Protecting our Water, Soil and Air

A Code of Good Agricultural Practice for farmers, growers and land managers

Unofficial translation

This code has been written by technical specialists from Defra and Natural England, and been produced in association with the Environment Agency

This book was selected as good practice by SPIN – Soil Protection Initiative Project team.

This book was unofficialy translated on Serbian and Bulgarian language.

Some parts of the book, which are not aplicable in Serbia and Bulgaria are missing.

Unofficial translation of the book is available on-line on Web-based Soil Protection ToolBox which is an Internet-based resource for practical, comprehensive, accessible, and user-friendly information on soil protection, which both professionals and ordinary citizens can use in everyday practice. It connects people, ideas, and resources.

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About this Code

1. This Code of Good Agricultural Practice is a practical guide to help farmers, growers and land managers protect the environment in which they operate.
- The Code describes key actions you can take to protect and enhance the quality of water, soil and air.
- In some cases you may also achieve cost savings for your business.
- It will help you to meet your legal obligations including those relating to cross compliance.

2. The Code is not a manual on how to manage your farm or holding. It is to help you select the appropriate actions for your individual situation. Many farms and holdings are already delivering a good standard of environmental protection, but there are some where it can be improved. Most can do something better.

3. Advice in this Code is appropriate for all farming systems. However, the advice does not override the legal requirement for certifed organic producers and any extra requirements of their chosen Certifcation Body.

5. There are international obligations, under the National Emission Ceilings Directive (reference 3) and the UNECE Gothenburg Protocol (reference 4), to meet targets for limiting ammonia emissions. If you follow good practice in this Code, you will contribute to meeting these targets.

7. The Water Resources Act 1991 contains provisions which are designed to prevent water pollution. Under Section 85 of the Act it is an offence to cause or knowingly permit a discharge of poisonous, noxious or polluting matter or any waste matter into controlled waters. Defences to this offence are set out in Section 88 of the Act and include consents and permits from the Environment Agency. Controlled waters include groundwater and all coastal and inland waters, including lakes, ponds, rivers, streams, canals and feld ditches.

10. Section 1 provides general information on how farm activities can pollute the environment, and basic precautions you should consider. It advises you how to prepare a plan to help cope with an environmental accident or emergency. Section 2 covers soil fertility issues, the loss of plant nutrients to water and the release of harmful gases to help you understand the practical measures in the rest of the Code. Problems can be avoided by considering the management of your holding, and Section 3 describes how you can do this by assessing risks and drawing up management plans for manures, plant nutrients, soils and crop protection.

11. To help you fnd more detailed information on specifc topics, advice is provided in sections that relate to operations you undertake on your farm or holding. Section 4 covers activities related to farm buildings and structures and what goes on in and around them. Section 5 is about feld-based operations. Section 6 provides basic comments on specialist horticultural production, Section 7 covers waste management, and Section 8 covers water supply issues.

12. There are references at Section 9 that will provide more information either on your legal obligations or on technical details to enable you to follow the recommendations. A Glossary at Section 10 provides defnitions of some of the key terms used in the Code.

13. If you carry out any practices that are not covered in the Code you should protect the environment by following the general principles that are outlined in it.

14. Each of the sections 2 to 8 are set out in a similar way to help you understand the relative importance of the various messages. Section 4.2 ‘Silage stores and effluent’ is given opposite as an example:

1 Introduction

1.1 Pollution sources and impacts

15. Protecting our natural resources of water, soil and air is essential for a sustainable environment. The advice in this Code recognises that things you do can affect water, soil and air all at the same time.

Examples of Good practice which can benefit water, soil and air

***Careful management of livestock manures can**:*

- reduce losses of ammonia and other gases to the atmosphere;

- limit nitrate leaching to groundwater;

- avoid excessive build up of nutrients and contaminants in soil; and

- stop micro-organisms such as salmonellae, Escherichia coli, campylobacters and Cryptosporidium parvum being washed into surface waters and reaching bathing-waters.

Changing what is in animal feed will change the manures you have to deal with. This can:
- reduce surplus nitrogen being lost to the environment;

- limit the unnecessary accumulation of phosphorus in the soil which will reduce impact on the water environment; and

- reduce the risk of contaminating soils with feed supplements, such as copper and zinc.

***Following a nutrient management plan will ensure efficient use of fertilizers (and organic manures) and can**:*

- limit nitrate leaching to surface and groundwaters;

- prevent the unnecessary accumulation of phosphorus in the soil which will also reduce impact on the water environment; and reduce the risk of nitrous oxide (a greenhouse gas) being lost to the atmosphere.

16. Pollution which originates from a single identifable source such as a building, store or feld, or from a particular event or action, for example, overflow or leakage from a manure store is called “point source pollution”.

17. By contrast “diffuse pollution” comes from felds or many sources within a catchment which need to be identifed and managed.

18. You should understand the relative risks to the environment that exist on your farm. Make sure you and your staff are aware of sensitive areas such as Groundwater Source Protection Zones, surface waters, water abstraction points (including on your neighbours land) and natural habitats, especially designated sites (see Section 1.2).

19. Some practical ways to save money by minimising both point source and diffuse pollution across a range of farming activities have been identified by the Environment Agency (reference 5).

20. Even though a single pollution incident may seem insigniifcant, the cumulative effect of a number of such incidents (either from point or diffuse sources) will become increasingly important. This may mean that Environmental Quality Standards or Water Framework Directive objectives are not met, particularly in sensitive river and groundwater catchments. For example, water abstracted from rivers, groundwater or reservoirs may not meet the required standards, may not be suitable for stock to drink downstream or may become eutrophic.

Eutrophication

Eutrophication is the enrichment of ecosystems by nitrogen or phosphorus. In water it causes algae and higher forms of plant life to grow too fast. This disturbs the balance of organisms present in the water and the quality of the water concerned. On land, it can stimulate the growth of certain plants which then become dominant so that the natural diversity is lost.

21. Livestock manures and organic wastes including sewage sludge and green waste compost are referred to collectively in this Code as organic manures. They are a particular hazard if they get into water. The ammonia they contain can kill wildlife in the water. Also, micro-organisms breaking down organic matter take oxygen out of the water. This is known as the Biochemical Oxygen Demand (BOD), and in severe cases can kill all river life. Many essential farm materials such as fuel oil, sheep dip, pesticides and fertilisers can also cause water pollution:

Livestock Manure and Dirty Water

In this Code, livestock manure includes slurries and solid manures (including farmyard manure). Dilute washings from dairy and milking parlours and run-off from lightly contaminated yard areas to which animals have regular access are referred to as dirty water.

Biochemical Oxygen Demand

Biochemical Oxygen Demand (BOD) is used to show the polluting strength of livestock manures and organic wastes. It is a measure (in mg/litre) of the amount of oxygen needed by micro-organisms to break down organic material. Crude sewage which only has a BOD of 200-300mg/litre can severely damage surface waters while milk (140,000 mg/litre), silage effluent (30,000 to 80,000 mg/litre), pig slurry (20,000 to 30,000 mg/litre) and cattle slurry (10,000 to 20,000 mg/ litre) are extremely polluting. Even dirty water (1,000 to 5,000 mg/litre) is a very high risk material.

22. Nitrogen, and in some circumstances also phosphorus, may be lost from the soil into groundwater and surface waters. These plant nutrients are also present in run-off from felds in soluble form, as well as in soil organic matter, organic manures and, and in the case of phosphorus, attached to soil particles from where they can be released into the water. The nitrate problem in England is so widespread that about 70% of the country drains to waters identifed as nitrate-polluted under the EC Nitrates Directive (see paragraph 68). About 60% of the nitrate in English rivers comes from agriculture.

23. Eroded soil may remain suspended in the water and reduce the quality of drinking water. Larger particles may settle (sedimentation) in river gravels, causing serious damage to fsheries by smothering spawning grounds and reducing food supply. Such sediment can also support large growths of aquatic vegetation, which may increase the risk of flooding.

Groundwater

Groundwater is the water held underground in rock formations. Where these formations support wells, boreholes, watercourses, wetland habitats etc, they are called aquifers.
Surface water
Surface water includes coastal waters, estuaries, canals, lakes, ponds, rivers, streams, and ditches which contain free water and also temporarily dry ditches and blind ditches.

24. Agro-chemicals (pesticides, disinfectants, sheep dip and other veterinary medicines) and fuel oil are potential pollutants of water, and must be managed accordingly. Sheep dip chemicals in particular can have a huge impact on the ecology of a river. Also there is a maximum permissible concentration of any one pesticide in drinking water of only 0.1µg/l which can easily be exceeded

Atmospheric Pollution and Climate Change

25. Ammonia and gases which cause unpleasant odours are released from organic manures and wastes during handling, storage and both during and after application to land. This Code includes advice on avoiding such odours. The local authority Environmental Health Department is responsible for enforcing legislation on odour nuisance (reference 6). Local authorities have a duty to inspect their areas to detect any statutory nuisances and to take reasonably practical steps to investigate complaints of statutory nuisances which are made to them. Where a statutory nuisance exists, or is likely to occur or recur, they have a duty to serve an abatement notice.

26. Ammonia in the air can cause human health problems. When it is re-deposited, it can acidify soils, natural habitats and fresh waters. By increasing the supply of nitrogen, it can reduce bio-diversity particularly in upland surface waters and natural and seminatural habitats. Agriculture produces more than 85 per cent of ammonia emissions in the United Kingdom, so it is important to consider ways of reducing them (reference 7). This Code includes advice on reducing ammonia emissions, particularly from the land application of livestock manures, and also from their storage and from livestock housing.

28. Using fossil fuel to produce manufactured nitrogen fertilisers is one of the largest sources of carbon dioxide associated with agriculture. This Code includes advice on energy effciency on the farm (reference 8, 9) and how to manage fertiliser inputs effciently. An assessment of the carbon balance of your farm can help identify cost savings and contribute to combating global warming. There are a number of Carbon Calculators to help you prepare such a balance (reference 10, 11).

29. Any loss of soil organic matter contributes to carbon dioxide emissions as well as making soils more diffcult to manage. Protecting lowland and upland peat soils from degradation and anything that locks up carbon such as grassland or trees or that produces a bio-fuel is benefcial.

30. Nitrous oxide and methane are other greenhouse gases. Nitrous oxide is produced by micro-organisms after the application of fertilisers and organic manures, especially if the soil is poorly aerated. Agriculture is estimated to be the source of two thirds of all the nitrous oxide produced in this country. The effcient use of fertilisers and organic manures as detailed in this Code will help to reduce these losses and provide a financial beneft to farmers.

31. Methane is produced directly by cattle and sheep and a smaller amount is also released from livestock manures. Agriculture is responsible for about a third of all emissions of methane. It is possible to reduce methane emissions by optimizing livestock diets. The amount of methane emitted from livestock manures depends on the handling, storage and feld spreading system, but avoiding anaerobic conditions will reduce such emissions. It is possible to collect and use

methane from livestock manures in a controlled process called anaerobic digestion (see paragraph 234)

32. Dark smoke or smoke nuisance has been signifcantly reduced by regulations that restrict what may be burnt in the open. All farms generate waste materials which, if they are not recycled or disposed of correctly, pose a risk to the environment (see Section 7).

33. Poultry and pig housing can generate large amounts of dust which may adversely affect the health of people living nearby.

Protecting soils

34. Most farmers recognise the importance of their soils for the sustainability of their business. However, small quantities of run-off and erosion, which may seem insignifcant, can cause pollution and nuisance. Well managed soils with adequate organic matter can result in lower costs and pose less risk of erosion and run-off.

35. When organic matter is added to soils in organic manures, care should be taken to prevent heavy metals and persistent organic pollutants reducing the fertility of the soil in the long term or contaminating food crops so that they fail to meet legal standards

1.2 Protecting the wider environment

36. Farmers, growers and land managers have a responsibility to protect the wider environment, especially designated areas such as Sites of Special Scientifc Interest (SSSIs) and Natura 2000 sites (Special Areas of Conservation, and Special Protection Areas) (reference 12, 13, 14). Some of these areas are particularly sensitive to nitrogen deposition from ammonia released by agriculture. The previous Section described how reducing and avoiding pollution can improve the quality of life in surface waters and in other sensitive ecosystems. The advice in this Code will also deliver other important benefts. You can obtain support for many of these by joining an agri-environment scheme.

37. You should ensure that you are aware of any SSSIs or other protected areas on, or adjacent to, your land. You must follow the provisions of the law (reference 12, 15), so that you do not harm SSSIs, and seek the necessary permission for activities such as cultivating soils and applying fertilisers and agro-chemicals. Specifc mention is made of SSSIs in key sections of this Code, but care should be taken with all operations that could damage these and other habitats.

38. Hedges, surface waters and feld margins are key habitats on farms. How they are cut, cleared or otherwise managed has a big effect on their value for wildlife. You should keep soil, organic manures, dirty water, fertilisers and pesticides out of these habitats and away from in-feld trees during feld operations. Leaving buffer strips or part of the headland untreated will provide additional benefts for ground nesting birds and natural predators of crop pests.

39. By careful management of permanent pasture, including possibly reducing stocking density and overall nutrient input, run-off and erosion can be reduced, nitrogen and phosphorus losses will decrease and in time the botanical composition of the sward will diversify with knock on benefts for insects and birds.

40. Fencing off surface waters prevents livestock fouling the water, damaging the banks, and getting soil into the water. It also allows a natural habitat to develop, which in turn provide additional protection from run-off and soil erosion.

41. To conserve our historic heritage you should protect archaeological remains that appear on or above the soil surface or are buried beneath it. Take care not to cause damage by sub-soiling, ploughing or other deep cultivation, by uprooting trees or by allowing pigs to disturb the ground. In the case of Scheduled Monuments, such actions may be illegal. Seek advice from the Archaeological Offcer of your local Authority if you are unsure about the status of an historic site.

42. The public’s appreciation of the countryside is a very important part of sustainable use of land. Wherever possible you should select and apply pollution control measures that improve or maintain the landscape in which you farm. Consider the visual effects and the historical landscape before you plant new hedges for wildlife or to break slopes to stop run-off, also before you select your crops or grass down strips to help control run-off and erosion. Advice on historical matters is available from your County Archaeology Service

1.3 Environmental regulation, cross compliance obligations and agri-environment schemes

Regulation

43. This Code includes details of legal requirements which you must follow if they apply to your farm. These are clearly identifed in each section, and references are provided to enable you to obtain more detailed information if you need it. The Environment Agency web site provides further guidance that will help you comply with environmental legislation and protect the environment (see also, reference 16).

46. While a number of cross compliance standards are directly related to the scope of this Code, all of the standards are kept under review as part of a monitoring and evaluation project and may be subject to change. If you are unsure you should refer to the guidance (reference 17) and the Rural Payments Agency web site.

47. Some of the good practice outlined in this Code will help you to meet your cross compliance requirements. However, the Code does not replace any specifc guidance issued for cross compliance purposes including that for soil management (reference 18).

