

Producing a Soil Management Plan for Environmental Stewardship

**RDS is part of the Department for Environment,
Food and Rural Affairs**

Introduction

Well managed soils are an important element of sustainable farming practice. Poor soil structure leads to patchy crops from uneven germination, poor growth and greater susceptibility to weed competition and disease. It can result in poor drainage and may lead to ponding, runoff and erosion. Managing soils according to a carefully considered and updated plan can help to reduce the risk of compaction and erosion, optimise the yields and quality of crops and pasture, as well as reducing the risk of damaging the environment.

- 1.1 This paper provides **guidance** on how to produce a Soil Management Plan for Entry Level (ELS) and Organic Entry Level (OELS) of the Environmental Stewardship scheme. It should be read alongside your ELS or OELS Handbook. (These are referred to simply as “the Handbooks” in the remainder of this guidance).
- 1.2 The Soil Management Plan is a voluntary option that contributes 3 points/ha towards your ELS or OELS points targets, **but is not available on unimproved land**, as defined in the Handbooks. The points awarded for the Plan assume you will use an adviser or consultant to help you prepare it. However, you may wish to do the work yourself using the guidance given here and contained in the revised Defra manual on Controlling soil erosion (available at <http://www.defra.gov.uk/environment/land/soil/pdf/soilerosion-lowlandmanual.pdf>).
- 1.3 If you are considering the resource protection options as part of a Higher Level Stewardship (HLS) application you will need to complete an ELS/OELS Soil Management Plan. HLS applications including these options are more likely to be successful in specific ‘target areas’. You can find out whether you are in such a target area by looking at <http://www.defra.gov.uk/erdp/schemes/hls/targeting.htm> or by contacting your local RDS office. Even if you are in a specific target area HLS is competitive and discretionary so you may not be successful with your application.
- 1.4 Some of the management practices you identify in your Soil Management Plan may coincide with options available under Environmental Stewardship. You may if you wish include some or all of them in your agreement such as not growing high risk crops like maize on high risk sites (ELS/OELS) or reverting cropped land to grass (HLS).

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- 1.5 Your Soil Management Plan should take into account environmental features on your farm to ensure they are preserved or enhanced.
- 1.6 You should consider carefully which practices you can adopt on your farm. Although you will only receive payment for options you are able to include in an Environmental Stewardship agreement the environmental impacts of soil runoff and erosion must be reduced, particularly in sensitive catchments. Following an effective soil management plan will help to reduce any adverse effects upon the environment that may be occurring at present.

What is the relationship between a Soil Management Plan prepared for ELS/OELS and the Soil Protection Review required under Cross Compliance for the Single Payment Scheme?

- 2.1 If you are claiming entitlement under the Single Payment Scheme, you will need to apply the three basic soil protection standards from 2005 and in 2006 complete a simple farm level review of your soil management as part of your cross-compliance obligations using a format and guidance which will be sent to you by Defra. In future this will be referred to as the cross compliance Soil Protection Review. You should already have received a Guidance Booklet (Cross Compliance Guidance for Soil Management PB10222B). If you do not have this booklet you should obtain one free of charge, from Defra Publications, Admail 6000, London, SW1A 2XX, Tel: 08459 556000, Email: defra@iforcegroup.com or from <http://www.defra.gov.uk/farm/capreform/pubs/pdf/Soil-hb.pdf>. A new edition of this Guidance will be sent to all farmers during winter 2005/6 with details of how to complete the Soil Protection Review.
- 2.2 You will need to complete the cross compliance Soil Protection Review even if you have prepared a detailed ELS/OELS Plan. However if you have the detailed plan it will be much easier to complete the cross compliance review, as all of the necessary information will be available. The ELS/OELS plan can help you secure payments for improved soil management through an Environmental Stewardship agreement.
- 2.3 To enter ELS/OELS you have to prepare a Farm Environment Record. As part of this Record, you have to identify fields at high risk of soil erosion using a simple key. The Soil Management Plan described here uses a more detailed assessment to identify varying degrees of risk of both runoff or soil wash and erosion. It will help you plan to implement specific options under Environmental Stewardship to protect both your soils and the environment and provide pointers to other measures that may be appropriate.

