B2 Scoping the environmental impacts of arable farming activities and the intensification of previously uncultivated land

Explanatory note

For projects which require Environmental Impact Assessment (EIA), a scoping exercise should be undertaken early in the planning stages of the project. This enables the project to be designed to avoid or minimise negative environmental impacts and provides an opportunity to incorporate positive environmental enhancements into the project. Early consultation with all interested parties, including the Environment Agency, is an essential part of scoping. Even if a project does not require EIA under EIA legislation, it may be advisable (and in some cases necessary) to undertake a scoping exercise in any case (e.g. to support applications for other relevant consents and authorisations needed to carry out the project).

This guidance note aims to promote a good practice approach to scoping as part of the EIA process which in some respects goes beyond the statutory EIA requirements. When scoping a project, developers, or their consultants, should satisfy themselves that they have addressed all the potential impacts and the concerns of all organisations and individuals with an interest in the project.

This guidance note provides information on the most likely potential environmental impacts of arable farming and intensification of previously uncultivated land. However, each project must be considered on a case-by-case basis as the detailed characteristics of the proposal and the site will determine the potential impacts.

This guidance is based on the main legal requirements on EIA stemming from the EC Directive and the UK Regulations. However, developers should seek independent legal advice to ensure that the proposed development is carried out in compliance with the requirements of this and any other relevant legislation relating to planning as well as to pollution control.

This guidance note must be read in conjunction with the *Scoping Handbook*, which provides general guidance on the EIA process and the scoping of projects.

ENVIRONMENT AGENCY

This guidance note must be read in conjunction with the *Scoping Handbook,* which provides general guidance on the EIA process and the scoping of projects.

IIn addition, the following scoping guidance notes are relevant to *all* arable farming and intensification of previously uncultivated land:

- A1 Construction works
- A4 Vegetation management and conservation enhancements

The following scoping guidance notes *may* be relevant in certain circumstances:

- B1 Afforestation and deforestation projects
- B3 Control of pest species, including disease vectors
- B4 Deliberate introduction of non-native and genetically modified species

Contents

1 Introduction

1.1 This guidance note, in conjunction with the *Scoping Handbook* and the notes listed on the previous page, seeks to help developers and other interested parties identify the potential impacts of agricultural intensification on the environment as a whole. It should be emphasised that the list of impacts is by no means exhaustive and that a full investigation into positive and negative impacts should be undertaken. Early consultation with the Environment Agency and other relevant organisations will enable the identification of environmental issues and constraints and the avoidance of sensitive areas, thus reducing the need for redesigning and mitigating avoidable impacts at a later stage.

1.2 Following this brief introduction, an overview of the legal requirements for EIA in relation to conversion of uncultivated land for arable farming is provided. The potential environmental impacts of such projects are identified in Section 3. The text and summary table in this section will enable the reader to begin to identify the likely impacts arising from the particular proposal under consideration. The subsequent sections present the mitigation measures that may be relevant to arable farming activities, followed by key references and further reading.

Background to development type

1.3 Arable farming activities involve the use of an area of land for producing crops for human or animal consumption, for industrial raw materials and energy. This may involve the creation of new buildings and storage areas, cultivation and drainage improvement works on the land. Such activities provide a valuable product and a source of employment in rural areas. However, the change of land use and management operations on site may have significant effects on the surrounding environment. This is particularly the case where marginal and intractable farmland (e.g. in hill farming areas, or on floodplains) is being considered for cultivation. A thorough scoping exercise and careful consideration of alternatives are, therefore, of prime importance. Land under consideration must have the capability for cropping.

2 Development control and EIA

Development control

2.1 Many activities associated with arable farming do not require planning permission under the town and country planning system. For example, drainage works and the erection of buildings for agricultural purposes are, in certain circumstances, allowed under the Town and Country Planning (General Permitted Development) Order 1995 (SI 418). Those parties involved in the conversion of uncultivated land for agricultural purposes should contact their local planning authority to confirm whether or not their proposals require permission.

Environmental Impact Assessment

2.2 Arable farming activities are included in Schedule 2 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (SI 1999 No. 293, hereafter referred to as the EIA Regulations). The EIA Regulations list applicable thresholds and criteria which apply to Schedule 1 and Schedule 2 developments. In cases where the thresholds are exceeded, Schedule 1 developments require an EIA (mandatory) but Schedule 2 developments only require an EIA if the development is likely to have significant effects on the environment by virtue of factors such as its nature, size or location.