1.4 Responsibilities of farmers, farm staff and contractors

50. All farm staff and any contractors you employ should know their responsibilities, and be familiar with the causes and effects of pollution. They should:

- receive appropriate training for what they have to do;

- know how to operate and maintain the equipment they use;

- know what to do in an emergency;

- be able to follow any emergency plan you have for your farm;

- comply with any risk assessments you have made, for example, in manure, nutrient, soil or crop protection management plans; and

- be aware of the presence of areas which they might damage in the course of their work, such as:

- Source Protection Zones, and near springs, wells and boreholes;

- Sites of Special Scientifc Interest;

- protected areas;

- land under agri-environment or other management agreements; and

- sensitive archaeological sites.

51. You should consider having a written agreement with any contractors, so it is clear who is responsible for the task in hand. This will help to avoid problems. If it is not clear who is responsible, you could both be held liable for any problems or pollution incidents that happen.

52. You should check all surface waters frequently to make sure that they are not polluted. Particularly check at times of high risk such as when slurry, silage effluent or dirty water is being applied or shortly after heavy rain. Look for signs of soil erosion and run-off which is sometimes referred to as soil wash, including damage to the banks by livestock, poaching of ground by livestock, ponded water in felds, gullying and run-off along ‘tramlines’. Use the advice in this Code to help you take appropriate action

1.5 Accident and emergency plan

If any surface water or groundwater is at risk of becoming polluted or becomes polluted, tell the Environment Agency at once and take immediate steps to stop any further pollution.

53. Many farms already have an emergency plan, and the larger pig and poultry farms are required to have them to comply with the Integrated Pollution Prevention and Control Directive (reference 20). It is good practice to produce one for the activities on your farm to prevent pollution, and to help you deal with incidents if they happen. Make sure everyone knows where the plan and emergency equipment is located, what they have to do, and how to do it.

54. Your plan should include:

a) ***A contact list***

This should contain the telephone numbers (including out-of-hours numbers) for the emergency services, regulators (e.g. Environment Agency and local Authority), water supplier, sewer provider, Health and Safety Executive, downstream water abstractors and landowners, and specialist clean-up contractors. Also include any key holders and staff to be contacted in the event of a signifcant incident.

b) ***A site plan***

Your site plan should show clearly the layout and access arrangements for:

- all relevant buildings and structures;

- all drains, inspection manholes and gullies – both for clean and foul drainage systems;

- location of sewer; discharge points, soakaways; and ditches, surface waters, springs, wells and boreholes near the site; and

- location of buildings that can be used during an emergency.

c) ***The location of equipment***

Identify the location of any equipment and materials that can be used to plug drains, block ditches or contain spillages.

d) ***A regular test***

You should carry out an emergency response exercise regularly. This way you will know whether the plan will work in a real emergency. Review your plan after an incident, or at least every 3 years. Further guidance and example plans are available (reference 21, 22). Remember to update the plan if there are changes affecting the site such as new buildings, materials being stored in a different place or the layout of the drains.

2 Soil fertility and plant nutrients

2.1 Introduction

55. You should read this section to help you understand the importance of following the practical measures in the rest of the Code. It deals with:

- Plant nutrients in soil and their loss from agriculture, which can pollute water and air and damage natural and semi-natural habitats; and

- Guidance on managing soil contamination which can affect the fertility of soil, the health of livestock, the safety of the human food chain, and the quality of surface water and groundwater.

2.2 Maintaining soil fertility

- **Maintaining an appropriate level of soil fertility by the careful use of fertilisers, organic manures and lime will help to maximise the proftability of your farming system. Apply fertilisers, organic manures and lime to provide optimum conditions for crop growth, taking account of regular soil analyses. Use soil and crop or grass analysis to confrm sulphur and trace element defciencies, and to help identify any that may be affecting your crops or livestock.**

Good practice

Soil pH and liming

56. Soil pH is a measure of acidity or alkalinity. Lime is lost from the soil as a result of cropping, leaching, pollution and the application of certain nitrogenous fertilisers making the soil more acid. Excessive soil acidity can cause large yield losses and reduce the effectiveness of other fertilisers. You should apply lime as necessary to maintain optimum pH. Do not over apply lime, as an unnecessarily high pH can increase trace element defciencies. It will take a long time for an over-limed soil to return to normal. Optimum pH varies according to soil type and crop rotation (reference 25, 26)

Maintaining soil organic matter

57. The organic matter content of soil is an important part of its fertility. It plays a key role in the physical, chemical and biological processes which control plant growth and soil management. You should seek to enhance soil organic matter by reducing losses, minimising cultivations and adding organic carbon. Carbon is added to soil by roots and other crop residues and by recycling organic manures.

Nutrient management

58. You should have soil analysed regularly. Ideally this should be done every 3 to 5 years to set and maintain a correct fertiliser policy, or whenever a major change of land use is proposed. This can be done as part of a nutrient management plan (see Section 3.3).

59. Provide crops with a balanced supply of the major nutrients: nitrogen, phosphorus, potassium, magnesium, calcium and sulphur. Sodium is also required by some crops. Also ensure adequate availability of trace elements such as iron, manganese, boron, copper, zinc, molybdenum and chlorine. Trace elements are generally supplied by the soil, but you may need to supplement with fertilisers or organic manures.

60. Use a recognised fertiliser recommendation system (e.g. reference 27, 28). If you receive professional advice on nutrient management and fertiliser use, make sure the person giving the advice is a current FACTS Qualifed Adviser who has the FACTS (Fertiliser Advisers Certifcation and Training Scheme) qualifcation and is either a member of the BASIS professional Register (Fertilisers) or a member of the FACTS Annual Scheme (reference 29).

61. You may need to analyse grass and other crops, in addition to soil, to identify any mineral imbalance which may be affecting growth. You should seek veterinary advice for livestock problems as it is usually, but not always, more effective to treat the stock than apply anything to the soil.

62. When applying fertilisers and organic manures, take care not to harm natural and semi-natural habitats, including surface waters, either by accidentally spreading directly into them, or from run-off getting into them afterwards (see Section 5.4, 5.5 and 5.6).

2.3 Managing nitrogen

- Manage nitrogen effciently by using the correct quantity which will reduce losses, increase proftability and protect the environment.
- Following the advice given here can reduce nitrate and ammonium losses into water, and ammonia and nitrous oxide emissions to air.
- Pay particular attention to how, when and the amount of nitrogen fertilizer and organic manure you apply to meet crop requirement.
- Maintain green cover on the land for as much of the year as possible.
- Match the nitrogen content of livestock feed to the particular requirements of the stock.
- To reduce both run-off risk and ammonia loss, when you apply livestock manures to bare land or stubble:
- you should incorporate into the soil any slurry that has been surface broadcast (spread by splash plate). You should do this immediately and at the latest within 6 hours.
- you should incorporate solid manures into the soil as soon as possible and at the latest within 24 hours

Note: Soil incorporation is not required where solid manure (farmyard manure) is used as a mulch to control wind erosion on susceptible soils.

If you farm in a Nitrate Vulnerable Zone you must follow the mandatory rules on the quantity and timing of applying manufactured nitrogen fertilisers and organic manures (references 23, 24). Ploughing permanent grass may breach Environmental Impact Regulations (references 17, 30). Concentrations of ammonium nitrogen in surface water have to comply with Regulations (reference 31)

Nitrogen fertiliser and manufactured nitrogen fertilizer
In this Code these terms have been used to mean the same as in the guidance for farmers in Nitrate Vulnerable Zones (reference 24).
Nitrogen fertiliser includes:
Manufactured nitrogen fertiliser ~ any nitrogen fertiliser (other than organic manure) which is manufactured in an industrial process;
- Other nitrogen-containing materials ~ any substance containing nitrogen that is neither a manufactured nitrogen fertiliser nor an organic manure e.g. dredgings; and
- Organic manure ~ any nitrogen fertiliser derived from animal, human or –plant sources, including livestock manure.
- The environmental impacts of nitrogen

63. Losses of nitrogen from agriculture have signifcant impacts upon the quality of water, soil and air. You should use nitrogen as effciently as possible and minimise losses.

64. Leaching of nitrate from soil to ground and surface waters reduces drinking water quality, often so badly it can no longer be used as a source drinking water. It can cause eutrophication, particularly in canals, estuarine and marine waters. High concentrations of ammonium in surface water can exceed threshold limits (reference 31), and kill fsh.

Leaching
Leaching is the process by which soluble materials are removed from the soil by drainage water passing through it.

65. Nitrogen escapes to the air as ammonia particularly from livestock manures (reference 7) and as nitrogen gas and nitrous oxide through natural soil processes.

66. Ammonia has signifcant impacts on the environment and human health. It can lead to damage of land and water ecosystems by depositing excess nitrogen and through soil acidifcation. Nitrogen gas is harmless to the environment but nitrous oxide is an important greenhouse gas which contributes to climate change.

67. When you reduce one form of loss, you may increase another. For example, reducing ammonia loss to air will mean more nitrogen gets into the soil. This can increase the risk of nitrate leaching or emissions of nitrous oxide. The following paragraphs outline the approaches to reducing losses of some particular pollutants. This Code also provides advice on integrated approaches which aims to achieve the best, overall practical environmental outcome.

Good practice

Minimising nitrate loss to water

Regulations

68. The EC Nitrates Directive (91/676/EEC) requires Member States to introduce a Code of Good Agricultural Practice to control nitrate loss and to protect against nitrate pollution, which all farmers should follow on a voluntary basis. In Nitrate Vulnerable Zones (NVZs) designated under domestic legislation which implements the Nitrates Directive, farmers must comply with mandatory measures or rules (references 23, 24).
These rules are similar to, although in some cases more strict than, the good practice guidance that follows in paragraphs 69 to 83 inclusive.

Controlling nitrogen application

69. You should carefully work out the amount of nitrogen fertiliser needed for each crop in each feld (the crop nitrogen requirement). You should not exceed the crop nitrogen requirement, as this increases the amount of nitrate lost by leaching so harming the environment as well as being a waste of money. You should take into account the amount of nitrogen supplied by the soil (the soil nitrogen supply). This will depend on the type of soil, previous cropping, rainfall and any organic manure you have applied.

There are various recommendation systems available to help you (e.g. reference 27). Where the soil nitrogen supply is high, soil analysis for mineral nitrogen can provide a more precise guide to fertiliser requirement.

70. You should keep accurate records of the amounts and dates of applications of manufactured nitrogen fertilisers, organic manures and other nitrogen containing materials that are used as nitrogen fertilisers (e.g. dredgings and soil from the processing of sugar beet) to help work out how much nitrogen fertiliser is needed for future crops.

Organic manures

71. You should not apply more than 250 kg of total nitrogen in organic manures to any given hectare in any 12 month period. Also, you should ensure that the amount of crop available nitrogen does not exceed the crop nitrogen requirement, which may mean applying less than this maximum amount. There are simple on-farm kits which can measure the nitrogen in animal

slurries that is readily available to crops (reference 34), or you can use look up tables (references 27, 28).

72. Livestock manures, such as cattle and pig slurries and poultry manure, and liquid digested sewage sludge contain a relatively high proportion of readily available nitrogen (i.e. greater than 30% of total nitrogen is present in a readily available form). You should apply these in late winter or spring when crops can use the nitrogen effciently. Where practically possible you should not apply them in the autumn and early winter months. This is particularly important on sandy and shallow soils where the risk of nitrate leaching is greatest.

73. You may need additional storage for livestock manures. You should provide suffcient storage capacity to allow optimum timing and use of manure nutrients which will allow you to reduce the amount of fertiliser you buy (see Section 4.3). All constructed stores should be impermeable and not allow liquids to escape.

74. You can spread organic manures that do not contain much readily available nitrogen (i.e. less than 30% of total N is readily available) such as farmyard manure, sewage sludge cake and compost made from green waste at any time, if feld conditions are suitable to avoid causing run-off.

75. You should not apply organic manures when:

- soil is waterlogged, flooded, frozen hard or snow-covered; or

- there is a signifcant risk of nitrogen getting into surface water via run-off, taking into account in particular the slope of the land, weather conditions, ground cover, proximity to surface waters, soil conditions and the presence of land drains

76. You should not apply organic manures within:

- 10 metres of surface waters, including feld ditches; or

- 50 metres of a spring, well or borehole.

77. You should be particularly careful when applying organic manures to steeply sloping land close to surface waters.

78. You should spread organic manures as accurately as practically possible. You should use spreading equipment with a low spreading trajectory when spreading slurries to avoid causing atomisation (small droplets) and subsequent drift (see Sections 5.4 and 5.5).

Manufactured nitrogen fertilisers

79. It is important to apply manufactured nitrogen fertiliser only at times when the crop can use the nitrogen. You should not apply it to grass between 15 September and 15 January and to other crops between 1 September and 15 January unless there is a specifc crop requirement at this time

80. You should spread manufactured nitrogen fertiliser as accurately as possible and at the right rate. You should not apply it directly to surface waters (including ditches).

Advice note

The current cross compliance requirement is that you must not apply any fertilisers or organic manures within 2 metres of the centre of hedges, a watercourse or feld ditch if you receive the Single Payment. This also applies to land within 1 metre of the top of the bank of a watercourse (reference 17).

81. You should consider not spreading manufactured fertiliser within 2 metres of surface water. Establishing managed buffer strips will help you protect surface water (as well as hedges and other sensitive habitats) from fertilisers; you may do this as part of an Entry Level Stewardship agreement.

82. You should take special care when applying any manufactured nitrogen fertiliser to felds where there is a signifcant risk of run-off to surface water, taking into account in particular the slope of the land, weather conditions, ground cover, proximity to surface water, soil conditions and the presence of land drains.

83. You should not apply manufactured nitrogen fertiliser when the soil is waterlogged, flooded, frozen hard or snow-covered.

Crop cover in arable rotations

84. On suitable soils, you should sow a temporary cover or catch crop in early autumn when an early harvested crop is to be followed by a spring-sown crop. This will take up nitrogen and reduce leaching losses. Winter green cover is particularly important on one-year set-aside land. Where it is not practical to establish a cover or catch crop, you should leave uncultivated stubble for as long as possible (also see paragraph 86 below).

85. Plan to sow autumn-sown crops as early as possible having regard to the needs of the crop such as the risks from pests and diseases. Crops sown in early September will take up more nitrate than later sown crops, and will also reduce the risk of run-off and soil erosion. This is particularly important when cattle slurry, pig slurry and poultry manures, which have a lot of readily available N, are applied to sandy and shallow soils.

Autumn cultivations and crop residues

86. In autumn you should cultivate the land as close to sowing the next crop as possible. This will reduce the build up of nitrate in the soil and can be especially benefcial after a crop, such as vining peas or oilseed rape, which leave residues containing a lot of nitrogen. You can often leave residues of late harvested crops, such as root crops, undisturbed until the following spring, unless the soil is compacted and there is a risk of run-off or soil erosion.

Cereal straw residues

Incorporating crop residues that do not contain much nitrogen, such as cereal straw, into the soil in autumn will help to reduce the amount of nitrate leached and to maintain or increase soil organic matter.

Advice Note

The current cross compliance requirement for land that has carried a crop of oil-seeds, grain legumes (e.g. peas or beans) or cereals (other than maize) which have been harvested using either a combine harvester or a mower:

- you must ensure that, from the day after harvest until the last day of February (dates inclusive) in the following year, the land is not left in a state where run-off is likely (reference 17).

Environmental Stewardship

Leaving uncultivated stubbles over winter can encourage wildlife. There are options in Environmental Stewardship to encourage such management but you should consider the risk of run-off and erosion before deciding to do this (reference 19).

