Notice

CONTENTS

ACRONYMS

Term	*Meaning / Definition*
AONB	Areas of Outstanding Natural Beauty
BAT	Best Available Techniques
BAP	Biodiversity Action Plan
BPEO	Best Practicable Environmental Option
BPM	Best Practicable Means
CDM	Construction Design Management
CFC	Chlorofluorocarbon
DEFRA	Department for the Environment, Food & Rural Affairs
DMRB	Highways Agency's Design Manual for Roads and Bridges
EA	Environment Agency
EEA	European Economic Area
EIA	Environmental Impact Assessment
ES	Environmental Statement
GHG	Greenhouse Gas
HCFC	Hydrochlorofluorocarbon
HEPA	High Efficiency Particulate Abatement
ODS	Ozone Depleting Substances
NVC	National Vegetation Classification
NOMIS	National On-line Manpower Information System
NOx	Oxides of nitrogen
PPG	Planning Policy Guidance
PPS	Planning Policy Statement
RIGS	Regionally Important Geological Site
RSPB	Royal Society for the Protection of Birds
SAC	Special Area for Conservation
SAM	Scheduled Ancient Monument
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Urban Drainage System
TTWA	Travel To Work Area
WHO	World Health Organisation
ZVI	Zone of Visual Influence

1 Introduction

This document has been produced as part of a project to develop the review tools to be used by the Health & Safety Executive in its assessment of Environmental Statements (ESs) submitted under the *Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999*, as amended 2006. As part of the project, Atkins has written a number of technical guidance notes to support reviewers undertaking an assessment using the revised UK EIA Centre Review Method. The guidance notes are intended to support reviewers by providing some basic information as to what could be expected within the sections of an ES produced for a reactor decommissioning project.

The guidance notes are not intended to be a definitive resource explaining how a reactor decommissioning Environmental Impact Assessment (EIA) could be undertaken. Neither are the guidance notes an exclusive information set; other, perfectly legitimate, methods, criteria and references could be used in undertaking EIA for a decommissioning project. Each guidance note contains a table of indicative impacts that could occur for a decommissioning project. The example impacts are provided only for illustrative purposes and are not the only impacts that can arise from a decommissioning project.

This document is divided into a number of sections which represent discrete topics that must be covered within an ES:

- Air and climate
- Flora and fauna (ecology)
- Landscape and visual
- Material assets (including archaeology and cultural heritage)
- Population (socio-economics)
- Soil (including geology, hydrogeology and contaminated land)
- Water

Each section is divided into a number of sub-sections that:

1. Introduce the topic under discussion
2. Define its meaning
3. Summarise its key issues
4. Describes some of the key assessment methods, criteria and legislation that are relevant to the topic
5. Indicate likely sources of baseline information that might be reported within the ES
6. Provide a table summarising some of the likely impacts under this topic from a decommissioning project, the assessment method(s) that could be used in the identification and prediction of these impacts and some measures that could be used in mitigation

The guidance notes can be employed by reviewers to supplement the use of the revised UK EIA Centre Review Method.

2 Air & Climate Guidance

2.1 Introduction

Decommissioning activities have the potential to adversely impact air quality and the climate. These impacts may be direct such as dust from the demolition of buildings or indirect such as exhaust emissions from vehicles travelling to and from the site. Decontamination and waste processing activities may also give rise to new emissions to air. Such activities may have adverse effects on people, plants, animals, materials and buildings.

It should be noted, however, that air pollution issues that are already regulated under other regimes, such as the Radioactive Substances Act or Pollution Prevention and Control Regulations do not need to be subjected to detailed assessment within the Environmental Statement but do require sufficient information to put them into context with the decommissioning project.

2.2 Objectives

- To identify, describe and assess the effects of the project on air
- To avoid, reduce and where possible offset significant adverse environmental effects on air
- To avoid, reduce and where possible offset significant adverse environmental effects on air in other European Economic Area (EEA) states
- Protect the health of people at work and the general public

Key Issue
Dust generated from decommissioning activities, such as the demolition of structures, including cooling towers, or from additional road transport, can be a source of great nuisance to local residents and other sensitive receptors. Depending on the source, dust may also be contaminated with radioactivity and/or asbestos.