2.3 The former DETR has published guidance (referred to in the *Scoping Handbook*) which helps in the decision on whether, in respect of Schedule 2 projects, impacts are significant and whether EIA should be required. The guidance thus contains "indicative criteria", although area sensitivity and project-specific issues must be taken into account and the decision is still discretionary. The following threshold criteria apply for projects that fall under EIA Regulations:

- Exclusive criteria

  Projects for the use of uncultivated land or semi-natural areas for intensive agricultural purposes may require EIA if the area of the development exceeds half a hectare.

  Water management projects for agriculture, including irrigation and land drainage projects, may require EIA if the area of the works exceeds one hectare.

- Indicative criteria

  Concerning the use of uncultivated or semi-natural land for intensive agricultural purposes, development (such as greenhouses, farm buildings, etc.) is unlikely to require EIA unless it covers more than five hectares. In considering whether a particular development is likely to have significant effects, consideration should be given to impacts on the surrounding ecology, hydrology and landscape.

  Concerning irrigation and land drainage works, EIA is more likely to be required if the development would result in permanent changes to the character of more than five hectares of land. EIA will not normally be required for routine water management projects undertaken by farmers.

Furthermore, EIA may be required for any change to or extension of farming activities already authorised, where the change or extension may have significant adverse effects on the environment. Responsibility for determining whether an EIA is required lies initially with the local planning authority.

2.4 Farming activities are to be covered in more detail by forthcoming regulations being drawn up by the Department for Environment, Food and Rural Affairs (DEFRA). Two draft regulations are of relevance – the Water Resources (Environmental Impact Assessment) Regulations and the Environmental Impact Assessment (Uncultivated Land or Semi-Natural Areas) Regulations. The competent authority for these regulations is likely to be DEFRA and it is also likely that where EIA is not required, some projects will be given automatic consent.

2.5 Whether or not a formal EIA of proposed arable farming activities is required under the planning regime, the Environment Agency and other statutory consultees and regulators may request environmental information concerning the proposal. An EIA may provide the most appropriate method for a developer to collate the necessary information.

Other licences, consents and authorisations

2.6 Certain aspects of an arable farming project, such as the alteration of river channels or the abstraction of surface or groundwater, may require prior permission from the Environment Agency. These may include, for example, land drainage consents, abstraction licences, impounding licences, groundwater authorisations and discharge consents. It is recommended that the developer seek independent legal advice and liaise with the Environment Agency during project design and subsequent stages to identify the consents, licences and authorisations that will be required.

3 Potentially significant environmental effects

3.1 The EIA Directive requires the EIA to "dentify, describe and assess the direct and indirect effects of a project on the following factors: human beings, fauna and flora; soil, water, air, climate and the landscape; material assets and the cultural heritage; [and] the interaction between the factors." Socio-economic issues, health and safety in the workplace, material assets and cultural heritage are all considered in EU *Guidance on Scoping* (ERM, 2001a) but are not impact categories for which the Environment Agency is the principal competent authority. Advice on these issues is presented in this guidance note without prejudice to the advice of the relevant competent authority, but the relevant competent authority should be consulted for each of these categories in all cases (further advice on the appropriate competent authority to contact is given in the *Scoping Handbook*).

3.2 An EIA for any proposed agricultural intensification of semi-natural or previously uncultivated land should determine the potential impacts on the environment of each aspect of the project, including location and management. Careful scoping facilitates this process. This section provides a non-exhaustive description of the environmental issues that might arise during the scoping of such a project. The *Scoping Handbook* provides guidance on how to conduct a scoping exercise.

3.3 Arable farming activities have the potential to affect the environment in many ways. They can differ widely in terms of their mode of operation and location, and key issues are likely to vary from site to site. Therefore, it is recommended that expert advice on detailed technical issues be obtained. The issues arising for all environmental receptors will change over time as the ground is prepared and as crops grow, mature and are harvested. Developers and site operators should, therefore, consider the impacts arising from land drainage, hedge and tree removal, cultivation, use of fertilizer, crop protection methods and crop harvesting.

3.4 Potential impacts are discussed here in broad terms only, as their nature and intensity will depend on the physical characteristics of the project and the composition of any polluting materials. An EIA of proposed arable farming activities should take these factors into account in assessing potential impacts on the environment.

3.5 The following paragraphs should be read in conjunction with Table B2. This details the activities involved in the preparation and ongoing management of arable farming activities, and the impacts arising from them. It should be noted here that the term "pesticide" is used to include all plant protection products such as herbicides, insecticides, molluscicides and fungicides, unless these are referred to specifically. Furthermore, the environmental impacts of pest control activities are dealt with in greater detail in Scoping Guidance Note B3.