Managing grassland

87. There is a risk of losing large quantities of nitrate from intensively grazed grassland. Reducing nitrogen applications and the intensity of grazing during the late summer and autumn months will reduce the amount of nitrate leached.

88. If at all possible, avoid ploughing old permanent grassland for arable cropping. Large quantities of nitrate can be leached over several years, organic matter will be lost and carbon released to the atmosphere. Ploughing permanent pasture may breach cross compliance requirements. Wherever practical, cultivate grassland in spring rather than autumn. If the grassland needs reseeding, you should do it with a minimum of soil disturbance and establish grass cover quickly and, if in the autumn, by early October.
If arable crops are to follow grass in a rotation, you should sow the crops as soon as possible after ploughing or cultivating the grass.

89. To reduce the amount of nitrate released, you should not apply organic manures in the 6 months prior to cultivation of grassland.

Minimising ammonium nitrogen loss to water

90. Ammonium nitrogen from organic manures can pollute ground and surface waters. For livestock manures this can happen from:
- uncontrolled run-off from buildings, yards and farm tracks used by livestock
- direct application of manure and dirty water, especially to drained land;
- run-off after applying manure and dirty water to land; and
- run-off caused by rain falling onto solid manure heaps.

You can reduce the risk of causing water pollution by following the advice in the relevant parts of this Code (see Sections 4.3, 4.8, 5.4, 5.5 and 5.8)

91. On bare land or stubble, you should reduce the risk of surface run-off getting into surface water from ***adjacent slopes*** by incorporating organic manures into the soil:

- For cattle slurry, pig slurry and liquid digested sludge applied by broadcast (splash plate) methods, you should incorporate them into the soil as quickly as possible and at the latest within 24 hours of application. But you should do this immediately and at the latest within 6 hours to reduce ammonia losses to air as well (see paragraph 93).

- For poultry manures, you should incorporate them into the soil within 24 hours of application.
- For farmyard manure, sewage sludge cake and compost made from green waste, you should incorporate them into the soil within 24 hours of application unless they are being applied to protect susceptible soils from wind erosion.

93. Take particular care when applying livestock manures to land because the benefts of reducing ammonia emissions from housing or stores will be lost if you do not. On bare land and stubble:
- If you broadcast slurry (by splash plate), you should incorporate it into the soil immediately and at the latest within 6 hours.

- If you apply solid manure, you should incorporate it into the soil as soon as possible and at the latest within 24 hours, unless it is being applied to protect susceptible soils from wind erosion.

94. When you reduce ammonia loss, more nitrogen is potentially available for grass or crop uptake. You should make allowance for any savings in your nutrient management plan (see Section 3.3, and reference 7, 27).

Livestock diets

95. You should match the nitrogen content of diets to the expected level of production and the particular growth stage of the stock. This will save you money and, by reducing the amount of nitrogen excreted, reduce the amount of ammonia being released. It may also make it easier for you to meet any restrictions on the quantity of livestock manure that you can apply to your land. You may wish to seek advice from a consultant or your feed supplier to help achieve this.*Use of urea fertilizer*

96. Ammonia can be lost from manufactured nitrogen fertilisers, especially when no rain falls soon after spreading any that contain urea. Up to 20% of the nitrogen content of urea may be lost to air. Such losses are more closely related to soil moisture and weather conditions than to soil type, and may be minimised if urea is applied shortly before light rain is expected (Reference 27).

Minimising nitrous oxide loss to air

97. The natural processes in the soil that produce nitrous oxide under wet and warm conditions are increased by the addition of nitrogen fertilisers and organic manures. You should adopt measures in this Code to help you use nitrogen effciently, and keep soils in good structural condition. This will reduce nitrate loss as well as nitrous oxide emissions and contribute to farm proftability.

2.4 Managing phosphorus

Phosphorus lost from agricultural land is an important contributory cause of poor quality in surface waters. Losses must be reduced to meet Water Framework Directive1 targets. You can reduce the risk by not over applying phosphorus in fertilisers and organic manures.

- You can reduce costs by only applying the fertilisers you need and taking account of phosphorus in all the organic manures that you apply. Follow a nutrient management plan to ensure effcient use of fertilisers and organic manures. Do not spread organic manures in conditions that are likely to lead to run-off. Control soil erosion and run-off. Match the phosphorus content of feed to the needs of the livestock.

The environmental impacts of phosphorus.

98. Phosphorus contributes to eutrophication of freshwaters. Agricultural land is the source of about 25% of the phosphorus entering rivers. Phosphorus from agriculture can reach surface water in various forms and by various routes, which will depend on the particular river catchment. The main ways phosphorus is lost from land are:

- by soil erosion, where phosphorus is attached to soil particles;

- by surface run-off, particularly along farm tracks and where residues of recently spread organic manures or phosphorus fertilisers remain on the soil surface;

- by organic manures running down cracks and getting into land drains; and

- when it is either dissolved in, or attached to very fne particles in drain flow. The latter can be important on silty soils, especially when there is a lot of phosphorus in the soil e.g. above Index 2 (reference 27).

Good practice

Animal feeds

99. Livestock diets should be formulated so that the phosphorus content of the feed closely matches the needs of the livestock. This minimises the amount of phosphorus in manures that are returned to land, which in turn reduces the risk of subsequent losses to the water environment. You may wish to seek advice from a consultant or your feed supplier to help achieve this.

Organic manures and fertilisers

100. The amount of phosphorus lost by erosion and run-off, or in drain flow will depend on the quantity of phosphorus in the soil. To reduce losses, you should not apply inorganic fertiliser or organic manures that contain more than the recommended amounts of phosphorus. For most crops, none is recommended at soil phosphorus Index 4 or above (reference 27).

101. When the soil phosphorus Index is already 3 or above and you wish to utilize the nitrogen and other nutrients in organic manures, you should not apply more total phosphorus than will be removed by the crops in the rotation. This will avoid raising soil reserves above those necessary for crop production.

102. Soils should be sampled and analysed every three to fve years in accordance with a nutrient management plan (see Section 3.3).

Surface run-off

103. Minimise the risk of phosphorus from organic manures reaching surface water by following the advice in a manure management plan (Section 3.2). Minimise losses following fertiliser application by following advice in a nutrient management plan (Section 3.3). On bare land or stubble you can reduce the risk of run-off reaching surface water by incorporating surface applied organic manure or fertiliser into the soil soon after application, and within 24 hours.
104. Follow a soil management plan (see Section 3.4) to reduce the amount of soil erosion, and the amount of particulate phosphorus reaching surface waters.

2.5 Soil contamination

- **Soils may be, or may become, contaminated by heavy metals or persistent organic chemicals. You should consider the possibility of this and manage the land to protect its long-term fertility. This will safeguard groundwater and surface water and the health of plants, livestock and consumers. If there is any reason to suspect soil is contaminated, the situation should be investigated and checks made on the quality of food sold. Monitor the metal content of the soil whenever organic manures, waste materials, or metal containing pesticides are applied regularly.**

There are maximum legal limits for the heavy metal content in foods offered for sale (reference 33).
If sewage sludge is applied to agricultural land, there are legal obligations that you and the sludge provider must follow (reference 34, 35). Complying with this legislation is currently a cross compliance requirement.

Compost and anaerobic digestate made from approved bio-degradable wastes may be used without specifc permission if the relevant Quality Protocols are followed (reference 36, 37). Other waste materials, including dredgings, should only be applied to land if the relevant regulations have been followed (see Section 7)

Sources and impacts of contamination

105. The contaminants of major concern are heavy metals such as lead, cadmium, copper and zinc, and persistent organic compounds such as dioxins and polychlorinated biphenyls. Some metals and compounds may harm soil organisms and reduce soil fertility, before they affect the quality of crops or the health of livestock.

106. Some soils contain contaminants from natural sources and old mine workings. This background contamination can be very variable. However, soil is usually contaminated by people's activities, either directly by things applied to the land or indirectly by atmospheric deposition. It is usually a slow process, taking place over many years. But accidental spillages of oil, or flooding with seawater or contaminated water (such as from old mine workings), may need urgent action. More information is available (reference 38). If the contamination is so serious that there are effects on crops or livestock there are legal powers that require action or remediation (reference 39). Removing the affected land from production may be the only cost effective way to meet such a requirement.

Good practice

Dealing with existing contamination

107. If you suspect any of your soils are contaminated you should get professional advice based on analysis of the soil and of crops or livestock as appropriate. There are legal limits for the maximum content of lead, cadmium, arsenic, mercury and some persistent organic compounds in certain foods offered for sale (reference 33). Remember that crops that are growing satisfactorily and apparently healthy animals may contain contaminants that exceed these legal limits. If necessary, you should seek advice from your local Authority or the Food Standards Agency.

108. The risk of poisoning livestock from contaminated soil depends almost entirely on how much soil they eat rather than the amount of contaminants in the grass. You should limit the amount of soil they ingest by controlling grazing and making sure that you do not get soil into silage and hay

during harvesting. Seek veterinary advice if you suspect contamination is affecting the health of your stock. Advice on grazing sites contaminated by mine spoil is available (reference 40).

109. Although there are ways of treating soils to remove contaminants, these are usually too expensive to be justifed for agricultural land. You may be able to reduce their availability by simple management actions such as liming the soil. You may need to consider alternative use of the land, such as growing bio-mass crops or crops for industrial use, planting trees, or establishing a habitat for wildlife, possibly through an agri-environment scheme. You should seek appropriate advice.

Preventing further contamination

110. Following the regulations, and observing good practice will prevent soil contamination by materials such as industrial wastes, dredgings from canals and rivers, sewage sludge, livestock manures, composted wastes, pesticides, or irrigation water.

Industrial wastes and dredgings

111. You will require an exemption under the Environmental Permitting Regulations (reference 35) before industrial wastes or dredgings from inland waters are applied to your land. This will only be granted when a qualifed person has made an application to the Environment Agency confrming that it will provide ecological improvement or agricultural beneft to the land, and that it will be safe to apply the proposed quantity. You should check that only the permitted quantities are actually applied. Dredgings from farm ditches can be applied to land under an agricultural waste exemption (see Section 7).

Sewage Sludge

112. It is benefcial to recycle the organic matter and plant nutrients contained in sewage sludge (sometimes called bio-solids). Applying sludge to agricultural land growing food and fodder crops is controlled by the Sludge (Use in Agriculture) Regulations (as amended) (reference 34) and by the voluntary application of the Safe Sludge Matrix (reference 41). Further guidance is given in a supporting Code of Practice (reference 42). Complying with this Regulation is currently a cross compliance requirement.

113. In practice, sludge producers will be responsible for meeting the legal limits on metals in the sludge, and in the soil to which it is applied. However, farmers should not accept sludge if they have doubts about whether these rules will be complied with. Farmers also have responsibilities to ensure the land is managed according to the regulations after sludge is applied. In particular stock must not be grazed or certain crops must not be harvested until a safe period of time has passed. This period will vary according to the type of sludge applied. You should ensure the pH of the soil is maintained at a satisfactory level during sludge application and in the years after sludge has been applied, as most metals become more available to plants in acid soils.

114. Sewage sludge can also be spread on land used to grow crops other than food, such as for industrial cropping (reference 42). This requires an Environmental Permitting exemption from the Environment Agency.

115. The metal content of sludge has decreased greatly in recent years as a result of controls on discharges to sewers. As a result it will usually be the nutrient content of the sludge which determines the rates at which it can be applied. See also Sections 2.2, 3.2, and 3.3 on making best use of the nutrients in sludge.

116. If you store liquid sludge, you must comply with regulations (reference 35). This provides for secure temporary storage for up to 12 months, that no more than 1250 m3 is stored at any one time, restrictions on location of the store, and that a freeboard of 300 mm is maintained (750 mm for an earth-banked lagoon).

Livestock manures

117. The main potential contaminants in livestock manures are copper and zinc. They are added to livestock feed as growth promoters, to increase the supply of trace elements or for medicinal purposes. You should minimise the amount of metal added to feed consistent with the health and welfare of your stock, after considering alternative husbandry practices. If you are mixing rations on the farm, you must not exceed the statutory limits for metal additions to feedingstuffs (reference 44). If you are administering medicines, you must follow instructions from your veterinary surgeon.

118. More metal will be applied to soil when you spread some kinds of livestock manure than from regular applications of sewage sludge. On felds which receive regular applications of pig and poultry manure, you should monitor the copper and zinc in the manure and in the soil. If concentrations in the soil approach those given in Table 2 you should seek professional advice before you apply more manure to this land.

Table 2: Trigger values for copper and zinc for seeking advice when applying manures or pesticides (reference 42)

	Table 2: Trigger value for seeking advice – total concentration (mg/kg)	
	pH 5.0 to 5.5	pH above 5.5
Zinc	200	200
Copper	80	100

119. Some veterinary medicines contain compounds that leave potentially harmful residues in manures and slurries. You must therefore follow instructions provided on the packaging of all veterinary medicines and where appropriate take advice from the Environment Agency on disposal options.

Composts and other wastes

120. Provided the Quality Compost Protocol is followed (reference 36), composts made from bio-degradable wastes may be applied to agricultural land outside of Environmental Permitting Regulations. The Protocol assures the quality of the compost by compliance with BSI PAS 100 (reference 45), and requires the land to be analysed for metals before applications are made and a record to be kept of where the compost has been spread. Other wastes and composts not produced according to the Quality Protocol may only be applied to land if Environmental Permitting Regulations are followed. These require prior notifcation to, or permitting by, the Environment Agency. Following the Regulations will ensure that soil does not become contaminated.

122. For land application of other organic wastes, composts and digestates not produced according to Quality Protocols – you must comply with an environmental permit or an exemption (see Section 5.5), and you must not cause harm to human health, or cause pollution of the environment (see Section 7).

123. You must also comply with the relevant provisions of the law on animal byproducts if these are applied to pasture land, except for manure and digestive tract contents (reference 47). You should consult Animal Health for advice.

Pesticides

124. If you apply pesticides, you must do so in accordance with label recommendations so that they will have no unacceptable long-term effect on the environment (see Section 5.7).

125. Most pesticides are organic compounds which break down in the soil. Some pesticides contain copper and, although not widely used, repeated applications will increase the copper content of the soil. In such situations you should have the soil analysed, and compare the content with Table 2 to decide if you should continue to use
the pesticide.

Lead shot

126. Lead shot can accumulate in soil. If land regularly used for clay pigeon shooting continues to be farmed, you should take professional advice to ensure that crop and livestock products meet food safety standards. Alternatively consider using shot that is not lead based.

Cleaning up accidental contamination

127. If your land is accidentally flooded by seawater, drain it off as soon as possible to minimise the amount of salt remaining in the soil. Normal winter rainfall will remove this salt in one or two winters. Seek professional advice. Be prepared to leave the land fallow, grow tolerant crops such as barley or ryegrass, take extra care with cultivations, and if necessary apply extra calcium as gypsum to stabilise soil structure. If you use waste gypsum, you will need to register an exemption with the Environment Agency under the Environmental Permitting Regulations (reference 35).