2.3 Definition of Air Quality Environmental Impact

Air pollution occurs when environmentally damaging substances, such as gases, dust, fumes or odours, are discharged into the atmosphere. Environmental damage means that the substances polluting the air are harmful to the health or comfort of humans and animals; or which could cause damage to plants and materials; or interfere with the comfortable enjoyment of life, or property, or conduct of business.

2.4 Assessment Methods, Criteria & Legislation

- Part III of the Environmental Protection Act 1990
- The Air Quality Strategy (2000) and its Addendum (2003) and the systems of air quality management under Part IV of the Environment Act 1995
- The UK Climate Change Programme (November 2000)
- EU Air Quality Directives (96/62/EC and 99/30/EC)
- European Directive 2000/76/EC on the incineration of waste
- World Health Organisation (WHO) Guidelines (2000)
- PPS23: Planning and Pollution Control 2004
- UK Occupational Exposure Limits
- Schedule 1 of the Radioactive Substances Act 1993
- Pollution Prevention and Control Regulations 2000

- Integrated Pollution Prevention & Control Guidance Note H1 on Environmental Assessment and Appraisal of BAT
- Selected air quality criteria including the Air Quality Strategy (2000) standards and objectives, current EU Directive limit and guide values and EU Daughter Directive limit values, World Health Organisation Guidelines, and Occupational Exposure Standards

2.5 Potential Sources of Baseline Information

- Local Air Quality Review available from the local authority
- Monitoring Data and background maps of annual mean concentrations from National Air Quality Archive
- Local meteorology data available from the Meteorological Office or from the site itself
- Any existing emissions records from the site
- Results of dispersion modelling that may have been undertaken

2.6 Potential Impacts, Assessment Techniques & Mitigation Measures

The example information provided in this table is for illustrative purposes only and are not the only impacts that can arise from a decommissioning project.

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Degradation of local and potentially regional air quality caused by exhaust emissions from vehicles travelling to and from the site to transport workers, dust from demolition, equipment and materials during decommissioning	Quantitative assessments of the likely impact from exhaust emissions of construction traffic may be undertaken using the methodology set out in Highways Agency Design Manual for Roads and Bridges (DMRB) Assessment against national air quality standards or objectives for NO_x, NO_2, Benzene (C_6H_6), 1,3-Butadiene (C_4H_6), carbon monoxide (CO), SO_2, particulate (PM_{10}), and lead (Pb) Use of fixed, diffusion tubes to monitor gaseous emissions, e.g. NO_2	• Regular inspection and maintenance of site vehicles and equipment to minimise exhaust emissions • On-site monitoring • Transport plan to minimise trips and define access routes • Dust monitoring using deposition gauges • Consultation with potential receptors before undertaking dusty operations or when planning transport routes

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Increased dust emissions caused by movement of vehicles and equipment; operation of plant such as concrete crushers or concrete batching plant; and open storage of particulate materials, such as top soil, rubble, etc	Identification of sensitive receptors and modelling dust plumes from particularly dusty operations, such as demolition	• Work to be carried out in manner that avoidable dust is not generated • Use of screens, dust sheets or other methods to prevent dust generation • Regular washing of vehicle wheels leaving the site to minimise the amount of mud and debris deposited on roads • Regular water spraying and sweeping of unpaved and paved roads • Speed limits for construction vehicles to minimise dust entrainment and dispersion • Sheeting of vehicles carrying spoil and other such materials to prevent dust being blown from the vehicles whilst driving • Storage of dusty materials away from site boundaries. • Dust monitoring using deposit gauges • Consultation with potential receptors during before undertaking dusty operations
Air pollution from operational non-radioactive and radioactive gaseous discharges	Non-radioactive gaseous releases associated with decommissioning works may be modelled using the following computer dispersion models, such as AERMOD or ADMS	• Compliance with relevant discharge authorisation • Demonstration of Best Practicable Means (BPM) for radioactive discharges. • Filtration or scrubbing
Release of particulate or radioactive materials due to dismantling and removal of plant or systems	Particulate releases associated with decommissioning works may be modelled using the following computer dispersion models: AERMOD or ADMS	• Use of Best Practicable Environmental Option (BPEO) and Best Available Techniques (BAT; for non-radioactive releases) and Best Practicable Means (BPM; for radioactive releases) to ensure minimal release to the environment during dismantling and removal of plant and systems • Use of existing filtration systems, temporary filtration systems, high efficiency particulate abatement (HEPA) filters