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Runoff is a natural process by which excess rainfall enters river systems. However even in the absence of obvious soil erosion, run-off from agricultural land may carry very fine soil particles, soluble pollutants such as plant nutrients and pesticides or manures to water courses. This process is sometimes called soil wash and can be an important polluter of watercourses, ponds and lakes. It is important that it is minimised to reduce water pollution.

- 2.4 You must produce a map showing the varying levels of risk across the whole farm and record how any soil issues or problems will be dealt with on a field-by-field basis. This record forms the basis of your Soil Management Plan and a worked example is provided in Appendix 1 below. When you or your adviser have produced the plan you should follow it as closely as possible.

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The following diagram highlights the relationship and increasing level of detail between a Soil Protection Review completed under Cross Compliance and a soil plan prepared for Environmental Stewardship

Cross compliance (GAEC) Soil Protection Review.
See Cross Compliance guide for Soil Management (PB10222B)

If you claim the Single Farm Payment you must identify and address soil management problems at a farm level by completing a Soil Protection Review pro-forma provided by Defra using the Cross Compliance Guidance for Soil Management (PB10222B).

ELS/OELS Farm Environment Record.
See ELS/OELS Handbook

If you apply for an ELS/OELS agreement you must identify fields where water or wind erosion or runoff occurs or may do so in future using the simple key, and mark them on a map as part of your Farm Environment Record.

ELS/OELS Soil Management Plan.
See Cross Compliance Guidance for Soil Management (PB10222B) and this guide

If you decide to prepare a Soil Management Plan as part of your ELS/OELS agreement you should:-

- Determine the risk of water erosion and runoff on a field by field basis and mark on a map, using the detailed risk risk assessment in Appendix 2 of this guide
- Mark fields where wind erosion occurs or flooding occurs regularly.
- Identify flow pathways to watercourses, roads, houses etc and mark these on your map
- Undertake a physical examination of soils to identify any soil structural problems.
- Consider appropriate land use according to the risks identified and if necessary, consider changing your rotation
- Complete a field by field record and indicate the management you will adopt in particular to reduce the risk of runoff and erosion

Selecting other options for Environmental Stewardship. See ELS/OELS and HLS Handbooks

Use the ELS/OELS Soil Management Plan

- to decide where you might best place management options available under ELS/OELS such as the management of high erosion risk cultivated land (EJ1/OJ1) and management of maize crops to reduce soil erosion (EJ2/OJ2)
- or as part of an HLS agreement that includes resource protection options such as reversion of arable land to grass (HJ3 or HJ4)

What do I have to do?

3.1 The following steps are recommended to prepare a comprehensive soil management plan. You or your adviser may wish to take another approach, which is acceptable, provided you:

- have read the relevant publications as set out in Appendix 4 of this guidance. The publications have previously focused on the management of rill and gully erosion. The guidance now includes problems of runoff or soil wash, including from heavier soils, and you should take this into account when preparing your Soil Management Plan.
- use the guidance provided in Appendix 2 and in the Defra manual on Controlling soil erosion or the advice of a consultant to prepare an assessment of the risks of runoff and erosion for your whole farm. Produce a map showing the risk class for each field or part field, including the features described below. You may find it easier to produce separate maps showing the risks of erosion and of runoff.
- record on a field-by-field basis the steps you will take during the coming year to minimise the risk of runoff and erosion, including how you will manage the soil to ensure good structure and maintain the infiltration of rainfall. Take in to account other aspects of environmental protection such as protecting buried archaeology and ground nesting birds.
- retain the plan and repeat the field-by-field assessment each year incorporating the experiences of previous years.

