1 Conventionally treated sludge has been subjected to defined treatment processes and standards which ensure that at least 99% of pathogens have been destroyed.

1 Enhanced treated sludge will be free from *Salmonella* and will have been treated so as to ensure that 99.9999% of pathogens have been destroyed (a 6 log reduction).

Appendix 4

Waste which can be used for agriculture where such treatment results in benefit to agriculture or ecological improvement **in compliance with the Waste Management Licensing Regulations 1994 (as amended):-**

Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing

- Plant tissue waste
- Straw, wood or paper-based bedding waste, slurry or dirty water from stables, zoos, animal parks or livestock markets, animal faeces, urine and manure.

Wastes from sugar processing

- Soil from cleaning and washing beet

Wastes from wood processing and the production of panels and furniture

- Waste bark and cork
- Sawdust shavings, cuttings, wood, particle board.

Wastes from pulp, paper and cardboard production and processing

- Waste bark and wood, including virgin pulp.
- Lime mud waste
- Sludges from on-site effluent treatment plants treating only virgin paper wastes which contain no inks.
- De-inked paper sludge from paper recycling, paper crumble derived from virgin pulp which contains no inks.

Soil (including excavated soil from contaminated sites), stones and dredging spoil

- Soil and stones.
- Dredging spoil

Wastes from aerobic treatment of solid wastes

- Off-specification compost consisting only of biodegradable waste

Garden and park wastes(including cemetery wastes)

- Biodegradable waste
- Soils and stones

Wastes from the preparation and processing of meat, fish and other foods of animal origin

- Materials unsuitable for consumption or processing consisting of blood and gut contents from abattoirs or poultry preparation plants only if treated in accordance with EC Regulation No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules concerning animal by-products not intended for human consumption.
- Wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation
- Wastes from sugar processing
- Wastes from production of dairy products
- Wastes from the baking and confectionery industry
- Wastes from the production of alcoholic and non-alcoholic beverages(except coffee, tea and cocoa).

Wastes from the leather and fur industry

- Sludges, in particular from on-site effluent treatment free of chromium

Wastes from the textile industry

- Organic matter from natural products (for example, grease, wax)
- Wastes from finishing other than those containing organic solvents
- Sludges from on-site effluent treatment
- Wastes from unprocessed textile fibres
- Wastes from processed textile fibres

Wastes from power stations and other combustion plants (except wastes from management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use)

- Gypsum

Wastes from manufacture of cement, lime and plaster and articles and products made from them

- Gypsum

Wastes from anaerobic treatment of waste

- Liquor from anaerobic treatment of municipal waste
- Digestate from anaerobic treatment of municipal waste
- Liquor from anaerobic treatment of animal and vegetable waste
- Digestate from anaerobic treatment of animal and vegetable waste

NITROGEN AND PHOSPHORUS

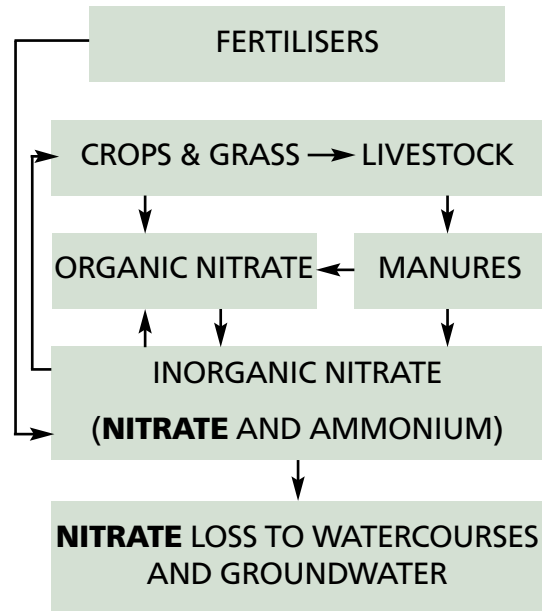
Introduction

6.1 This section of the Code covers the steps which can be taken to reduce the risk of nitrate leaching, and is recommended to be followed by all farmers. **The steps described in paragraphs 6A.1 to 6A.26 are mandatory for farmers in Nitrate Vulnerable Zones (“NVZs”).** The rest of this section relates to **all** farmers.

6.2 Agricultural advisers are particularly requested to familiarise themselves with the Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2003 (“the NVZ Action Programme Regulations”) Farmers in NVZs must read, and use, the Scottish Executive’s “Guidelines for farmers in nitrate vulnerable zones”.

What is nitrate?

6.3 Nitrate occurs naturally in soil and is an essential plant nutrient. Sources of organic and inorganic nitrogen are used in agriculture to improve soil fertility and promote crop growth. Chemical fertilisers (containing nitrogen) usually contain nitrogen in the form of ammonium and nitrate. Nitrate is very soluble and is therefore at risk of being washed into watercourses and groundwater by leaching from the soil, especially in late autumn and early winter when soil may be bare or there is little crop uptake. Subsequent rainfall readily washes nitrate from the soil profile. The main sources and losses of nitrate to water are shown in the diagram:



6.4 See the appendix to this section for a detailed nitrogen cycle diagram which also includes nitrogen losses to air.

6.5 The terms used in this section for slurry, livestock manure, nitrogen fertiliser, chemical fertiliser, organic manures, crop requirement, autumn sown crop and fertiliser and manure plan are as defined in the NVZ Action Programme Regulations.

6.6 There is a high risk of water pollution from nitrate losses if livestock manures and slurries with a high proportion of their nitrogen content in soluble form (e.g. slurry and poultry manures) are applied when crop uptake is low or non-existent (i.e. in the autumn or winter period).

6.7 Typical leaching losses of available nitrogen from a slurry application are:

Time of application	Typical losses of available nitrogen (%)
Autumn	90%
Early Winter	60%
Late Winter	30%
Spring and Summer	0%

6.8 Nitrate leaching from application of farmyard manure is far lower, as most of its nitrogen is in organic rather than an immediately soluble form. This makes the timing of the spreading operation less critical.

What is phosphorus?

6.9 Phosphorus is an essential plant nutrient that occurs naturally in soils either as inorganic phosphate or as part of the organic matter. Phosphorus fertilisers, manures and slurries supply phosphate to improve soil fertility and to maintain plant growth. Once added to soils, phosphate is normally strongly bound to soil particles and has a very low solubility. Drainage water percolating through soils therefore normally contains very low concentrations of phosphate, except when soil phosphate levels are excessively high. Phosphate can also be lost from farmland if soil erosion occurs or due to surface run-off following the application of manures and slurries.

Why are nitrogen and phosphorus important?

6.10 Agricultural land is the main source of nitrate in many rivers and groundwaters. Nitrate concentration in rivers and groundwaters has been increasing in recent decades in many areas of Scotland. This is a cause for concern for two main reasons. Firstly, because of possible risks to human health posed by high levels of nitrate in drinking water. Secondly, elevated levels of nitrate and phosphorus

are considered to be significant contributors to eutrophication. (“Eutrophication” is the enrichment of water by nitrogen compounds, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water.)

Nitrate Vulnerable Zones

6.11 You can check whether your farm is in an NVZ from the maps in the Scottish Executive’s “Guidelines for farmers in NVZs”, copies of which have been distributed. Alternatively, enquire at your local SEERAD office. If you do have land within an NVZ, you should follow the aforementioned “Guidelines”. Further copies of that guidance, in paper or CD-ROM format, are available free of charge from the Water Environment Division, Scottish Executive, Victoria Quay, Edinburgh EH66 QQ.

Section 6A: FARMERS IN NITRATE VULNERABLE ZONES (“NVZs”)

[Note: more details are given in the Scottish Executive’s “Guidelines for farmers in NVZs”]

DOs	DON'Ts
<p>A1. Comply with the statutory requirements of the NVZ Action Programme Regulations if you are farming within an NVZ.</p> <ul style="list-style-type: none"> 1 Prepare and implement a fertiliser and manure plan. 1 Ensure that adequate records are kept for land within NVZs relating to livestock numbers, use of inorganic fertiliser and use of organic manures. <p>A2. Ensure that minimum storage requirements for livestock manure are provided for the purposes of the NVZ Action Programme Regulations, taking account of the need to comply with the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003.</p> <ul style="list-style-type: none"> 1 Locate any field midden at least 10m away from any clean surface water or field drain or watercourse and at least 50m from any spring, well or borehole. <p>A3. Take account of ‘local environmental factors’ before applying nitrogen fertilisers. These include:</p> <ul style="list-style-type: none"> 1 Soil conditions, type and slope. 1 Climatic conditions, rainfall and irrigation. 1 Land use and agricultural practice, including crop rotation systems. <p>A4. Apply nitrogen fertilisers in as accurate and uniform a manner as possible.</p>	<p>A1. Don’t apply chemical fertiliser (containing nitrogen) within closed periods in the NVZ Action Programme Regulations unless there is a specific crop requirement (as referred to in the SE’s “Guidelines for farmers in NVZs”)</p> <p>A2. Don’t apply chemical fertiliser (containing nitrogen) in a location or manner which makes it likely that the fertiliser will directly enter a watercourse.</p> <p>A3. Don’t apply organic manure where the application would result in the total nitrogen (in kilograms) contained in organic manure applied per year to the land – including that deposited by animals – exceeding permitted rates in the NVZ Action Programme Regulations.</p> <p>A4. Don’t apply slurry, poultry manures or liquid digested sewage sludge to sandy or shallow soils within closed periods in the NVZ Action Programme Regulations.</p> <p>A5. Don’t apply nitrogen fertilisers in excess of crop requirements, or to any land if the soil is waterlogged.</p> <p>A6. Don’t apply nitrogen fertilisers if the land is flooded, or if the soil has been frozen for 12 hours or longer in the preceding 24 hours.</p> <p>A7. Don’t apply nitrogen fertilisers to any land covered with snow, or to steeply sloping fields.</p> <p>A8. Don’t allow livestock to foul watercourses by having uncontrolled access. Instead, provide water at drinking troughs, if at all possible.</p> <p>A9. Don’t plough up permanent pasture, if possible.</p>

DOs (cont.)

A5. Any proposal to plough up pasture of high environmental or archaeological value, e.g. species-rich grassland, machair habitats, pastoral woodland and heather moorland, will require the consent of the relevant authority (e.g. SNH for land in SSSIs, SEERAD for land in an agri-environment agreement) or approval under the Environmental Impact Assessment (Uncultivated Land and Semi-Natural Areas) (Scotland) Regulations 2002 (SSI 2002/6). [GAEC measure 12]

A6. Produce and implement a farm nutrient plan.

A7. Sow winter cereals in time to establish a suitable crop cover in the autumn to winter period.

A8. Apply fertilisers only when soil conditions are suitable.

A9. Spread organic manures at least 10m away from any clean surface water, field drain or watercourse, and at least 50m from springs, wells or boreholes that supply water for human consumption or use in dairies.

A10. Apply nitrogen fertilisers only when there is a specific crop requirement.

A11. Apply phosphorus fertiliser according to soil analysis and the needs of the crop. Always allow for the nutrients supplied by any organic manures.

A12. Analyse your soil for phosphorus to ensure that excess and unnecessary levels are not building up.

DON'Ts (cont.)

A10. Don't apply P and K chemical fertilisers (i.e. those which don't contain nitrogen) in a location or manner which makes it likely that the fertiliser will directly enter a watercourse.

A11. Don't over-compact soil.

What legislation must be complied with in NVZs?

6A.1 The Private Water Supplies (Scotland) Regulations 1992 are concerned with the quality of water supplied from private supplies in Scotland for drinking, washing or cooking or for food production purposes. These Regulations establish a maximum admissible nitrate concentration in water of 50 mg/l and are implemented by the local authorities.

6A.2 The Protection of Water Against Agricultural Nitrate Pollution (Scotland) Regulations 1996 transpose into Scots law the requirements of EC Nitrates Directive (91/676/EEC). These Regulations were amended by the Designation of Nitrate Vulnerable Zones (Scotland) Regulations 2002 and place a duty on the Scottish Ministers to identify and designate “NVZs” where surface freshwaters or groundwaters exceed, or could exceed, 50 mg/litre of nitrates and where waters are, or may become, eutrophic. The Scottish Ministers designate NVZs based on advice from SEPA, who monitor for nitrate in over 250 rivers and at 220 groundwater points across Scotland.

6A.3 The Scottish Ministers also have a duty to introduce mandatory action programme measures in NVZs with the aim of reducing water pollution from agricultural nitrates. These measures were introduced by the Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2003.

6A.4 The Scottish Executive is the competent authority responsible for enforcing and checking farmer compliance with the Action Programme measures. SEERAD Agricultural Staff inspect the farms in question. Non-compliance with the measures can lead to statutory penalties.

6A.5 The action programme may be different for each NVZ or parts of NVZs

and, as such, this section only gives a broad outline of requirements. Further details are available in the individual action programme for each NVZ. Check the SE’s “Guidelines for farmers in NVZs”; if in doubt, your local SEERAD Area Office will be able to provide advice on measures which apply in your area.

6A.6 Farms at which slurry is produced are subject to the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003. Drainage from middens and high-level slatted buildings are included within the definition of slurry, whereas the solid manure itself is not. Such drainage is therefore covered by the Regulations and must be suitably collected and stored prior to land spreading. For new, substantially enlarged or substantially reconstructed slurry storage systems, the Regulations require the provision of adequate storage capacity (for the farm as a whole), taking account of the likely quantities of slurry and of the likely quantities of rainwater. SEPA may accept storage capacity of less than 6 months, but only where it can be demonstrated by a professionally prepared Farm Waste Management Plan that this will not cause harm to the environment or lead to a significant risk of pollution of controlled waters.

6A.7 It is an offence under environmental legislation to cause or knowingly permit any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters. Farmers or their contractors may be liable to prosecution if livestock slurry or manure is allowed to enter a watercourse.

MANDATORY MEASURES IN NVZs

Fertiliser and Manure Plan

6A.8 A Fertiliser and Manure Plan will help ensure that fertiliser use is cost effective

and that nitrate leaching is low. Advice on how to prepare a Fertiliser and Manure Plan is given in the Scottish Executive NVZ Guidelines (*see Annex D*). Nitrogen fertilisers should not be applied to land in excess of crop requirements, taking into account crop uptake and soil supply from soil organic matter, crop residues and organic manures. This rule requires that an assessment be made of the amount of nitrogen fertiliser required by each crop on each field each year. In doing so, full allowance should be made for the nitrogen available from soil organic matter, previous crop residues and from applications of organic manures. The land application of nitrogen fertilisers should take account of local environmental factors such as the influence of soil conditions, type and slope, climatic conditions, rainfall and irrigation and land use and agricultural practices, including crop rotation systems.

6A.9 Chemical fertilisers (containing nitrogen) must not be applied to land between:

- 1 15th September and 15th or 20th February in the case of grassland; and
- 1 1st September and 15th or 20th February in the case of other land unless there is a specific crop requirement during that time.

[The “20th February” date applies to the Moray, Aberdeenshire and Banff and Buchan NVZs. For all other NVZs, the “15th February” date applies.]

6A.10 Nitrogen applied during this closed period is not generally required by crops and, if applied, is poorly utilised and at greater risk of leaching. Avoiding application of chemical fertiliser (containing nitrogen) during this period can therefore save costs.

6A.11 Nitrogen fertilisers should be applied to land in as accurate and uniform

a manner as is practically possible, at the right rate, and without applying it to uncropped areas, hedges and ditches. This is consistent with good agricultural practice. All spreading equipment should therefore be tested regularly for accuracy of spreading and calibrated for the application rate required.

6A.12 Nitrogen fertilisers must not be applied to any land if:

- 1 the soil is waterlogged;
- 1 the land is flooded;
- 1 the soil has been frozen for 12 hours or longer in the preceding 24 hours; or
- 1 the land is covered with snow.

6A.13 Application may be acceptable on days when early morning frost is predicted to thaw during the day, provided heavy rain is not forecast and other requirements of the NVZ Action Programme Regulations are met. Similar precautions should be taken with organic manures, especially slurries. It is important to ensure that the soil does not become compacted as a result of making such applications on frost.

6A.14 Nitrogen fertilisers should not be applied to steep slopes. The risk of run-off increases with slope. The legislation does not define a “steeply sloping field” in terms of the angle of slope, due to the complexity of landscape features and the fact that run-off is also influenced by other factors such as soil type and condition, ground cover and rainfall. In general, fields in the steeply sloping category are unlikely to be cultivated. Proximity to watercourses should also be taken into account due to the risk of causing water pollution by run-off from sloping land.

6A.15 Nitrogen fertilisers must be spread accurately on the cropped area without any direct contamination of any watercourse. Care must be taken to avoid direct contamination when spreading nitrogen

fertiliser alongside streams, ditches, lochs with running or standing water. Direct application to temporarily dry ditches and blind ditches must also be prevented. Full width spreading machines should present few problems. Spinning disc and oscillating spout machines need careful operation. If appropriate, they should be fitted with headland deflector plates.



Organic manures

6A.16 On sandy or shallow soils, slurry, poultry manures or liquid digested sewage sludge must not be applied within closed periods specified in the NVZ Action Programme Regulations. These periods are:

- 1 1st October to 1st November, where the land is in grass or is to be sown with an autumn sown crop.
- 1 1st August to 1st November in any other case.

6A.17 The capacity of storage vessels for livestock manure must exceed the capacity required to store livestock manure produced throughout the longest period during which land application of livestock manure is prohibited by closed periods in the NVZ Action Programme Regulations.

6A.18 Organic manure must not be applied to land where the application would result in the total nitrogen (in kilograms) contained in organic manure exceeding:

- 1 250 kg/ha of total nitrogen each year averaged over the area of grassland on the farm.

- 1 170 kg/ha of total nitrogen each year averaged over the area of the farm not in grass

6A.19 These limits apply to all organic manures, including that deposited by animals whilst grazing, and to all the agricultural land on the farm within the NVZ boundary. They include all other nitrogen-containing organic wastes such as sewage sludge but do not include chemical fertiliser.