Water environment

3.6 Surface water hydrology can be affected during all phases of agricultural operations. Cultivation and harvesting can result in soil structure degradation which prevents infiltration, leading to increased surface runoff, while artificially improving site drainage will cause the rapid transfer of water to nearby streams. These two factors will affect the flow regimes of nearby watercourses and could increase the risk of flooding and soil erosion. The risks are higher on the more marginal land to arable farming in wetter hill farming areas. As the crop matures, water may be abstracted from nearby streams to meet irrigation needs. This may reduce the volume of water in the streams at times of high water

demand, which will usually coincide with summer low-flow periods. Reduced water volume will cause increased deposition and the morphology and flow characteristics of the stream will be altered.

3.7 Surface water quality could be affected by a number of factors during farming operations. Crop establishment activities may encourage surface runoff and soil erosion and increase the sediment loads of nearby streams, while accidental leaks or spills of oil or fuel from storage tanks or planting and harvesting vehicles can also pollute surface waters. As the crop matures, sediment inputs to streams will fall, but fertilisers and pesticides used to maximise productivity may, if stored, applied or disposed of incorrectly, cause pollution of surface waters. Irrigation of the crop may compound such pollution by lowering stream volumes and reducing their capacity to dilute harmful pollutants, whilst over-drained land may increase nutrient leaching and reduce soil moisture retention. Harvesting in wet conditions can cause rutting of soils and compaction that can lead to soil erosion. Plant nutrients, particularly phosphorus and nitrate, in water draining from arable land also contribute to increased eutrophication in receiving waters. The choice of crops grown, crop rotation and harvesting dates should be considered in relation to soil type and topography in order to avoid soil erosion, gullying, etc.

3.8 Surface water quality may also be adversely affected by the release of acid waters where peat lands and upland soils are drained for agriculture. The acidic water may also mobilise metals, especially aluminium and manganese, with detrimental effects on water quality. This change in quality may also affect stream organisms, especially fish. Conversion of wet grasslands to arable land in floodplains has a high risk of affecting water quality during floods where overland flow can erode soils if they are bare.

3.9 Farming activities may have significant impacts on groundwater hydrology and quality. The site may need to be drained to provide suitable conditions for crop growth, resulting in a lowering of the water table. The main threat to groundwater quality is the possible contamination by fertilizers, pesticides and oil. The siting and design of storage, mixing, filling and disposal areas will need careful consideration. Also, abstractions of water for irrigation purposes may cause a reduction in groundwater flows and levels, thereby having an impact on neighbouring wetland areas.

3.10 When permanent grasslands such as old meadows and pastures are ploughed for the first time, there is a significant release of nitrate to surface and groundwater as soil organic matter is broken down by micro-organisms. This may have a pronounced effect on surface and groundwater quality. The effect is most serious where the receiving river catchment or aquifer provides a drinking water source. In nitrate vulnerable zones, there are mandatory measures that must be complied with for the management of manures and nitrogen fertilizers.

3.11 In order to protect vulnerable groundwater resources, it is the policy of the Environment Agency to encourage new developments to locate in areas of low vulnerability to groundwater pollution. However, this policy does not imply an automatic prohibition on agricultural intensification projects within source protection zones.

Land

3.12 Agricultural intensification projects will have implications for the physical characteristics and land use of the site. By their nature, such projects have the potential to change the site significantly. The most important issues to consider are the increased potential for the depletion of the soil resource from erosion by wind or water, and the possible contamination

that may arise from repeated applications of pesticides and organic or inorganic fertilizers. Other issues include the effect on landscape character of the change in land use, and the changes to soil structure and composition that result from cultivation.

3.13 In many parts of the UK, hedgerow and hedgerow tree removal is frequently associated with agricultural intensification as farmers need to achieve economy of scale with large, efficient machinery. Where hedgerows are retained, their management is often intensified with frequent flailing to keep them compact. Hedgerow networks are often important elements in the landscape character of particular areas and their loss or heavy maintenance can have a marked visual impact. An assessment should be made of hedgerows to ensure that any proposed removal meets the requirements of the Hedgerow Regulations 1994. Similarly an assessment should be made to ensure that wetlands and important archaeological remains are preserved.

3.14 The visual quality of an area may also be adversely affected by agricultural waste, such as waste plastic wrapping and fertilizer bags.