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Release of asbestos dust caused by dismantling and demolition of buildings/facilities	Qualitative assessment	• Special procedures for removal of asbestos • Appropriate final disposal
Impact on the atmosphere i.e. the ozone layer as a result of gaseous releases such as CFCs and HFCs from plants such as refrigeration systems and fire suppressants	Baseline data or project description indicates presence or absence of materials as part of the project	• Management procedures and legal compliance to ensure correct handling and disposal of GHGs or ODS
Dose to workers and the public due to radioactive releases during accident conditions such as a fire	Assessment taken from nuclear safety case	• Mitigation taken from nuclear safety case

3 Flora & Fauna (Ecology) Guidance

3.1 Introduction

Decommissioning activities have the potential to adversely impact flora and fauna in both terrestrial and aquatic environments. These impacts may be direct impacts caused by the disturbance of species or loss of habitat. Other impact types may occur due to accidents, spills for example, or even changes to the water table. Many nuclear reactors are located in sensitive environments that are characterised by protected habitats and the presence of rare species.

3.2 Objectives

- To maintain the biodiversity of the area
- To identify, describe and assess the effects of the project on habitats and ecology
- To avoid, reduce and where possible offset significant adverse environmental effects on habitats and ecology

Key Issue
Nuclear reactors are generally located in sensitive environments and are frequently in close proximity to habitats and species protected by law. Some reactor sites may even harbour protected species within their boundaries. Consequently, decommissioning activities have the potential to adversely affect these habitats and species either through disturbance to species by noise, dust or pollution; or destruction of habitats through the removal of buildings and equipment used by flora and fauna.

3.3 Definition of Flora and Fauna (Ecology) Environmental Impact

The relationship between living organisms and their environment is fragile. Any change in flora and fauna populations may be detrimental to the ecosystem being assessed.

3.4 Assessment Methods, Criteria & Legislation

- EU Habitats Directive 92/43/EEC
- EU Wild Birds Directive 79/409/EEC
- The Wildlife and Countryside Act 1981
- The Countryside and Rights of Way Act 2000
- The Conservation (Natural Habitats) Regulations 1994
- The Ramsar Convention of Wetlands of International Importance 1976
- EU FASSET Framework for Assessment of Environmental Impact for the radiological protection of non-human species
- PPS9: Biodiversity and Geological Conservation 2005
- Office of the Deputy Prime Minister Circular 06/2005: Biodiversity and Geological Conservation
- International Union for the Conservation of Nature and Natural Resources Red Data Book for endangered species
- Impacts measured against sensitivity criteria, e.g. abundance, rarity, diversity, identification for protection in European Directives or national legislation, or cited for conservation action in Biodiversity Action Plans (BAPs)
- Guidelines for Ecological Assessment by the Institute for Ecology and Environmental Management [2]

3.5 Potential sources of baseline information

- Data search undertaken with local authorities, Environment Agency, Scottish Environmental Protection Agency, English Nature, Scottish Natural Heritage land owners, ecological non-governmental organisations, such as Royal Society for the Protection of Birds (RSPB) and local ecology groups that may have historical information and maps, aerial photographs and satellite images, previous surveys and other information on the local ecological environment
- Surveys using National Vegetation Classification (NVC) methods [1]
- Buildings survey to establish the presence or otherwise of species such as bats
- Conservation designations, whether international, e.g. Ramsar or SAC; national, e.g. SSSI (Site of Special Scientific Interest) or local

3.6 Potential Impacts, Assessment Techniques & Mitigation Measures

The example information provided in this table is for illustrative purposes only and are not the only impacts that can arise from a decommissioning project.