6A.20 Where there is insufficient land on the farm to spread organic manures within the total nitrogen limits, either the number of livestock should be reduced or arrangements will need to be made to utilise any excess on other farmland in accordance with good agricultural practice.

6A.21 Applications of organic manure to individual fields must not exceed 250 kg/ha per year of total nitrogen, excluding any deposited by animals whilst occupying the field. This field limit applies in addition to, and in combination with, the overall farm limit. This approach allows some flexibility to adjust application rates according to crop nutrient requirements and field conditions. The area of the field used to calculate the 250 kg/ha limit should exclude any areas where manures should not be spread, such as the 10m exclusion zone from any watercourse. Remember that grazing deposition must be taken into account when calculating the farm-based limits for grassland and non-grassland areas.

6A.22 Organic manure must not be applied to any land less than 10m from a watercourse. This includes rivers and lochs and any temporarily dry ditches. To help protect the quality of groundwater, organic manures should not be applied within 50m of a spring, well or borehole that supplies water for human consumption, or which is to be used in farm dairies. This is a

minimum distance and may need to be increased in the case of boreholes depending on local conditions.

Leafy vegetable residues

6A.23 Vegetable crop residues should be incorporated into the soil when an autumn sown crop is established. Alternatively, the residues should be incorporated into the soil with a binding material such as straw or appropriate paper mill sludge before 1st October or left untouched until 1st December at the earliest.

Records

6A.24 All farms must keep adequate records relating to:

- 1 livestock numbers;
- 1 use of inorganic fertilisers; and
- 1 use of organic manures.

6A.25 Records of the amount and date of applications of chemical fertilisers (containing nitrogen), livestock manures and slurries and other organic wastes will help with future calculations of nitrogen fertiliser requirements. The Scottish Executive “Guidelines for farmers in NVZs” gives details on how to keep such records so as to meet statutory requirements. The enforcing authority for the NVZ Action Programme Regulations in Scotland is the SEERAD Agricultural Staff.

6A.26 Soil sampling should be carried out at least once every 4 to 5 years to ensure that soil pH, phosphate and potash levels are at the optimum level. This will significantly improve the targeting and use of fertilisers whilst at the same time helping to minimise the losses of nitrogen and phosphorus to rivers, lochs and groundwater.

SECTION 6B – Measures relating to ALL farmers

DOs	DON'Ts
<p>B1. Comply with the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003.</p>	<p>B1. Don't apply chemical fertiliser (containing nitrogen) in a location or manner which makes it likely that the fertiliser will directly enter a watercourse.</p>
<p>1 Locate any field midden at least 10m away from any clean surface water or field drain or watercourse and at least 50m from any spring, well or borehole.</p>	<p>B2. Don't apply nitrogen fertilisers in excess of crop requirements, or to any land if the soil is waterlogged.</p>
<p>B2. Any proposal to plough up pasture of high environmental or archaeological value, e.g. species-rich grassland, machair habitats, pastoral woodland and heather moorland, will require the consent of the relevant authority (e.g. SNH for land in SSSIs, SEERAD for land in an agri-environment agreement) or approval under the Environmental Impact Assessment (Uncultivated Land and Semi-Natural Areas) (Scotland) Regulations 2002 (SSI 2002/6). [GAEC measure 12]</p>	<p>B3. Don't apply nitrogen fertilisers if the land is flooded, or if the soil has been frozen for 12 hours or longer in the preceding 24 hours.</p>
<p>B3. Take account of 'local environmental factors' before applying nitrogen fertilisers. These include:</p> <p>1 Soil conditions, type and slope.</p> <p>1 Climatic conditions, rainfall and irrigation.</p> <p>1 Land use and agricultural practice, including crop rotation systems.</p>	<p>B4. Don't apply nitrogen fertilisers to any land covered with snow, or to steeply sloping fields.</p>
<p>B4. Apply nitrogen fertilisers in as accurate and uniform a manner as possible.</p>	<p>B5. Don't allow livestock to foul watercourses by having uncontrolled access. Instead, provide water at drinking troughs, wherever possible.</p>
<p>B5. Produce and implement a farm nutrient plan.</p>	<p>B6. Don't apply P and K chemical fertilisers (i.e. those which don't contain nitrogen) in a location or manner which makes it likely that the fertiliser will directly enter a watercourse.</p>
<p>B6. Sow winter cereals in time to establish a suitable crop cover in the autumn to winter period.</p>	<p>B7. Don't over-compact soil.</p>
<p>B7. Apply fertilisers only when soil conditions are suitable.</p>	

DOs (cont.)

B8. Spread organic manures at least 10m away from any clean surface water, field drain or watercourse, and at least 50m from springs, wells or boreholes that supply water for human consumption or use in dairies.

B9. Apply nitrogen fertilisers only when there is a specific crop requirement.

B10. Apply phosphorus fertiliser according to soil analysis and the needs of the crop. Always allow for the nutrients supplied by any organic manures.

B11. Analyse your soil for phosphorus to ensure that excess and unnecessary levels are not building up.

What legislation must be complied with?

6B.1 The Private Water Supplies (Scotland) Regulations 1992 are concerned with the quality of water supplied from private supplies in Scotland for drinking, washing or cooking or for food production purposes. These Regulations establish a maximum admissible nitrate concentration in water of 50 mg/l and are implemented by the local authorities.

6B.2 Farms at which slurry is produced are subject to the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003. Drainage from middens and high-level slatted buildings are included within the definition of slurry, whereas the solid manure itself is not. Such drainage is therefore covered by the Regulations and must be suitably collected and stored prior to land spreading. For new, substantially enlarged or substantially reconstructed slurry storage systems, the Regulations require the provision of adequate storage capacity (for the farm as a whole), taking account of the likely quantities of slurry and of the likely quantities of rainwater. SEPA may accept storage capacity of less than 6

months, but only where it can be demonstrated by a professionally prepared Farm Waste Management Plan that this will not cause harm to the environment or lead to a significant risk of pollution of controlled waters.

6B.3 It is an offence under environmental legislation to cause or knowingly permit any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters. Farmers or their contractors may be liable to prosecution if livestock slurry or manure is allowed to enter a watercourse.

VOLUNTARY MEASURES (ALL FARMERS)

Organic manures

6B.4 To help protect the quality of groundwater, organic manures should not be applied within 50 metres of a spring, well or borehole that supplies water for human consumption, or which is to be used in farm dairies. This is a minimum distance and may need to be increased in the case of boreholes depending on local conditions.

Permanent pasture

6B.5 Avoid ploughing up of permanent pastures, if possible, due to the flush of nitrate which can continue for several years after such action. If the permanent pasture is to be cropped or re-seeded, account should be taken of the nitrate release in calculating the fertiliser applications for the subsequent crop. If permanent pasture is to be re-seeded it is important to ensure that a full crop cover is established as quickly as possible, by early October at the latest.

Green cover

6B.6 Early sowing of winter cereals encourages more of the residual nitrate to be utilised by the newly established crops thereby reducing the potential for losses. Winter crops sown in late October/November will have little effect in reducing the amount of nitrate lost in the winter. A better strategy in arable areas, where growth of winter cereals is slow, is to grow spring cereals with the land remaining in stubble in winter as long as possible. This is particularly relevant to the Scottish climate and growing conditions.

6B.7 If possible, a cover or catch crop, such as Italian Ryegrass, should be sown in fields that would otherwise be bare over the autumn and winter period.

6B.8 Leave cereal stubbles, straw and non-cereal and vegetable crop residues uncultivated over the winter to minimise nitrate leaching. Run-off from rutted or compacted ground can be a particular problem for some rotations, including potatoes and vegetables. The use of buffer strips can assist in reducing the impacts of soil erosion and nutrient losses.

Grazing

6B.9 Where intensive grazing is practised, up to 90% of the nitrogen is returned to the land as excreta and urine resulting in high soil concentrations of available N.

The loss of nitrate from the grassland through leaching may therefore be high, if intensively grazed by cattle throughout the autumn.

6B.10 In order to prevent soil erosion and direct contamination of watercourses, livestock should, where possible, not have direct access to watercourses.

Chemical fertiliser (containing nitrogen)

6B.11 Chemical fertiliser (containing nitrogen) should not be applied to grassland until the spring, close to the time when the nitrogen is needed for grass growth, and only then if soil and weather conditions are suitable. Heavy rainfall immediately following application can result in most of the nitrogen fertiliser being lost through run-off. T-sums, which are usually made available in the farming press, provide a good guide to when nitrogen should be applied to grassland. The system is based on air temperature with the mean temperature from 1st January being added together (ignoring temperatures below 0°C). When the accumulated temperatures reach the sum of 200, this is considered to be the optimum time to apply nitrogen to maximise early grass yields. For arable crops, chemical fertiliser (containing nitrogen) should be applied at the start of periods of rapid crop growth and nitrogen uptake. Fertiliser applications should only be made when soil and weather conditions are suitable.

Soil conditions

6B.12 The risk of run-off and losses of nitrogen is increased in compacted soil. Physical damage to soils also reduces the rate of nitrogen uptake by the crop. This damage can to some extent be avoided by reducing the number of field operations particularly when the soil is vulnerable to damage (e.g. when wet, after frost, etc.). Low-pressure tyres can be a mixed blessing

in that they limit compaction but may encourage field access in conditions which are really not suitable.

Fertiliser storage and handling

6B.13 Fertiliser stores should be sited well away from any clean surface water drain, watercourse, spring, well or borehole. Bylaws for the protection of public water supply sources may impose specific restrictions on using or storing fertilisers within a stated distance from the source. Storage containers for liquid fertilisers should be capable of being locked, suitably constructed for the intended purpose, watertight and treated with a protective coating resistant to corrosion from the contents. Although not a legal requirement, it is recommended that these tanks are bunded.

6B.14 Handling procedures for filling stores from road tankers and for transferring liquid fertilisers to the spreader should be such that the risks of accidental spillage are minimised. Tanks should not be overfilled and allowances should be made for expansion of the contents. Operators should be aware of these procedures, of the potential pollution problems arising from spillage, and of the emergency procedures to be followed.

6B.15 Store ammonium nitrate fertiliser securely, where there is no public access (and out of view from roads etc). Ideally, store this fertiliser in a locked building, and carry out regular stock checks. Under the Notification of Installations Handling Hazardous Substances Regulations, farmers should notify the Health and Safety Executive (HSE) if they are handling, or likely to handle or store, 150 tonnes or more of ammonium nitrate fertiliser. Further information about the safe handling and storage of fertiliser is given in HSE publications.

Buffer zones

6B.16 Leave, where possible, uncultivated strips of land adjoining watercourses and other sensitive habitats (e.g. wetlands, botanically rich pastures, etc.). This area can act as a buffer between the land under cultivation and the valuable habitat. Take into account natural heritage and conservation issues.

Phosphorus

6B.17 Phosphorus can contribute to eutrophication of freshwater habitats and is a particular threat to still or slow moving freshwaters. Although treatment works provide the major input in many catchments, agricultural land can also be a significant source of phosphorus input to watercourses.

6B.18 Phosphorus from agriculture can reach watercourses in various forms and by various routes. Their relative importance will depend on the particular catchment. The main losses are:

- 1 surface run-off, particularly of recently spread animal manures;
- 1 erosion of soil particles;
- 1 particulate and dissolved phosphorus in water flowing from land drains.

6B.19 Phosphorus can also be leached to groundwater.

6B.20 You can help to minimise the risk of phosphorus from fertilisers and organic manures reaching a watercourse by following the good practice guidance for nitrate given in the preceding paragraphs of this section.

6B.21 The amount of phosphorus lost by erosion, leaching or drain flow will largely depend on the soil phosphorus level. The higher the soil phosphorus levels, the greater the potential loss. To minimise losses, you should not apply amounts of phosphorus fertiliser in excess of those recommended by an authoritative source.

Regular soil sampling and analysis and nutrient budgeting is recommended.

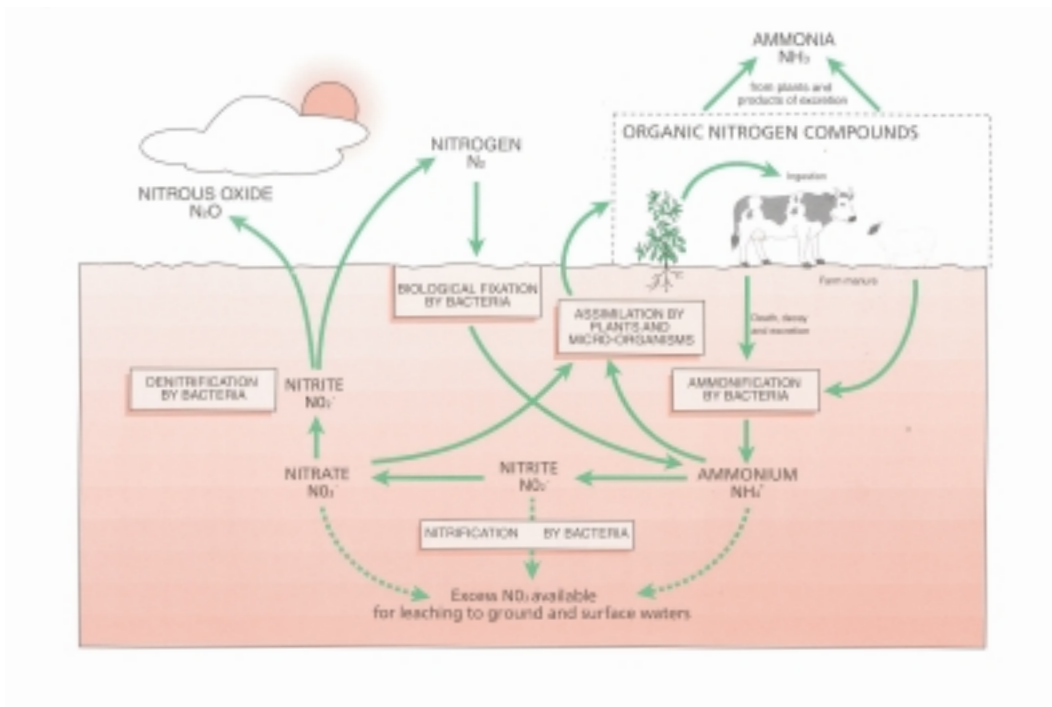
Organic farming

6B.22 While organic farming does not use inorganic fertilisers, there are still risks of nitrate leaching due to organic manure use, grazing and ploughing-in of grass and crop residues. The mandatory measures contained in the NVZ Action Programmes given in paragraphs 6A.8 to 6A.26 must be complied with for organic farming. The further guidance to reduce nitrogen and phosphorus losses given in paragraphs 6B.4 to 6B.21 is also appropriate for organic farming.

General

6B.23 “The 4 Point Plan” provides an easy-to-follow guide to minimising pollution caused by farm run-off. It guides farmers through the steps required to draw up a risk assessment for manures and slurries, promotes dirty/clean water separation, provides advice on water margin management and identifies the nutrient value of slurry and manure (to promote their use as fertilisers). Copies are available from SEERAD Area Offices.

Appendix



SILOS AND SILAGE EFFLUENT

DOs

- 1.** Comply with the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003.
 - 1 Notify SEPA at least 28 days before bringing into use any new, substantially enlarged or substantially reconstructed silo and silage effluent storage facility.
 - 1 Ensure the base of the silo, effluent tank and drains are impermeable. In addition, they, and any silo walls, should be resistant to attack from silage effluent.
 - 1 Properly maintain all parts of the silo system such that it will meet a 20-year design life.
 - 1 Ensure the minimum effluent tank capacity requirements are provided. Consult SEPA on the size of tank required.
- 2.** Ensure that effluent tanks, channels, silo floors, walls and wall floor joints are inspected annually and any necessary repairs carried out well in advance of the start of silage making.
- 3.** Try, if possible, to wilt the crop that is to be ensiled, so as to reduce effluent production to a minimum.
- 4.** Keep all effluent collection channels and drains clear of blockages.
- 5.** Check effluent tank levels on a frequent basis when effluent is being produced, and regularly throughout the year. Empty as necessary.
- 6.** Regularly check watercourses throughout the year to ensure that they are not polluted. If any signs of pollution become evident, immediate action should be taken to stop any discharge and SEPA should be contacted immediately.

DON'Ts

- 1.** Don't site a silo or any part of the effluent collection system within 10m of any inland or coastal waters.
- 2.** Don't store baled silage within 10m of any inland or coastal waters or remove the wrapping of any bales within 10m of any inland or coastal waters.
- 3.** Don't allow silage effluent to enter a watercourse as this is an offence under environmental legislation.
- 4.** Don't allow effluent tanks to overflow, or ever use a by-pass to divert run-off from a silo.
- 5.** Don't use a soakaway to dispose of silage effluent.
- 6.** Don't neglect maintenance and inspection of silos, as pollution does not have to occur for a Notice to be served by SEPA.
- 7.** Don't continue to use silage-making facilities which present a significant pollution risk.
- 8.** Don't make silage in a free-standing field heap (i.e. without an impermeable base or an effluent containment system).
- 9.** Don't allow contaminated silo run-off to escape into a watercourse. Collect it – it is very polluting.
- 10.** Don't underestimate the quantity of effluent produced from wet grass silage.
- 11.** Don't add silage effluent to slurry in confined spaces or in buildings, because this will produce lethal gases very quickly.

DOs (cont.)

7. Have a contingency plan to deal with structural failures and effluent escapes.
8. Dilute silage effluent with a minimum of one-to-one (1:1) water if spreading on grassland to avoid scorching.
9. Avoid rainwater entering effluent collection systems.
10. Remember that silage effluent can be a valuable feedstuff or fertiliser. Think of it as a potential resource.

DON'Ts (cont.)

12. Don't apply silage effluent on sites where there is a danger of direct discharge into field drains (e.g. on cracked soils or recently drained or subsoiled fields).
13. Don't apply silage effluent within 10m of a watercourse and at least 50m of a drinking water supply.
14. Don't apply silage effluent to steeply sloping fields, when the soil is wet or waterlogged, when there is a flooding risk or when heavy rainfall is forecast.
15. Don't apply more than 50m³/ha (normal rate 25-30 m³/ha or 2,200 – 2,700 gallons/acre) of diluted silage effluent to land.