Air and climatic factors

3.15 Agricultural practices have the potential to affect local air quality and climate, and to contribute to global climate change. During ground preparation, planting and harvesting, local air quality may decline as a result of gaseous and particulate emissions from vehicle movements on and off site. Also, substances used on the land may reduce local air quality especially during storage. For example, ammonia from the breakdown of manure is a contributor to "acid deposition", which causes soil and stream acidification and the release of metals such as aluminium. In addition, methane and nitrous oxide from the breakdown of manures are "greenhouse gases". Organic matter in the soil is also a sink for carbon dioxide. Cultivations that result in a decline in soil organic matter can contribute to global climate change.

Ecology

3.16 The removal of native vegetation and its replacement with an arable crop can cause direct damage to, or loss of, terrestrial and aquatic habitats. Aspects of farming operations may affect terrestrial and aquatic species. Pesticides may cause harm to species other than those which they aim to control. If such chemicals are sprayed onto the crop they may be carried by wind to the surrounding vegetation and associated fauna, while potentially toxic residues may enter surface waters via surface runoff or discharge from field drains. The use of water for irrigation can exacerbate low-flow periods in streams, affecting aquatic ecology and those other species such as otters, kingfishers or wildfowl that depend on the health of such aquatic ecosystems.

3.17 As well as providing habitat for a range of plants and animals, the retention of a network of hedgerows in the landscape is important for the local movement of a range of animal species including, for example, the dormouse (a species of great conservation importance). These movements are essential for maintaining viable populations in the locality. Thus, the removal or simplification of the hedgerow network may be a significant ecological issue. Mitigating measures such as vegetated field margins can significantly increase biodiversity, reduce weed and pest encroachment into fields and can qualify for grant aid under agri-environment schemes.

Human environment

3.18 The potential impacts of agricultural intensification on the human environment may take a variety of forms. They are divided here into sections covering socio-economic and health issues; amenity, visual impact and nuisance issues; and culture, heritage and archaeology.

3.19 The potential for socio-economic and health impacts (real and perceived) arising from agricultural intensification is likely to be small. Such activities usually require comparatively small staffing levels and, as a result, employees are not likely to have a significant effect on local socio-economic issues. However, such social issues should be considered when scoping an EIA, because some farm diversification enterprises, such as energy crops or new industrial crops, will be important in keeping some farms viable. There may also be opportunities for new skills within local communities.

3.20 The identification of which of these issues are significant or are perceived to be significant is an important function of public involvement during the scoping exercise. Understanding likely public concerns is a key issue and note should be taken of experience from similar developments and any public representations made to the local planning authority.

3.21 Other issues that commonly need to be addressed include the visual impact of the converted land use and any additional buildings or other structures associated with it. Any restrictions to access that may arise as a result of the development should also be considered, as should the creation of nuisances such as noise and vibration from traffic during both ploughing and harvesting activities, dust in the air, mud on roads, and slow agricultural vehicles on public roads. Also, amenity use of nearby streams or lakes may be affected if reduced water quality causes harm to fish. Public access to land, e.g. along field margins, may significantly improve public acceptance of projects and may be eligible for agri-environment grant aid.

3.22 Impacts on architectural and archaeological heritage are most likely during the site preparation and ploughing phases, as features may be removed or disturbed by such activities. The likelihood of there being any unrecorded sites and their potential for discovery should also be examined.

Table B2

3.23 The impact identification table highlights:

- sources of impact (development activities);
- potential impacts;
- receptors for these impacts.

3.24 It is recommended that the table is annotated and used during consultations with other interested parties. Reference should be made to the prompt lists detailing impacts and sources of impacts in the *Scoping Handbook*.

Table B2 Summary of key potential impacts of arable farms and agricultural intensification of uncultivated land

Potential receptors of impact		Activities and potential impacts		
		Site preparation and planting	Ongoing site management	Harvesting/after-use
WATER	Surface water hydrology and channel morphology	**Drainage and cultivation** • Increase in surface runoff • Increased sedimentation of watercourses • Increased flood risk • Impact on neighbouring wetlands **Works next to or near watercourses** • Change in flow velocities • Increased erosion and subsequent changes in bed and bank stability • Increased flood risk	**Site drainage** • Rapid transfer of rainwater to watercourses via drains • Changes to flow regimes of receiving watercourses • Change in deposition regime, caused by changes in flow and possible increase in sediment input from soil erosion	**Crop removal and site drainage** • Increased surface runoff • Increased sedimentation of watercourses • Increased flood risk
	Surface water quality	**Drainage and cultivation** • Pollution from suspended material which may also carry phosphorous and pesticides • Disturbance of contaminated soil and subsequent pollution of watercourses • Input of nitrate following ploughing **Use of agrochemicals, manure and sewage sludge** • Pollution from toxic pesticides and heavy metal-rich sludge • High BOD[1] of sludge and slurry reducing available oxygen • Increase in nitrate from fertilizers and manures	**Use of agrochemicals, manure and sewage sludge** • Pollution from toxic pesticides and heavy metal-rich sludge • High BOD[1] of sludge and slurry reducing available oxygen • Increase in nitrate from fertilizers and manures **Storage and disposal of chemicals and other materials** • Pollution from spills or leaks of stored substances • Pollution from incorrect disposal (deliberate or accidental)	**Crop removal and site drainage** • Pollution from suspended material • Increased input of nitrate and phosphorous due to exposed soil • Exposed soil prone to erosion