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Landtake/habitat loss through creation of access roads and other structures, storage of materials, earth moving, building demolition and site clearance	Identification of sensitive species from baseline information & use of expert opinion to assess potential impact against predicted habitat loss. Assessment of impact measured against sensitivity criteria Survey using Ratcliffe's criteria for evaluating sites or the Guidelines for Ecological Assessment by the Institute for Ecology and Environmental Management [2]	• Identification and provision of alternative habitat if habitat loss unavoidable • Ecological monitoring and survey • Identification and provision of alternative habitat if habitat loss unavoidable • Awareness training for employees & contractors • Physical protection (fencing) • Consultation with local ecology groups in the wider community
Change in water table, stream flows, site water budget and flooding regime caused by changes from decommissioning activities	Identification of sensitive species from baseline information & use of expert opinion to assess potential impact against predicted water impacts. Assessment of impact measured against sensitivity criteria	• Water management through reuse and recycling • Controlled disposal of waste water • Sympathetic landscaping to ensure control of surface water runoff
Water-borne pollution through accident spillages adversely affecting species and habitats	Identification of sensitive species from baseline information & use of expert opinion to assess potential impact against predicted water impacts. Assessment of impact measured against sensitivity criteria such as national water quality standards	• Provision of spill kits • Effective management of chemicals and waste materials • Implement relevant advice given in the Environment Agency's Pollution Prevention Guidance notes

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Disturbance to wildlife and habitats due to nuisance, such as noise or dust	Identification of sensitive species from baseline information & use of expert opinion to assess potential impact against predicted air impacts. Assessment of impact measured against sensitivity criteria	• See mitigation in Air Quality for dust mitigation • Appropriate noise monitoring & modelling • Appropriate timing of nuisance activities to avoid distrubance • Location of of noisey activities away from sensitive receptors where possible
Radiological impacts on wildlife	EU FASSET Framework for Assessment of Environmental Impact for the radiological protection of non-human species	• Dependent on source of impact – see mitigation for air quality, water quality and land quality
Creation of habitat due to the removal of buildings allowing re-colonisation	Appropriate survey techniques	• Effective land management to deter re-colonisation, particularly by protected species, during decommissioning

4 Landscape and Visual Amenity Guidance

4.1 Introduction

Decommissioning activities have the potential to affect the landscape and visual amenity of the area adversely and beneficially. Decommissioning activities may impact on specific landscape elements or the overall affect on visual amenity.

4.2 Objectives

- To identify, describe and assess the effects of the project on landscape and visual amenity
- To avoid, reduce and where possible offset significant adverse environmental effects on the landscape and visual amenity
- To provide recommendations to alleviate the identified impacts where they cannot be avoided

Key Issue
Many nuclear reactors are located in sensitive environments designated for the landscape character and visual amenity, such as in Areas of Outstanding Natural Beauty (AONB). The visual impact on the local environment of decommissioning activities, such as the dismantling and demolition of buildings or the re-cladding of buildings that are to remain on-site can be a source of concern to local residents and visitors to the area.

4.3 Definition of Impacts on Landscape and Visual Amenity

Landscape impacts result from changes in the fabric, character and quality of the landscape as a result of development. Visual impacts relate solely to changes in available views of the landscape and regional and local distinctiveness.