128. If there is a signifcant oil spillage, put your emergency plan into operation (see Section 1.5). Do not try to absorb petrol spillages as these are highly flammable. Create a bund to hold the spillage and arrange for the excess to be taken away. This is good practice for any spillage, as it reduces the amount of absorbent material generated. Any material contaminated with oil is classed as hazardous waste and must be disposed of accordingly (see Section 7).

131. Floodwater from urban or industrial areas, including from sewers, are other potential sources of contamination. Seek professional advice on the actions that should be taken, including veterinary advice if livestock are involved

3 Management plans

3.1 Introduction

132. Preparing management plans for your farm will help to improve the effciency of your business. They could save you money, and will help you to meet the standards of environmental management set out in this Code.

133. You may fnd it most effective to prepare all the relevant plans for your farm at the same time because some information will be needed in more than one plan. It can be helpful to combine the plans into one document to provide a better overview of your system.

134. The following sections describe the key steps you should take to prepare a satisfactory plan. The information in the plans should be available so it can be consulted regularly and shared with everybody who has an input to the business, including consultants, farm staff and contractors. Everyone who uses them should be asked to contribute when they are reviewed. See also Section

136. Management plans should be reviewed regularly and updated when circumstances change.

3.2 Manure management plan

- The most economic and environmentally friendly way of dealing with livestock manures (slurry and solid manure) and dirty water will usually be to apply them to agricultural land at appropriate rates for the beneft of soil and the crop.

- When combined with a nutrient management plan, a manure management plan will help you to make the most of your livestock manures to reduce your fertiliser bill and reduce the risk of water pollution.

The following guidance will help you to decide when and where to safely spread slurry, solid manure, dirty water, silage effluent and other organic materials. It will reduce the risk of transfer of nutrients, organic matter and pathogens from livestock manures and dirty water to surface water.

The plan can be used to work out the amount of slurry and dirty water storage you need, although you may need to take specialist advice.

In Nitrate Vulnerable Zones you must comply with the rules that restrict the quantity of livestock manure and organic manures you can apply and times of the year when certain types may not be applied, and set minimum storage requirements for some livestock manures (reference 24). New or substantially altered slurry stores must comply with regulations that lay down minimum construction standards (reference 51,52). The regulations also include minimum storage periods that you may have to provide (see also Section 4.3).

Good practice

137. Management plans should be reviewed regularly and updated when circumstances change.

138. If you have already produced a manure management plan you may wish to check it includes the following steps. It should include a feld-by-feld risk map (See Figure 1 at the foot of the reference list in Section 9) and an assessment of the need for any extra slurry or dirty water storage (see Section 4.3). You can draw up your own plan (reference 53) or obtain professional advice from a consultant (reference 54). Your plan should be clearly set out and include the steps identifed in the following paragraphs.

139. By considering slope, soil type and the position of surface waters and water supplies, you should identify felds or parts of felds where livestock manures and dirty water should never be spread. These non-spreading areas should be marked on a farm map (in red).

140. Identify where livestock manures and dirty water should not be spread under certain conditions or where application rates should be restricted. These very high risk areas (orange) and high-risk areas (yellow) should be marked on the farm map. The remaining areas should be marked as lower risk (green). Identify on the map any areas in Nitrate Vulnerable Zones affected by the closed (non-spreading) periods.

141. Calculate the minimum area of land needed for spreading livestock manures by using a maximum feld application rate of 250 kg total nitrogen per hectare per year. You can use standard tables or an analysis of your manures for this. But you must check that you comply with legal requirements in Nitrate Vulnerable Zones and with other management agreements where lower spreading rates may apply (e.g. organic standards and agri-environment schemes).

142. Assess if you have suffcient land available to spread your livestock manures and dirty water within the relevant restrictions. If you do not, you should consider reducing stocking levels or make

arrangements to transfer manure elsewhere, e.g. for use as a fertiliser on another farm. Surplus manure from a certifed organic farm can only be sent to another organic production unit. There may be other opportunities, for example sending poultry litter to a power station but this would be subject to environmental permitting (see Section 7).

143. If you wish to spread sewage sludge, green waste compost or other organic materials you should identify how much land is available after you have spread livestock manures and dirty water produced on your farm. You should not accept such materials on to your land if it will make it diffcult to spread livestock manures and dirty water safely or to meet any restrictions (see also Sections 2 and 5.4).

144. Assess whether extra storage is needed for slurry or dirty water. Use the risk map (coloured map), and your experience of spreading over the winter period, to help you decide how much, if any, you can safely apply at this time. If you farm in a Nitrate Vulnerable Zone, you must comply with the minimum storage capacity requirements (reference 24). All new or substantially altered slurry stores must comply with standards of construction (reference 51, 52).

145. Update the risk map if you take on extra land.

146. Update the manure management plan if livestock numbers increase, the dirty yard area gets bigger, or other changes affect the volume of slurry or dirty water produced.

3.3 Nutrient management plan

A nutrient management plan will help you to make the most efficient use of inorganic fertilisers and maximise the use of nutrients contained in any organic manures that you apply.
- If you use organic manures, you should combine this plan with a manure management plan.
A nutrient management plan will help you decide upon lime and fertilizer use, taking account of all sources of nutrient supply, as well as soil nutrient status, and the influence of soil type and rainfall.
Following the plan will minimise the risk of pollution resulting from the overapplication of nutrients.

In Nitrate Vulnerable Zones you must comply with the mandatory rules, and only apply manufactured nitrogen fertilisers and organic manures according to crop requirement and at certain times. You must keep records that enable the Environment Agency to check what you have applied (reference 24). This is currently a cross compliance requirement.

Good practice

147. If you have already produced a nutrient management plan you may wish to check it is clearly set out and includes the steps in the following paragraphs. The “Tried and Tested” plan will meet all the advice and criteria set out below (reference 55).

148. Soils should be analysed for pH, P, K, and Mg every three to fve years, depending on the cropping system. Use the results to adjust inputs of lime and phosphate, potash and magnesium nutrients.
149. Assess the nutrient requirement of the crop using a recognised fertilizer recommendation system (e.g. references 27, 28). If you receive professional advice on your plan, ensure that you use a current FACTS (Fertiliser Advisers Certifcation and Training Scheme) qualifed person (reference 56).

150. Assess the nutrient supply from organic manure. Consider if a laboratory or on-farm analysis is necessary (references 27, 28, 57 and 32). Make sure you obtain representative samples of manure for analysis. You may need to thoroughly mix the contents of slurry stores.

151. Calculate the need for fertiliser nutrients by deducting the contribution from organic manures from the crop nutrient requirement.

152. Keep clear and accurate feld records of your cropping and of all applications of fertilisers, livestock manures and organic manures. This will help future decisions on nutrient management and demonstrate the practical outcome of the plan.

153. Update the plan at the start of each cropping year.

3.4 Soil management plan

- **A soil management plan will help you to provide optimum conditions for the growth of crops and grass, while minimising the risk of run-off and erosion.**

- It will help you protect the long term productivity of your land. Match crops and rotations to the capability of soils on the farm. Inspect the structure of soils regularly. Record what you fnd and draw up a soil management plan for managing your land. You should review this plan annually and where necessary make changes based on what has happened during the year.

If you prepare a soil management plan it will be in addition to the 'Soil Protection Review' (reference 58). This is currently a cross compliance requirement.

Good practice

154. A soil management plan can help land managers to improve the way they treat soils. If you have already produced a soil management plan you may wish to check it includes a risk map for run-off and erosion, and a feld-by-feld assessment of the condition of the soil and how you will manage it. You can either draw up your own plan or obtain professional advice from a consultant. Your plan should be clearly set out and include the steps identifed in the following paragraphs.

155. When developing a soil management plan the protection of archaeological sites should be taken into account.

156. Read relevant publications on controlling run-off and erosion and good practices for managing soils (reference 18, 59).

157. Using published guidance (reference 60) or advice from a consultant, prepare an assessment of the risks of run-off and erosion for your whole farm. It can help to look at soil during and after rain to identify areas of poor drainage and where run-off or erosion may be occurring including gateways, roads and tracks. When you have done this, you should prepare a map showing the risk class for each feld or part feld.

158. Match the intended use of each feld with the capability of the land so as to minimise the risks of harming the environment.

159. Use a spade to look at soil structure in each feld, or part feld, to decide what you will need to do to maintain or improve its condition. Consider if you need to take any additional actions to improve the organic matter content of the soil.

160. Record on a feld-by-feld basis the steps you will take during the coming year to minimise run-off and erosion and to ensure good structure and maintain the infiltration of rainfall (see Section 5.2).

161. During the year you should record any problems such as ponding, patches of poor growth, or run-off or erosion events. This will remind you what has happened, and where you need to consider changing your management when you come to review the plan. You should review the plan each year, and include another assessment of soil structure, paying particular attention to any areas where you noticed problems.

3.5 Crop protection management plan

- **A crop protection management plan will help you to maximise the effciency of any pesticides you use and to minimise effects on the environment. A crop protection management plan will minimise the risk of affecting human health, harming bio-diversity or polluting water. Adopt alternative methods of control wherever possible and select pesticides with the least risk of causing adverse effects. Inspect crops regularly and apply pesticides relevant to any problems that occur.**

Good practice

162. A crop protection management plan will provide a checklist of what you should consider when planning the use of pesticides. Either complete a plan using an established format such as for the Voluntary Initiative or LEAF or prepare one of your own (reference 61, 50). See also Sections 4.5 and 5.7 for the measures you should take when storing and applying pesticides. You should read the code of practice for using plant protection products (reference 62) before producing a plan.

163. If you have already produced a crop protection management plan, you may wish to check it is clearly set out and includes the steps in the following paragraphs.

164. If neither you or a member of your staff are BASIS qualifed, you should produce your plan with a BASIS qualifed agronomist (reference 56).

165. Consider farm location, soil type, previous cropping, rotations and pesticide resistance issues. This can help you anticipate and predict potential problems.

166. Adopt non-chemical options wherever economic and practical. Include the use of rotations, cultivations and resistant varieties and encourage natural predators by incorporating beetle banks and feld margins. You should consider the environmental impact of alternative control options such as flame and mechanical weeding, including the fuel used.

167. Inspect crops regularly to identify weeds, pests and diseases accurately. Evaluate the need for a pesticide by use of thresholds and diagnostic kits.

168. Select an effective pesticide that will minimise impacts on:- crop pest predators, non-target organisms, neighbouring crops, wildlife habitats, and the quality of surface water and groundwater.

169. If you want to reduce the statutory no-spray buffer zone adjacent to surface waters you must undertake a Local Environment Risk Assessment for Pesticides (LERAPS) (reference 63).

170. Keep accurate records. They are a key management tool to help identify where improvements can be made and should include the justifcation for a particular course of action. Record keeping is a requirement under EC law when you grow food or feed crops (reference 64).

171. Complete an annual review so as to incorporate any new priorities.

4 Farm buildings and structures

4.1 Introduction

172. The following sections deal with some of the buildings and structures on farms that could cause pollution of water, air or soil. They also contain advice on the handling and management of both solids and liquids in and around the farmyard to avoid pollution, and how to deal with wastes that arise. More information on wastes is provided in Section 7.

173. You should consider whether you need to make any changes, including how you manage buildings and structures, to protect the environment. Some changes will be inexpensive but deliver signifcant benefts. Run-off of contaminated water and rainfall from yards and tracks can cause pollution of water and may damage habitats. Remember to consider if this happens from feld tracks and gateways. New buildings and structures, or signifcant changes, may require planning permission (reference 65). You should always seek advice from your local planning Authority; they will also tell you if an environmental impact assessment is needed for new or extended livestock buildings.

174. To conserve our historic heritage you should protect archaeological remains that appear on or above the soil surface or are buried beneath it. Seek advice from the Archaeological Offcer of your local Authority if you are unsure about the status of an historic site.

175. Keeping buildings and structures in good repair is key to good practice and may reduce your insurance premiums. Regular checks on all structures, such as fuel stores and slurry stores containing potentially polluting liquids will alert you to problems before they occur and can prevent serious pollution incidents.

176. Make regular checks:
- of liquid levels;
- for signs of corrosion, damage and leaks in containers, pipework and stores; and
- of all buildings, roofs, gutters, downpipes, clean water drains, foul drains, yard areas, and any clean water outfalls to ditches, surface waters and soakaways.

Greenhouse gases

177. You can reduce emissions of carbon dioxide (a greenhouse gas) by maintaining fixed equipment such as grain driers, refrigerated stores and bulk milk tanks in good condition, and by operating them effciently. You can reduce heat loss from buildings by using effective insulation and ventilation systems. Insulation will also reduce heat gains which can reduce the need for subsequent ventilation. Consider opportunities for using alternative energy sources which are not fossil fuels. You should monitor energy use and identify ways to save costs by making energy reductions (reference 66).

178. Apart from their effect as greenhouse gases, chlorofluorocarbons (CFCs) and halons also damage the ozone layer. CFCs are used in refrigeration equipment and halons are often used in fre extinguishers for use on electrical fires. Refirigeration equipment needs specialist servicing to avoid loss of refrigerant. Dispose of old refrigeration equipment and old or partly used fre extinguishers through specialist contractors (see Section 7).

4.2 Silage stores and effluent handling

- **Even small amounts of silage effluent from crops in an enclosed pit or silo, or from baled silage, will kill fsh and other water life for a long way downstream if it gets into surface waters.**
Silage effluent should be contained and stored safely until it can be applied to land to make use of its nutrient content, or it can be used for animal feed. If possible, recycle clean silage wraps, bags and sheets.

Good practice

179. Every year before using silos, you should inspect effluent tanks from the outside (as much as you can see) for leaks and corrosion – **do not go into them**. Also check channels, drains, silo floors, walls and wall/floor joints. Carry out repairs well before the silage making season.

180. During silage making:
- check around the silo and effluent tank for leaks and blockages daily. Put right any problems immediately;
- check effluent tank levels frequently and empty as necessary; and
- check ditches, surface waters and clean water drains for signs of pollution. If any are found, put your accident and emergency plan into action. The construction of facilities for making and storing silage and storing effluent are controlled by law (Reference 51).
Seek advice from the Environment Agency if:
- you intend to construct a new silo or substantially enlarge or reconstruct an existing silo.
- you want to make feld silage (feld heaps or non-baled bagged silage). Sites must be notifed to the Environment Agency.
You must notify the Environment Agency before you use new or substantially altered facilities for the frst time. See ‘Regulations’ below.

181. You can minimise the amount of effluent produced by wilting grass to at least 25% dry matter before it is ensiled. Harvest other crops (such as whole crop cereals and maize) at the correct stage of maturity.

182. Apply effluent to land in accordance with your manure management plan (see Section 3.2). To avoid scorch when applying to a growing crop – dilute the effluent in a slurry tanker with the same amount of water, dirty water or slurry, and do not apply more than 50 m3/ha. Note: adding effluent to slurry or dirty water will increase the risk of causing an odour nuisance.

183. For baled silage:

- you must store bales at least 10 metres away from feld drains, ditches and surface waters. Do not remove plastic wrap within this 10-metre zone as effluent may be released. If bales are stored directly on the ground (i.e. not on a specially constructed base), you must ensure they do not leak effluent. Bales should be located well away from any ruts or tracks that could provide a pathway for effluent to get into ditches, surface waters or damage habitats; and

- when crop dry matter is below 25%, using a 750 mm wide bale wrap (rather than 500 mm) will reduce the quantity of effluent released during storage. This applies for both 4 and 6 wrap systems.