[1] BOD – Biological Oxygen Demand

Potential receptors of impact		Activities and potential impacts		
		Site preparation and planting	Ongoing site management	Harvesting/after-use
WATER *continued*	Groundwater hydrology	**Drainage and cultivation** • Reduction in water table • Changes to groundwater distribution and flow	**Site drainage** • Continued reduction in water table and alteration of groundwater flows	**Site drainage** • Ongoing alterations to groundwater flows following harvesting
	Groundwater quality	**Drainage and cultivation** • Input of nitrate following ploughing **Use of agrochemicals, manure and sewage sludge** • Pollution from toxic pesticides and heavy metal-rich sludge and slurry • Increase in nitrate from fertilizers and manures	**Use of agrochemicals, manure and sewage sludge** • Pollution from toxic pesticides and heavy metal-rich sludge and slurry • Increase in nitrate from fertilizers and manures **Storage and disposal of chemicals and other materials** • Pollution from spills or leaks of stored substances • Pollution from incorrect disposal (deliberate or accidental)	

Potential receptors of impact		Activities and potential impacts		
		Site preparation and planting	Ongoing site management	Harvesting/after-use
LAND	Landscape	**New buildings and structures** • Changes in appearance of landscape **Cultivation** • Changes in appearance of landscape • Removal of trees, hedges and other vegetation	**Growth of crop** • Changes in character of landscape as crop matures • Altered hedgerow management	
	Soils	**Cultivation** • Compaction • Increased erosion • Increased leaching of nutrients, especially nitrate **Use of agrochemicals, manure and sewage sludge** • Possible contamination from toxins and heavy metals	**Growth of crop** • Reduced erosion with increasing vegetation cover **Use of agrochemicals, manures and sewage sludge** • Possible contamination from toxins and heavy metals	**Harvesting machinery** • Further soil compaction • Further soil erosion **Use of agrochemicals, manures and sewage sludge** • Persistence of heavy metals and toxins in soil
	Geology	**Excavations** • Removal of rock by excavation works		

Potential receptors of impact		Activities and potential impacts		
		Site preparation and planting	Ongoing site management	Harvesting/after-use
AIR	Local air quality	**Use of vehicles and machinery** • Emissions from site traffic • Dust generation **Use of agrochemicals, manures and sewage sludge** • Volatilisation of chemicals (e.g. ammonia) may decrease local air quality	**Use of agrochemicals, manures and sewage sludge** • Volatilisation of chemicals (e.g. ammonia) may decrease local air quality	**Use of vehicles and machinery** • Dust generation
	Regional/global air quality	**Use of vehicles, machinery & cultivation** • Emissions of greenhouse gases (e.g. oxides of sulphur and nitrogen, CO_2,) contribute to global warming **Use of animal manure** • Denitrification of manure in soil produces nitrous oxide (N_2O), a greenhouse gas which contributes to global warming	**Use of animal manure** • Denitrification of manure in soil produces nitrous oxide (N_2O), a greenhouse gas which contributes to global warming • Release of ammonia from breakdown of manures contributing to soil acidification	**Use of vehicles and machinery** • Emissions of greenhouse gases (e.g. oxides of sulphur and nitrogen, CO_2), contribute to global warming