4.4 Assessment Methods, Criteria & Legislation

- Landscape and Visual Assessment Guidelines, 2nd edition, Landscape Institute and Institute for Environmental Management and Assessment 2002
- Landscape Character Assessment Guidance for England and Scotland, Countryside Agency and Scottish Natural Heritage (2002)
- Guide to Best Practice in Seascape Assessment published by Maritime Ireland/Wales INTERREG (2001) (for coastal assessments only)
- Photomontaging and use of Zones of Visual Influence (ZVI) assessment techniques
- British Standard 3998: Recommendations for Tree Work and British Standard 5837: Trees in Relation to Construction

4.5 Potential Sources of Baseline Information

- Field surveys undertaken following guidelines drawn up by the Landscape Institute and Institute for Environmental Management and Assessment, and by the Countryside Agency.
- Existing landscape character assessments carried out by the local planning authority and the Countryside Character Initiative carried out by the Countryside Agency

4.6 Potential Impacts, Assessment Techniques & Mitigation Measures

The example information provided in this table is for illustrative purposes only and are not the only impacts that can arise from a decommissioning project.

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Direct impact through change in local landscape character, primarily through loss or gain of new built form Removal of reactor buildings may result in short term adverse impacts	Landscape/seascape assessment, using an approved method, including use of photomontages and Zones of Visual Influence (ZVI)	• Minimise impacts through building design and use of buffer planting, where appropriate
Visual impact due to introduction of new elements in views contrasting with the existing visual context		• Minimise impacts through building location and design • Use of screen planting, where appropriate
Visual impact due to loss of key visual features		• Minimise impact through appropriate landscaping and screen planting, where appropriate
Visual impact due to change in character of views, e.g. increased built form		• Minimise impact through building design and use of appropriate screen planting, where appropriate
Temporary visual impacts due to construction works, including lighting		• Consideration of location and design for temporary accommodation and stockpiling • Use of directional and/or sensor controlled lighting if required at night • Use of temporary screens (e.g. coloured hoardings) to screen views of works
Temporary landscape impacts during construction works	Reference to British Standard 3998 Recommendations for Tree Work and British Standard 5837: Trees in Relation to Construction	• Adequate protection of landscape features (e.g. tree protection in accordance with BS 3998)

5 Material Assets Guidance

5.1 Introduction

Decommissioning activities have the potential to adversely affect material assets, which include buildings and objects of cultural heritage, such as archaeological remains and historic monuments. Impacts to material assets could include archaeological remains or the removal or alteration of built and industrial heritage. Archaeology in this context refers to buried remains, prehistoric landscape, marine or offshore heritage/archaeology, historic buildings, historic landscapes or industrial heritage.

5.2 Objectives

- To identify, describe and assess the effects of the project on material assets
- To avoid, reduce and where possible offset significant adverse environmental effects on material assets

Key Issue
Many reactor sites are industrial sites and any buried archaeological interest may have been lost through the construction of the reactor and its associated infrastructure, in many cases the reactor buildings themselves will represent significant historical interest as an example of both industrial heritage and Cold War technology. Not all reactors, however, will be equal in historical terms whilst some might have international importance others will only be of regional significance.

5.3 Definition of Impacts on Material Assets

In a decommissioning project, the material assets that represent the fabric of the reactor and its associated buildings are being removed as they have reached the end of their useful lives. Some of these buildings may, however, represent value beyond their actual purpose through association with certain periods in history, e.g. the Cold War, or as industrial artefacts. Additionally, the clearance of the reactor site allows the land to be re-used for other purposes and the cleared land can itself be considered a material asset..

5.4 Assessment Methods, Criteria & Legislation

- Ancient Monuments and Archaeological Area Act 1979
- Office of the Deputy Prime Minister Circular 01/01: Arrangements for Handling Heritage Applications
- Office of the Deputy Prime Minister Circular 09/2005: Arrangements for Handling Heritage Applications
- Planning (Listed Buildings and Conservation Areas) Act 1990
- PPG15: Planning and the Historic Environment (England)
- PPG16: Archaeology and Planning (England)
- NPPG5: Archaeology & Planning (Scotland)
- PPPG18: Planning and the Historic Environment (Scotland)
- PAN42: Development & Cultural Heritage Best Practice Guidance (Scotland)
- Welsh Office Circular 60/96 - Planning and the Historic Environment: Archaeology (Wales)
- Welsh Office Circular 61/96 - Planning and the Historic Environment: Historic Buildings and Conservation Areas (Wales)

5.5 Potential Sources of Baseline Information

- Records of Scheduled Ancient Monuments (SAMs) and consultation with the relevant national heritage agency* and local authority archaeology units
- Consultation with regional heritage agency regarding historical value of industrial buildings
- Register of buildings to be removed during decommissioning
- Survey of material assets to assess their cultural heritage value

5.6 Potential Impacts, Assessment Techniques & Mitigation Measures

The example information provided in this table is for illustrative purposes only and are not the only impacts that can arise from a decommissioning project.