184. For feld silage – feld heaps or large bags (non-baled):

- choose a level site and make a careful assessment of pollution risk to groundwater and surface water. Discuss your proposals with the Environment Agency well in advance of silage making;
- sites must be at least 10 metres away from feld drains, ditches and surface waters; and at least 50 metres away from springs, wells and boreholes where water is used for human consumption or in farm dairies; and

- make sure bags are closed and sealed at each end. If there is any effluent inside the bag you must use it or dispose of it safely.

Regulations

185. There are legal obligations that control how you make and store silage in a silo; or in wrapped and sealed or bagged bales; or in a tower silo; or as feld silage (feld heaps or non-baled bagged silage). The requirements (reference 52) for silos include having impermeable floor and walls (they must not leak), being corrosion resistant, the base must extend beyond the walls and have channels on all sides to collect effluent, it must have an effluent tank of appropriate size, and no part may be within 10 metres of any feld drains or surface waters. Effluent tanks must have a design life of 20 years without maintenance.

186. If you intend to remove silage from where it was originally made and put it into another store – **either** that store must comply with the regulations, **or** you must get prior approval from the Environment Agency.

Designing new silos

187. The base and wall of the silo should be **professionally** designed to suit the conditions of the site. There are a number of British Standards or other equivalent standards involved. Building work should be supervised to make sure the silo is structurally sound and effluent cannot escape. Further guidance is available (reference 67, 68). The use of hot-rolled asphalt (HRA) surfacing is an activity that should be carried out by a specialist (Reference 69).

Feeding effluent to livestock

188. Silage effluent contains only a small quantity of dry matter but it does have some feed value. You may be able to use some of the effluent in this way – but take advice particularly on how to feed it to dairy cows. Any new storage facilities for feeding purposes must meet the regulations (reference 51).

Silage additives

189. Most additives are extremely polluting. They should be stored safely and handled at least 10 metres from a feld drain or surface water. Do not leave undiluted product out on site or allow additives or used containers to get into surface waters (see Section-7).

Disposal of silage plastics and tyres

190. Silage wraps, bags and sheets will require disposal. Ideally they should be recycled off-farm using specialist collectors but make sure such wastes are as clean and free from soil as possible. Tyres used for holding down silage sheeting will eventually require disposal. Do not burn plastics or tyres in the open. For disposal options – see Section 7.

Safety Note

Effluent tanks can contain lethal gases. Do NOT go into them at any time. Lock tank covers. Display a clear warning notice.

4.3 Livestock manure and dirty water collection, storage and treatment

- Livestock manures and dirty water can cause serious water pollution if they get into surface water or groundwater. Storage systems that are properly designed, built and maintained will reduce these risks.

Adequate storage will allow better timing and use of manure nutrients, and allow you to reduce the amount of fertiliser you buy.

Minimise the amount of slurry and dirty water by keeping rainwater out, unless it is specifcally required for dilution. This will reduce storage and feld application costs. Consider using floating covers or roofs on slurry stores to reduce odour and ammonia emissions, as well as keeping direct rainfall out. Natural surface crusts on stored slurry will reduce odour and ammonia emissions. Consider roofng over solid manure stores and outside soiled yard areas to keep rainfall out of slurry and dirty water systems.

The construction of **slurry storage systems** is controlled by law (reference 51, 52). This includes stores for dilute effluent such as dirty water, run-off from solid manure stores in yards, washings from buildings or yards used by livestock, reception pits and associated pipes and channels. Seek advice from the Environment Agency if you intend to construct a new system or substantially enlarge or alter an existing system. You must tell the Environment Agency in writing before you use such facilities for the frst time. In Nitrate Vulnerable Zones you must comply with the rules that set minimum standards for manure storage (reference 24). See ‘Regulations’ below.

Livestock manures and dirty water

Livestock manures are either slurries or solid manures. Slurries can be pumped or discharged by gravity. Solid manures, including farmyard manure, can generally be stacked. Dirty water is a term commonly used to describe rainfall run-off from yard areas to which animals have regular access, and washings from the dairy and milking parlour (reference 32, 27).

Good practice

General

191. All solid manure, slurry and dirty water should be properly contained and directed into a well designed and constructed store, although solid manures can be stored temporarily in the feld if the site is suitable (see paragraph 228). Some of the store types that are commonly used are described below, but others will be suitable if they meet the requirements of the regulations. It is good practice to keep at least a 750 mm freeboard2 in earth-banked lagoons and 300 mm in other slurry and dirty water stores (Note: the 750 mm freeboard is a legal requirement for new or substantially altered earth-banked lagoons).

192. You can minimise the amounts collected by providing separate drainage for clean roof water and clean yard water. Consider whether you can collect and re-use clean water (see Section 8). Careful re-organisation of yards and drains can dramatically reduce the volume of foul drainage (reference 70). Where applicable, you should consider roofng over stores and outside soiled yard areas to keep rainfall out. Avoid over-use of wash water by checking volumes occasionally (see Section 8.2)

193. Check all foul drains, channels, pipes, valves and sluices frequently to ensure they are operating well. Remember to check clean drains, including roof gutters and downpipes, to ensure they are not adding unwanted dilution to foul drainage. Carry out repairs as soon as possible.

194. Check storage tanks and structures frequently for signs of corrosion or leakage. Once a year, when the store is empty, check the walls and floor for signs of corrosion or degradation of mastic sealant (concrete and steel structures), and damage and leakage (all structures). With steel stores, you should check for corrosion around bolt holes and at the edges of panels as this can lead to the collapse of the store. Use binoculars for inaccessible areas. Get professional help to carry out repairs.

195. Make sure you have an accident and emergency plan in place and everyone knows how to respond to run-off, leaks or other failures (see Section 1.5).

Safety Note

- Mixing or re-circulating slurry can give off dangerous gases that are lethal to both humans and livestock.

- Never put silage effluent into under-floor slurry stores, as similar problems can occur.

- Cover or fence-off below ground tanks and reception pits; fence off earthbanked stores. Clearly display warning signs.

Under-floor storage and transfer channels

196. The base and walls of channels or pits should be impermeable to stop polluted liquids getting out, or to prevent water getting in if they are built below ground.

197. If slurry is emptied from channels to a reception pit through a sluice, the pit should be big enough to hold all the slurry that might be released.

Below-ground tanks and reception pits

198. Below-ground tanks should be big enough to suit the circumstances and emptying method. Reception pits should be built to hold at least two days' slurry and dirty water taking into account likely rainfall. Consult the Environment Agency about specifc requirements as the risk of causing water pollution depends on site conditions.

199. Make sure you provide adequate access arrangements if tanks and pits are to be emptied by tractor-drawn slurry tankers.

Above-ground circular stores

200. These are suitable for storing slurry that is easy to pump. They are not suitable for slurries with a lot of long straw bedding, sand bedding or waste feed.

201. Keep long bedding and long feedstuffs out of the store by scraping to one side, so that you can deal with it separately after liquids have drained into the reception pit.

202. Use the transfer pump to mix the slurry thoroughly in the reception pit, before putting it into the store.

203. If you allow a surface crust (from floating solids) to develop in unroofed stores it will reduce odour and ammonia emissions. This is particularly effective with cattle slurry. You will need to be able to break up such crusts later to avoid problems when you empty the store.

204. Mix the store contents to break up any crust and stir up sediment before you empty the store. To avoid the risk of overflow, do not leave the pump running unattended with the valves open between the store and reception pit.

205. You should ft two valves in-line between the store and the reception pit to control the outflow of slurry (reference 71). The valves should be located far enough apart to reduce the chance of a blockage keeping both valves from being shut properly (e.g. from pieces of wood or long sticks). Keep them locked shut when they are not being used.

Weeping-wall stores

206. These are normally flled by tractor scrapers and/or automatic scrapers and are particularly suitable for cattle slurry with a lot of straw bedding in it.

207. The store is not usually emptied during the winter housing period because access panels cannot be opened safely until the contents have dried out – typically from early summer onwards. When conditions are right – remove access panels carefully, section by section, and check that the store contents will not flow out.

208. Rain that falls into the store, and about 10% of slurry going into it, will drain out through the gaps or slots in the walls. This liquid should be collected in a drainage channel outside the store and directed into a suitable tank. The size of the liquid storage tank should be large enough to avoid having to spread its contents when conditions are unsuitable. Remember that this liquid is much more polluting, and contains more plant nutrients, than dirty water.

209. You should prevent excess liquid from entering a weeping-wall store, as this may cause “spurting” through the slots which is diffcult to contain. Any excess liquids should be directed into the associated storage tank or other containment, depending on the design of the system.

Earth-banked stores

210. These can be used for all types of slurry or dirty water. Depending on the consistency of its contents, they can operate as a liquid store which is emptied by pump or vacuum tanker, or by taking some liquids away frst and removing the remaining solids with a mechanical digger.
211. New or substantially altered stores must be impermeable and therefore built in suitable soil – you can import clay or use a liner to make sure you contain the liquid material. Pre-fabricated liners are not suitable for mechanical emptying and therefore should only be used for liquid storage.
212. A strainer box placed at the deepest part of the store will allow gradual removal of some liquid slurry by pump

213. The designer should check that the soil and the site are suitable and provide details on moving any land drains, removing growing plants and top soil, building the embankments and their consolidation, making allowance for settlement, and covering exposed surfaces with a layer of topsoil sown to grass to prevent erosion.

214. For stores without a cover, allowing a crust to develop will reduce odour and ammonia emissions from the store, particularly for cattle slurry. You will need to be able to break up such crusts to avoid problems when you empty the store.

215. If you use mechanical unloading methods, or agitate the contents with propeller mixers you should take care not to damage the earth banks or floor. The bank tops should be wide enough for safe operation of equipment. Take care not to damage any liners when mixing or emptying the store.

216. You should keep vegetation on embankments short to allow for inspection. Do not let trees grow on or next to them. If cracks appear or the banks settle, they should be repaired straight away. Examine embankments after heavy rain

Systems for dirty water

217. You may decide to direct small amounts of dirty water into slurry stores, but for larger amounts you should consider a separate system for storage and subsequent application to land.

218. 'Low rate' irrigation systems use suitable tanks or earth-banked stores to collect liquids and let them settle. They use an electric pump, small bore piping and sprinklers (up to 5 millimetres per hour) or a small travelling irrigator (up to 50 m3/ha or 5-millimetres per run) to spread liquids onto the land. The storage period required will depend on the risks of causing pollution from run-off when spreading (see paragraph 31).

219. 'High rate' irrigation systems use large bore pipes to provide high flow and application rates. These systems are not normally used in winter because of the high risk of run-off, and therefore long-term storage is usually required. Applications in excess of 50 m3/ha are only acceptable on feld sites when soil and slope conditions are optimum.

220. A manure management plan will help you to decide when and where to irrigate dirty water (see Section 3).

221. If you can apply dirty water to land on a regular basis, then the tank should have 2 to 4 compartments to remove solids (those that float and those that settle). These compartments should be joined by overflow H-pipes to reduce solids getting into the fnal compartment or pump chamber. The pump chamber should be big enough to avoid overflow when a lot of rain falls in a short time. The overall minimum buffer capacity in the tanks should be suffcient to contain a 25 mm rainfall on the area draining to the store – and should be available when the level of dirty water causes the pump to switch on. In some cases the buffer should be much greater, so you should agree details with the Environment Agency.

222. Use frost protection for the pumping system, and ft automatic devices to stop the pump when there is a very high pressure (caused by blockage) or a very low pressure (caused by leakage). Fit a warning device that you can see or hear easily, to warn you hat the system has shut down or failed. Travelling irrigators should have an automatic shut down at the end of a run.

223. Move sprinklers and irrigators regularly. Check land you are irrigating for any signs of run-off, ponding on the surface, or worms being killed. Move sprinklers or re-set travelling irrigators if there are any signs of these problems. On sloping land, set the travelling irrigator to run across slopes. Check surface waters (including all ditches) frequently during and after spreading, to make sure there is no pollution.

224. Remove sludge from settlement tanks as necessary. Check storage tanks, pumps, flters and control gear regularly. During use – check warning devices, sprinklers and mobile irrigator several times a day.

Solid manure stores

225. Permanent stores for solid manures should have bases that do not let liquids pass through. The base should slope so that liquids run-off into collection channels. Collection channels should be outside the store if the walls let liquids pass through them.

226. You should consider providing a roof to keep rainfall off the manure and minimize the volume of liquids produced. You can reduce odour and ammonia emissions from poultry manure by keeping it as dry as possible.

227. Collect liquids in a suitably sized tank, or direct them to a slurry store.

Field heaps

228. Only put solid manures into temporary feld heaps if there is minimal risk of run-off polluting groundwater or surface water. Normally you should not put feld heaps within 10 metres of feld drains. If there is no alternative, you should only put heaps over feld drains for a few days before application and then only if it does not cause pollution. You should not put any feld heaps within 10 metres of surface waters or within 50 metres of a spring, well or borehole or in positions that would cause odour problems for nearby residents. Field heaps should be located well away from any ruts or tracks that could provide a pathway for effluent to get into ditches, surface waters or damage habitats.

229. Using narrow densely packed A-shaped heaps for poultry manure will shed rainwater more easily and prevent manure from becoming very wet. This will reduce odour and ammonia emissions.

Manure treatment

232. The management and handling of livestock manures, particularly the length of time they are stored, are important factors in the survival of micro-organisms. On farms where *Cryptosporidium parvum* (a parasite that can make humans ill) has been diagnosed, reduce the risk of contaminating surface waters with viable oocysts (eggs) by storing:–

- slurry for as long as practically possible; and

- solid manures (farmyard manure) for at least 2 months before spreading to land.

233. If you plan to apply livestock manures before planting “ready-to-eat” crops, you should follow advice on how to reduce risks of food contamination by pathogens (reference 77).

234. The following techniques go beyond good agricultural practice, but may be appropriate or even required, in certain situations.

a. ***Composting*** solid manures reduces the quantity to be spread to land, and the odour that is released during and after spreading. Composting itself can give rise to site odours, and increase the loss of ammonia. The best results are obtained by using ingredients that are chopped and well mixed – usually manure and straw in the right proportions – and by controlling temperature and moisture content. Typical farmyard manure heaps that are not turned will not compost thoroughly.

b. ***Mechanical separation*** of slurry removes some solids and provides a liquid that can be pumped. The solid portion, typically 10 to 20% of the original slurry volume can be stacked and stored in a similar way to farmyard manure, although you must make provision to collect run-off (usually from beneath the separator). Simple wedge-wire run-down screens or vibrating screens for pig slurry, produce separated solids which will not stack but tend to slump. For pig and cattle slurries, separators which press and squeeze the slurry against a fabric belt or steel screen will produce separated solids of 18 to 30% dry matter that can be more easily stacked and composted

c. If you wish to consider other ***biological or mechanical treatment*** of slurry or solid manure to reduce odour, polluting potential or for other reasons – you should obtain specialist advice.

i. In some circumstances the ***anaerobic digestion*** of slurry, often with other organic bio

degradable materials, can produce suffcient biogas to be used for local heating schemes or for generating electricity (reference 78). Key factors for success include:

- securing a regular and consistent supply of organic bio-degradable material;

- receiving “gate fees” for organic bio-degradable material; and

- matching the nutrients in the digested material (digestate) with land available for spreading nearby, and with crop nutrient requirements.