Potential receptors of impact		Activities and potential impacts		
		Site preparation and planting	Ongoing site management	Harvesting/after-use
FLORA AND FAUNA	Aquatic ecology	**Drainage and cultivation** • Negative impact on flora and fauna from increased sediment loading of streams • Lowering of water table will adversely affect aquatic wetland species **Storage, use and disposal of agrochemicals, manures and sludge** • Harm to aquatic flora and fauna from toxic substances entering watercourses • Phosphorus and nitrogen inputs contribute to eutrophication of lakes and reservoirs • Substances with high BOD may enter water, reducing oxygen content and causing death of fish and aquatic invertebrates **Works next to or near watercourses** • Disturbance and altered flows will have an adverse effect on in-stream ecology	**Storage, use and disposal of agrochemicals, manures and sludge** • Harm to aquatic flora and fauna from toxic substances entering watercourses • Phosphorus and nitrogen inputs contribute to eutrophication of rivers, lakes and reservoirs • Substances with high BOD may enter water, reducing its oxygen content and causing death of fish and aquatic invertebrates **Abstraction of ground or surface water** • Possible increase in the frequency of low-flow in streams, and subsequent impacts on aquatic flora and fauna due to reduced water volume, increased deposition, reduced turbulence, reduced oxygen, reduced dilution capacity and general fall in water quality	**Crop removal and site drainage** • Sediment loading of streams following harvesting will adversely affect aquatic habitats **After-use** • Opportunity for enhancement of nature conservation value if production becomes unnecessary or non-viable
	Terrestial ecology	**Drainage and cultivation** • Lowering of water table will adversely affect terrestrial wetland species • Habitat removal, fragmentation or severance • Disturbance to, or loss of, species (including rare and sensitive species) **Storage, use and disposal of agrochemicals, manures and sludge** • Harm to flora and fauna from direct or indirect (e.g. consumption of treated vegetation) contact with toxic substances • Reduction in number of species and individuals • Bioaccumulation of toxic substances up the food chain	**Use of agrochemicals** • Pesticides sprayed on to the growing crop may fall as "spray drift" on surrounding vegetation • May harm pollinating insects such as bees, and in turn affect the reproductive success of floral species • Overall reduction in species diversity	**Crop removal** • Disturbance to species adjacent to the harvested area **After-use** • Opportunity for enhancement of nature conservation value if production becomes unnecessary or non-viable

Potential receptors of impact		Activities and potential impacts		
		Site preparation and planting	Ongoing site management	Harvesting/after-use
HUMAN ENVIRONMENT	Socio-economic[1]	**Conversion of land use** • Impact on the nature and amount of employment (may be positive or negative depending on existing conditions and the characteristics of the proposed development) • Change in the skills needed to run successful intensive arable operation **Site drainage** • Disruption of services such as electricity, gas, water, or telecommunications due to the presence of underground cables and pipes	**Use of agrochemicals and other materials** • Increase in the cost of water treatment with inputs of nitrates and other substances to drinking water supplies **Abstraction of ground or surface water** • Possible reduction in water table or surface flows may have a secondary impact on water consumers (e.g. restrictions on use)	**Harvesting activities** • Possible increase in seasonal work • Economic benefit from value of crop produced
	Health and safety[1]	**Use of pesticides** • Risk of exposure of workers to toxic substances • Toxins may enter drinking water supplies **Use of fertilizers** • contribution to increased nitrate concentrations in drinking water	**Use of agrochemicals** • Continued health risk from the use of pesticides and fertilizers **Use of organic fertilizer** • Possible transfer of pathogens to drinking water supplies	**Use of vehicles and machinery** • Risk of injury to operators and other workers
	Amenity	**Creation of new field boundaries** • Alteration of rights of way or reduction in access	**Field boundaries** • Continued alteration of rights of way or reduction in access	**Ecological impacts** • Recreational activities such as bird watching and fishing may be affected

Potential receptors of impact		Activities and potential impacts		
		Site preparation and planting	Ongoing site management	Harvesting/after-use
HUMAN ENVIRONMENT *continued*	Nuisance	**Use of vehicles and machinery** • Noise • Mud and slow-moving traffic on roads	**Use of vehicles and machinery** • Noise • Mud and slow-moving traffic on roads **Storage, use and disposal of agrochemicals and other substances** • Odour nuisance	**Harvesting operations** • Dust • Increased vehicle movements
	Architectural and archaeological heritage[1]	**Drainage and cultivation** • Damage to features of archaeological or cultural importance		

[1] The Agency considers that key impacts to be identified and assessed are likely to include the following, but further advice and guidance should be sought from the relevant competent authority, as indicated in the *Scoping Handbook*.

Additional site-specific issues:

4 Mitigation measures

4.1 Following the scoping exercise and the identification of potential environmental effects, mitigation measures should be proposed to avoid or reduce potential negative impacts to air, water, land, ecology and humans, or to introduce positive aspects to the agricultural activity. For example such measures could aim to increase biodiversity, landscape quality and amenity value. Guidance has been provided by the Environment Agency to assist developers on a range of relevant subjects in the form of Pollution Prevention Guidelines (see the *Scoping Handbook*). Other relevant publications are listed in Section 5.