Introduction

What is silage effluent?

7.1 Silage effluent is produced from any forage crop which is being made, or has been made, into silage. It is also defined as a mixture consisting wholly of or containing such effluent, rain or groundwater emanating from a silo, silage effluent collection system or drain. Silage effluent is the most common cause of agricultural pollution in Scotland as reported by SAPG. Each year, a significant number of serious pollution incidents occur through failure to contain or dispose of effluent satisfactorily. **The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 (“the SSAFO Regulations”)** set minimum standards for installations used for the storage of such substances and their associated effluents.

Why is silage effluent important?

7.2 **Silage effluent has a Biochemical Oxygen Demand (BOD) of up to 200 times that of raw sewage.** A clamp

containing 500 tonnes of unwilted silage has the same polluting potential as the daily untreated sewage from a city of approximately 200,000 people (i.e. about the size of Dundee or Aberdeen). As almost 6 million tonnes of silage are produced per annum in Scotland and there are approximately 10,000 silos, the potential for pollution is high. If silage effluent is allowed to enter a watercourse it rapidly strips oxygen from the water, killing fish, plants and other aquatic life.

7.3 Silage effluent is also highly acidic and attacks steel and concrete surfaces, causing deterioration of cracks and joints in silo floors, collection channels and tanks, making it very difficult to contain and collect all the effluent.

Quantities of effluent

7.4 The volume of effluent produced depends on the moisture content of the crop being ensiled. This in turn depends on factors such as the maturity of the crop, the degree of wilting, the weather conditions, the use of additives and absorbents (e.g. dried sugar beet pulp) and whether the silo is roofed or unroofed. The

peak flow of effluent normally occurs within 2 to 3 days of ensiling the crop. Up to 50% of the total volume of effluent is produced in the first 10 days. The table below demonstrates that the typical volume of effluent likely to be produced varies significantly with the dry matter of the crop ensiled.

Dry Matter Content of Grass Ensiled and Quantity of Effluent Produced	
Dry Matter Content of Grass Ensiled (%)	Effluent Production (litres/tonne of Grass Ensiled)
10-15	450-360
16-20	300-50
21-25	90-0

7.5 Wilting is very desirable but is highly dependent on weather conditions at the time of silage making. The ensiling of crops with a relatively high dry matter content, such as whole crop cereals, results in less effluent production. Farmers should always be prepared to contain, collect, store and dispose of any effluent and should be aware that the use of some silage additives tends to increase the amount of effluent produced. **In a wet year, very high volumes of effluent have to be dealt with and even greater care is required.**

7.6 The objective should be to reduce the volume of effluent to a minimum. Rainwater falling directly on the silo cover should be diverted and drained separately from the silage effluent if practical. When the silo is being used, rainwater falling on the floor will become polluted and must be collected. A roof over the silo with an independent rainwater drainage system will minimise the quantities of effluent which require to be handled. Care should be taken by directing rainwater through a sealed system to a suitable outfall to ensure roof drainage does not become contaminated.

7.7 The regular monitoring of collection tank levels should be undertaken at all times but with greater frequency during the first 10 days following ensiling to

contend with peak flow rates of effluent, and during periods of wet weather. Many factors influence effluent flow, such as depth of silage, efficiency of drainage within the silo and the use of certain additives. Tank levels must be checked throughout the year especially in the autumn/winter and not just during silage making. A significant number of pollution incidents occur in the autumn from effluent tanks overflowing with dirty water run-off from open clamps. All contaminated water must be collected and by-pass systems must never be used.

Silage making

What legislation must be complied with?

7.8 The Control of Pollution (Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 (“the SSAFO Regulations”) are intended to prevent environmental pollution by silage effluent. While the Regulations set minimum standards for the construction and siting of new, substantially enlarged or substantially reconstructed silos, SEPA also has powers to ensure that all existing structures conform if they pose a significant risk of pollution or if they otherwise fail to comply with the requirements of the Regulations. The SSAFO Regulations also apply to facilities used for whole crop forage.

7.9 All silos, effluent tanks and any associated pipes and channels must be designed in such a way that with proper maintenance they will satisfy the requirements of the Regulations for at least 20 years. All parts of the silo must be sited at least 10m from a watercourse, including permeable drains (e.g. field drains) and open ditches, to which any escaping effluent could enter.

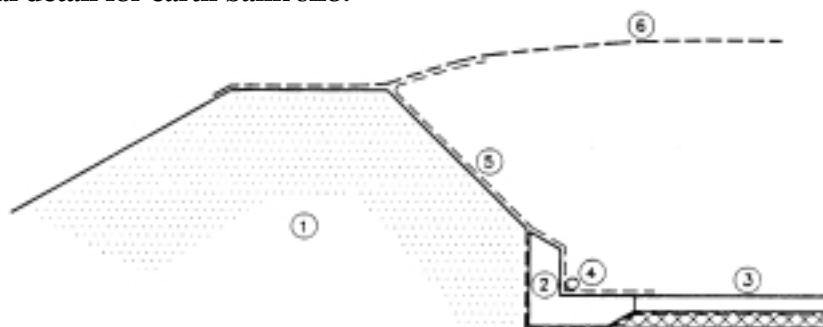
7.10 The Regulations state where silage can and can't be made.

7.11 It is prohibited to make silage in freestanding field heaps without an impermeable base and an effluent containment system.

7.12 Silage can be made in any of the following sites:

- 1 in tower silos;
- 1 by an unbaled, bulk-bagged system which uses an impermeable membrane with sealed ends that effectively prevent any effluent leaking from the bag. The minimum specification to meet the required standard is 3-ply 1000 gauge polyethylene or a material of at least equivalent impermeability and durability. The bags must be kept sealed and stored on a firm level base, a minimum of 10m from the nearest watercourse. **It is no longer necessary to pre-notify SEPA of the intention to make silage in this form;**
 - 1 by baled and bagged or wrapped techniques, providing it is sealed in an impermeable membrane and not stored or opened within 10m of a watercourse;
 - 1 in earthbanked silos, providing that the base is impermeable and the walls are lined with an impermeable membrane such as 1000 gauge polyethylene or butyl rubber sheeting. An effluent collection and storage system as described below, but excluding the external channel, must be provided. A kerb is recommended for the edge of the floor adjacent to the earth banks and the lining should be carried down over this to prevent any leakage of effluent into the earth banks. Temporary internal drainage pipes should also be provided to aid the removal of effluent to a storage tank; or
 - 1 in a conventionally constructed silo.

Typical detail for earth bank silo.



1. Consolidated earth bank.
2. Concrete kerb at foot of bank.
3. Impermeable concrete floor.
4. Permeable drain.
5. Impermeable lining sheet carried under temporary drain.
6. Plastic silo cover placed to shed rainwater and melting snow.

7.13 Silos and effluent tanks must comply with the following:

- 1 the base and associated effluent tanks, pipes and channels must be impermeable, and along with the walls, should be resistant to attack by silage effluent;
- 1 there should be a slope across silo floors to drains running the length of the silo walls and from back to front to a drain across the front of the silo;
- 1 the base must extend beyond the walls (other than for earth banks) and be provided with channels to collect any effluent which may escape;
- 1 collection channels must lead to an effluent tank, and be similar in profile to a roof gutter. They should be regularly cleaned out;
- 1 retaining walls must be capable of withstanding minimum wall loadings as calculated in accordance with BS 5502 Part 22; and
- 1 effluent tanks must have a minimum capacity of not less than 3m³ for each 150m³ (or part thereof) of silo capacity for a silo of less than 1500m³ capacity. For larger silos, the effluent tank requires to have a capacity of at least 30m³ plus 1m³ for each 150m³ (or part thereof) of silo capacity in excess of 1500m³.

7.14 The effluent tank capacities which are stated are a **minimum** and are unlikely to be sufficient for 2 days' storage for unwilted silage or silage made in an unroofed silo.

7.15 Farmers should check and empty their tanks as often as is necessary in the light of their own circumstances and experience. Additionally farmers should take as much advantage of storage facilities elsewhere on the farm e.g. slurry towers, for the storage of silage effluent as part of a Manure Management Plan (Farm Waste Management Plan).

7.16 If possible a farmer should try to have an effluent tank which has a capacity in excess of the minimum requirement. An effective alarm system, ideally with audible and visible alarm (i.e. warning lights), will provide an early indication that tanks are almost full, thus avoiding overflow. For unroofed silos, it is important to take account of the volume of surface water run-off and plan accordingly.

7.17 Under exceptional circumstances it may be possible to install an effluent tank which is less than the minimum requirement. This can only be permitted after full consultation and approval with SEPA.

7.18 It is important to remember that effluent can also be produced from other livestock feeds such as draff and whole crop cereals, thus making it essential that such effluent is collected and not allowed to escape and cause pollution.

7.19 If any part of the tank is below ground, it should be either prefabricated in one piece (the preferred approach) or of an alternative construction capable of meeting the requirement of being impermeable and resisting silage effluent for at least 20 years with maintenance. If the farmer intends to opt for this latter alternative, it would be sensible to discuss his proposals with SEPA at the planning stage. In order to protect tanks from attack by silage effluent, it is essential that they be lined with bituminous paint, butyl rubber, glass fibre, proprietary resin or other equivalent material. These linings should be checked at regular intervals and repaired/renewed as necessary.

7.20 SEPA require the farmer to verify that the completed facilities conform to the minimum standards set by the SSAFO Regulations.

7.21 Under the Construction (Design and Management) Regulations (which came into force on 31 March 1995), two aspects of the management of a silage making operation (in addition to health and safety) must be considered:

- a. Maintenance to retain the minimum performance standards.
- b. Management of a silo at all times but particularly during periods of maximum effluent discharge to confirm that there are no leakages, that the drainage system is working effectively and that the tank is not allowed to overflow.



New facilities

What can I do?

7.22 The following general principles of good practice should be adopted when considering and initiating proposals for silage production on the farm.

Planning and siting

7.23 Silos and effluent collection systems should not be sited within 10m of any inland or coastal waters nor in a position where any escape of effluent may reach a watercourse. The risk of flooding from adjacent watercourses must also be avoided. Account should also be taken of public and private water supply sources in the vicinity. Public bylaws may restrict the siting of silage and effluent facilities in such localities.

7.24 Reasonable care must be taken to avoid sites where drains exist. **If any drains are present, they must be identified and removed.** Any trenches created by such works should be securely backfilled with an impermeable material.

Open and permeable drains are not permitted within 10m of any part of the silo, its effluent tank or any associated pipes or channels. Drains should be provided to intercept surface water which may otherwise reach the silo or its drainage system.

7.25 In the case of open silos, the amount of storm water from the cover reaching the silage or floor should be minimised. Where possible, it should be removed at the opposite end to the effluent collection system.

7.26 Storm water from roofed silos should, where practical, be led in the opposite direction to the effluent collection system and removed in downpipes connected to a sealed drainage system. These drains should be backfilled with impermeable material.

Design

7.27 The essential design requirements are to provide facilities which will contain the effluent produced during the making and storage of silage, to collect the effluent by means of a drainage system and lead it to a store of an adequate capacity. With proper maintenance, the whole system must continue to comply with the performance standards for at least 20 years.

7.28 Professionally prepared plans and specifications for all the work are recommended so that the necessary standards are attained on any site.

SEPA will require to see these before work commences.

Construction

7.29 The ground on which a silo is to be built must be capable of carrying the necessary loads to avoid structural failure due to settlement. This will involve removing all topsoil to a firm base and laying hardcore in well-compacted layers to form the necessary gradients. **Avoid made up ground wherever possible, due to**

the risk of settlement and cracking.

7.30 Adequate steps must be taken to ensure that all work is carried out to a high standard in order to satisfy the SSAFO Regulations. Laying concrete is a skilled operation, and any contractor employed in constructing a silo or effluent tank should be fully proficient in this and associated works.

7.31 Hot rolled asphalt may be used in place of concrete to form the floor slab. It is important to seek specialist guidance on the specification for the floor design and the asphalt mix to be used. Good workmanship including adequate compaction and a suitable 'tack' coat are essential to the success of this material.

7.32 Concrete walls and steel columns which are permanently built-in should be given a surface treatment as protection against corrosion. Such treatments used in accordance with the manufacturer's instructions will minimise maintenance and enable the structures to satisfy the SSAFO Regulations for the statutory period of 20 years.

7.33 Where silo walls are constructed using prefabricated panels the column supports must be secured in concrete bases and care taken to ensure no leakage of effluent at these points. This is particularly important where the columns are set into sockets formed in the base.

7.34 **When enlarging a silo, the whole structure must be brought up to standards set by the SSAFO Regulations.** It is essential to seek professional guidance on the practicability of the proposal prior to starting any work. Often upgrading is likely to be impractical if lower design criteria were used in the original construction. **SEPA should be consulted before any work commences.**

7.35 In all cases, SEPA must be notified in writing at least 28 days in advance of bringing a new, substantially enlarged or substantially reconstructed silo or silage effluent tank into use.

Maintenance

7.36 The silo drainage system and effluent tank must be carefully inspected for any signs of surface corrosion, cracking of concrete or fractured pipes.

7.37 The following procedure should be carried out each year immediately after the silo is emptied:

- 1 empty and, when safe to do so, visually check the effluent tank.
Do not enter the tank, as poisonous gas may be present. If it is necessary to enter for repair purposes, seek advice on safety requirements;
- 1 clean any areas which cannot be clearly seen;
- 1 inspect walls, floors and wall floor joints for cracking or surface corrosion;
- 1 reseal all sealed joints where the jointing material has been damaged;
- 1 inspect all drains and channels for damage;
- 1 check that all channels and pipework are free flowing;
- 1 check all safety arrangements; and/or
- 1 list all repairs required and prepare a timetable to execute the work.

7.38 There are often only a few weeks between silos being emptied and refilled. As many materials require time to cure before being exposed to effluent, plan ahead to ensure the silo is emptied completely and that there is sufficient time before silage making begins to properly complete any works.

Management practice

7.39 Although roofed silos require less management during and after filling, it is

essential that frequent checks be made to ensure that the drainage system is free running and that the effluent tank does not overflow.

7.40 The design criteria of BS5502 require that there are internal drains along the bottom of the walls to reduce pressure.

7.41 Where the silage is made as a wedge or grass ramps are used, care must be taken that the ramp does not extend beyond the silo's drainage system, to ensure that the effluent is contained. To deal with this difficulty, many silos have a concrete apron which slopes inwards to the silo floor. The filling of unroofed silos requires planning if the maximum quantity of rainwater is to be diverted from the effluent tank. The aim is to dome or shape the top of the silo so that water falling on the cover is directed away from the working end of the pit. To achieve this in solid walled silos, the covering sheet should extend over and out from the end or one side of the silo. The covering sheet may be run out over the effluent channel to shed stormwater away from it on completion of filling open silos.

7.42 It is important that silo covers are properly secured in place by the use of weights such as rubber tyres, and are regularly inspected to ensure they remain intact.

7.43 While any silage remains in the pit, all effluent and contaminated rainwater (floor, cover and silage) must be collected and disposed of. When empty, the silo may be washed down but on no account should wash waters be discharged to a watercourse.

7.44 All adjacent ditches, burns or watercourses should be checked regularly (preferably daily) for signs of pollution, particularly when silage effluent is being produced just downstream of the point of discharge

of the surface water drainage system from the farm. If any pollution is found, immediate action should be taken to remedy the situation. SEPA should also be notified.

Disposal of silage effluent

7.45 Although aeration treatment can significantly reduce the BOD strength of silage effluent, it cannot be treated to a safe level for discharge to a watercourse.

7.46 Silage effluent should be diluted by a minimum of 1:1 with water and spread safely on land. The application rate should be determined by the land suitability and crop cover and should never exceed 50m³/ha or 4500 gallons/acre (normal rate 25-30m³/ha or 2,200 – 2,700 gallons/acre) of diluted effluent. In order to avoid scorching, a reduced rate of application will be necessary. Any repeat application should not be made within 3 weeks. The maximum rate of application should be reduced if the soil has been compacted.

7.47 Silage effluent is also a significant source of nutrients, with a high proportion of these nutrients readily available to the growing crop. These should be accounted for in any farm nutrient budget and in determining crop requirements.

7.48 Soakaways are not an acceptable method of effluent disposal and must not be used.

7.49 Fresh silage effluent can be a valuable feedstuff on which livestock thrive. Increasingly farmers are appreciating this and a growing number are collecting and storing silage effluent to feed back to their livestock.

SHEEP DIP

8

DOs

1. Comply with the Groundwater Regulations 1998.
2. Ensure that disposal of waste sheep dip to land is carried out in accordance with an authorisation issued by SEPA.
3. Have staff properly trained in the correct use of dips and dipping practice and ensure that they understand the very harmful effects of sheep dip on aquatic life.
4. Only purchase sheep dip if you hold the required Certificate of Competence.
5. Follow the Sheep Dipping Code of Practice.
6. Plan all aspects of the dipping operation in advance, identifying all possible pollution risks and taking action to minimise these risks as far as possible.
7. Ensure that a Contingency Plan is drawn up to deal with any potential spillage.
8. Ensure that proprietary kits or absorbent materials are readily available to deal with spillages.
9. Strictly follow manufacturers' instructions if detoxifying waste sheep dip.
10. Ensure that when mobile dipping is carried out, registered mobile dipping contractors are used.
11. Adopt high standards of flock management that aim to minimise the possibility of ectoparasitic infection on your farm.
12. Wear appropriate Personal Protective Equipment.