4.4 Sheep dips and dipping

- **All sheep dip compounds are very toxic and extremely small amounts will kill fsh and other water life for a long way downstream if they get into surface waters. Small quantities can also be very damaging to groundwater and can affect drinking water supplies, including neighbours' private supplies. Site all dips (including mobile dips, jetters and showers) well away from surface waters, springs, boreholes and other vulnerable groundwater. Make sure that used dip is safely contained. You must get an authorisation from the Environment Agency to dispose of used dip on land. Everyone involved in sheep dipping must be properly trained and competent.**

Read and follow the Groundwater Protection Code on the use and disposal of sheep dip compounds (reference 79). Complying with this legislation is currently a cross compliance requirement. Sheep dip compounds must be handled by, or their use supervised by, a competent person (reference 80). You must comply with the law if you are jetting, spraying, showering or carrying out conventional dipping of sheep (reference 81). See 'Regulations' below.

4.5 Pesticide storage and handling

- **Pesticides can harm water life, and affect drinking water sources. Good storage and handling procedures will minimise risks of causing water pollution. Very small amounts of pesticide can cause serious pollution problems, even just the amount of residue on a foil seal from a concentrate container. Mixing, flling and washing operations should be carried out carefully to avoid pollution. Everyone who uses pesticides must be properly trained and competent.**

The use of pesticides is controlled by law (reference 86). Everyone who uses pesticides should know the rules set out in these laws and their practical implications. Read the Code of practice for using plant protection products (reference 87). See ‘Disposal of wastes’ and ‘Regulations’ below.

Good practice

Storage

256. New pesticide stores should meet good standards of design and construction (reference 88, 89). You should not build stores where there is a risk of polluting surface waters or groundwater. Get advice from the Environment Agency, local planning and fre authorities, the crime prevention offcer, and the Health and Safety Executive before you build or substantially alter a pesticide store.

257. You can store small amounts of pesticide in a suitable chest, bin, vault or cabinet. This container should be resistant to impact and fre and capable of retaining any pesticide leakage, and kept locked.

258. Stores should have an impermeable floor and be able to hold spillage from all the store contents plus at least an extra 10% (an extra 85% if you are near an environmentally sensitive site).

259. You should review existing stores and identify and carry out any necessary improvements.

Mixing pesticides, flling spray tanks and washing equipment

260. Mixing, flling and washing operations should be carried out in an area designated for the purpose such that spillages and washings cannot escape to contaminate soil, groundwater or surface water. All liquids should be directed to a suitable collection tank or system. These facilities should be well away from yard drains, ditches, feld drains and other surface waters.

261. You must avoid back-siphoning when flling a sprayer by ensuring there are no direct connections between a sprayer and water supply.

Transport

262. You should transport pesticides safely. If you collect pesticides from a supplier, or move pesticides around or off the farm, you should check your legal obligations for the safe transport of dangerous goods. Consult the Code of practice for using plant protection products (reference 87) for more detail.

Training

263. Everyone who uses pesticides must be properly trained and competent to do their job. You may need a certifcate of competence to use pesticides. Check the Code of practice for using plant protection products, for details of training and certification requirements (reference 87).

Spillage

264. If spillage occurs outside of the area designated for sprayer cleaning, you should follow your accident and emergency plan (see Section 1.5). Even small spills should be soaked up immediately with absorbent material e.g. sand or cat litter. Do not hose down, as this will increase the risk of causing water pollution. Spillages of any treated seed or slug pellets should be cleared up immediately to avoid the risk of poisoning wildlife.

Treatment

265. If you intend to install a waste treatment facility for dilute pesticide washings – such as a biobed, you should frst consult the Environment Agency (see Section 7) (reference 90).

Disposal of wastes

You must dispose of the wastes described below by using recognised disposal options – for further details see Section 7.

266. You should minimise ***packaging waste*** by carefully considering how much product to buy and store. Do not burn packaging waste in the open. Recycle packaging off-farm or use another recognised disposal option.

267. You can minimise or eliminate sprayer tank ***washings*** by careful planning, use of rinsing equipment or direct-meter sprayers. You can cut down the amount of waste washings when you clean out equipment by using an effcient flushing system, instead of flling the sprayer tank with water and pumping it through the equipment. You may be able to use washings to make a further batch of the dilute pesticide, but if not you can:

- apply washings to the treated or untreated *crop* provided this is within the terms of the product approval

- apply washings to *land* under conditions set out in a prior written groundwater authorisation from the Environment Agency – this is a legal requirement (reference 81); or

- use another recognised disposal option.

268. It is not economical to store ***pesticides*** that you cannot use in the near future; only order according to need. It is illegal to store them if the approval has been taken away. You may be able to return unwanted, unused containers to your supplier otherwise you must use a recognised disposal option.

269. Do not re-use pesticide ***containers*** except, if in good condition, to hold an identical pesticide from a container that is damaged or leaks. Triple rinse empty containers (reference 91) or use specialist rinsing equipment. If possible, clean the containers when you are preparing working strength spray dilution and use rinsing liquid to dilute the spray. Store the cleaned containers upright and under cover before recycling them or disposing of them off-farm.

Safety Note

Do not rinse or clean containers that have held hydrogen cyanide gassing powders or aluminium, magnesium or zinc phosphides. They give off dangerous gases if they get damp. These containers must be dealt with as hazardous waste (see Section 7).

270. You must dispose of other ***contaminated materials***, e.g. soiled protective clothing, material for soaking up spillages, used rodenticide, or other pesticide baits, using a recognised disposal route for hazardous waste.

Regulations

271. A number of regulations deal with the use of pesticides, so it is important that users understand their responsibilities. The Code of practice for using plant protection products gives detailed guidance on how to comply with the law when using pesticides (reference 87).

4.6 Fertiliser storage and handling

Good storage and handling procedures for fertilisers will minimise the risks of causing water pollution. If pollution incidents occur, they are likely to be very serious. The risks of causing water pollution are low from storing and handling solid fertiliser, but you need to be especially careful with fluid fertilisers.

Recycle clean plastic fertiliser bags.

A number of regulations deal with storage and handling of dangerous substances such as ammonium nitrate fertilisers. General guidance is available (reference 92).

Good practice

General

272. You should consider the risk of polluting water from the storage and handling of fertilisers. Make sure you include how to deal with spillages in your accident and emergency plan (see Section 1.5).

Solid fertilisers

273. Do not store bags of fertiliser within 10 metres of a feld drain, ditch or surface water. Return unused bags from temporary feld sites to a permanent store as soon as possible.

274. You should handle bags carefully to avoid damage, and you should gather up any spilt material.

275. Provide secure storage on farm and carry out regular stock checks (reference 92, 93, 94, and 95 if you store over 150 tonnes of ammonium nitrate fertiliser). If possible keep fertiliser in a locked building.

276. Further guidance is provided in a Code of Practice (reference 96)

286. Fertiliser bags can be re-used on the farm but eventually they will need to be disposed of or recycled. Such bags can be recycled off-farm using specialist collectors. Keep bulk bags separate from small fertiliser bags and make sure all are clean and free from soil. You should shake bags clean to remove fertiliser residues. Do not burn plastics in the open. For disposal options – see Section 7 on waste.

4.7 Fuel oil storage

- Every year fuel oil spills on farms pollute water and damage wildlife. Oil spreads rapidly and widely over the surface of water and can also get into groundwater. The clean up costs are very expensive.

Agricultural fuel oils should be contained and stored safely within bunds to provide secondary containment. Take steps to minimise the risks from vandalism and from accidental damage by moving vehicles.

Good practice

287. All agricultural fuel oil stores should be bunded to provide secondary containment of possible leaks and spillage. Some installations must comply with permit conditions set by the Environment Agency (reference 98, 35).

288. Make sure you include how to deal with spillages in your accident and emergency plan (see Section 1.5). You should have sand or other absorbent material available to soak up any spillages. Ideally, spill kits should be available at all locations where oil is stored and used. Do not hose down a spillage or use detergent.

292. Inspect tanks, pipes and equipment regularly for damage and corrosion. Carry out maintenance and repaint metal tanks on the outside to prevent corrosion. Inspect bunds and keep them in good condition.

293. Transport, site and use mobile tanks with care, especially when you are refueling machines such as irrigation pumps next to surface waters. Check that the fuel systems and tanks of all tractors and diesel engines used in a fxed position are not leaking. Use a drip tray as a short-term measure.

Design of storage facilities

295. Tanks are normally sited above ground and built from welded mild steel plate or plastic.

297. You should be able to lock any tank drain valve closed. There should be room for a container (for example a bucket) underneath it. Fuel lines to equipment such as grain driers should have hand valves ftted next to the tank.

298. Outlet valves should be marked to show when they are open and closed.

Safety Note

Take precautions to reduce the risk of fre. Ask your local Fire Service for advice.
Waste oils

299. Waste oils come from the servicing of agricultural machinery. The main types are used lubricating oil from engines and oil from hydraulic systems. These should be collected and stored in suitable leak-proof containers – preferably bunded and secure from vandals. Disposal or recycling of waste oil must be through registered carriers and licensed sites (see Section 7).

4.8 Livestock buildings and their management

- Good management and a high standard of hygiene and cleanliness will reduce emissions of odour and ammonia from livestock buildings and from fouled open concrete yards. Keep buildings and concrete yards in good repair.

Rainfall from roofs and clean yards should be kept separate from manure systems unless you need extra dilution for slurry handling and storage.

Good practice

All livestock buildings

301. If possible, you should collect and transfer slurry every day from buildings and concreted areas to a suitable store.

302. For bedded systems – use suffcient clean, dry bedding to keep animals clean. Dirty livestock increase emissions of odour and ammonia.

303. Clean and disinfect buildings regularly, for example, after each batch of stock is removed or as pens become empty. Remove thick deposits of dust from surfaces inside the building, especially from ledges, ventilation shafts and cowls. Clean out grit and sediment from slurry channels and collection systems. Do not allow any of these washings or deposits to get into clean water drains, surface waters or soakaways.

304. Remove and dispose of all dead animals, birds and foetal remains through recognised options as soon as possible (see Section 7).

305. You should maintain ventilation fans and check they are running at the correct airflow for the number and weight of animals or birds present. Poor ventilation can result in humid conditions that give rise to unpleasant odours, high concentrations of ammonia and poor conditions for animal health and welfare.

306. Keep areas of open concrete used by livestock to the minimum, as these areas will be fouled by manure. Pipe or channel foul run-off rather than letting it flow across clean concrete. Keep soiled concrete areas free from any build-up of slurry or manure. Where applicable, you should consider roofng over outside soiled yard areas to keep rainfall out of slurry and dirty water stores (see Section 4.3).

307. You should maintain drains and repair broken or badly laid concrete to prevent effluents from ponding – both inside buildings and on open concrete yards.

309. Store all chemicals, disinfectants and veterinary medicines in suitably designed and appropriate storage facilities. Make sure that your accident and emergency plan covers them (see Section 1.5).

Cattle buildings

311. Scrape cubicle passages and other heavily soiled areas regularly, typically twice daily.

312. Dairy and parlour buildings need to be washed and cleaned frequently (reference 106).

Pig buildings

314. The space allowances and other provisions for pigs must meet legal requirements (reference 108). You should follow advice in the Welfare Code (reference 109).

315. Emissions are minimised if pens are kept clean. Dirty pens can result from poor management, poor ventilation and inadequate floor surfaces, as well as incorrect pen design and construction, and badly sited feeding and watering facilities.

316. Whenever possible you should clean non-bedded, concreted dunging areas every day.

318. Larger pig units must comply with permit conditions set by the Environment Agency (reference 98, 35).These conditions are based on the Best Available Techniques (BAT) for avoiding or minimising all types of emissions, including from pig buildings. Guidance is available on BAT from the Environment Agency (reference 111). You should consider these techniques for smaller pig units when refurbishing or constructing new buildings.

Poultry buildings

319. The space allowances and other provisions for poultry must meet legal requirements (reference 112).You should follow advice in the Welfare Codes (references 113, 114).

320. You can reduce emissions from housing by keeping poultry manure in a dry condition.

321. You should consider ways to reduce energy use in buildings that are mechanically ventilated or heated.

322. Larger poultry units must comply with permit conditions set by the Environment Agency (references 98, 35). These conditions are based on the Best Available Techniques (BAT) for avoiding or minimising all types of emissions, including from poultry buildings. Guidance is available on BAT from the Environment Agency (reference 111). You should consider these techniques for smaller poultry units when refurbishing or constructing new buildings.

Caged laying birds

323. Remove manure frequently from poultry houses with manure belt systems.

Odours from feeding and food stores on farms

329. Odours can be absorbed by dust particles which are then carried in the air. Finely ground feeds and long feed drops (into bins or onto floors) increase the amount of dust. Using liquid feeds or pelleted feeds can reduce dust and may help to reduce odours.

330. Keep foods such as whey, skimmed milk, yeasts and molasses which can produce strong odours in properly constructed covered tanks or silos. The delivery area should be concreted and any spillage directed into the foul drainage system.

331. Do not allow effluent from any food storage, including silage, to flow across open concrete; it should be collected in a channel or drain and directed to a suitable storage tank.

5 Field work

5.1 Introduction

- The advice in this section will help to protect soils and maintain yields while reducing the risks of causing water pollution by run-off and erosion. It will also reduce air pollution and protect sensitive habitats and historical features.

332. Good soil management is diffcult to achieve unless you make a realistic assessment of the capability of your land. Certain crops can only be grown, and particular management practices can only be carried out, under appropriate conditions. If you exceed the limitations of your land it can lead to poor production and may cause unacceptable damage to the environment.

333. All feld operations should take into account any management plans you have produced for your farm (see Section 3), and should be consistent with your cross compliance obligations.

334. You must comply with the Environmental Impact Assessment Regulations (reference 30) which control the agricultural intensifcation of uncultivated land and semi-natural areas. Complying with this Regulation is currently a cross compliance requirement.

335. To conserve our historic heritage you should protect archaeological remains that appear on or above the soil surface or are buried beneath it. Take care not to cause damage by sub-soiling, ploughing or other deep cultivation, or by uprooting trees.
Actions you take now may mean that irreplaceable archaeological sites are lost to present and future generations. This is true whether the sites are legally protected or not. Seek advice from the Archaeological Offcer of your local Authority if you are unsure about the status of an historic site or for advice on management.

336. Ensure that all staff and contractors are aware of, and follow, the requirements of cross compliance and of any agri-environment scheme and are familiar with any relevant management plans for the holding.

337. Unnecessary or badly planned feldwork is a cost to your business and a pollution risk. It will use extra fuel which will contribute to greenhouse gas emissions.

338. Consider both soil and weather conditions and the short-term weather forecast. Be prepared to suspend work, including that of contractors, until conditions improve.

339. If you have to travel on wet soils, reduce the loading with low ground pressure setups, or set tyre pressures at the lowest that is compatible with the load and tyre type. This is currently a cross compliance requirement (reference 17).