The recommended key steps are:

1. Prepare a map or maps of the whole farm showing the risks of runoff and water erosion. You will find it helpful to use a colour coding system to show these risks. These maps should be based on soil texture and slope and observations of what happens now or has done so in the past. You must also consider what might happen if you plan to change your cropping to one more likely to cause erosion. This is important, especially if your land is currently under grass.

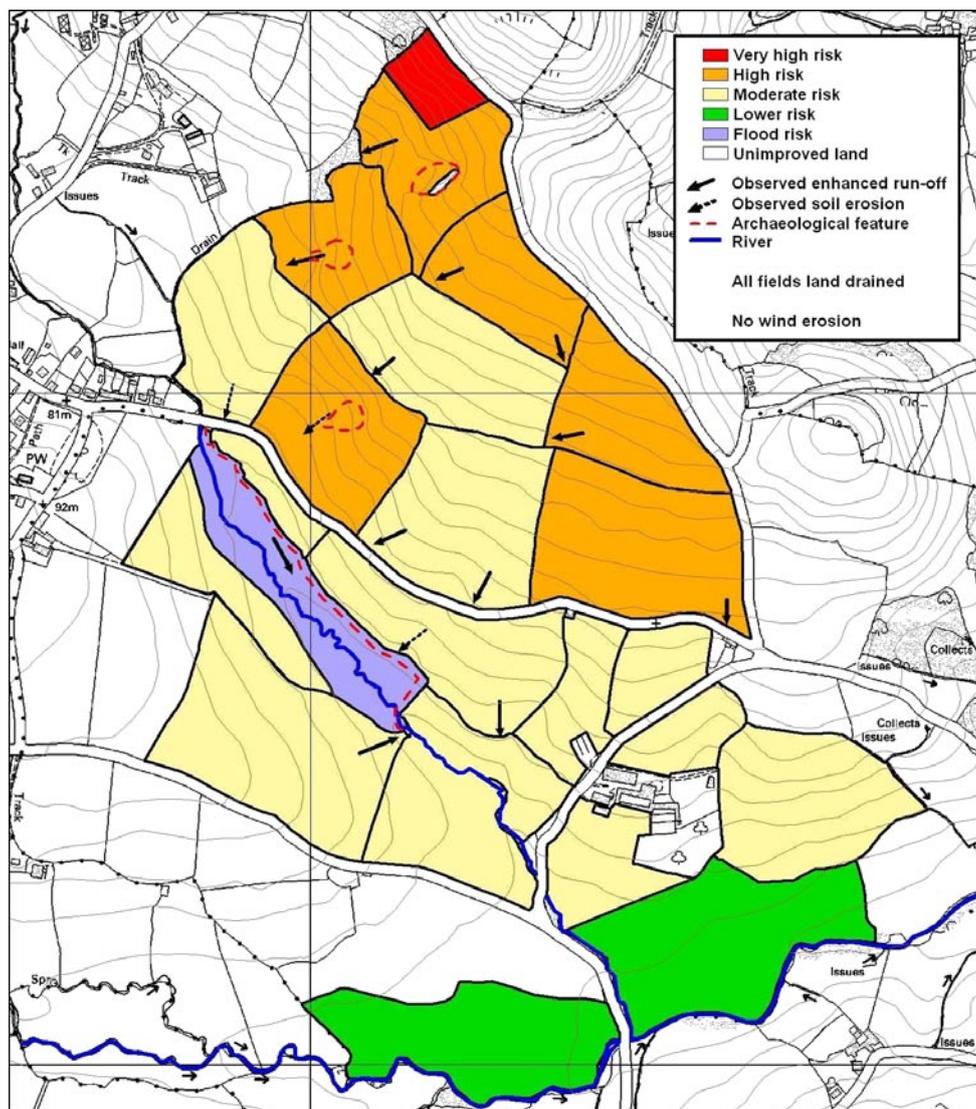
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2. Add to the maps any flow pathways where water runs across the surface of your land. This water may come from within the farm or from runoff that enters your land from elsewhere. You do not need to include all the watercourses on your farm, but you should indicate areas that are affected if these flood or overflow on to your land.