DON'Ts

1. Don't allow dip to enter a watercourse. This will result in serious pollution, and may result in enforcement action being taken by SEPA under environmental legislation.
2. Don't use dips that are not approved.
3. Don't delay in contacting SEPA regarding any pollution incident involving sheep dip.
4. Don't store waste sheep dip for re-use. This is against veterinary medicines legislation and could result in harm to animal health.
5. Don't bury empty containers without obtaining a landfill permit.
6. Don't be afraid to seek veterinary advice as to the most appropriate method of ectoparasite control for your flock.
7. Don't site dippers within 10m of a watercourse and certainly not within 50m of water supplies.
8. Don't ignore the need to carry out regular maintenance of sheep dipping facilities, taking account of signs of cracking, wear, damage or corrosion.
9. Don't leave a full dip bath uncovered or unattended.
10. Don't delay emptying the dip bath, unless weather conditions do not permit safe disposal.
11. Don't allow the dip bath to overflow.

DOs (cont.)

13. Allow sheep to drain in their drip pen for at least 10 minutes and prevent run off to any watercourse.

14. Rinse empty containers thoroughly and add washings to the dip bath.

Introduction

8.1 Sheep dipping can play an important role in the maintenance of good animal welfare. The chemicals used in dips are highly toxic and, if used properly, can be very effective against parasites that colonise sheep skins and fleeces. However, if good practice is not followed, this can have devastating consequences for the water environment. Aquatic life in many miles of watercourses in Scotland has been killed as a result of the entry of tiny amounts of dip. Groundwater can also be put at risk if dipping-related activities are not managed properly. There are a number of legislative requirements for the handling and disposal of sheep dip as explained below.

8.2 Treatments containing Organophosphates (OPs) and Synthetic Pyrethroids (SPs) are **extremely toxic**, even at very low concentrations. This is especially the case with SP-based dips, which are **100 times more toxic** to aquatic life than OP-based dips. The improper use and disposal of all dips also poses a significant risk of contaminating drinking water supplies taken from groundwater (e.g. springs, wells or boreholes). Groundwater and surface water are interlinked and therefore pollution of one can seriously affect the quality of the other.

8.3 Adherence to the Groundwater Regulations 1998 is a Cross Compliance Statutory Management Requirement. Farmers are required to ensure that certain

listed substances, including waste sheep dip, do not enter or cause pollution of groundwater. In addition to giving SEPA the power to issue a Notice on persons involved in any activity which poses a risk to groundwater, the Regulations allow Scottish Ministers to approve the issuing of Codes of Practice to those involved in activities that pose a risk. The disposal of waste sheep dip must be authorised by SEPA and all other activities associated with sheep dipping should be carried out in accordance with the *Sheep Dipping Code of Practice for Scottish Farmers, Crofters and Contractors – Groundwater Regulations 1998*. This Code has been published to provide practical guidance on the steps to take before, during and after dipping so as to prevent adverse impacts on groundwater.

8.4 The purchaser of any sheep dip product must hold a Certificate of Competence in the Safe Use of Sheep Dips to demonstrate that they will use dips responsibly. All people managing or carrying out dipping must be trained in the safe use and disposal of sheep dips to ensure adequate knowledge of:

- 1 personal health and safety;
- 1 animal welfare; and
- 1 environmental protection.

8.5 Further details of training and certification can be found in the National Proficiency Test Council publication, *Certificate of Competence in the Safe Use of Sheep Dips* (1998).

8.6 New controls on agricultural wastes, which include spent sheep dip, were introduced in 2004. Contact your local SEPA office for further advice on if and how these controls apply.

Good sheep flock management

8.7 Adopt flock management techniques that ensure chemical treatments (and sheep dips in particular) are limited to the minimum necessary to maintain animal welfare. This can make good financial, as well as environmental, sense.

8.8 Only use treatments when they are strictly needed for animal health reasons. Other authorised alternatives to plunge dips, such as pour-on products or injectables, may be effective for maintaining the health of flocks and should be considered. If in doubt about what product to use, seek advice from a veterinary surgeon.

8.9 It is vital that records are kept of the date and location of dipping, and the type of dip used. Records must also be kept in respect of any authorised disposal of waste sheep dip to land in accordance with an authorisation granted by SEPA.

Before dipping

8.10 The risk to the aquatic environment from sheep dipping can be confined to the few days each year when dipping is taking place and tight management of the operation during this time can significantly reduce this risk.

8.11 Plan all aspects of your dipping operation – where the dip will be stored; how it will be transported to the dipper; how the dipper will be filled and emptied; how and where the waste dip will be disposed of and what to do in the event of anything going wrong.

8.12 Limiting the purchase of dip concentrate to the minimum quantity

necessary to meet the manufacturers dipping instructions will help to reduce the amount of waste dip produced. Only licensed products should be purchased and used. On arrival at the farm, dip concentrate must be stored in a secure store, safely locked and clearly identified.



8.13 Dipping facilities must be sited and constructed in such a way as to prevent entry of water from the surrounding land, and to ensure no loss or leakage from the dip occurs above or below ground. In particular, dipping facilities should:

- 1 be of a one-piece, prefabricated construction;
- 1 not be cracked, or have any drain holes;
- 1 be fitted with splash boards and kerbs;
- 1 have impermeable drip pens draining or directing all drippings back to the dip bath;
- 1 be sited at least 10m away from a watercourse or 50m away from wells, springs or boreholes.

8.14 It is important that the condition of the dipper is examined before use. If the dipper is damaged, it should be replaced.

8.15 During filling, the dipper must not be allowed to overflow. Avoid any possibility of dip being siphoned or sucked back into the water system.

During dipping

8.16 Effective, safe dipping should be carried out in accordance with the manufacturer's instructions on the product label. Dip concentrate should be poured into the dip bath slowly. To reduce excess splashing, work to a routine, calmly and in control. The contents of the dip bath should be kept well mixed and maintained at the recommended strength.

8.17 Personal Protective Equipment should be used at all times during dipping.

After dipping

8.18 After dipping, sheep should be allowed to drain in a drip pen for at least 10 minutes, to allow surplus dip to drain completely back to the dipper. Once sheep have left the drip pen, subsequent holding areas and their return route to grazing should be chosen such that there is no contact with watercourses and a minimum of 50 metres distance from any spring, well or borehole used as a drinking water supply. Waterlogged ground and hard surfaces, such as metalled roads, should also be avoided.

8.19 Do not delay emptying the dip bath unless weather conditions do not permit safe disposal. A full dip bath should never be left unattended. The dipper should be emptied as soon as possible by a slurry tanker or pump and disposed of in accordance with an authorisation granted by SEPA under the Groundwater Regulations 1998 – contact SEPA for advice on this. Waste sheep dip should not be stored for re-use. This is against veterinary

medicines legislation and could result in harm to animal health. Spent dip must never be discharged to a watercourse. The drip pens and dipper should then be washed thoroughly with clean water and the washings removed to the authorised disposal site. The dipper should then be made secure so that rain cannot infiltrate and cause overflow.

8.20 Subject to an authorisation issued by SEPA, the preferred method of disposal is the spreading of diluted spent dip on land. Prior to spreading, waste sheep dip should be further diluted with a minimum 1 part dip to 3 parts slurry or water, before application to land which has been assessed as suitable.

8.21 Key criteria for suitable land for disposal include areas that:

- 1 are well-vegetated, and flat or gently-sloping, so as to prevent either surface run-off or 'pooling' of the waste dip on the disposal area;
- 1 are more than 10m from a watercourse;
- 1 are more than 50m from any spring, well or borehole;
- 1 are more than 500m from any borehole, or 500m upslope of any spring or well, used for drinking water supply;
- 1 do not have saturated, waterlogged, cracked or frozen soil (to a depth of more than 50 millimetres);
- 1 are freely or moderately drained; and
- 1 have deep loamy or peaty soils.

8.22 SEPA should be contacted for advice in the event of potential disposal areas not being able to meet one or more of these criteria.

8.23 The maximum surface spreading rate will be specified by SEPA when it grants an authorisation.

8.24 When further treating, or detoxifying, waste sheep dip prior to disposal, it is vital that the particular treatment employed is that specified by the manufacturer for the dip type and formulation used. SEPA should be consulted for advice before undertaking treatment. On no account must waste dip be treated using a method designed for another product. The disposal of treated waste sheep dip will be subject to an authorisation from SEPA. Even when treated, waste sheep dip remains highly toxic, and the same level of care must be adopted during its handling, as for untreated dip.

8.25 Empty dip containers and measuring vessels must be thoroughly rinsed out and the rinse water should be returned to the dip bath before dipping. The cleaned containers should never be reused or left lying about the pens, as they can be a source of pollution and a potential safety hazard due to the presence of dip residues. Cleaned containers can be disposed of via the local authority waste collection service (if available) or by a registered waste disposal contractor. The burning of empty, even rinsed, containers is not advised. Farmers should enquire as to whether any surplus concentrate may be returned to the supplier. Alternatively, such dip may be disposed of by using the services of a registered waste disposal contractor. The burial of empty sheep dip containers without a permit is a contravention of the Landfill (Scotland) Regulations 2003.

Mobile dipping, showers and jettors

8.26 Use of mobile dipping units, often operated by contractors, has become more popular in recent years. It is vital, therefore, that the site selected for mobile dipping is 'low risk' from the point of view of the environment and that the design, construction and overall management is of a high standard.

8.27 At farm steadings, mobile dippers pose an environmental risk if sited on impermeable surfaces close to surface water drainage systems. Out in the field, mobile dippers pose a particular risk of pollution if situated close to a watercourse, well, borehole or field drain. Sealed drainage systems and suitable collection facilities should be provided to contain any spillages, leaks or drainage from equipment or from sheep immediately after treatment. Provision should be made to collect any drainage or drippings from treated sheep in a similar manner to that for static sheep dippers.

8.28 Field-based mobile dippers should be located more than 10m from watercourses and 50m from any spring, well or borehole. Sites chosen should be flat, or gently sloping, with well established grass cover and be underlain by at least 15cm top soil, preferably with a total soil depth of at least 60cm to rock. The area should be free from flooding, surface ponding or waterlogging and not be frozen or compacted

8.29 The issue of who is actually responsible for the disposal of waste sheep dip, the farmer or the mobile dipping contractor, must be resolved prior to the commencement of dipping.

8.30 The use of showers and jettors to apply dip to sheep can also pose increased environmental risks. The same high standards of management referred to above for the use of mobile dippers must also be applied in respect of showers and jettors. It should be noted, however, that product label recommendations might not permit the use of OP and SP sheep dips in this manner.

Safety precautions

8.31 It is important to be prepared for any spillage as swift action can prevent a serious pollution incident. All staff involved in the dipping operation should be aware

of what action needs to be taken in the event of a spillage. Spillages should be immediately washed into the dip bath and not allowed to enter any drain that might discharge to a watercourse.

8.32 Proprietary kits or absorbent materials should be available at the dipping site to deal with spillages. If a spillage occurs away from the immediate vicinity of the dipper, use absorbent materials to contain it, and collect and transfer all contaminated material, including soil, to a clearly labelled sealed container for collection by a registered waste disposal contractor.

8.33 You should alert SEPA immediately regarding any pollution incident involving sheep dip by telephoning the 24-hour Emergency Hotline number 0800 80 70 60.

PESTICIDES

9

DOs

1. Check that the pesticide is approved for the purpose and always follow the instructions on the product label before use.
2. Comply with the Groundwater Regulations 1998 when disposing of waste pesticides and pesticide washings. Consult SEPA if in doubt.
3. Ensure that all staff and contractors involved with pesticides are properly trained and where appropriate have Certificates of Competence.
4. Follow the relevant Code of Practice for the Safe Use of Pesticides on Farms and Holdings.
5. Consult SEPA if you intend to use a pesticide in or near a watercourse.
6. Always consider alternative management strategies. If in doubt about the need to spray, take advice from a BASIS qualified adviser.
7. Carry out a Local Environmental Risk Assessment for Pesticides (LERAP) for "Category B" pesticide products with a buffer zone requirement **if** it is applied by a horizontal boom or broadcast air-assisted sprayer **and if** you want to reduce the aquatic buffer zone.
8. Contact your local SEERAD Office for further advice on LERAPs.
9. Prepare a Crop Protection Management Plan for your farm. Although voluntary, a CPMP will help to set clear management objectives in reducing the impact of pesticides on the environment.

DON'Ts

1. Don't apply any pesticide (unless approved for use in or near water) within 5m of the bank of a watercourse unless the LERAP demonstrates this is satisfactory.
2. Don't bury empty pesticide containers on farm without obtaining a landfill permit.
3. Don't fill sprayers directly from burns, watercourses, ditches or a mains supply.
4. Don't handle pesticides without proper protective clothing.
5. Don't spray if too windy i.e. avoid spray drift.
6. Don't permit spray or spray drift to endanger sensitive habitats.
7. Don't leave foil seals or caps or empty chemical containers lying around, as these will all increase the risk of pollution of local watercourses.
8. Don't neglect routine maintenance and calibration of spray equipment.
9. Don't spray crops unless the weather conditions are right.
10. Don't spray crops without selecting the nozzle system to suit the product(s) being applied, the crop and spray volume. Use advice on the product label, Home Grown Cereals Authority (HGCA) chart, Crop Protection Association (CPA) leaflets and British Crop Protection Council (BCPC) Handbooks.
11. Don't store more pesticide than is required for immediate use.
12. Don't burn empty plastic pesticide containers or other pesticide-contaminated material (e.g. clothing).

DOs (cont.)

- 10.** Prevent drips, spillages and leaks when filling and mixing pesticides as the active ingredient can run-off into farm drains, surface and ground waters causing a significant pollution hazard.
- 11.** Keep appropriate records of pesticide use (e.g. spraying, LERAPs).
- 12.** Minimise the volumes of waste pesticide produced.
- 13.** Have a contingency plan in case of accidental spillage. Carry out a COSHH assessment ("Control of Substances Hazardous to Health"). If in doubt seek professional advice.
- 14.** Consider using a biobed to minimise the risk of pollution of watercourses from pesticide handling activities. A design manual for such areas is to be produced by the CPA under "The Voluntary Initiative".
- 15.** Investigate the possibility of manufacturers and suppliers offering a recovery service for used containers.
- 16.** Ensure that any waste pesticides sent off-farm for disposal or recovery are consigned under a special waste consignment note. The consignment notes are available from SEPA and attract a small fee to cover the costs of administering the special waste system. Contact SEPA for further details on these requirements.

Introduction

9.1 This section provides guidance to farmers and growers to ensure the safe use of pesticides so as to protect the environment and allow efficient farming activity. Pesticides have the potential to harm the environment and wildlife if poorly or inappropriately used. In arable farming areas, in particular, pesticides can contribute to diffuse pollution via field run-off, spray drift and accidental spillages. Users of pesticides and their advisers must therefore ensure that pesticides are used correctly.

What are pesticides?

9.2 For the purposes of this Code, pesticides include crop protection chemicals such as herbicides, fungicides, growth regulators and insecticides. They also include substances, preparations or organisms prepared or used as pesticides to protect plants or wood from harmful organisms or pests. In legislation some of these chemicals may be defined as "biocides".

What legislation must be complied with?

9.3 All elements of the safe use of pesticides are described in the Defra/HSE Code of Practice for the Safe Use of Pesticides on Farms and Holdings (the “Green Code”). It is strongly recommended that a copy of that Code is available on farms, and that all those who use or handle pesticides understand its requirements. A new version of that Code is in preparation, as is a Scottish version ; both are likely to be titled Codes of Practice for the Safe Use of Plant Protection Products.

9.4 The use of pesticides is controlled by a range of legislation made under Part III of the Food and Environment Protection Act 1985 (FEPA). The requirements of legislation are covered in the above Code.

9.5 Compliance with the Plant Protection Products Directive is due to become a Cross Compliance requirement as from 1st January 2006. To receive the Single Farm Payment, farmers will not be allowed to retain products that are no longer approved for use. Also, farmers will have to carry out spray operations on approved crops only, and will have to follow the Green Code using the pesticide at the correct dosage levels and leaving sufficient “buffer zones” so that the spray does not enter watercourses.

Efficient use of pesticides

9.6 There are increasing demands on farmers and growers to apply pesticides only where they are justified. Furthermore, to minimise their use, pesticides should comprise part of an integrated control programme using alternative control methods wherever possible. An integrated approach reduces pesticide use, and associated environmental risks. A note of the reason or justification for pesticide use forms part of quality assurance schemes (e.g. through being asked to prepare a

Crop Protection Management Plan) and is good practice for every farmer and grower.

9.7 In order to make sound decisions on pesticide use, crops need to be inspected regularly for disease, weed and pest infestation.

9.8 The label should always be read before using a pesticide. Pesticides should only be used for the purpose for which they are approved. Even if a pesticide is used regularly, the label should be consulted as revisions do occur including changes to the legal requirements. If in doubt about pesticide use, a BASIS qualified adviser should be consulted (see Annex D).

Sensitive habitats

9.9 There are certain areas on farmland which are particularly affected by pesticides. For example these might include arable field margins, the strips of land lying between cereal crops and field boundaries but also extending partly into the crops managed specifically for the benefit of farmland wildlife such as tree sparrow and song thrush. Field boundaries are another sensitive habitat as pesticide drift into hedges or ditches will reduce their value as wildlife refuges e.g. for bullfinch, brown hare and linnet. Any wetter habitats such as marshy grassland and rush pasture are also very sensitive to pesticide and herbicide drift. Published lists of Biodiversity Action Plans for species and habitats, with information on their sensitivity to pesticides, are available (see Annex D).

Crop Protection Management Plan

9.10 The pesticides industry Voluntary Initiative (VI) is a package of measures aimed at reducing the adverse environmental impact of pesticides use and improving farmland biodiversity. To further this aim the Crop Protection Association

(CPA) and supporting organisations have developed the concept of Crop Protection Management Plans (CPMP), a measure that encourages farmers and growers to produce a CPMP for their businesses. A CPMP will set clear management objectives and identify specific issues that need to be addressed as well as the actions needed including alternatives to using pesticides. Guidance on preparing CPMPs is available from the NFU Scotland, the CPA, agricultural advisers and online (See Annex D).

9.11 Two further voluntary initiative measures are the National Sprayer Testing Scheme (NSTS) and the National Register of Sprayer Operators (NRoSO). Farmers are advised to ensure that any contracted sprayers used are registered with the NRoSO and tested in accordance with the NSTS. Local advisers should be consulted for advice on these measures.