4.2 Site-specific factors are a primary consideration in impact mitigation. Any proposed agricultural intensification should aim to avoid damage to important ecological sites and high quality landscapes. Also, it is Environment Agency policy to seek the preferential location of developments in areas which are not vulnerable to groundwater pollution (Environment Agency, 1998). It is strongly recommended, therefore, that developers undertake an assessment of alternative sites.

Mitigating the impacts of site preparation and planting activities

4.3 Site preparation, the building of new livestock units and planting activities have the potential to affect all environmental receptors. However, the following list summarises the mitigation measures most relevant to the proposed agricultural intensification of semi-natural or previously uncultivated land:

- the timing of drainage work should be planned to coincide with dry soil conditions;
- phasing activities to minimise disturbance to wildlife at sensitive times of year, such as during the breeding season or when young are being raised;
- drains should be constructed to end 15 to 20 metres short of natural watercourses. This enables water to be filtered through soil or ground vegetation before reaching streams, thereby reducing the rate of runoff and the amounts of sediment and nutrients transported;
- the use of contour ploughing, ripping or spot-scarification will reduce surface runoff and disturbance to soils and hydrology, and will also minimise the sudden release of nitrate to surface waters which may follow the ploughing of established grassland;
- use of techniques to minimise compaction of soil, such as restricting access during wet conditions, and using protective boarding and low ground pressure machinery;
- buffer strips (undisturbed areas of land at field margins 2-6 metres wide) may be used to reduce soil erosion, runoff rates and sediment and nutrient inputs to streams;
- storage of fuel, equipment and other materials so as to minimise the risk of soil contamination or water pollution (see Environment Agency, 2000a);
- for more detailed measures relating to reducing the environmental impacts of pesticide use, see scoping guideline B3, concerned with the control of pest species, including disease vectors.

Mitigating the impacts of ongoing site management

4.4 Although the sensitive siting and design of proposed agricultural intensification are the primary means for avoiding or reducing its environmental impacts, further measures can be introduced to minimise impacts occurring from ongoing management practices. Overall considerations are that buildings, roads or other structures are in compliance with any planning conditions imposed by the local authority, and the site is managed in accordance with codes of practice for the protection of soil, water and air produced by the Ministry of Agriculture, Fisheries and Food. Guidance on the use of pesticides is contained in the *Green Code* produced by MAFF (now DEFRA). For more detailed information on reducing the environmental impacts of pesticide use, see Scoping Guidance Note B3, *Control of pest species, including disease vectors*. Developers should seek independent legal advice to ensure that all legal requirements relating to the proposed development are identified and complied with.

4.5 The measures have been arranged according to their primary receptor. However, it should be noted that many of the following mitigation measures are interrelated. For example, correct handling, storage and disposal of chemicals, plus bunding to contain spills, would serve to eliminate or reduce the impacts of such materials on soils, surface and groundwaters, and ecology.

Protecting the water environment

4.6 In order to minimise potential impacts on the water environment during the ongoing management of such projects, owners and operators must ensure that:

- the choice of crops and rotations match the capability and limitation of the land (eg. on land with very steep slopes, on land at risk of flooding, on wet slowly-draining land, etc);
- organic fertilisers are applied using specified quantities and under conditions without causing direct pollution of watercourses;
- drainage systems are constructed so that discharge water flows through a buffer area of vegetation;
- tracks and gateways are constructed so that they are well drained and to ensure that surface water is diverted to buffer areas of vegetation;
- pesticides are used optimally, with adherence to “no-spray zones” according to label requirements;
- uncultivated field margins are left adjacent to watercourses;
- an appropriate water management system is used, including, for example, efficient land drainage and the use of constructed ponds for receiving site runoff to reduce the impact of runoff on nearby watercourses;
- where ponds are not constructed, drains should be stopped 15 to 20 metres short of natural watercourses to allow runoff to be filtered through soil or ground vegetation. This reduces the amount of surface runoff entering streams, thereby reducing flood risk. It also reduces sediment and nutrient inputs to watercourses;
- inputs of nitrate from soils to surface and groundwaters are minimised by good management practices. For example, not applying fertilizer in autumn when uptake of nutrients by plants is low and rainfall increasing, sowing winter cereals to take up residual soil nitrate in the

autumn and using "direct drilling" of fertilizer rather than ploughing. Further regulations and guidance apply to agricultural operations within nitrate vulnerable zones;

- hazardous or potentially polluting materials such as fuel, oil or wastes are sited on an impervious base away from water, properly bunded, and kept locked when unattended;
- stable top soils are developed by applying bulky organic materials;
- runoff is checked away from areas prone to erosion;
- crops are varied or grass introduced into crop rotation to reduce runoff and erosion;
- if materials such as fertilizers or pesticides are necessary, they are used in accordance with relevant guidance (see Section 5, below);
- a risk assessment is carried out for each substance to be used or stored on site and the appropriate containment measures installed;
- an emergency plan is formulated and tested through exercises to ensure that procedures to prevent or mitigate impacts due to accidents or spillages are in place and operate effectively (some developments may require such plans to be formulated and the Environment Agency should be consulted to identify where this is the case).