Example of farm risk map:

A map or maps showing the erosion and runoff risk categories should serve as a basis for planning crop rotations and management to reduce runoff and soil loss.



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3. From this initial assessment decide if any simple measures such as moving gateways or other access points would be beneficial in stopping or diverting the flow. Mark these changes on your map.
4. Mark on your map, e.g. by cross/hatching, any fields or parts of fields that suffer from wind erosion.
5. Mark on your map, e.g. by cross/hatching, any fields or parts of fields that contain an effective under-drainage system.
6. Carry out an inspection of the soils on your farm using your Cross Compliance Guidance for Soil Management. Record their structural condition on a field-by-field basis and use this information as part of the decision making process.

N.B. Ensure that you record the presence of any historical features and consider other habitat and wildlife areas shown on your FER. Particularly note archaeological remains including those buried in the soil. Plan your soil management to preserve and enhance the wider environment.

7. Consider, on a field-by-field basis any improvements that are needed to soil condition and how this might be achieved. For example by deeper cultivation, by subsoiling on tramlines or headlands (where soils are often more compacted) or soil loosening on badly compacted pastures. For the longer term you should consider if you need to increase the return of organic matter to the soil. If you apply bulky organic manures you should take account of the nutrients they contain when planning your fertiliser policy. In Nitrate Vulnerable Zones you must follow the timing restrictions and maximum application rates that apply.
8. Identify on a field-by-field basis, or part field if appropriate, how the land will be managed. The following steps will enable you to do this.

You should pay particular attention to controlling runoff and erosion from fields that are adjacent to a watercourse or have a clear flow path to one.

- Refer to the basic soil types in the Cross Compliance Guidance for Soil Management and consider how best to manage the issues and risks associated with each.
- Compare your current or intended rotation with the risk of runoff and erosion risk. Consider how you can avoid having high-risk crops, practices or enterprises on high-risk fields or part fields. See Appendix 3 .

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- If necessary prepare a modified rotational plan. Include areas that need to be taken out of production and/or grassed down. If these changes are permanent, such as grassing of valley bottoms, add these areas to the map.
 - Consider if new hedges, shelterbelts, woodlands etc could reduce the risk of erosion and enhance the environment.
 - Include in your plan measures that would protect watercourses from livestock, such as fencing the banks and installing bridges.
9. Prepare a field-by-field description of the specific management practices that will be required or will have to be avoided in order to minimise runoff and or erosion or ensure that soil conditions are maintained or improved. This will include how livestock and manures will be managed, for example: -
- how you will control grazing to prevent poaching.
 - how supplementary feeding will be managed.
 - what specific precautions will be taken on outdoor pig and poultry units.
 - What precautions will be necessary to avoid damaging the soil and preventing run-off when spreading organic manures. You may wish to prepare a full manure management plan (options EM3/OM3) as part of your agreement.
10. As the year progresses you should note any additional management you do to deal with soil issues and record any problems that occur, particularly of runoff and soil erosion. In the example in Appendix 1 there is a final column for this purpose.
11. At the end of the year repeat the process modifying the risk assessment, soil assessment, rotation and intended/required management according to your experience. Add any additional areas that you may grass down or take out of production and make any other changes that experience indicates.
12. Update the plan each year.
13. Retain the plan for possible inspection and to inform any possible HLS agreement. You do not have to submit the plan as part of your application or as a follow up.

Appendix 1 Example Soil Management Plan

Worked example

The following is an example of what your field-by-field plan might look like. For some fields, or possibly your whole farm, it might be as simple as the example given for field 1. For others there might be a number of things that could be done to improve your management such as for fields 2 and 3. Remember that livestock and manure spreading can have a major impact on soil conditions and grassland fields must be included as for field 4.