Training

9.12 Everyone involved in the use of pesticides on a farm or holding must have adequate training in the safe, efficient use and disposal of pesticides – including emergency action in the event of spillages. Competence in the use of pesticides is a statutory requirement.

Pesticide pollution incidents

9.13 Pesticide pollution may occur accidentally or through inappropriate handling at any stage of use – during storage, mixing, application, or from subsequent disposal of the dilute pesticide washings or the used containers.

9.14 If any spillage occurs, immediate action should be taken to limit the effects and to warn others who may be affected (particularly downstream water users) and SEPA. Pesticide users should be prepared for spillage and have a contingency plan to deal with such incidents. The two key aspects to this plan are to have a list of all emergency contact numbers and sufficient

absorbent materials to cope with any spillage. Also carry out a “Control of Substances Hazardous to Health” (COSHH) assessment. If in doubt, seek professional advice.

9.15 The disposal of solid waste arising from the clean-up of spillages, including pesticides, contaminated equipment, protective clothing and absorbents should be arranged through a licensed waste disposal contractor.

Storage

9.16 All pesticide stores should be designed and constructed to the highest standard. Stores should not be sited in areas where there is a risk of pollution to watercourses or groundwater. Local bylaws may impose restrictions on storing pesticides in certain catchments to protect drinking water supplies. Before erecting a new pesticide store or substantially altering existing storage arrangements, specialist advice should be sought. Guidance on the storage of approved pesticides is given in HSE Agricultural Information Sheet No 16 ‘Guidance on Storing Pesticides for Farmers and Other Professional Users’.

9.17 A chemical store should be large enough for its intended use and be constructed of fire resistant materials. The store should be designed to contain any leaks or spillages to the capacity of 110% of the maximum store contents. In areas where there are particular environmental concerns this will require to be increased to 180%.

9.18 Don’t store more pesticide than is required for immediate use.

Mixing pesticides and filling sprayers

9.19 Recent studies have shown how easily pesticides can pollute the environment. Even during the careful opening of a pesticide container and pouring into a sprayer tank, small drops can create ‘point’

sources of pollution. These small amounts can cause pollution if they are allowed to run off into watercourses. The careful selection of the location of pesticide handling and wash down areas is important. At the steading, these operations should be carried out on areas specifically designed and constructed for this purpose. This may include biobeds or grassed areas provided an assessment has been made of the suitability of the site and this has been agreed with SEPA. In the field, these operations must be carried out at least 10m from watercourses and at least 50m from springs, wells and boreholes. Additionally every precaution should be taken to prevent spillage from entering field drains.

9.20 Where possible, full use should be made of equipment that reduces the risk of pollution when filling sprayers (e.g. induction hoppers, closed transfer systems, direct injection). Where possible, techniques such as closed-handling and pre-mixing of pesticides should be used.

9.21 Water for filling the sprayer should be drawn from an intermediate tank and never directly from the mains or a watercourse, as there is a danger of back-siphoning occurring.

9.22 Guidance on the design of pesticide handling and washdown areas is to be available from the CPA under the VI at <http://www.voluntaryinitiative.org.uk/Content/default.asp>

Record keeping

9.23 Records of the amounts, dates and location of applications of pesticides, together with the type used, should be kept in accordance with the “Green Code” (mentioned in paragraph 9.3 above).

Application

9.24 Pesticides should only be used where there is justification and where conditions

are suitable for application. Take the following actions prior to applying pesticides:

- 1 carry out a COSHH assessment;
- 1 read the pesticide product label, paying particular attention to the Statutory Box;
- 1 ensure the applicator is serviced and calibrated;
- 1 check that the correct nozzles are attached;
- 1 check the correct forward speed and boom height for spraying; and
- 1 ensure the correct water volume and application dose of pesticide.

9.25 In addition to the information on the product label, help with selection of nozzle type is available on a Home Grown Cereals Authority (HGCA) chart, in CPA leaflets and British Crop Protection Council (BCPC) Handbooks. When spraying near to a watercourse, low drift nozzles are advised to prevent contamination.

9.26 There are some circumstances when the approved use of a pesticide may present a risk to groundwater. Where groundwater is vulnerable (for example, because of a shallow water table, thin soil or very sandy soil), pesticides may move rapidly through the ground and enter groundwater. This may be of particular concern where the groundwater is feeding a drinking water supply. In general, persistent pesticides should not be applied within 50m of a spring, well or borehole used for water supply and you should consider the use of all pesticides carefully within these areas. SEPA can be consulted for site-specific advice on groundwater protection in such areas.

Local Environmental Risk Assessment for Pesticides (LERAP)

9.27 Advice on LERAPs is given in the Scottish Executive leaflets “Horizontal Boom Sprayers: Local Environment Risk

Assessment for Pesticides” and “Keeping Pesticides out of Water : LERAP”. For certain pesticides with a buffer zone requirement, which are applied via a ground crop sprayer, there is a legal obligation to carry out and record the results of a LERAP. By carrying out and complying with that LERAP, users may be able to reduce the size of the 5m buffer zone normally required to protect water, by taking account of the width of the watercourse and using approved low drift nozzles and/or reduced dose(s) of pesticides. You cannot reduce buffer zones designed to safeguard hedges, field margins, etc. While users retain the option to simply comply with the existing buffer zone, they still have an obligation to record that decision.



Controlling drift

9.28 In order to minimise the impact of pesticide drift onto non-target crops, vegetation, wildlife habitats or watercourses, it is important to take account of droplet quality and weather conditions.

9.29 Where the wind speed is greater than Force 3 on the Beaufort Scale (4 to 6 mph or 6.5 to 9.6 km/h), conditions are unsuitable for spraying. Even at Force 3 there is an increased risk of spray drift and special care needs to be taken. Detailed guidance on these points is set out in the “Green Code”.

Disposal

Waste concentrates

9.30 It is not only a false economy to continue storing unused pesticides as an alternative to disposal, it is illegal if the approval for storage and use has been withdrawn. In some instances, it may be possible to return unwanted, unused pesticides to the supplier. Alternatively, holders of such materials will need to employ the services of a licensed waste disposal contractor. Such a contractor should be employed in order to dispose of obsolete pesticides. On no account may waste concentrates be diluted for disposal by the methods described below. Good stock control in store prevents waste.

Waste pesticide and pesticide washings

9.31 Whenever possible sprayers should be washed and rinsed out in the field where the pesticide has been used using the minimum amount of water necessary and ensuring that the maximum dose is not exceeded.

9.32 If the sprayer is washed out elsewhere and the resulting washings cannot be used on the treated crop, these washings should be collected for disposal under an authorisation issued by SEPA. The washing facilities provided must be designed to ensure that back siphoning of pesticides into the water supply cannot occur. Non-return valves should be fitted to any taps connected to spray equipment. Such activities will produce a relatively large volume of water contaminated at low concentration with pesticide. If suitable, the contaminated water may be used later for making a further batch of the same dilute pesticide. On completion of washdown, protective clothing involved in the operation should be cleaned, washed and rinsed within the area used for cleaning the sprayer. Single use coveralls should be stored in a separate locker prior to disposal.

9.33 Other acceptable options for dealing with waste pesticides and pesticide washings are:

- 1 if it is permissible under the terms of the product approval, the unused spray can be disposed of by applying to the treated crop, recognising that the efficacy of the previous application of pesticide may be impaired. As this operation will count as a separate application, it is important to check that the maximum number of applications permitted to any one crop or within any season and the maximum dose of product or active ingredient that may be applied to any one crop in a whole season. It is illegal to exceed the maximum dose stated on the label;
- 1 subject to the product approval and in the absence of streams and watercourses nearby, application to previously untreated crop areas, within the permitted use of the pesticide;
- 1 spray onto an area of uncropped land, of minimal wildlife value. Such an area of land will only be approved if it is capable of absorbing the volume of liquid to be applied without run-off, ponding or risk to wildlife, water or draining systems;
- 1 use of suitable equipment designed to treat liquid waste containing pesticides, provided the treated effluent can be stored satisfactorily and reused or used for another purpose or disposed of by means acceptable to SEPA;
- 1 subject to consent from Scottish Water, discharging the pesticide contaminated water to a sewer; or
- 1 storage of the waste in a suitable container pending collection by a licensed waste disposal contractor.

Adherence to the Groundwater

Regulations 1998 is a Cross Compliance statutory management requirement. This means that, prior to any waste pesticide washings being disposed of onto or into land, authorisation must be obtained from SEPA.

Containers

9.34 Farmers and growers should check whether manufacturers and suppliers of pesticides offer a recovery service for used containers. Empty pesticide containers should never be re-used for any purpose except where the manufacturer offers a refilling service. Containers of liquids, except those liable to produce hazardous gases, should always be thoroughly rinsed into the spray tank before disposal or return. Label instructions for cleaning should be followed or, in the absence of any instructions, the container should be thoroughly rinsed and the rinsing liquid added to form part of the spray dilution.

9.35 Once the container has been cleaned, all foils and seals should be placed within the container and the cap re-attached. The container should then be punctured in several places and crushed to make it unusable. If practicable, the labels should not be disfigured. Perforated or crushed containers should be stored in a secure compound pending their disposal. Such waste will generally be accepted at licensed disposal sites.

9.36 Empty pesticide containers and measuring vessels must be thoroughly rinsed out and the rinse water should be returned to the sprayer. The cleaned containers should never be reused or left lying about, as they can be a source of pollution and a potential safety hazard due to the presence of residues. Cleaned containers can be disposed of via the local authority waste collection service (if available) or by a registered waste disposal contractor. The burning on farm of empty,

even rinsed, pesticide containers is not advised. Farmers should enquire as to whether any surplus concentrate may be returned to the supplier. Alternatively, surplus pesticide may be disposed of by using the services of a registered waste disposal contractor. The burial on farm of empty pesticide containers without a landfill permit is a contravention of the Landfill (Scotland) Regulations 2003.

DISPOSAL OF ANIMAL CARCASSES

NOTE: – The Animal By-Products (Scotland) Regulations 2003 prohibit the routine burial or burning of animal carcasses on farm. The regulations provide for a derogation to allow the continued on-farm disposal of fallen stock in the designated remote area, which covers most of the Highlands and Islands and Argyll. **This is the only area in Scotland where on-farm disposal is permitted.**

DOs

1. Report all sudden deaths and seek veterinary advice.
2. Comply with the Animal By-Products (Scotland) Regulations 2003 and dispose of fallen stock through an approved disposal route, such as incineration or rendering. Only resort to burial on farm in the remote area and if an approved disposal route is not available. Where burial does take place:
 - 1 Bury animal carcasses with at least 1 metre of covering soil to prevent dogs, foxes or vermin getting access.
 - 1 Keep a Location Plan of all burials and a note of type of animal buried.
 - 1 Choose sites where there is at least 1 metre of subsoil at the bottom of the burial pit.
 - 1 Make sure that incineration is carried out in a dedicated animal carcass incinerator, designed or adapted for that purpose.
 - 1 Make sure that burning of carcasses in the open is undertaken with care and by the approved method.
3. Seek professional advice if in doubt. Advice on veterinary issues is available from your local Animal Health office. SEPA will provide advice on environmental pollution issues.
4. Consider subscribing to the National Fallen Stock Scheme.

DON'Ts

1. Don't leave carcasses unburied or open to dog or fox access for any length of time.
2. Don't add lime to a lined disposal pit.
3. Don't dump carcasses.
4. Don't operate an animal carcass incinerator without prior consultation with SEPA.
5. Don't bury carcasses any closer than 250m from any drinking water supply; 50m from any watercourse or 10m from any field drain.
6. Don't locate burial pits in areas prone to waterlogging or at risk of flooding, or that are underlain by sandy or gravelly soil.
7. Don't bury carcasses in polythene bags or other impervious material.
8. Don't bury carcasses on archaeological sites or on sites designated for their nature conservation interest.

10

Introduction

10.1 The disposal of animal carcasses on farm can present significant environmental, animal and human health risks. There is a serious risk of spreading disease to stock on that holding or on neighbouring farms, as well as a public health risk, including pollution of water courses.

What legislation must be complied with?

10.2 The statutory provisions of the Animal By-Products (Scotland) Regulations 2003 must be complied with. There are however several other pieces of legislation which are relevant to this topic, and the main ones are referred to in the individual paragraphs of this section.

10.3 Local authorities have the principal enforcement role under the Animal By-Products Regulations. Contact SEERAD for further details.

Deaths of cattle

10.4 At present, there are certain specific rules relating to cattle deaths that must be met. These are as follows:

- 1 **ALL** sudden unexplained cattle deaths must be reported immediately to the local veterinary inspector or local Animal Health Office. The carcasses will be routinely tested for anthrax.
- 1 Where deaths are explainable, **ALL** fallen cattle and bovine animals slaughtered on-farm for welfare reasons over 24 months old should be reported to the [Rural Payments Agency \(Tel: 0800 525890\)](http://www.rpa.gov.uk) who will arrange to collect the carcasses and arrange for testing for transmissible spongiform encephalopathies.
- 1 Explainable deaths of cattle 24 months old or under are not currently subject to special rules, and may be dealt with as described below.

All other deaths

10.5 A number of options exist for disposal of carcasses of animals that die on the farm. The Animal By-Products (Scotland) Regulations 2003 stipulate that disposal should be by an approved route such as rendering or incineration. It is also permissible to consign carcasses to the local knackery, hunt kennel or zoo for disposal purposes. The routine on-farm disposal of fallen stock is only permitted within the designated remote area, and even then only where an approved disposal route is not available. Where carcasses are to be disposed of by burial or burning on a holding in the remote area, this must be done in accordance with guidance contained in this section.

Notifiable diseases

10.6 Irrespective of any other considerations, if ill health or death is thought to be caused by a notifiable disease, this must be reported to the Divisional Veterinary Manager at the local Animal Health Office (see Annex A), or the police station. In such circumstances carcasses should be made available for post mortem examination. In cases of unexplained sudden death of cattle, veterinary advice must be sought in order to eliminate anthrax as the cause of death. In such cases, the carcass will be routinely tested.

BSE surveillance

10.7 For cattle deaths which are explainable, **ALL** fallen cattle and bovine animals slaughtered on-farm for welfare reasons which are over 24 months old should be reported to [Rural Payments Agency \(Tel : 0800 525890\)](http://www.rpa.gov.uk) who will arrange to collect the carcasses and arrange for testing for transmissible spongiform encephalopathies.

10.8 Explainable deaths of cattle 24 months old or under are not currently subject to special rules, and may be dealt with as described below.

Disposal to a renderer or incineration plant

10.9 You local Animal Health Office should be consulted as to renderers or incinerators in the area that are suitable for carcass disposal. The local authority is under no obligation to collect or dispose of animal carcasses.

On-farm disposal

10.10 **On-farm disposal may only be practised within the designated remote area (see map) and even then only where there is no alternative disposal route.**



10.11 Where on-farm disposal is being carried out, methods such as burial, incineration or burning in the open air should be carried out with care to prevent serious air, soil or water pollution. In such situations the following guidelines should be fully observed.

Burial

10.12 It is an offence under the Dogs Act 1906 to leave an animal carcass unburied in a place where dogs may have access to it. Under the Animal By-Products (Scotland) Regulations 2003, fallen stock must be disposed of without undue delay.

10.13 Under no circumstances should carcasses remain unburied or be disposed of in or near watercourses. It is an offence under the Control of Pollution Act 1974 to cause or knowingly permit any poisonous, noxious or polluting matter or solid waste to enter any controlled waters. Apart from risking prosecution for causing water pollution, there is a serious risk of spreading disease to stock on neighbouring farms as well as posing a public health risk.

10.14 If a notifiable disease is not suspected, or has been eliminated as a possible cause, and other means of disposal are not available, burial on-farm within the designated remote area may be considered if the following criteria can be satisfied. The burial site must:

- 1 be at least 250 metres from any well, borehole or spring used as a source of drinking water (where byelaws specify a greater distance, this must be complied with). Byelaws may also impose restrictions relating to the distance of a burial site from a surface source;
- 1 be at least 50 metres from any other spring or watercourse, and at least 10 metres from any field drain;
- 1 have at least one metre of subsoil below the bottom of the burial pit,

and the pit must be dug deep enough to give at least one metre of covering soil; and

- 1 where possible, sites on soils which are moderately permeable should be used. Avoid waterlogged sites and sites on free draining subsoil. Ensure that the pit is dry after it is dug. Do not use a pit which fills with water.

10.15 Records of all burial sites, including a field plan, should be kept, together with number and type of stock buried and dates of burial.

10.16 The Groundwater Regulations 1998, enforced by SEPA, aim to protect groundwater quality from pollution by certain substances. The burial and subsequent decomposition of animal carcasses could pose a threat to groundwater quality and possibly to human and animal health, particularly if drinking water supplies might be affected. If there is doubt over the suitability of a proposed burial site or scale of burial then SEPA should be consulted to ensure that the Groundwater Regulations 1998 are complied with. Under these circumstances, the local authority should be consulted first to ensure that the requirements of the Animal By-Products (Scotland) Regulations 2003 are taken account of.

10.17 Dogs and foxes must not gain access to carcasses. Carcasses placed in the pit must be covered immediately with a sufficient depth of soil to deter scavenging animals and birds. Placing an animal carcass in a manure store is **not** acceptable.

Lined disposal pit

10.18 For small carcasses such as poultry mortalities and foetal material, a pit with an impervious wall (precast concrete rings or glass fibre), and with its base open to the soil, may be used. It should be covered with a substantial top, fitted with a manhole cover. The pit should be sited on

an area that fulfils the criteria given for burial sites and the local authority and SEPA should be consulted before construction commences.

10.19 These pits work best if started in spring or summer, using a bacterial starter. A slit in the abdominal wall to release intestinal contents also helps, as does the addition of a few gallons of water each week to keep the contents moist.

LIME MUST NOT BE ADDED.

10.20 Be aware of the requirements of any farm quality assurance scheme concerning what is, and is not, acceptable for disposal of fallen stock.