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Removal or alteration of buildings or other features leading to the loss of material assets	Produce assessment in accordance with the standards and guidance for Archaeological Desk-Based Assessments and according to the principles of PPG15 and PPG16	• Recording in advance of alteration or demolition
Destruction or removal of sensitive archaeological deposits		• Archaeological evaluation leading to potential further survey and excavation
The alteration of stable ground conditions that may lead to degradation of the quality and survival of buried archaeological remains.		• Archaeological evaluation leading to potential further survey and excavation
Alteration of the setting of archaeological features or structures (the historic landscape)		• Avoid damage to known features or structures through sensitive design
Loss and/or destruction of historic documents detailing the activities associated with the site before and during decommissioning	Consultation with local authorities and communities regarding the historical value of the site Examination of available archive information retained at site, amongst the local community, interviews with ex-employees and the National Records Office	• Provision made for historic recording • Cultural Heritage watching brief before and during demolition and excavation works • Retention of selected archives, including architectural and engineering drawings, photographs, electronic data, industrial artefacts, etc

* English Heritage in England, Scottish Heritage in Scotland; and, Cadw in Wales.

6 Population Guidance

6.1 Introduction

The long duration of decommissioning activities has the potential to adversely and/or beneficially affect the local population at different times. There is potential for the local economy and facilities available to serve the local community to be affected. The temporary increase in population through import of labour may place a burden on the local health and educational services. Alternatively this increase may have benefits for the economics through employees' retail expenditure.

6.2 Objectives

- To identify, describe and assess the effects of the project on local communities
- To avoid, reduce and where possible offset significant adverse environmental effects on local communities

Key Issue
Commercial nuclear reactors are often located in rural areas and provide well-paid, technical and scientific jobs to the area. The loss of these jobs can result in changes to the local population and its economy. The site has probably contributed to the local economy for a considerable period of time and may well do so for many more decades, depending on the decommissioning strategy to be employed.

6.3 Definition of Population Impacts

Population impact assessment includes the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of a decommissioning project and any social change processes invoked by that project [3].

6.4 Assessment Methods, Criteria & Legislation

No particular legislation applies to population impact assessment, although there may be local policies relevant to the socio-economic environment around the decommissioning project as well non-statutory indicators (see 6.5 below).

Similarly, there are a variety of methods that could be used for population impact assessment, which can be summarised into 2 groups:

- Using existing data – interpretation and extrapolation of existing baseline data (see 6.5 below) against defined indicators
- Extrapolative forecasting – consultation with the local population via public hearings, focus groups, etc to collect opinions and measure trends

6.5 Potential Sources of Baseline Information

- Examination of local economic context, population and employment statistics and other sets of existing data
- Impact of the proposed development to local employment levels.
- National On-line Manpower Information System (NOMIS)
- Training and Enterprise councils or Local Enterprise Companies
- The Department of Education and Employment
- Census of Population

- Travel to Work Area (TTWA) & staff travel surveys
- Public hearings, focus groups, presentations, etc

6.6 Potential Impacts, Assessment Techniques & Mitigation Measures

The example information provided in this table is for illustrative purposes only and are not the only impacts that can arise from a decommissioning project.