Protecting the land environment

4.7 Impacts on soils and landscape are of most significance during cultivation, harvesting and post-harvesting phases, when there is the greatest potential for erosion, compaction and changes in the character of the landscape. During the growth of the crop, certain measures noted above for protecting the water environment, such as the correct storage, use and disposal of potentially polluting substances, will also reduce the likelihood of soil contamination. Impacts on landscape and soils may also be mitigated by the following:

- the choice of crops and rotations must match the capability and limitation of the land (eg. on land with very steep slopes, on land at risk of flooding, on wet slowly-draining land, etc);
- land should be cultivated under suitable conditions to maintain soil structure and to prevent runoff and erosion;
- levels of soil organic matter should be maintained;
- any damage to soil structure should be addressed;
- inorganic and organic fertilisers should be applied to match crop requirements and soil fertility;
- fields should be designed to prevent soil erosion (e.g. layout of tracks, hedges, grass strips, location of gateways, avoiding long downhill slopes, and planting of vegetation in valley bottoms);
- appropriate designs for roads, buildings and other structures;
- appropriate screening for visual impacts;
- protect eroding areas by encouraging a plant cover;
- prevent wind erosion by a co-cover of nurse crops and by making and applying organic mulches on sandy soils;
- adapting cultivation techniques, especially depth of ploughing, appropriate to the physical characteristics of the soil;
- effective stabilisation of altered landforms so as to minimise soil erosion and the potential for water pollution from suspended solids.

Protecting the air environment

4.8 Developers should consider the aspects of the development that are likely to lead to air emissions. Such aspects can include vehicle emissions, the volatilisation of substances from fertilizer or pesticide use, and the emission of nitrous oxide from the denitrification of manure in soil. Suitable mitigation measures may include:

- the use of vegetation screens to act as a barrier to gaseous and particulate emissions;
- analysis of alternative substances and management techniques available to minimise unnecessary inputs of chemicals to the environment.

Protecting ecology

4.9 Measures designed to prevent or reduce impacts to water or land will also help to prevent adverse impacts on ecology. The following list identifies further measures to reduce or avoid impacts to terrestrial and aquatic species and their habitats:

- existing habitat features should be incorporated into site farm management regimes and protected from change wherever practicable. Grant aid may be available;
- where possible, pesticides should be drilled with the seed in preference to surface broadcasting, thereby, reducing the exposure of flora and fauna to possibly harmful chemicals;
- consider using "disturbance regimes" to provide pest control benefits to reduce reliance on pesticide applications. For example, intercropping and crop rotation, should reduce the dominance of any one weed species;
- use more target-specific pesticides rather than broad-spectrum materials, thereby reducing impact on flora and fauna in the surrounding environment;
- further habitats should be created to compensate for habitat losses and to improve the landscape and ecological potential of the site. Grant aid may be available;
- creating in-field uncultivated strips and buffer zones around fields to provide habitats for invertebrates and feeding birds.

Protecting the human environment

4.10 Some of the measures noted above can also reduce possible impacts on humans, notably the risk assessment and emergency planning measures. Also, any measures which aim to reduce pollution of water, land and air will also benefit humans. Further mitigation measures more specific to the human environment are listed below:

- management operations should aim to minimise disturbance to adjacent residential and recreational uses;
- where access restrictions result from the change in land use, arrangements for alternative access should be made with the provision of gates, bridges or stiles as appropriate;
- possible health risks to agricultural workers from the use of pesticides and fertilizers should be addressed by adhering to health and safety guidelines;
- odour control strategies should take account of varying wind directions;
- sites of archaeological or cultural interest should be preserved in situ where possible. As relocation is rarely possible, thorough archaeological investigations should be carried out where damage is unavoidable.

5 References and further reading

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20 **Ministry of Agriculture Fisheries and Food/Welsh Office Agriculture Department (1998)** *The Water Code – The Code of Good Agricultural Practice for the Protection of Water.* HMSO, London.

21 **Ministry of Agriculture Fisheries and Food (1998)** *Code of Practice for the Safe Use of Pesticides on Farms and Holdings.* HMSO, London.