Disposal by burning

10.21 Under the Clean Air (Emission of Dark Smoke) (Exemption) Regulations 1969, carcasses of animals which:

- 1 have died or are reasonably believed to have died because of disease or,
- 1 have been slaughtered because of disease or,
- 1 have been required to be slaughtered in pursuant of the Animal Health Act 1981

are exempt from the Clean Air Act 1993 providing that:

- a. there is no other reasonably safe preferable method of disposal; and
- b. the burning is carried out in such a manner as to minimise the emission of dark smoke; and
- c. the burning is carried out under the direct and continuous supervision of the occupier of the premises concerned, or the person authorised to act on his/her behalf.

Incineration

10.22 Dead stock should be burnt, preferably in an incinerator, within 12 hours of death.

10.23 Incinerators should be equipped with secondary combustion chambers

where temperatures of greater than 1000°C over a flue gas residence period in excess of 2 seconds can be achieved throughout the incineration process. Professional engineering advice should be sought with regard to sizing, selection, installation and operation of incinerators and carcass storage facilities. Incinerators designed for, or operated at, loading rates of greater than 50kg/hour must be authorised by SEPA and operated in accordance with the Scottish Executive's Local Authority Guidance for Animal Carcass Incineration Processes under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991. New incinerators are covered by the Pollution Prevention and Control (Scotland) Regulations 2000 as amended by the Waste Incineration (Scotland) Regulations 2003. All existing incinerators will eventually be covered by these new Regulations.

10.24 The design-loading rate of the incinerator should not be exceeded at any time.

Burning in the open

10.25 Fires should be located as far as possible from (and, where practicable, downwind of) public highways and residential areas. A shallow pit can be dug with additional cross trenches to provide an adequate air supply to the base of the fire, but this is not always necessary. The primary fuel, (straw, fuel oil, heavy **untreated** timbers and/or coal) should be placed in the base of the fire and the carcass (es) placed on top. The design should be so as to encourage burning to take place up and through the material rather than from the top down. This burning process gives a much higher temperature and also reduces the risk of creating dark smoke. The fire should not be overloaded with carcasses, and sufficient fuel should be provided to ensure complete combustion. The burning should be carried out under the direct and

continuous supervision of the occupier of the premises, or a person authorised on his behalf. A fire extinguisher and water supply or bowser should be available for emergency use. Burning should take place only in daylight hours, and the local fire brigade should be alerted to the event prior to igniting the fire.

fee, with further charges depending on the farmer's usage of the Scheme. Farmers will be able to choose their preferred approved collector from a list provided by the National Fallen Stock Company. Further details of the Scheme are available from www.nationalfallenstock.co.uk

Notifiable disease outbreaks

10.26 The outbreak of a notifiable disease, such as foot and mouth, may require the rapid and wholesale slaughter of animals at the infected premises and, possibly, of animals on neighbouring properties. The disposal of carcasses on-farm in a disease outbreak situation is not confined to the designated remote area. Each farm should therefore prepare for such an outbreak and consider carefully which sites might be suitable for burning and/or burial to take place. This will be useful in determining what action needs to be taken in an emergency.

10.27 The State Veterinary Service will advise on what needs to happen to control the outbreak. Other agencies such as the police, fire brigade, local authority, public health consultants, Scottish Water and SEPA will also have a role to effectively protect human health and the environment. It is better for farmers and crofters to be prepared, than to have to consider these issues in the midst of an emergency.

National Fallen Stock Scheme

10.28 The Government recognises the cost to farmers of meeting the new requirements to dispose of all fallen stock using approved methods. It has developed the National Fallen Stock Scheme, to help farmers cope with the change by facilitating a cost-effective method of disposing of fallen stock in the areas outwith the derogation. Livestock farmers will be able to access the Scheme on payment of a nominal annual registration

AGRICULTURAL FUEL OIL

DOs

- 1.** Comply with the statutory requirements of the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 if your farm storage of agricultural fuel oil exceeds 1250 litres.
 - 1 Ensure that any new fuel oil storage above 1250 litres capacity is surrounded by a bund capable of containing 110% of the capacity of the tank.
 - 1 Make sure that the bund and the base of the storage area is designed and constructed to be impermeable and remain so for 20 years.
 - 1 Keep every part of the tank within the bund.
 - 1 Ensure any outlet tap or valve can only discharge into the bund in the event of a loss or leakage, and also keep this outlet shut and locked when not in use.
- 2.** Notify SEPA at least 28 days before bringing into use any new, substantially enlarged or substantially reconstructed agricultural fuel oil storage area.
- 3.** Consider the location of the storage tank and ensure there is a suitable firebreak between the storage area and adjacent buildings.
- 4.** Ensure that all staff and contractors working on your farm are aware of the pollution dangers from fuel oil spills and how they should be dealt with.
- 5.** Ensure that a Contingency Plan is drawn up to deal with any potential spillage.

DON'Ts

- 1.** Don't site a fuel oil storage area within 10m of any inland or coastal waters.
- 2.** Don't continue to use a fuel storage tank that poses a significant risk of pollution, as SEPA may serve a Notice requiring you to carry out improvements to bring the installation up to the standards set by the 2003 Regulations.
- 3.** Don't pour fuel oil into a watercourse, or allow it to enter a watercourse, as this is an offence in terms of environmental legislation.
- 4.** Don't use detergents in attempting to clear up any spillage, unless the area is contained so that material is collected for safe disposal.
- 5.** Don't be afraid to seek professional advice on clean up if there is a spillage or loss.
- 6.** Don't ignore small leaks from fuel tanks.
- 7.** Don't forget, or neglect, to carry out regular maintenance of fuel storage areas, as pollution does not have to occur for SEPA to serve a Notice.
- 8.** Don't overlook the need to empty the bund of accumulated, uncontaminated, rainwater.

DOs (cont.)

- 6.** Ensure that proprietary kits or absorbent materials are readily available to deal with spillages.
- 7.** Contact SEPA immediately in the event of a serious loss or spillage of oil.

Introduction

11.1 Agricultural fuel oil is used on farms to power a wide range of agricultural machinery. It is poisonous and spillages into watercourses and onto land can have serious implications for plant and animal life. Each year, accidental spillages cause many pollution incidents.

What legislation must be complied with?

11.2 The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 (“the SSAFO Regulations”) govern the storage of agricultural fuel oil where the total quantity stored at any time exceeds 1250 litres. In particular, new, substantially enlarged or substantially reconstructed fuel storage areas must conform to the standards set in Schedule 3 of the Regulations, and SEPA must be informed at least 28 days prior to their use.

11.3 Many farms may have more than one storage area and it is important to note that the storage capacity at each counts towards the total on-farm storage.

11.4 Domestic fuel oil which is stored separately and underground storage tanks are not covered by the Regulations.

Specific requirements

11.5 The fuel storage area must be surrounded by a bund. This bund and the base of the storage area must be impermeable and constructed so that, with proper maintenance, they remain so for at least 20 years.

11.6 No part of the storage facility shall be within 10m of inland and coastal waters.

11.7 The floor of the storage area will normally be constructed in reinforced concrete and should drain to an internal sump. This sump will facilitate the removal of the final part of any spillage or rainwater collecting within the bund.

11.8 The minimum bund capacities required are:

- 1 For a single tank – 110% of the tank capacity; or
- 1 For two or more tanks, for drums or barrels or for any combination of these with tanks – 110% of the capacity of the largest container or 25% of the total volume of oil which could be stored in the area, whichever is the greater.

11.9 Every part of any container shall be within the bund including all taps, valves, pipes and these must discharge downwards into the bund. Permanently attached flexible pipes must be fitted with automatic cut off taps and valves which must be locked shut when not in use. No outlet should be provided from the bund as this could allow escape of oil and cause a major pollution incident. The installation of new fuel tanks should be discussed with SEPA to ensure their compliance with the Regulations.

11.10 A system for the removal of rainwater and spillages must be provided, for example a small sump for removal by a hand pump. Providing a roof will reduce

the volume of waste material collected in the sump where practical.

Design and construction

11.11 The walls of the bund will generally be constructed in reinforced concrete either as blockwork or in-situ concrete.

11.12 In the former situation, the internal surface must be rendered and is likely to require to be finished with a suitable impermeable protective coating.

11.13 All oil tank(s) supports (i.e. block walls) should be contained within the bund. Such supports are normally comprised of concrete blockwork and can be independent of or part of the bund. In the latter situation, they must not be as high as the bund, to avoid the risk of any spillage or leakage escaping over the top of the bund. For similar reasons, other types of tank support systems must not be carried on the wallhead of the bund.

11.14 Steel tanks should be separated from the supports on which they rest by a bitumen felt or equivalent material in order to reduce the potential for corrosion.

11.15 Certain proprietary prefabricated oil storage tanks come self-bunded. These will only satisfy the Regulations if all ancillary equipment such as sight gauges, vents etc are within the bund.

11.16 Storage tanks should be labelled to describe tank capacity and fuel type, and 'No Smoking' signs should be displayed. All storage tanks should meet with the requirements of BS799 and BS5410. A safe means of access to and from the bund should be provided. Facilities should be installed to enable the delivery operator to fill the fuel tank from ground level.

Location

11.17 This must be considered in relation to other buildings as well as to the

proximity of drains, watercourses and water supplies. Fire and the possibility of spillage should be considered. There should always be a suitable firebreak between the storage area and adjacent buildings.

11.18 It is preferable not to store fuel oils inside buildings unless the building is designed for that specific purpose.

11.19 Avoid locations where spillage could contaminate other storage materials such as animal feeds. Storage of oil within catchments of public water supply, or in protected zones around underground sources for public supplies, may be prevented or restricted by bylaws.

Access

11.20 This must satisfy the needs of delivery and farm vehicles. Good artificial lighting should be considered for the area to provide safe working conditions and for security reasons in some situations,

11.21 Areas around the store on which vehicles park to load or unload should ideally be of concrete. If possible, the drainage gradients should be inwards to the storage area. Drains must be fitted with a suitable oil trap and some means of sealing the drain in an emergency

Operational management

11.22 Where feasible, the delivery of fuel should be supervised and only when unavoidable should ladders or steps be used. In such cases, it is essential to conform to the Health & Safety at Work Act 1974. Top openings when used should be provided with a suitable system to hold the filler pipe in position. Where the connection to a filler pipe is below the maximum oil level in the tank, a tap or non-return valve must be fitted to prevent spillage when the filler pipe is disconnected.

11.23 Some method to indicate the level of oil in the tank should be provided. Gravity is frequently the method adopted for transferring oil from a farm storage tank and this will necessitate the tank being raised above the level of a vehicle's fuel tank. Good working access and a trigger valve should be provided to prevent the operator overfilling the vehicle's tank.

11.24 In the case of a direct oil feed from a storage tank to fixed equipment, an automatic emergency fuel shut off system should be provided.

Maintenance

11.25 The storage area and bund should be regularly checked for the presence of water and oil to ascertain that there have been no failures of the structure. The bund should be frequently emptied of accumulated rainwater.

11.26 The storage tank(s) and associated pipes and valves should be regularly checked for leakage.

11.27 The tank itself, if of steel, will require regular maintenance of the exterior surface.

Temporary storage in mobile tanks

11.28 The same care and attention should be given to mobile tanks as to those for permanent storage. These should be constructed to the same basic specification and fitted with equivalent safety devices as appropriate to minimise spillage of oil.

11.29 The fuel systems of engines used to drive pumps should be regularly checked to ensure they are in good working order, especially when sited close to a watercourse. Any leakage of fuel would pose a significant risk of pollution.

11.30 Avoid the temporary storage of fuel oil for such equipment in places from

which a leak or spill could enter a watercourse. Great care must be taken in transferring fuel oil from cans or drums to the fuel tank of the engine.

Safety precautions

11.31 A supply of dry sawdust, or proprietary oil absorbent, should be provided close to the fuel oil store. This can be used to soak up accidental spillages or to contain a more serious spillage. A Contingency Plan should be prepared to cope with any possible potential spillage and proprietary spill kits should be available to deal with any clean up. Any contaminated spill kits (i.e. which have been used after a spillage) should be disposed of to a suitably licensed site.

11.32 Never use detergents to clean up an oil spill on the farm. This will cause an increased and unacceptable risk of environmental harm.

11.33 Suitable fire extinguishers should be provided close to the storage area.

11.34 All farm personnel working with fuel oil should be made aware of the pollution risk, which can occur should it reach water and be aware of the action to take in an emergency. The SEPA Emergency number is: 0800 80 70 60.

WASTE MANAGEMENT AND MINIMISATION

DOs

1. Store waste securely, to prevent harm to the environment or to human health.
2. Only burn waste "plant tissue" if the activity has first been registered with SEPA.
3. Only burn waste oil in an appliance after prior authority has been obtained from SEPA.
4. Follow "The 4 Point Plan", which offers guidance on how to:
 - 1 reduce dirty water around the farm;
 - 1 improve nutrient use;
 - 1 carry out a land risk assessment for slurry and manure;
 - 1 manage your water margins.
5. Consider using the Defra/BOC Manual "Opportunities for saving money by reducing waste on your farm" to help identify potential cost and efficiency savings in minimising waste production.
6. Reduce, re-use and recycle waste, wherever possible, by segregating materials such as plastic bags and wrapping materials. Collect and store waste plastic straight after use and contact an approved plastic-recycling scheme if the plastic is deemed no longer useable on farm.
7. Recycle waste oil, lubricants, scrap metal and tyres.
8. Keep farm steadings and farmlands clean and tidy and free from unsightly litter from farming activity, especially farm plastics, containers and scrap.
9. Monitor water use carefully and reduce any leakage or wastage, especially where such leakage is contributing to levels of waste production (i.e. of stored slurry).

DON'Ts

1. Don't import anybody else's waste without proper authority from SEPA or the local authority.
2. Don't give waste to a third party without:
 - 1 ensuring that the person it is being given to is authorised by SEPA; and;
 - 1 providing that person with a written description of it.
3. Don't dispose of any waste, including scrap metal, plastic or other rubbish, on farmland or farm tips without proper authority from SEPA.
4. Don't keep hold of waste or store it for more than 1 year if your intention is to dispose of the waste, otherwise a landfill permit is required.
5. Don't keep hold of waste or store it for more than 3 years if you intend to recycle it, otherwise a landfill permit is required.
6. Burning of plastic is not recommended, because it can result in nuisance. Great care is required in using this disposal method.
7. Don't contaminate clean water with livestock slurry, animal manures or farmyard run-off.
8. Don't tolerate fly-tipping. Report such activities on the hotline – 0845 2304090.
9. Don't hesitate to get involved in any local recycling initiatives operated by Machinery Rings or other groups.

DOs (cont.)

10. Use an irrigation scheduling service or direct measurements of soil status to avoid over and under application of irrigation water.

Introduction

12.1 There are many opportunities for farmers to make financial savings and help the environment through efficient use of resources and improved waste management. Waste minimisation (the reduction of waste at source) should be fundamental to decisions on farm waste management and can reduce the risk of pollution from agricultural activities. A framework for cost-effective waste management, in order of priority, is set out as follows:

- 1 Avoid
- 1 Reduce
- 1 Reuse
- 1 Recycle.

12.2 Large quantities of waste materials are generated by modern farming practices and their reuse, recycling, and disposal should be carefully planned to avoid or minimise the risk of causing environmental pollution.

12.3 The Defra/BOC Manual *Opportunities for saving money by reducing waste on your farm* is available to help identify potential cost and efficiency savings in waste management.

12.4 Where possible the purchase of materials used in farming operations should be restricted to those which can be reused/recycled after their initial use. Such materials include:

- 1 packaging and containers;
- 1 plastic covers, rubber tyres and sheeting used in crop storage; and
- 1 worn out and used materials utilised in the servicing of agricultural machinery, e.g. oils.

12.5 Don't hesitate to get involved in any local recycling initiatives operated by Machinery Rings or other groups.

12.6 When selecting materials or products, give preference to those which are biodegradable and which can be reused on the farm or disposed of either by a safe on-farm method or recycled through a waste disposal authority or contractor.

12.7 Following "The 4 Point Plan" can help maximise the value of manures and slurries produced on farms and will reduce the loss of nutrients from land.

What legislation must be complied with?

12.8 Do not dispose of scrap metal, plastic or other rubbish on farmland or farm tips unless a permit from SEPA has been obtained. The burning of plastics, packaging, tyres, waste oil or waste straw in the open can produce large amounts of polluting smoke and should be avoided. Residues from plastics and tyres in particular will contaminate the ground and cause pollution of groundwater and watercourses. Burning them at low temperatures typical of a bonfire or open drum will allow toxic compounds to escape into the atmosphere. Licensed waste disposers should preferably be employed in all cases.

12.9 Wastes are substances or materials which the holder discards, intends to discard, or is required to discard. Some wastes have hazardous properties (e.g. waste oil and asbestos cement sheeting) – these are called special wastes. Special wastes are subject to additional controls to

reflect the higher risk associated with their handling, treatment and disposal. SEPA is waste regulator in Scotland and should be the first point of contact for queries about the regulations that apply to the storage, treatment or disposal of waste.

12.10 Anyone who imports, produces, carries, keeps, treats or disposes of controlled waste or, as a broker, has control of such waste, has a legal duty of care to ensure that:

- 1 they do not cause pollution of the environment or harm to human health;
- 1 they prevent the escape of waste from their control or that of any other;
- 1 wastes are only passed onto persons who are authorised to accept them; and
- 1 a written description of the waste (a transfer note) accompanies the handover of the waste to any third party to enable them to comply with the duty of care and take any such precautions that are necessary to ensure continued compliance with the duty of care.

12.11 It is important to ensure that a person is authorised to accept waste. Persons who accept wastes for storage, treatment or disposal will either require an appropriate environmental permit or may qualify in certain circumstances for an exemption from permitting. In terms of transportation of waste, and with few exceptions, only registered waste carriers are authorised to transport waste. However, those who transport only agricultural, mine or quarry waste do not have to be registered waste carriers.