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Loss of direct employment	Quantification of workforce from reactor operator	• Re-training schemes for affected staff to work on the decommissioning project • Local employment policy for the decommissioning project • Consultation with workforce and unions • Support schemes for staff seeking to re-locate or look for work outside the local area
Loss of inward investment from reactor operation	Quantification of the contribution made by the reactor and its operators to the local economy	• Consultation with the local community and businesses • Local purchase policy for the reactor decommissioning phase
Increase in employment opportunities / Import of employment for other areas	Quantification of workforce required to construct and operate the project Assessment of local labour market and quantification of the potential benefits for employment in the local areas Assessment of the indirect and induced employment associated with the net additional employment resulting from the project	• Provide local people with the opportunity to be involved in jobs associated with project
Increase in demand for materials and services during active decommissioning phases	Identification of likely sources of construction and operational materials and services necessary to implement the project and the approximate value of those goods and services Assessment of the local area social infrastructure to sustain the workforce	• Project open days • Form a register of local suppliers

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Adverse effects to the local community or population affected by the project	Local consultations involving stakeholders including the public	• Develop and implement an effective public involvement plan to involve all stakeholders • Local Community Liaison Committee or Site Stakeholder Group • Responsive complaints procedure • Commitment to monitoring and publishing of monitoring data

7 Soil Guidance

7.1 Introduction

This section deals with impacts to soil, which also covers geology, hydrogeology and contaminated land issues. Decommissioning activities have the potential to adversely impact soil quality and geology. Contaminated land issues are also covered in this section. The effects of decommissioning on the soil can include compaction of soil through increased vehicular movement, contamination through accidental spills or excavation of underground structures.

7.2 Objectives

- To identify, describe and assess the effects of the project on soil
- To avoid, reduce and where possible offset significant adverse environmental effects on soil (and subsequently groundwater) including those caused by land contamination and re-mobilisation of any existing contamination as well as emissions of polluting substances to land

Key Issue
Sites may be historically contaminated by radioactive and non-radioactive materials. Contamination may have arisen from previous uses of the site – many sites were used during World War 2 as airfields or munitions manufacturing – or from past reactor activities when environmental standards were not a strict as today. This past contamination, whether radioactive or non-radioactive, may be poorly characterised and understood.

7.3 Definition of Soil Impacts

Soil impacts can arise from pollution incidents, such as spills and leaks, which may occur during decommissioning. Alternatively, soil contamination may already exist and decommissioning activities may lead to new impact pathways developing. Impacts to soils may also lead to impacts to geology and hydrogeology depending on the underlying environmental conditions. Indirectly, soil impacts may also affect flora and fauna, water resources and people.

7.4 Assessment Methods, Criteria & Legislation

- Part IIA of the *Environment Protection Act 1990* which provides a regime for the identification and remediation of contaminated land
- PPS23: Planning and Pollution Control 2004
- Circular 02/2000 Contaminated land, Environmental Protection Act 1990, Part IIA 2000
- Schedule 1 of the *Radioactive Substances Act 1993* and associated exemption orders
- CIRIA's Safegrounds Guidance for Site Investigations on Nuclear and Defence Sites [4]
- Conceptual model (identifying source, receptor, pathway, risk, mitigation and residual risk) conclusions and recommendations
- Source-pathway-receptor assessment

7.5 Potential Sources of Baseline Information

- Site context and surrounding land uses

- Statutory and non-statutory conservation designations, e.g. geological SSSI (Site of Special Scientific Interest) or RIGS (Regionally Important Geological Site) available from national heritage organisations and local authorities
- Summary of site history
- Geology, hydrology and hydrogeology maps
- Data from British Geological Survey – drift and solid geology maps
- Agricultural land quality data from DEFRA
- Groundwater vulnerability maps and monitoring data from the Environment Agency
- Results of previous investigations
- Any previous remediation work undertaken and contaminants of concern

7.6 Potential Impacts, Assessment Techniques & Mitigation Measures

The example information provided in this table is for illustrative purposes only and are not the only impacts that can arise from a decommissioning project.