340. Maintain and calibrate all equipment regularly and use it according to manufacturers' instructions. Pay attention to weights and tyre pressure.

341. Regular inspection of your soils will show when you need to maintain or replace existing feld drainage schemes or carry out secondary treatments (moling or subsoiling). This will reduce the risk of run-off and increase the time available for working on the land or for grazing livestock.

342. Operating across the slope can reduce the risk of run-off and erosion. Make sure your equipment can operate properly and that it is safe to travel whenever you decide to work in this

way.

343. Minimise the quantity of soil taken from the feld on equipment or on crops. Soil left on the road is a traffc hazard and if washed into surface water it is a source of pollution. You will also reduce the risk of spreading soil borne diseases.

5.2 Soil management and cultivations

- **Good soil management is essential to maintain a productive and sustainable farming system.**
- **Poor soil structure leads to poor crop growth, poor drainage and can be a key factor in run-off and erosion which can cause serious harm to surface waters and other sensitive habitats.**

Preparing a soil management plan will help you to manage and protect soils on a feld-by-feld basis. It can also help identify any areas where special action may be needed. Take soil conditions into account whenever travelling over or cultivating the soil. Select management systems and approaches that will enable you to protect the structure of the soil and manage it to minimise run-off and erosion from both water and wind.

Organic matter

353. Take positive action to maintain or increase soil organic matter which will improve soil stability and increase workability. Consider if you can reduce the number of passes, including introducing integrated systems of management, returning crop residues, applying bulky organic manures and introducing grass or green manures into the rotation. Remember to adjust your fertiliser use accordingly.

Primary cultivations

354. Where the soil is compacted, undertake any soil loosening or sub-soiling that is needed when soils are dry (but not hard) to depth. Deeper cultivation may be needed on tramlines, headlands and gateways than in the rest of the feld. During the operation check to see whether it is being successful and adjust the implement accordingly.

355. Do not cultivate more deeply than is necessary. It will slow down overall work rates, increase fuel use and therefore costs and may damage feld drainage, archaeological features and bring up poorly structured or low organic matter soil.

356. Soil moving down the slope by erosion or tillage operations can reduce the depth of soil and restrict crop growth, especially on the crest of a hill. To counteract this, plough or cultivate across the slope throwing the soil upslope if it is safe to do so.

357. Where any harvesting takes place or if forage crops (e.g. kale, stubble turnips) are grazed, in winter or under wet conditions, undertake a primary cultivation as soon as conditions are suitable to create a rough surface that will reduce the risk of run-off and erosion.

358. To increase work rates and reduce fuel consumption, select a cultivation system which uses the minimum number of passes consistent with creating soil conditions suitable for the crop to be grown. Consider direct drilling or reduced tillage systems and using a furrow-press if ploughing.

359. To minimise run-off and erosion before spring sown crops, establish temporary green cover or leave the land in stubble or roughly cultivated over winter. Complying with this will ensure you meet current cross compliance requirements.

Crop establishment

360. A coarse seedbed will reduce the risk of the soil slumping or capping which can reduce emergence and lead to run-off and erosion. Prepare as coarse a seed bed as you can that will still produce a good germination and ensure the effectiveness of any pre-emergence herbicides.

361. Plan your program of autumn cultivations so that, after combinable crops, you do not leave a fne seedbed unplanted or you may be in breach of current cross compliance requirements.

362. On any soil liable to capping or which may suffer from run-off, drill autumn-sown cereals early to ensure a good crop cover to reduce the risk of this happening.

363. To reduce the risk of run-off, consider if you can delay establishing tramlines until after winter or if you can avoid using them until the spring. Pulling a tine along a compacted tramline can reduce run-off.

365. De-stoning soils before planting can cause long-term damage to soil structure and increase the loss of organic matter. Only do it where it is essential to ensure the quality of the harvested crop.

367. Where it is not possible to plant row crops such as potatoes and vegetables across the slope, divide long slopes with grass strips or unplanted cultivated headlands within the feld. Use tied ridges or dykes in furrow bottoms to improve water infltration.

Managing the crop

369. To prevent sealing or capping of the soil surface and to reduce run-off, ensure irrigation is applied evenly and that droplet size is not too big.

370. Use a tined weeder or similar implement within the crop to break up capped soils that are causing run-off.

Harvesting

373. Distribute chopped straw and crop residues evenly across the feld to aid subsequent incorporation.
374. You must not burn crop residues (other than linseed residues) unless certain restricted conditions apply (reference 120). This is currently a cross compliance requirement

5.4 Application of livestock manures and dirty water

- Livestock manures are valuable sources of nutrients and organic matter. Correct application of manures will reduce your fertiliser costs, improve soil structure, and reduce the risk of causing pollution.
Use your manure management plan together with a feld inspection to identify whether it is safe to spread livestock manures and dirty water – and avoid causing water pollution. You should not spread if heavy rain is forecast within the following 48 hours.
Use both your manure and nutrient management plans to work out an application rate.
Avoid applying more than 50 m3 of slurry or dirty water per hectare at any one time to reduce the risk of run-off.
If possible, to reduce odour and ammonia loss:
- use a band spreader or injector to apply slurry.
- otherwise, use broadcast equipment with a low trajectory and large droplets.
On bare land and stubble, to reduce odour, ammonia loss and run-off risk:
- if you broadcast slurry (by splash plate), you should incorporate it immediately, and at the latest within 6 hours.
- if you apply solid manure, you should incorporate it as soon as possible, and at the latest within 24 hours.
Note: Soil incorporation is not required where solid manure (farmyard manure) is used as a mulch to control wind erosion on susceptible soils.
Check that all equipment is in good working order and calibrated to give a known application rate and uniform spread pattern. If you use contractors, make sure they are aware of all pollution risks and safe application rates.
The application of livestock manures in Nitrate Vulnerable Zones is controlled by law (reference 23). You must comply with the nitrogen loading limits, restrictions (times of the year) when spreading slurry and poultry manure is not allowed, and other controls and record keeping (reference 24).

Good practice

General

380. Use your manure management plan to help you decide when and where to apply solid manure, slurry and dirty water. Use your nutrient management plan to work out an application rate to supply the nutrients needed to meet crop requirements, taking into account other sources of fertility (see Section 3).

381. The method and timing of livestock manure and dirty water applications to land can affect the length of time that micro-organisms survive on herbage or in the soil:
- spreading manures onto grazing land can play a role in transferring disease to healthy livestock. Risks are reduced by storage, using low application rates and leaving the land for as long as possible before grazing (reference 32).
- if you plan to apply these before planting ready-to-eat crops, you should follow advice on how to reduce risks of food contamination by pathogens (reference 77).

382. If you use contractors – ensure they are aware of pollution risks on your farm and that they use safe application rates.

383. Check feld drain outfalls and surface waters frequently during and after spreading slurry, solid manure, and dirty water to make sure there is no pollution.

384. You should apply livestock manures when grass and crops can make efficient use of nitrogen. Spring applications on all soil types make best use of nitrogen in the manures (see Section 2).

385. You should not apply livestock manures and dirty water when:
- the soil is waterlogged; or
- the soil is frozen hard; or
- the feld is snow covered; or
- the soil is cracked down to feld drains or backfll; or the feld has been pipe or mole drained or subsoiled over drains in the last 12 months; or
- heavy rain is forecast within the next 48 hours.

386. Use a weather forecast to help choose suitable conditions for spreading. The best conditions are where air mixes to a great height above the ground, which are typically sunny, windy days, followed by cloudy, windy nights. These conditions cause odours to be diluted quickly. Check wind direction in relation to nearby housing before spreading.
387. Avoid spreading at weekends, bank holidays, or in the evening unless it is solid manure that has been well composted, or slurry that is to be band spread, or injected or has been treated to reduce odour.

388. If you have any land in a Nitrate Vulnerable Zone, you must not spread slurry or poultry manures (materials that have a high readily available nitrogen content) during the closed periods (reference 24).

389. You should not apply livestock manures and dirty water:
- within 10 metres of any ditch, pond or surface water; or
- within 50 metres of any spring, well, borehole or reservoir that supplies water for human consumption or for farm dairies; or
- on very steep slopes where run-off is a high risk throughout the year; or
- on any areas where you are not allowed to because of specifc management agreements.

390. You should only broadcast slurry and solid manures to bare land or stubble if soil conditions are suitable for incorporation within a few hours (see paragraphs 398 to 400).

391. Avoid spreading solid manure, slurry or dirty water in felds close to and upwind of houses.

392. If there is an outbreak of a notifable disease, you must comply with any conditions for livestock manures set by the Secretary of State. Contact Animal Health for advice.

393. Some veterinary products contain highly polluting compounds, and manures from treated livestock should only be applied to land according to advice from the Environment Agency. You must follow any instructions provided with the products.

397. Consider applying slurry with a band spreader or injector to reduce odour and ammonia loss. Otherwise, use broadcast techniques (splash plate) with a low trajectory and large droplets. If you broadcast slurry or solid manure to bare land or stubble, you should only do so if soil conditions allow such manures to be incorporated into the soil soon afterwards (see paragraphs 398 to 400).

398. If you apply slurry to bare land or stubble by a broadcast method – use equipment with a low trajectory and large droplets. You should incorporate the slurry as soon as possible to reduce odour, ammonia loss and the risk of run-off. Best results are achieved by incorporating slurry immediately after it has been spread with the aim of completing work within 6 hours.

399. If you apply solid manure to bare land or stubble, you should incorporate it as soon as possible and aim to complete the work within 24 hours to reduce odour, ammonia loss and the risk of run-off.

400. Ploughing bare land or stubble to incorporate slurry and solid manure is more effective at reducing odour and ammonia emissions compared to other techniques such as discs or tined equipment. You should consider the most appropriate technique for the circumstances

5.5 Application of organic wastes and treated materials

- **Organic wastes and certain treated materials3 are valuable sources of nutrients and organic matter.**
- **Correct application of such materials will reduce your fertiliser costs, improve soil structure, and reduce the risk of causing pollution.**

The risks of causing pollution from applying these organic materials to land are similar to those when applying livestock manures. Use your manure management plan, together with a feld inspection to identify whether it is safe to spread such organic materials – and avoid causing water pollution. You should not spread if heavy rain is forecast within the next 48 hours.

Use both your manure and nutrient management plans to work out an appropriate application rate. Avoid applying more than 50 m3 of liquid waste per hectare in a single application, to reduce run-off risk.

Use the same techniques as when spreading livestock manures to reduce odour, ammonia loss and the risk of run-off. Check all equipment is in good working order and calibrated to give a known application rate and uniform spread pattern. If you use contractors – make sure they are aware of pollution risks and safe application rates

Good practice

General

410. The risks of causing pollution from applying organic wastes to land are similar to those when applying livestock manures. Check through the general recommendations in Section 5.4, and those on timing of applications, restrictions on certain areas, application rates and application techniques.

411. Soil metal contents should also be monitored for the Quality Protocols and when other organic materials are applied regularly (see Section 2.5 on soil contamination).

412. You should not apply more than 250 kg of ‘total nitrogen’ per hectare in any 12 month period (taking into account any livestock manures). You should not apply more available nitrogen than the crop needs, which may mean applying less than this maximum amount. In river catchments less sensitive to nitrate leaching, some wastes such as sewage sludge cake or composted organic waste that contain very little plant available nitrogen may be applied at rates supplying up to 500 kg per hectare of ‘total nitrogen’ in one application every 2 years. You must comply with the Organic Manure N Field Limit and other controls if you are applying organic wastes in a Nitrate Vulnerable Zone (reference 24).

413. Organic wastes may be spread and left on the surface of susceptible soils to reduce the risk of wind erosion. They may also be applied to a growing crop as a mulch and left on the surface of soils. In such cases you will need an environmental permit or an exemption from the Environment Agency.

414. Guidance is available on the application of paper sludge to agricultural land (reference 124).

Regulations

415. The treatment of land by the application of organic wastes to provide agricultural beneft or ecological improvement is controlled (reference 35). Consult the Environment Agency for further advice.

416. Sewage sludges (sometimes known as bio-solids) contain signifcant proportions of nitrogen, phosphorus, trace elements and organic matter. But they can also contain potentially harmful substances including pathogens and heavy metals. The regulations and guidance (reference 34, 42, 41, 43) are designed to protect the environment, human and animal health, and the soil. If sludge is used on your land, you should make sure that you know about your responsibilities (reference 42); information packs are available from many of the sludge producers. Separate guidance deals with the use of sludge and composts in forestry (reference 125).

417. Applications of sewage sludge must take into account the metal content of the soil and of the sludge that is applied.

418. When sewage sludge is applied you must comply with controls before and after applications to ensure food safety and to reduce the risk of disease transmission to animals (reference 34, 41, 43).

Other organic wastes

421. For other organic wastes – you must comply with an environmental permit or an exemption (reference 35), and you must not cause harm to human health, or cause pollution of the environment (see Section 7).

425. There are some exemptions for land spreading agricultural waste e.g. waste milk, ash from on-farm incineration of pigs and poultry, and dredgings from farm ditches (see Section 7.4).

5.6 Application of lime and manufactured fertilisers

- **Lime and manufactured fertilisers are important inputs to a farm system. Using them ineffciently is a cost to your business and increases the risk of causing pollution. All applications should be based on a nutrient management plan and take into account your soil management plan. Machinery should be regularly maintained and calibrated. Keep all plant nutrients away from sensitive habitats in the landscape.**

Good practice

427. All applications of lime and manufactured fertiliser should be based on your nutrient and soil management plans (see Sections 3.3 and 3.4).

428. Ensure all equipment, including that used by contractors, is checked, maintained and calibrated at least once a year. Particular care is needed when using solid urea. You should only use fertiliser of a quality that you can spread accurately and evenly.

429. Match up bout widths and spread patterns carefully to ensure an even spread, taking into account the width of any tramlines.

431. You should take special care when applying lime and manufactured fertiliser to felds where there is a risk of run-off to surface water, especially on steeply sloping land.

432. You should not apply lime and manufactured fertiliser when:-
- the soil is waterlogged, flooded, frozen hard or snow-covered; or
- heavy rain is forecast to fall within the next 48 hours.

433. You should not spread directly into ditches (even if dry), surface waters, hedge bottoms, uncropped areas or other habitats where lime or nutrients may harm the natural flora and fauna.

434. You should not spread manufactured fertilisers in very windy conditions when spread patterns will be disrupted, unless you use a pneumatic spreader. Uneven application may affect crop growth and increase the risk of nitrate leaching if overlap occurs or the fertiliser may get blown into sensitive habitats.

435. Take particular care when spreading very fne materials such as lime, not to cause a nuisance to neighbours or contaminate sensitive habitats.

5.7 Application of pesticides

- **Applying pesticides effectively will maximise their beneft and reduce the risk of harming people and livestock and polluting the environment. A crop protection management plan will help you determine the best way to use pesticides on your farm. Consult the National Sprayer Testing Scheme for guidance on maintaining and testing machinery. Apply pesticides so that they only affect their intended target.**

Everyone who uses pesticides must have the appropriate training so that they have the relevant certifcate of competence, or have “grandfather” rights, or they must work under the supervision of someone with the correct certifcate (reference 62). You must always comply with the conditions of use. These are either on the label or are part of a Specifc Off-Label Approval (SOLA) (reference 128). You have a legal obligation to keep all pesticides on the sites of intended application. You must keep records of all pesticides used when you grow food or feed crops (reference 129). This section should be read together with advice on preparing a crop protection management plan (see Section 3.5) and on the storage and handling of pesticides (see Section 4.5).