Field Identification Use Rural Land Registry number or field name		Characteristics including:- Risk of runoff and erosion and physical factors such as (soil, slope, soil permeability) runoff and erosion, presence of buried or other historical features and land use. Proximity to watercourse.	Management Issue - refer to Cross Compliance Soil Guidance and your risk assessment	Management Proposals	Note soil issues that arise during the year for annual review e.g. runoff and or erosion particularly of soil loss to the wider environment.
RLR No.	Field name or other identifier				
	1	Lower risk of runoff and erosion Medium textured well-drained stable soil in combinable crop rotation. Soil structure good, no signs of runoff or erosion. Low risk of this occurring	None apparent	Maintain current management. Reconsider if cropping changes.	
	2	High risk of runoff and erosion Adjacent to road and watercourse. Erodible light sandy soil. Rotation including main crop potatoes (high risk crop) Buried remains of Roman Villa	Soil/sediment deposition Risk of compaction increasing runoff and erosion	<ol style="list-style-type: none"> 1. Establish cereal crops early in autumn with coarse seedbeds. 2. Loosen tramlines if necessary to increase infiltration. 3. Attempt to increase soil organic matter with short-term green manures. 4. Establish grass buffer alongside watercourse using long-term set-aside or HLS Option if available. 5. Use options ED/OD 2 to take area of Villa out of production or ED/OD 3 to reduce cultivation depth. 	Erosion down rows during irrigation of potatoes. Consider alternative strategy next year according to risk of relevant field and note for next time

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3	Very high risk of erosion Steep Gradient Erodible light silty soil Rotation including main crop potatoes (high risk crop)	Risk of runoff Risk of compaction increasing runoff and erosion	<ol style="list-style-type: none"> 1. Avoid high-risk crop on high-risk land. Take up an appropriate ELS/OELS Options for this 2. Establish cereal crops early in autumn with coarse seed beds, 3. Loosen tramlines if necessary to increase infiltration. 4. Attempt to increase soil organic matter with short-term green manures. 5. Establish grass buffer alongside water-course using long term set-aside or HLS Option if available 6. Consider reverting whole field to grass. Using long-term set-aside or HLS Option if available 	
4	Moderate risk of runoff Heavy soils under permanent pasture. Slight to moderately sloping land. Beef cattle with an extended grazing season.	Runoff occurs in wet periods from poached areas in gateways and around feeding sites. Also runoff occurs from moderately sloping areas. Not suitable for spreading slurry or manure for most of winter when soils wet.	<ol style="list-style-type: none"> 1. Move feeding sites more regularly and to top of slope where possible. 2. Restrict late season grazing to better-drained areas of farm. 3. Improve infiltration by removing surface compaction to reduce risk of runoff. 4. Install buffer strips alongside watercourses from which stock are excluded using ELS/OELS or HLS where available. 5. Reduce overall stocking rates on most vulnerable sites using HLS option if available. 	Runoff overwhelmed buffer strip. Consider more action to reduce surface compaction and widen buffer strip
5	Light sandy soil with high risk of erosion but land in long term grass	No problems seen under this land use	<ol style="list-style-type: none"> 1. Maintain current management 2. When necessary reseed using surface seeding technique 	

Appendix 2 Risk Assessment

This annex provides the basis for preparation of an erosion risk map for the farm.

The criteria of importance at this stage are:

- Soil Texture
- Slope
- Flooding frequency

Subsequently you will need to consider cropping and soil structural condition.

The risk of runoff or soil wash and erosion depends on the physical features of the farm and upon soil management. Actual events are determined by rainfall. Very high intensity storms or repeated storms can cause serious erosion in many situations and the following assessment procedure does not necessarily cover such events. However good management practices will help to minimise these effects.

In making a risk assessment, each field should be examined. Runoff and erosion risk in any part of a field will depend on the soil texture and steepness of slope. The uniformity of slope above and below a particular area, are also important in determining the likelihood of rill or gully formation.