12.12 Particular legal requirements apply to the transfer and movement of special wastes, including 72 hours prior notification to SEPA of its removal from the farm and specific paperwork requirements. Contact SEPA for further details.

12.13 Disposing of waste on farmland or farm tips requires authorisation from SEPA, including the disposal of waste that has been generated on the farm. Strict technical and engineering standards are enforced in relation to the construction and operation of such sites. Contact SEPA for further details. In certain circumstances, the storage of waste falls within the controls of the Landfill (Scotland) Regulations 2003. Waste that is intended for disposal must not be stored for a period exceeding 12 months unless a landfill permit has been obtained from SEPA. Waste that is intended for recovery or recycling must not be stored for a period exceeding 3 years unless a permit had been obtained from SEPA.

Packaging

12.14 Use packaging which is biodegradable or can be returned to the supplier for reuse. Where possible, minimise packaging by using bulk delivery and re-usable packaging.

12.15 Containers for agricultural chemicals and other persistent toxic or harmful substances should not be put to an alternative use. Guidance on the disposal of used pesticide containers is provided in the Code of Practice for the Safe Use of Pesticides on Farms and Holdings.

Plastic materials

12.16 Where possible, reuse or recycle plastic materials on the farm as this will help to reduce the quantity of waste which has to be disposed off. Care in the handling and use of plastics will increase its potential for reuse and/or recycling and its useful life expectancy. Where plastic material is not reusable for its original purpose, all opportunities should be sought to reuse or recycle it for other applications.

12.17 Materials to be recycled should be as clean as possible and free from soil. Different

types of material should be kept separately and the material stored in a safe place ready for collection.

12.18 Many plastic crop covers are biodegradable but do not degrade sufficiently well to avoid a litter problem. Be aware that wind blown plastic can accumulate in hedges and on riverbanks, which is unsightly and potentially harmful.

Waste oil

12.19 Waste lubrication and hydraulic oils are produced in significant quantities from the servicing of agricultural machinery. Where waste oil cannot be used on the farm, for example to fuel a heater, it should be taken to a suitable licensed disposal point. Waste oil must never be disposed of to a soakaway or other farm waste system. Waste oil on farms can only be burned in appliances authorised by SEPA for this purpose. Farmers should contact SEPA regarding the legal requirements.

12.20 The use of waste oil for the purposes of starting bonfires should be avoided.

12.21 The drainage system from vehicle wash areas should be provided with a suitable oil interceptor which will require cleaning at regular intervals. The drainage should discharge into a collection tank. SEPA should be contacted for guidance on the options available for disposal.

Scrap

12.22 The disposal of scrap is banned under the Landfill (Scotland) Regulations 2003 except in accordance with a permit from SEPA or under an exemption from the requirement to hold a permit. Such dumping causes potential environmental hazards which can also pose a threat to human health and animal welfare. Dumped materials can attract vermin and are unsightly.

Waste fertiliser, feed and crop residues

12.23 Purchased fertiliser can account for up to 60% of variable costs in crop production. Considerable savings can be made by reducing storage losses from damp or split bags, improved spreadability by spreader calibration and matching application to crop requirements using soil analysis and crop growth monitoring.

12.24 Better design and calibration of feeder systems can considerably reduce feed waste whilst reformulation of rations can improve efficiency.

12.25 Crop losses at harvest, grading and storage range between 5 and 25% of total production. Improvements in harvesting, storage, marketing and recycling of crop residues can result in significant cost savings. Close attention to vermin control will also reduce crop losses and minimise risks to human and animal health.

Efficient water use

12.26 It is important to minimise losses from leakage, contamination or misuse of water. Water use should be monitored carefully and opportunities for more efficient use considered as well as reducing the volume of mains or abstracted water used.

12.27 Irrigation is a high consumer of clean water in dry seasons. Ponds for the retention of rainfall should be considered on these farms. Optimise use of irrigation water by monitoring weather forecasts, soil moisture deficits and crop growth stage using irrigation scheduling techniques.

12.28 Clean water from roofs should be kept separate from dirty yard water and may be used for irrigation and washing down. By doing so you will also be reducing the volume of slurry to be collected and applied to land.

12.29 Use water troughs gravity-fed from adjacent watercourses and in-house bite-type or nipple drinkers if practicable.

12.30 Protect pipes from freezing and fracturing resulting in leakage and unnecessary losses.

Energy use

12.31 If appropriate consider the installation of low-energy lamps, smaller fluorescent tubes, thermostats and insulation. Potential energy savings are in the order of 10%.

12.32 Independent lighting systems for sections of large buildings and reminder notices to switch-off lights and equipment are low-cost solutions.

12.33 In new buildings, investment in efficient heating/cooling and ventilation system will result in a large on-going reduction in energy use.

12.34 Advice on more efficient energy use can be obtained by calling the Scottish Energy Efficiency Office helpline on Freephone 0800 585794.

Fly-tipping

12.35 Fly-tipping is a criminal offence and any such activity should be reported to the local authority, SEPA or the police. These bodies are empowered to prepare reports to Procurators Fiscal so that proceedings can be instigated against perpetrators, and may themselves issue fixed penalty notices to fly-tippers. The Scottish Executive funds Keep Scotland Beautiful to provide advice and training on how to use existing legislation against fly-tippers. That organisation chairs the Scottish Flytipping Forum, on which NFU Scotland is represented. A national Stop Line has also been set up (08452 30 40 90), to provide a single point of contact for anyone who witnesses flytipping or who wishes to inform the authorities of a site that needs cleared.

Imported waste

12.36 Farmers are increasingly being approached to import solid wastes normally destined for landfill sites. Since farm tips are now covered by the Landfill (Scotland) Regulations 2003, this operation may be illegal and you should always consult SEPA beforehand. Some wastes, however, may be imported for use on the farm in certain circumstances under exemptions from waste management licensing controls. Some exemptions must be registered with SEPA. Again you should contact your local SEPA office for more information on this prior to accepting any such waste.

Spent rodenticide or other pesticide baits

12.37 Disposal of spent rodenticide or other pesticide baits and carcasses should be in accordance with the requirements specified on the product label.

PREVENTION AND CONTROL OF EMISSIONS TO AIR

DOs

1. Seek a permit from SEPA if you have more than 40,000 places for poultry, or 2,000 places for production pigs or 750 places for sows at an installation.
2. Submit an application between 1 November 2006 and 31 January 2007 if your farm exceeds the above thresholds.
3. Apply for a permit from SEPA if you intend to construct a new installation for rearing pigs or poultry and where the number of places for animals or birds will exceed the thresholds specified in the Pollution Prevention and Control (Scotland) Regulations 2000, as amended ("the PPC Regulations").
4. Consult SEPA about any proposals you have to substantially change an existing pig or poultry installation in advance of 1 November 2006, as this may require you to seek a permit to operate such an altered installation under the PPC Regulations.
5. Consult Scottish Natural Heritage (SNH) regarding any areas designated for their nature conservation value within 2km of any new or substantially changed installation that exceeds the thresholds in the PPC Regulations.
6. Comply with the 'Standard Farming Installation Rules' developed by SEPA for pig and poultry installations operated under the PPC Regulations.
7. Follow the latest edition of the **Muirburn Code**. [GAEC measure 6]
8. Consult SEPA if in any doubt about the requirements of the PPC Regulations.

DON'Ts

1. Don't apply for a permit if your pigs or poultry are reared outdoors, as this type of production is not covered by the PPC Regulations.
2. Don't spread slurries or manures in a manner that may cause pollution of air or result in odour nuisance.
3. Don't be a 'bad neighbour' by spreading livestock slurry and manures:
 - 1 close to domestic or public buildings;
 - 1 at weekends or public holidays;
 - 1 when the wind direction is towards public/residential areas;
 - 1 in areas designated for their conservation value; or
 - 1 during the hours of darkness, unless unavoidable.
4. Don't burn plastics, rubber, tyres or other materials which will produce dark smoke.
5. Don't light fires near a public road.

DOs (cont.)

- 9.** Spread slurries and manures when the wind direction is away from public/residential areas and areas designated for their nature conservation value.
- 10.** Seek professional advice about how to prevent and control emissions to air if in doubt.
- 11.** *Use low-emission techniques for slurry spreading e.g. trailing-shoe, shallow (open slot) injector, deep (closed slot) injector or band spreader. When this is not possible, use a broadcast slurry spreader that gives a low and downward trajectory and large droplets.*
- 12.** *Minimise odours from livestock housing by collecting and transferring all slurry every day to a suitable store and cleaning buildings regularly.*
- 13.** *Cover slurry stores where practicable to reduce emissions of ammonia. This will also reduce levels of waste production by excluding rainfall.*
- 14.** *Incorporate applications of slurry and solid manure to uncropped land as soon as practical, preferably within 6 hours for slurry and 24 hours for solid manure.*

(Italics indicates mandatory if specified in a permit issued by SEPA.)

Introduction

13.1 Increasingly, the impact of agricultural activities on air quality is being recognised. It is known, for example, that agriculture is the dominant source of ammonia emissions in the UK, mainly arising from the storage and application of livestock manures and slurries.

13.2 Agricultural activities can also give off various “greenhouse” gases, such as carbon dioxide, methane and nitrous oxide, which contribute to climate change. Carbon

dioxide is emitted when soil is disturbed (e.g. by ploughing) and when peat is drained. Methane is formed from the decomposition of organic matter and is also produced by ruminant animals. Nitrous oxide, a powerful greenhouse gas, can be formed in wet soils from using nitrogen fertiliser and from the treatment and application of animal manures and slurries. Using energy in buildings and transport also leads to emissions of greenhouse gases.

13.3 Methyl Bromide, a chemical pesticide/fumigant, is an ozone-depleting substance. Production and supply of methyl bromide for general use ceased on 31 December 2004. Where suitable alternatives are not available, an application for a critical use exemption must be made. For further guidance on exemptions visit the Scottish Executive website, (www.scotland.gov.uk).

13.4 Complaints about agricultural odours arise mainly from slurry or manure spreading, farm buildings and slurry or manure stores.

13.5 A permit is required from SEPA for the operation of certain large intensive pig and poultry installations to control the overall impact on the environment, including emissions to air.

What legislation must be complied with?

13.6 The Pollution Prevention and Control (Scotland) Regulations 2000, as amended (“the PPC Regulations”), which are enforced by SEPA, apply to a wide range of industries. In terms of agriculture, however, only large installations used for the intensive rearing of pigs and poultry that exceed the following thresholds will become subject to control:

- 1 40,000 places for poultry;
- 1 2,000 places for production pigs (over 30kg); or
- 1 750 places for sows.

13.7 The Regulations are being phased in, with complete implementation required by 2007. However, new intensive pig and poultry installations, and those that become substantially changed, will be required to comply immediately by applying for a permit from SEPA. Note that installations where pig and poultry are reared outdoors are not covered by the PPC Regulations.

13.8 The overall environmental impacts of intensive pig and poultry installations are controlled under the Regulations. As well as focusing on issues such as waste minimisation and noise generation, PPC involves looking at raw material inputs, the transfer, collection and storage of manures and slurries, odour control, and efficiency of water usage. The storage and spreading of manures is a critical issue, given that the pig and poultry sectors contribute to 23% of the UK’s ammonia emissions.

13.9 Guidance on meeting the requirements of the PPC Regulations for pig and poultry rearing installations has been incorporated into the *Standard Farming Installation Rules for Pig and Poultry PPC Installations* developed by SEPA in conjunction with the industry and other UK organisations. Contact your local SEPA office, or access the SEPA web-site (www.sepa.org.uk), for further guidance on the requirements of PPC. Scottish Natural Heritage (SNH) must also be consulted regarding any areas designated for their nature conservation value within 2km of any new or substantially changed installation that exceeds the thresholds in the PPC Regulations.

13.10 Consult SEPA if you are planning to treat slurry and FYM on your farm, including the processes highlighted in Appendix 1, as this may require to be controlled under waste management legislation.

Farm odour

13.11 The statutory nuisance provisions under Part III of the Environmental Protection Act 1990 give local authorities power to act on complaints arising from agricultural activities. Using these powers, an abatement notice may be served requiring a decrease of the nuisance or prohibiting or restricting its reoccurrence.

13.12 The use of appropriate practices allied to good planning and management of both new and existing installations/structures can help minimise the risk of causing a nuisance. The aim is to contain the smell within the farm buildings or surrounding agricultural land by reducing emissions at source and allowing the diluting effect of air movement and distance to complete its dispersion.

Biological treatments

13.13 Biological treatment of slurry and manures by anaerobic or aerobic techniques has proved successful in significantly reducing odour emissions in certain circumstances and it may be worth considering the use of such treatments to tackle specific or severe problems. Further advice on this can be found in Appendix 1 to this section.



Minimising odour from livestock buildings

13.14 When designing new buildings, consider their siting in relation to residential accommodation, and avoid sites within 400m of such developments. Where possible, sites downwind of residential areas should be chosen. Ensure buildings are properly ventilated to control temperature, humidity and the concentration of gases, and to provide a good distribution of clean air under a wide variety of external weather conditions. Ventilators should be thoroughly cleaned between batches of stock and maintained to ensure operation at the correct airflow for the stock requirements. The removal of

dust will help to reduce the level of odour. Humid conditions caused by poor ventilation result in smells and the build up of high levels of ammonia.

13.15 Professional advice should be sought on the positioning of ventilator outlets. The higher the outlet, the greater the dilution factor from air movement. Ventilation outlets positioned along the sides of buildings, below slatted floors and immediately over slurry collection channels can result in poorer dispersion of odours. The use of bioscrubbers, biofilters and tall chimneys as exhaust ventilators for odour removal can be effective technologies, but they are expensive and it is generally better to control odours at source.

13.16 To control odour, it is essential to maintain a high standard of hygiene and cleanliness:

- 1 plan the collection and storage of slurry and manure (see Section 4 for further details);
- 1 minimise open concrete areas used for livestock. Drainage arising from this area must drain to the slurry storage system. It should not be allowed to run off on to roads where evaporation will increase smells, in addition to posing a road safety risk;
- 1 maintain or replace drinking systems to avoid overflow and spillage which leads to wet, smelly areas, increased levels of waste production, slurry dilution or wet poultry litter or bedding;
- 1 clean livestock buildings regularly and thoroughly using the correct type and quantity of disinfectant and volumes of wash water;
- 1 ensure that all cleaning material/drainage water is collected. Never discharge wash waters to watercourses as these can give rise to conditions, giving rise to odour. Contact SEPA for advice on suitable disposal arrangements; and

- 1 comply with the stocking density recommendations set out in the appropriate Codes of Practice for the Welfare of Livestock. Further advice on this can be obtained from Scottish Executive Animal Health Offices, the Farm Animal Welfare Council and SAC.

Minimising odour from slurry and manure stores

13.17 New slurry store sites should not be located within 400m of a residential development. In solid manure stores, natural composting should be encouraged by allowing air penetration to stimulate the breakdown of the manure.

13.18 Offensive smells from slurry stores are produced by:

- 1 long periods of storage under warm conditions; and
- 1 the addition of waste foods, milk products or silage effluent.

13.19 Where safe and practicable, odour emissions can be reduced by the use of a floating or fixed cover. Take care as poisonous and explosive gases may collect under the cover.

Minimising odour from land application

13.20 The whole-farm production and management system should be considered in relation to the overall control of emissions. The release of odours during the spreading of slurries, manures and other organic fertilisers can be detected at large distances from the field. The level of odour is affected by:

- 1 the type of manure or slurry, especially slurries containing waste foods, milk or silage effluent;
- 1 the age of the manure or slurry;
- 1 the time of year, length and method of storage;
- 1 the weather conditions during and following spreading;

- 1 the rate of application; and
- 1 the method of spreading/equipment used.

13.21 The following guidance should be adhered to:

- 1 obtain a weather forecast and select suitable conditions for spreading. The best spreading conditions are bright, sunny and windy days, followed by cloudy, windy evenings. Avoid spreading when the forecast indicates very damp, humid weather with very light winds and clear, still nights with light winds, as these conditions prevent odour dilution and dispersion;
- 1 use machinery with low emission techniques for slurry spreading e.g. trailing shoe, shallow (open slot) injector, deep (closed slot) injector or band spreader. When this is not possible, use a broadcast slurry spreader that gives a low and downward trajectory at low pressure. High trajectory applicators, such as those fitted with a splash plate or rain guns, should only be used on sites remote from residential housing or areas to which the public have no access;
- 1 inject or incorporate applications of slurry and solid manures to uncropped land as soon as practical, preferably within 6 hours for slurry and 24 hours for solid manures;
- 1 seek to immediately plough or work slurry into the soil on arable land, as this can reduce emissions by up to 90%. Rates of loss are highest during the first few hours after spreading;
- 1 adopt a 'good neighbour' policy and, where possible, avoid slurry, sewage sludge and poultry litter spreading at weekends, public holidays and in the evenings. Do not spread during the hours of darkness, unless unavoidable, as it is difficult to supervise and control such activities

- or see any impacts on local watercourses etc. Where possible, slurry spreading should not be undertaken less than 1km upwind of residential development and a wide margin should be given to public footpaths and private gardens;
- 1 avoid spreading in areas designated for their conservation value including unimproved grassland and rough grazings; and
 - 1 consider exporting the slurry to another farm where land application does not cause environmental problems, if the above precautions are inadequate to control nuisance at an acceptable level. The additional slurry must be included in that farm's Manure Management Plan (Farm Waste Management Plan) / Risk Assessment for Manures and Slurries. Please note that, in some circumstances, the movement of manures and slurries from one farm to another will be considered movement of waste. In these cases, the exporting farmer will have to produce a waste transfer note within 7 days if SEPA asks. Further details are available from SEERAD and from SEPA.

Ammonia emissions

13.22 Ammonia emissions from agriculture not only represent the loss of a valuable nutrient but can also cause the following detrimental effects to the environment:

- 1 acidification of the soil through deposition of ammonia and transformation to ammonium and then nitrate; and
- 1 addition of nitrogen, by deposition to areas of high nature conservation value, which may result in vegetation changes or increased nitrate leaching because many ecosystems are adapted to low nutrient conditions. This may give rise to increased nutrient enrichment of watercourses.