Good practice

General

436. Advice on applying pesticides is published in the Code of Practice for using plant protection products. Everybody involved should follow the code and other helpful guidance (reference 62, 128). Keeping records of all pesticides is not only good practice but is a requirement under EC law when you grow food or feed crops (reference 129).

437. Anybody who applies pesticides must have appropriate training, and may need a certifcate of competence to do so. Managers and advisers should be appropriately trained and knowledgeable before giving advice.

438. A crop protection management plan will help you determine the best way to use pesticides on your farm (see Section 3.5). You should identify and protect all surface waters and groundwater protection zones, wildlife habitats and enhance conservation areas on the farm including all hedgerows and other boundary areas and prevent spray drift affecting them.

440. Ensure you take adequate precautions to protect bees and other benefcial insects (reference 62).

Field application

441. You should maintain your sprayer properly to prevent all leaks and drips and ensure that it sprays evenly, and does not leave untreated patches, or over-treated areas.

442. Make sure conditions are suitable so that the soil is not compacted or rutted in a way that might lead to run-off and erosion.

443. Check local weather conditions, and take the direction and strength of the wind into account when deciding if it is safe to spray. Be prepared to stop work if conditions deteriorate. Conditions are often better early in the morning or in the evening.

444. Minimise spray-drift at all times by using the appropriate equipment and sprayer controls. Use low drift and other types of nozzles where effcacy is not compromised and adopt the correct forward speed and boom height.

446. In each feld, consider the pattern of working, so you avoid overlap, particularly when turning on headlands. You may need to leave an area unsprayed in order subsequently to dispose of tank washings safely within label recommendations.

447. If you decide that you need to use a pesticide in or near any water, not just rivers and streams, you must only use a specifcally approved material.

5.8 Managing livestock

- **Managing livestock in a way that protects grassland and soils will maintain productivity, and reduce the risk of causing damage to the surrounding environment. You should include the impact of all your livestock systems when preparing a soil management plan, and follow the principles of good husbandry. Minimise the impact of stock and of all management operations on the soil and the sward to reduce the risk of run-off and erosion. Be prepared to remove livestock from felds if problems occur. Whenever practical, keep livestock out of watercourses.**

You must not burn heather, rough grass, bracken, gorse or *Vaccinium* in breach of regulations (reference 121). You must not allow stock to damage important features on Sites of Special Scientifc Interest (SSSIs), or on other designated areas (reference 12).

Good practice

General

448. Do not exceed the livestock carrying capacity of your land. You should take into account available feed, soil and climate.

449. Adopt systems that are appropriate for your soil, climate and infra-structure (such as farm tracks). Extending the grazing season can save on the cost of housing and manure storage, but should only be considered on suitable sites where the risk of poaching, erosion and run-off and of nitrate leaching can be managed to maintain the productivity of the sward and prevent water pollution.

450. Make allowance in your nutrient management plan (see Section 3.3) for the fertility left behind by all types of livestock.

451. Be prepared to relieve compaction in grassland soils to improve infltration and drainage. Consider spiking, sub-soiling or lifting the soil according to the prevailing conditions.

452. Remove and dispose of all dead animals, birds and foetal remains through recognised options as soon as possible (see Section 7).

5.9 Soil handling

- **Soils are an important resource and their long-term function should be protected when they are disturbed for mineral extraction, pipeline laying, landflling, land reclamation and other operations on the farm. Many activities will involve soil handling which has the potential to damage the soil. Ensure that plans are in place to protect soil before work starts.**
If soils have to be removed, this should be done with care. They should be:

- stored properly to preserve their integrity;

- re-instated under good conditions; and

- subsequently managed to help them return to good condition.

Good practice

Planning the work

473. Ensure that any operation on your land that involves moving soil includes detailed proposals that will protect its long-term use and function. Where necessary seek specialist advice to ensure these are appropriate for the work that will be carried out. As well as best practice (reference 141, 142, 143), you should be aware of anything that might be a legal obligation on you, or a contractual issue outside of any planning condition or environmental permit.

474. Good planning is essential and should include any implications for the surrounding land and the locality. You should consider the risk of run off and erosion causing flooding and pollution in surrounding areas and ensure there are provisions to prevent this happening.

7 Wastes

7.1 Introduction

513. Waste is any substance or object which the holder discards, or intends to or is required to discard (reference 146). Wastes produced from agricultural and horticultural premises, often referred to as “agricultural wastes”, are controlled to protect the environment and public health; you must comply with the law (reference 35). The disposal of animal carcases is controlled by Animal By-Products legislation (see Section 7.6).

514. There is no defnitive list of agricultural waste but examples (when you need to get rid of them) are vehicle and machinery waste, non-packaging plastics, plastic packaging, animal health products, building waste, cardboard and paper, metal, wood, glass, rubber, ash, and some hazardous wastes such as unused agro-chemical concentrates, oils, brake fluids, antifreeze, asbestos, lead-acid batteries, and fluorescent light tubes.

515. Livestock manures are not waste if they are used to fertilise soil for agricultural or ecological beneft on agricultural land – whether on the farm where they are produced, or on another farm.

516. You must not burn, bury, dump or tip waste unless you have a permit, or have registered an appropriate exemption with the Environment Agency (reference 35). Farm tips and dumps must not be used unless you have a permit.

517. You can use any of the 5 basic options (in combination) for dealing with agricultural waste:
- store waste securely on your holding for up to 12 months;
- take the waste to a recovery or disposal site;
- give the waste to an authorised person;
- register permitting ‘exemptions’ and comply with conditions for recovery or disposal of that waste; and
- get an environmental permit.

518. There are other methods for dealing with dilute liquid wastes, waste oil and animal carcases (see Sections 7.5 and 7.6).

Duty of Care

519. A duty of care applies to everyone who handles waste – from the person producing the waste to the person who fnally disposes of or recovers it. This duty is based on common business sense and is a key method to combat fly-tipping. You must keep such waste secure so it does not leak, spill, or blow away and you can only give your waste to an authorised person – a registered waste carrier. It is your duty to ensure that the waste goes to a properly authorised site, and to give the person a transfer note describing the waste and signed by both of you.

Hazardous waste

520. Examples of farm wastes that are classifed as hazardous include waste oil, asbestos, lead acid batteries and agro-chemicals containing dangerous substances (reference 148). You must not mix hazardous wastes or mix hazardous waste with non-hazardous waste or other substances and materials. Hazardous wastes must be collected and disposed of separately, and are subject to the requirements of the Hazardous Waste Regulations (reference 149).

Exemptions (from environmental permitting)

522. These are a light form of regulatory control that allow you to recover or dispose of some wastes that present a low risk of causing pollution or damaging public health (see Section 7.4). You must comply with all the conditions that are set down in each exemption.

7.2 Waste minimization

- **Minimising the amount of waste you produce will reduce its potential impact on the environment.**
Creating less waste will save you time and money in managing, handling and disposing of waste. It will also mean you use raw materials more effciently.

Good practice

524. Review current practices by considering the nature, quantity and full costs of dealing with wastes on your holding. Deal with the more signifcant issues frst.

525. Identify whether you can avoid producing waste from the outset. Consider alternative materials, or the use of alternative techniques.

526. If you cannot avoid producing waste, consider how it might be reduced by making technical changes, by using a different management technique, and by improving staff training.

527. Some wastes may be re-used – identify whether this is possible.

528. Many waste materials can be recycled for a secondary purpose (reference 152).

529. Produce a shortlist of potential improvements, and prioritise them based on cost/beneft and how easy they are to put into practice. Make the changes when the opportunity arises.

530. Further guidance is available to help you carry out a waste audit, and to provide ideas for reducing the cost of dealing with waste (reference 66).

7.3 Waste storage, recovery and disposal

Poor arrangements for storing and dealing with waste can cause pollution and risk harming public health.
You can only store waste for up to 12 months. Wastes must be stored securely to avoid pollution.
You can take waste from your holding to a recovery or disposal site and/or you can give the waste to an authorised person – but you must comply with your "duty of care."

Wastes produced from agricultural and horticultural premises, often referred to as "agricultural wastes," are controlled to protect the environment and public health; you must comply with the law (reference 35).

8 Water supplies on the farm

8.1 Introduction

552. The amount of water available for domestic, industrial, agricultural and horticultural use, and to support the needs of the environment, is limited. Its use should be planned and managed properly to avoid waste, which in turn will help to keep control of your costs.

556. Water is used for drinking by livestock, for washing and cleaning, for heating and cooling, for irrigating crops, and for protected crops and nursery stock. It may be taken from the mains supply or abstracted from a river or borehole. Using water efficiently is key to protecting the environment and you should consider whether it is practical to collect rainfall from roofed areas for use on your farm or holding – often called ‘rainwater harvesting’ (reference 168).

557. Anybody who installs or uses water fttings has a legal duty not to cause or allow waste, misuse, undue consumption or contamination of mains drinking water (reference 169). You must take steps to ensure mains water cannot be contaminated from backsiphonage or backflow.

Crop irrigation

564. Use ‘irrigation scheduling’, and good practice, to make effcient use of water (reference 170, 171, 172, 173).

565. Consider using boom irrigation to apply water more accurately than a gun. For some crops, trickle irrigation can be used to reduce water consumption.

566. Make regular checks of pumps, mains pipe, hydrants, supply hoses and irrigators and carry out necessary repairs.

567. Check that you are using the correct pump and pipe size to operate at the stated pressure. Make adjustments to avoid soil compaction from large droplets and to avoid run-off.

568. Avoid uneven application by not irrigating when it is windy. Irrigating at night, in the early morning or late evening will reduce loss (evaporation) of water, but be aware of potential noise nuisance when siting your pump.

569. Consider the need for winter storage of water and the potential for co-operating with neighbours (reference 174). There may be opportunities for recreational use and conservation management.

570. Keep up-to-date with developments for water use within your area. Experience has shown it is important to be involved and informed.

9 References

Note:
Text of European laws and directives can be obtained from
http://eur-lex.europa.eu/en/index.htm
Text of National laws and explanatory memoranda can be obtained from
http://www.opsi.gov.uk/
- Available from www.defra.gov.uk
- Available from www.environment-agency.gov.uk

- Available from Defra Publications, Admail 6000, London, SW1A 2XX or e-mail defra@cambertown.com or Tel 0845 955 6000.

1. Compendium of UK Organic Standards made under The Organic Products Regulations 2004

2. The Water Framework Directive 2000/60/EC

3. National Emission Ceilings Directive 2001/81/EC implemented by The National Emission Ceilings Regulations 2002

4. Protocol to the 1979 Convention on long-range transboundary air pollution to abate acidifcation, eutrophication and ground-level ozone.

5. Best Farming Practices: Profting from a good environment, Environment Agency, 2008

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10 Glossary of terms

Biochemical Oxygen Demand (BOD) ~ describes the polluting strength of livestock manures and organic wastes. It is a measure (in mg/litre) of the amount of oxygen needed by micro-organisms to break down organic material.

Cover crop ~ a crop sown primarily for the purpose of taking up nitrogen from the soil and which is not harvested.

Compost ~ produced by aerobic decomposition of biodegradable organic materials.

Digestate ~ produced by anaerobic digestion of biodegradable organic materials. They may include liquid or separated fbre after digestion.

Dirty water ~ lightly contaminated run-off from lightly fouled concrete yards or from the dairy/parlour that is collected separately from slurry. It does not include liquids from weeping-wall slurry stores, slurry strainer boxes, slurry separators, or silage effluent which are rich in nitrogen and regarded as slurries.

Eutrophication ~ the enrichment of ecosystems by nitrogen or phosphorus. In water it causes algae and higher forms of plant life to grow too fast. This disturbs the balance of organisms present in the water and the quality of the water concerned. On land, it can stimulate the growth of certain plants which then become dominant so that the natural diversity is lost.

Excreta ~ the materials directly deposited (excreted) by livestock, and includes dung and urine.

Farmyard manure (FYM) ~ livestock excreta that is mixed with straw bedding material, that can be stacked in a freestanding heap without slumping.

Frozen hard ~ a term used when the soil is frozen for more than 12 hours in the previous 24 hours. Days when soil is frozen overnight but thaws out during the day do not count.

Groundwater ~ the water held underground in rock formations. Where these formations support wells, boreholes, surface waters, wetland habitats etc, they are called aquifers.

High readily available nitrogen content ~ more than 30% of the total N content of the organic manure is present in molecular forms that can be immediately taken up by the plant, or is released in the year in which it is applied to land. Examples include cattle and pig slurry, most poultry manure, and liquid digested sludge.

Leaching ~ a process by which soluble materials are removed from the soil by drainage water passing through it.

Livestock manure N farm Limit ~ a limit to the annual average loading of the total amount of nitrogen (N) in livestock manure across the area of a holding in a Nitrate Vulnerable Zone.

Low readily available nitrogen content ~ less than 30% of the total N content of the organic manure is present in molecular forms that can be immediately taken up by the plant, or is released in the year in which it is applied to land. Examples include strawbased cattle and pig manure.

Manufactured fertiliser ~ any fertiliser (other than organic manure) which is manufactured in an industrial process.

Manufactured nitrogen fertiliser ~ any nitrogen fertiliser (other than organic manure) which is manufactured in an industrial process.

Nitrate Vulnerable Zone (NVZ) ~ an area of land designated in accordance with Article 3 of the Nitrates Directive as a vulnerable zone for the purposes of that Directive.

Nitrogen fertiliser ~ any substance containing one or more nitrogen compounds used on land to enhance the growth of vegetation and includes organic manures.

Organic manure ~ any nitrogen fertiliser derived from animal, human or plant sources. It includes livestock manure, sewage sludge and other organic materials.

Organic manure N feld limit ~ an upper limit for the addition of nitrogen from all livestock manures and all other organic manures applied to each feld in any 12 months in a Nitrate Vulnerable Zone. It does not include excreta and urine deposited directly to land by grazing animals.

Other nitrogen-containing materials ~ any substance containing nitrogen that is neither a manufactured nitrogen fertiliser nor an organic manure e.g. dredgings.

Quality Protocol ~ standards for the production and use of compost and digestate such that they are no longer waste materials.

Readily available nitrogen ~ nitrogen that is present in livestock and other organic manures either as ammonium or nitrate, or in poultry manure as uric-acid N, is known as the readily available fraction as it will be taken up more quickly by plants than nitrogen that is bound in organic compounds.

Slurry ~ excreta produced by livestock (other than poultry) while in a yard or building (including any bedding, rainwater and washings mixed with it), that has a consistency that allows them to be pumped or discharged by gravity. The liquid fraction of separated slurry is also defned as slurry.

Soil nitrogen supply (SNS) ~ the amount of nitrogen (kg N/ha) in the soil that becomes available for uptake by the crop in the growing season, taking account of nitrogen losses.

Solid manure ~ organic manure which can be stacked in a freestanding heap without slumping.

Surface water ~ includes coastal waters, estuaries, canals, lakes, ponds, rivers, streams, ditches which contain free water and also temporarily dry ditches and blind ditch