For assessment purposes large fields might be sub-divided if slope, soils or topography differ significantly, but for whole field assessment the worst scenario should generally be mapped. Field entrances should be marked on the map where they may influence erosion by channelling water movements into or out of a field.

In most situations a hand texture assessment carried out in the field will be adequate. Details are given in Appendix 2 of the Cross Compliance Guidance for Soil Management <http://www.defra.gov.uk/farm/capreform/pubs/pdf/Soil-hb.pdf>. If required soil textures can be obtained from a laboratory analysis of particle size distribution. The diagram in the same Guidance shows the percentages of sand, silt and clay within each textural class.

It is helpful to assess slope angles as accurately as possible however slopes are frequently uneven and variable and it is more important to determine the relative overall risk of an area of land than to worry about precise angles of slope.

Typical situations which would fall into different risk categories are outlined in the tables below. The criteria given are guidelines and professional judgment should be used to upgrade or downgrade a site, taking into account additional factors such as:

- Soil structure
- Organic matter content
- Valley features which tend to concentrate runoff water
- Long unbroken slopes
- Land restored following opencast mining or landfill operations
- Very steep slopes (i.e. greater than 1:10)

Very light soils with low organic matter on gentle slopes, even in low rainfall areas, can erode more seriously than indicated in the following risk assessment. Sometimes by as much as two risk classes. Therefore in addition to a field assessment, local knowledge is also useful in estimating risk, as previous erosion occurrences are often well remembered.

The following assessment procedure estimates the risk of runoff from fields carrying nutrients and soil down slopes. Runoff pathways, slope patterns and valley features will influence the likelihood of this runoff causing further erosion or having deposition impacts beyond the field. Areas where this could happen should also be indicated on the plan. You should also consider if your land receives runoff from elsewhere that will increase erosion problems on your land.

The following tables provide a guide to field classification for runoff and erosion. They assume moderately good soil conditions. If the land is currently in grass you should still apply this risk assessment. It will act as a guide to what might happen if you decide to reseed or introduce arable cropping in future.

Water erosion

This part of the risk assessment refers to the movement of sediment within the field and possible transfer to watercourses or other places such as neighbouring properties or on to roads.

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Soils	Steep slopes > 7°	Moderate slopes 3° – 7°	Gentle slopes 2° - 3°	Level ground < 2°
Sandy and light silty soils	Very high	High	Moderate	Lower
Medium and calcareous soils	High	Moderate	Lower	Lower
Heavy soils	Lower	Lower	Lower	Lower

Signs of erosion that may be associated with each of the risk classes are described below. Such observations should override an assessment derived solely from the table.

Very High Risk Areas – Rills are likely to form in most years and gullies may develop in very wet periods.

High Risk Areas – Rills are likely to develop in most seasons during wet periods.

Moderate Risk Areas – Sediment may be seen running to roads, ditches or watercourses and rills may develop in some seasons during very wet periods.

Lower Risk Areas – Sediment rarely seen to move but polluting runoff may enter ditches or watercourses.

Runoff or soil wash

This part of the risk assessment refers to runoff which is usually but not always discoloured. This runoff may carry very fine soil particles, soluble pollutants such as plant nutrients and pesticides or manures to watercourses.

Soils	Steep slopes > 7°	Moderate slopes 3° – 7°	Gentle slopes 2° - 3°	Level ground < 2°
All soils	High	Moderate	Lower	Lower

Signs of runoff that may be associated with each of the risk classes are described below. Such observations should override an assessment derived solely from the table.

High Risk Areas – Runoff seen in most years during wet periods

Moderate Risk Areas - Runoff seen in some years during wet periods and in most years during very wet periods

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Lower Risk Areas - Runoff seen in some years during very wet periods

Remember that: The accumulated runoff from a catchment with a large proportion of only lower risk fields can still cause serious damage to watercourses and may require action to be taken.