13.23 Ammonia losses are considerably higher from manures and slurries containing a high ammonium nitrogen content e.g. cattle and pig slurry and poultry manure. While the PPC Regulations only apply to intensive pig and poultry installations above certain size thresholds, smaller livestock units (including dairy and beef) can give rise to potentially damaging emissions if sited or managed inappropriately.

Minimising ammonia losses from buildings and slurry and manure stores

13.24 Several techniques can be used to reduce ammonia emissions from buildings and slurry and manures stores. Slurry stores should be covered if this is safe and practical, which will also help to reduce levels of waste production by excluding rainfall. In addition, additives can be added to stored manure to manipulate its pH value and techniques can be employed to encourage fast air drying of manure or litter in poultry houses.

Minimising ammonia losses from land application of slurry

13.25 Of the total ammonia lost through slurry spreading, over 50% can be accounted for within the first 24 hours of application. The amount lost varies according to the following factors:

- 1 Soil condition
- 1 Slurry type and composition
- 1 Crop
- 1 Weather conditions (e.g. rainfall, wind-speed, temperature).

Techniques used for odour reduction are also effective in reducing ammonia emissions resulting from slurry applications.

General on-farm burning

13.26 Burning plastics, rubber, tyres or other waste produces dark, polluting smoke and could constitute a statutory nuisance under Part III of the Environmental Protection Act 1990. It is **not** recommended that these materials be burned.

Muirburn

13.27 Muirburn is a means of managing the vegetation of upland grazings to maintain them in a productive condition. In the planning and control of muirburn, farmers and landowners should follow “The Muirburn Code” and its supplement “Guide to Best Practice” published by SEERAD.

Straw and stubble burning

13.28 Straw and stubble burning presents several risks, including:

- 1 the farm – buildings, crops and machinery may catch fire;
- 1 the countryside – hedges, trees, wildlife and game can all be affected;
- 1 general – serious risks can be caused to nearby businesses and homes and, if smoke is allowed to drift onto roads, this can result in unsafe driving conditions;
- 1 loss of valuable organic material for soils; and
- 1 emissions of greenhouse gas.

13.29 As straw is of value to livestock farmers, baling and carting is the preferred alternative to burning where this can be achieved within cost and time constraints. Alternatively, straw can be chopped and incorporated into the soil prior to establishing the next crop.

13.30 If stubble burning is to be carried out, the following precautions should be taken:

Before burning

- 1 make a fire break at least 10m wide;
- 1 warn neighbours in order to prevent unnecessary alarm or inconvenience when burning starts;
- 1 consult the local authority Environmental Health Department, if burning near a residential area; and
- 1 check the up-to-date weather forecast before you burn. Avoid burning in still conditions or if wind is forecast to exceed Force 3 (4-6 mph).

When burning

- 1 each separate fire must be continually supervised by a sufficient number of competent staff;
- 1 limit the area of burning to controllable blocks of not more than 10 hectares, with not less than 150m between any 2 blocks being burned simultaneously; and
- 1 burn against the wind.

After burning

- 1 check carefully that no straw remains alight or smouldering; and
- 1 incorporate ash as soon as possible.

Never burn

- 1 when the fire may get out of control e.g. in windy or exceptionally dry conditions;
- 1 within 15m of the trunk of a tree or a hedgerow;
- 1 within 50m of any housing or farm buildings;
- 1 within 100m of any road;
- 1 after dusk; or
- 1 on weekends or public holidays.

Appendix 1

BIOLOGICAL TREATMENT OF MANURES AND SLURRIES

Biological treatment occurs either in the presence of air/oxygen (aerobic systems) or in its absence (anaerobic systems). Most livestock slurries are present in highly concentrated forms so their biological treatment has been directed towards the reduction of odour and soluble Biochemical Oxygen Demand (BOD) to reduce environmental pollution and the production of energy in the form of biogas or heat.

Biological treatment of slurry and FYM by anaerobic or aerobic (aeration and composting) techniques has proved successful in significantly reducing the amount of odour from waste products experimentally and has potential to deal with specific or severe problems. The cost of providing and operating treatment systems can be high. Expert advice should therefore be sought to ensure the treatment is appropriate and cost-effective.

a. Anaerobic digestion

Controlled anaerobic digestion takes place in an insulated gas-tight tank. Slurry is fed in on a regular, usually daily, basis. The contents of the tank are mixed regularly and heated to 35 or 55°C. The treatment period is usually 12 to 15 days for pig slurry and 20 days for cattle and poultry slurries. The main benefits of anaerobic digestion are:

- 1 a very substantial reduction of slurry offensive odour;
- 1 reduction of dry matter and BOD, thus minimising the risk of creating anaerobic soil conditions and minimising pollution of drainage water after field application of digested slurry. However, neither the digested slurry nor the liquid decanted from the digested slurry can be discharged to a watercourse;
- 1 some destruction of harmful organisms (e.g. pathogens) and weed seeds;
- 1 improved fertilising quality of digested slurry; and
- 1 energy generation in a form of biogas.

b. Aerobic treatment

Whole or separated slurry can be aerated either in specially built tanks, slurry storage tanks or lagoons using compressed air or mechanical aerators. Correctly designed aeration systems can treat slurry in a relatively short period of time, between 3 to 10 days, to achieve the following objectives:

- 1 offensive odour removal; and
- 1 reduction of BOD.

In addition, aerobic treatment can manipulate the nitrogen content by either increasing the proportion of ammonia nitrogen in slurry (resulting in higher nitrogen availability to crops compared to untreated slurry) or by removing up to 70% of total nitrogen in the form of nitrogen gas. This may be useful in certain circumstances for some farms in Nitrate Vulnerable Zones.

The heat produced during aeration of slurry increases the temperature within insulated tanks or lagoons to over 30°C. This accelerates the treatment and where temperatures of 50°C are achieved this will increase the kill of harmful organisms and weed seeds in the slurry. Heat from the treatment can be extracted and used for heating water for on-farm use or direct heating of farmhouses.

Note: While aerobic and anaerobic treatments are effective in reducing slurry odour, they can increase ammonia loss from land by increasing the pH value of the slurry. A modification of aerobic treatment of manures and slurries can convert ammonia into nitrogen gas. This minimises ammonia and odour emissions while reducing the nitrogen input to soil.

c. Use of slurry additives and deodorants

Additives to reduce odour emissions can be used as a short-term treatment for a batch of slurry or a store which is causing a nuisance. Masking agents may be used to control site smells where it is not possible to deal effectively with the source. As most additives and deodorants have not proved very effective, seek professional advice before making a purchase.

d. Composting

Composting is an aerobic process, which stabilises organic matter such as solid livestock and vegetable wastes, straw, grass and hedge cuttings, leaves and other biological wastes. It prevents a further degradation of wastes which, normally stored under anaerobic conditions, generate leachates, gases and obnoxious smells. High temperature, which occurs during composting, substantially decreases the viability of weed seeds and significantly reduces harmful organisms (pathogens). Compost, made by this process, can be used as a fertiliser or soil conditioner depending on its manurial value. Compost is a potentially marketable product but the farmer should seek professional guidance on technical feasibility and economic viability of composting before commencing such an enterprise.

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B = Animal Health Offices

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British Crop Protection Council (BCPC)

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BIBLIOGRAPHY AND LEGISLATION REFERRED TO IN THE SECTIONS OF THIS CODE

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<p>SECTION 2 The 4 Point Plan www.sac.ac.uk</p> <p>Local Environmental Risk Assessment for Pesticides (LERAP) www.scotland.gov.uk</p> <p>Crop Protection Management Plans(CPMPs) www.voluntaryinitiative.org.uk</p> <p>Crop Protection Association www.cropprotection.org.uk</p> <p>Sheep Dipping Code of Practice for Scottish Farmers, Crofters and Contractors www.scotland.gov.uk</p>	<p>The EU Water Framework Directive 2000/60/EC</p> <p>The Groundwater Regulations 1998 (S.I. 1998/2746)</p> <p>The Pollution Prevention and Control (Scotland) Regulations 2000 (S.S.I. 2000/323)</p> <p>The Water Environment and Water Services (Scotland) Act 2003 www.scotland-legislation.hmso.gov.uk/legislation/scotland/acts2003/20030003.htm</p>
<p>SECTION 3 SEPA: Soil Quality Report 2001 www.sepa.org.uk</p> <p>EIA Uncultivated Land www.scotland.gov.uk</p> <p>The Muirburn Code www.scotland.gov.uk</p>	<p>The Sludge (Use in Agriculture) Regulations 1989 (S.I. 1989/1263) (as amended)</p> <p>The Environmental Impact Assessment (Uncultivated Land and Semi-Natural Areas) (Scotland) Regulations 2002 (S.S.I. 2002/6)</p>

ANNEX
D

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<p>SECTION 4</p> <p>British Standards: BS 5502 – Buildings and Structures For Agriculture (Part 50) BS 8007 – Code of practice for design of concrete structures for retaining aqueous liquids BS 8110 – Structural use of concrete www.bsi-global.com</p> <p>Health and Safety Executive www.hse.gov.uk</p> <p>Guidelines for farmers in nitrate vulnerable zones www.scotland.gov.uk</p> <p>The 4 Point Plan www.sac.co.uk</p> <p>Scottish Agricultural College: The Fertiliser Series Technical Notes www.sac.ac.uk</p>	<p>Control of Pollution Act 1974 (as amended)</p> <p>The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil)(Scotland) Regulations 2003 (S.S.I. 2003/531) <i>[but the offence of causing or knowingly permitting any poisonous, noxious or polluting matter to enter controlled waters is to be replaced by equivalent controls under the ‘Water Environment (Controlled Activities) (Scotland) Regulations’ in 2005.]</i></p> <p>The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2003 (S.S.I. 2003/51) (as amended by S.S.I. 2003/169)</p> <p>The Environmental Impact Assessment (Uncultivated Land and Semi-Natural Areas)(Scotland) Regulations 2002 (S.S.I. 2002/6)</p>

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<p>SECTION 5 UK Water Industry/British Retail Consortium: Safe Sludge Matrix www.adas.co.uk</p> <p>Code of Practice for Agricultural Use of Sewage Sludge www.defra.gov.uk</p> <p>SAC: The Fertiliser Series Technical Notes www.sac.ac.uk</p> <p>Code of Practice for the Management of Agricultural and Horticultural Waste www.defra.gov.uk</p>	<p>The Plant Health (Great Britain) Order 1993 (S.I. 1993/1320)</p> <p>The Potatoes Originating in Egypt (Scotland) Regulations 2001 (S.S.I. 2001/421)</p> <p>The Sludge (Use in Agriculture) Regulations 1989 (S.I. 1989/1263) (as amended)</p> <p>Environmental Protection Act 1990</p> <p>The TSE (Scotland) Regulations 2002 (S.S.I. 2002/255)</p> <p>The Waste Management Licensing Regulations 1994 (S.I. 1994/1056)</p> <p><i>These have been amended several times. Recent Scottish amending instruments are S.S.I. 2003/171 and S.S.I. 2004/275</i></p> <p>The Animal By-Products (Scotland) Regulations 2003 (S.S.I. 2003/411)</p>

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<p>SECTION 6 Guidelines for farmers in nitrate vulnerable zones www.scotland.gov.uk</p> <p>SNH, WWF, FWAG, SEPA, SAC: Farming and Watercourse Management A Code of Good Practice Handbook 2000</p> <p>The 4 Point Plan www.sac.co.uk</p>	<p>EC Nitrates Directive (91/676/EEC)</p> <p>The Private Water Supplies (Scotland) Regulations 1992 (S.I. 1992/575) (S. 64)</p> <p>The Protection of Water Against Agricultural Nitrate Pollution (Scotland) Regulations 1996 (S.I. 1996/1564) (S. 137)</p> <p>The Water Framework Directive (2000/60/EC)</p> <p>The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 (S.S.I. 2003/531)</p> <p>The Designation of Nitrate Vulnerable Zones (Scotland) Regulations 2002 (S.S.I. 2002/276)</p> <p>The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2003 (S.S.I. 2003/51) (as amended by S.S.I. 2003/169)</p> <p>The Environmental Impact Assessment (Uncultivated Land and Semi-Natural Areas) (Scotland) Regulations 2002 (S.S.I. 2002/6)</p> <p>The Notification of Installations Handling Hazardous Substances Regulations (S.I. 1982/1357) as amended by (S.I. 1996/825) and (S.I. 2002/2979)</p>

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<p>SECTION 7 BS 5502 – British Standards specification: Buildings and structures for agriculture www.bsi-global.com</p> <p>SECTION 8 National Proficiency Test Council: Certificate of Competence in the Safe Use of Sheep Dips 1998 www.nptc.org.uk</p> <p>SEERAD: Sheep Dipping Code of Practice for Scottish Farmers, Crofters and Contractors – Groundwater Regulations 1998 www.scotland.gov.uk</p>	<p>The Construction (Design and Management) Regulations 1994 (S.I. 1994/3140)</p> <p>The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil (Scotland) Regulations 2003 (S.S.I 2003/531)</p> <p>The Groundwater Regulations 1998 (S.I. 1998/2746)</p> <p>The Landfill (Scotland) Regulations 2003 (S.S.I 2003/235)</p>

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<p>SECTION 9 Defra/HSE Code of Practice for the Safe Use of Pesticides on Farms and Holdings (1998) – the “Green Code”. www.pesticides.gov.uk <i>[But note that this is likely to be superseded in 2005 by the ‘Code of Practice for the Safe Use of Plant Protection Products in Scotland’]</i></p> <p>HSE Agricultural Information Sheet No 16 ‘Guidance on Storing Pesticides for Farmers and Other Professional Users’. www.hse.gov.uk/pubns/ais16.pdf</p> <p>Keeping Pesticides out of Water: Local Environment Risk Assessment for Pesticides (LERAP) www.scotland.gov.uk</p> <p>Horizontal Boom Sprayers: Local Environment Risk Assessment for Pesticides (LERAP) – A step-by step guide to reducing aquatic buffer zones in the arable sector www.scotland.gov.uk</p> <p>Is your sprayer fit for work?: Local Environment Risk Assessment for Pesticides (LERAP) www.scotland.gov.uk</p> <p>SEPA Guidance Note 1. Disposal of waste agrochemicals to land: Guidance on compliance for farmers, crofters and growers.</p> <p>Home Grown Cereals Authority: Chart on selection of nozzle type www.hgca.com</p> <p>British Crop Protection Council: Handbooks www.bcpc.org</p>	<p>Food and Environment Protection Act 1985</p> <p>The Control of Substances Hazardous to Health Regulations 1994 (S.I. 1994/3246)</p> <p>The Groundwater Regulations 1998 (S.I. 1998/2746)</p> <p>The Landfill (Scotland) Regulations 2003 (S.S.I. 2003/235)</p>

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<p>Crop Protection Management Plans(CPMPs) www.voluntaryinitiative.org.uk</p> <p>Crop Protection Association: Leaflets on agrochemical disposal and container incineration www.cropprotection.org.uk</p> <p>Biodiversity Action Plans for species and habitats www.ukbap.org.uk</p> <p>BASIS Registration Ltd – an independent registration, standards, certification and training organisation www.basis-reg.com</p>	
<p>SECTION 10 SEERAD: Local Authority Guidance for Animal Carcass Incineration Processes under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991 (S.I. 1991/472)</p>	<p>Dogs Act 1906</p> <p>Control of Pollution Act 1974 (as amended)</p> <p>Clean Air Act 1993</p> <p>The Clean Air (Emission of Dark Smoke)(Exemption) Regulations 1969</p> <p>The Animal By-Products (Scotland) Regulations 2003 (S.S.I. 2003/411)</p> <p>The Pollution Prevention and Control (Scotland) Regulations 2000 (S.S.I 2000/323)</p> <p>The Waste Incineration (Scotland) Regulations 2003 (S.S.I 2003/170)</p>

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<p>SECTION 11</p> <p>SECTION 12 Defra/BOC: Opportunities for Saving Money by Reducing Waste on Your Farm www.defra.gov.uk</p> <p>Defra: Code of Practice for the Safe Use of Pesticides on Farms and Holdings www.pesticides.gov.uk</p> <p>The 4 Point Plan www.sac.co.uk</p> <p>SECTION 13 SEPA: Standard Farming Installation Rules for Pig and Poultry PPC Installations 2001 www.sepa.org.uk</p> <p>SEERAD: Muirburn Code, and its supplement Guide to Best Practice www.scotland.gov.uk</p> <p>SEERAD/SAC/Animal Welfare Council: Animal Health Offices: Codes of Practice for the Welfare of Livestock</p> <p>SEERAD: Substances that Deplete the Ozone Layer, exemption for using Methyl Bromide www.scotland.gov.uk</p>	<p>Control of Pollution Act 1974 (as amended)</p> <p>Health and Safety at Work Act 1974</p> <p>The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil (Scotland) Regulations 2003 (S.S.I. 2003/531)</p> <p>The Waste Management Licensing Regulations 1994 (S.I. 1994/1056)</p> <p><i>These have been amended several times. Recent Scottish amending instruments are S.S.I. 2003/171 and S.S.I. 2004/275</i></p> <p>The Landfill (Scotland) Regulations 2003 (S.S.I. 2003/235)</p> <p>Environmental Protection Act 1990</p> <p>The Pollution Prevention and Control (Scotland) Regulations 2000 (S.S.I. 2000/323)</p>

Notes:

1. Copies of references in the Bibliography are available either online or from the named organisation. Most addresses are in Annexes A, B or C.
2. Most domestic legislation mentioned above is available online at: www.hms0.gov.uk.
Alternatively, copies may be obtained from: TSO Scotland Bookshop, 71 Lothian Road, EDINBURGH EH3 9AZ Telephone: 0870 606 55 66.
E-mail: edinburgh.bookshop@tso.co.uk
www.tso.co.uk/bookshop/bookstore.asp
European legislation can be found at:
www.europa.eu.int

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