Wind erosion

Mark on this map any areas at risk of wind erosion. You should already have identified these areas as part of your Farm Environmental Record (FER) when you applied for ELS/OELS.

Flood risk

Land that floods is susceptible to erosion and runoff, particularly when under cultivation. Land that floods regularly (at least 1 year in 3) must be regarded as highly vulnerable and should be indicated on your map. When considering the management of land that floods consider restricting cropping to the less susceptible options in Appendix 3.

Appendix 3 Susceptible land use

The risk map shows which fields or parts of fields are most at risk when exposed to heavy or prolonged rain or flooding. At this stage, it might become clear that steps such as new hedge plantings could usefully reduce risks or relocation of field entrances could reduce deposition of sediment onto roads or into watercourses.

The next step is to plan crop rotations and land use to minimise exposure of bare, vulnerable land to the effects of rainfall. The type and timing of cultivations should be planned to minimise the periods when the soil is left in its most vulnerable condition. Some examples of different degrees of vulnerability are shown below:

Most vulnerable



Fine seedbeds
Bare land after root crop harvesting
Rough ploughed/cultivated land
Cereal stubble
Land with good crop/vegetation cover

Least vulnerable

The susceptibility of soil to runoff and erosion is dependent upon the land cover or livestock enterprise using the land, and can be considered in three broad categories. Some examples of land management practices within each category are listed below.

Highly susceptible land use

On Very High Risk and High Risk sites, avoid these land uses unless suitable soil management precautions are taken. If these precautions do not control the problem then introduce more changes and if that is not successful discontinue the land use. Some precautions may be necessary on all sites.

- Late sown winter cereals
- Potatoes
- Sugar beet
- Field vegetables

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- Outdoor pigs
- Grass re-seeds
- Forage maize
- Outwintering stock
- Grazing forage crops in autumn or winter

Moderately susceptible land use

On Very High Risk and High Risk sites these moderately susceptible land uses usually can be carried out with care.

- Early sown winter cereals
- Oilseed rape – winter and spring sown
- Spring sown cereals
- Spring sown linseed
- Short rotation coppice/Miscanthus

Less susceptible land use

Consider the following land uses on Very High Risk and High Risk sites and on sites that flood regularly as a means of reducing the overall erosion risk.

- Long grass leys
- Permanent grass
- Woodland (excluding short term coppice)

By altering rotations and changing land use, for example, switching from late sown autumn to spring sown crops on higher risk sites, the likelihood of erosion can be reduced significantly.

Appendix 4 Additional Guidance

Defra advice (available from Defra publications – Tel: 08459 556000) is contained in the Soil Code and the Controlling Soil Erosion series, which comprises:

- An advisory booklet for the management of agricultural land (PB 3280).
- A manual for the assessment and management of agricultural land at risk from water erosion in lowland England. Web version only. Available at <http://www.defra.gov.uk/environment/land/soil/pdf/soilerosion-lowlandmanual.pdf>.
- Advisory leaflets for preventing erosion:
 - By grazing livestock in lowland England (PB 4091).
 - By outdoor pigs (PB 5820 C).
 - In the uplands (PB 5820 A).
 - By wind (PB 5820 B).

These leaflets have been amalgamated into one compendium - Controlling soil erosion. Incorporating former advisory leaflets on grazing livestock, wind, outdoor pigs and the uplands., Available only as web version:- <http://www.defra.gov.uk/environmental/land/soil/pdf/soilerosion-combinedleaflets.pdf>

In addition you may wish to refer to the following:

- Environment Agency – ‘Best Farming Practices’ handbook (Tel: 08708 506 506 or e-mail: enquiries@environment-agency.gov.uk). This handbook is also available to download from www.environment-agency.gov.uk
- National Soil Resources Institute (NSRI) Guide to Better soil structure (www.silsoe.cranfield.ac.uk/nsri/).
- Soil Management Initiative (SMI) Guide to Managing Crop Establishment (www.smi.org.uk).

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