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Contamination from accidental spills and waste water	Source-pathway-receptor assessment made against regulatory limits	• Containment for liquid on site must be effectively managed
Loss of soil through construction activities & lay-down areas	Identification of sensitive receptors from baseline information	• Effective topsoil storage and restoration
Mobilisation of historic contamination, radioactive and non-radioactive, in the ground causing a hazard and risk to workers and the environment	Source-pathway-receptor assessment made against regulatory limits Development of a site conceptual model	• Contaminated land baseline investigations • Remediation and/or monitoring of contaminated areas
Compaction of soil due to vehicle movements, equipment lay-down areas, top soil storage, etc	Identification of sensitive receptors from baseline information	• Use wide tyres to spread the weight of the vehicles • Use a single or few tracks to bring vehicles to the working area • Till the area after compaction has taken place • Correct management of topsoil storage
Disaggregation of soil structure causing a reduction in quality & utility	Identification of sensitive receptors from baseline information	• Remove as little vegetation as possible and revegetate bare areas as soon as possible after completion of the decommissioning • Where possible create gentle gradients and avoid steep slopes
Air pollution deposition from decommissioning processes or adjacent facilities	Source-pathway-receptor assessment made against regulatory limits	• See mitigation measures in Section 2

8 Water Guidance

8.1 Introduction

Decommissioning activities have the potential to affect both surface water and groundwater quality. This can be through contamination of surface and groundwater as a result of releases and leachates. Additionally, discharges of radioactive and non-radioactive material may arise through the processing of decommissioning wastes. Changes to the reactor site through the removal/addition of buildings, hardstanding and so forth will also affect the surface water run-off regime of the site; affect local water courses and groundwater.

8.2 Objectives

- To identify, describe and assess the effects of the project on water
- To avoid, reduce and where possible offset significant adverse environmental effects on water
- To avoid, reduce and where possible offset significant adverse environmental effects on the hydrographic characteristics of the site.
- To avoid, reduce and where possible offset significant adverse environmental effects on water in other EEA states

Key Issue
Numerous issues may have direct and indirect impacts to the water environment during decommissioning. Key water issues, however, are generally site specific and may include:

- De-watering, leading to changes in the water table
- Construction and decommissioning site run off, which may contain pollutants or sediments
- Accidental spills from site vehicles and activities

If impacts to the water environment are not adequately controlled, nearby water receptors, such as lakes, rivers and the sea, could be adversely affected or give rise to indirect effects on other receptors, including people, flora and fauna.

8.3 Definition of Water Quality Impacts

Adverse water quality impacts occur when water becomes contaminated with physical, chemical or biological pollutants in quantities that could be harmful to the health or comfort of humans and animals or which could cause damage to plants and materials enters the hydrological cycle. Associated indirect impacts can affect flora, fauna, soils and people, for example, impacts effecting groundwater may ultimately affect nearby habitats, such as marshes, that are dependent on the height and quality of the water table.

8.4 Assessment Methods, Criteria & Legislation

- The *Water Resources Act 1991* and associated regulations and regulatory guidance, which protect both surface waters and groundwaters, in particular:
  - Surface Waters (Dangerous Substances) Regulations
  - Surface Waters (River Ecosystem) (Classification) Regulations
  - Surface Waters (Fishlife) (Classification) Regulations
  - Surface Waters (Shellfish) (Classification) Regulations
  - Bathing Waters (Classification) Regulations

- Water Protection Zones
- Nitrate Sensitive Areas
- The EC Water Framework Directive (2000/60/EC)
- PPS23: Planning and Pollution Control 2004
- Radioactive Substances Act 1993, Schedule 1, and its relevant exemption orders

8.5 Potential Sources of Baseline Information

- River Quality Objectives
- River Ecosystem classification schemes
- Chemical, biological and nutrient General Quality Assessment
- Areas of nature conservation interest (water environment)
- Surrounding land uses
- Conservation Designations
- Previous prosecutions
- Summary of site history, geology, hydrology and hydrogeology
- Groundwater monitoring
- Results of previous investigations
- Any previous remediation work undertaken
- Contaminants of concern
- Conceptual model (identifying source, receptor, pathway, risk, mitigation and residual risk) conclusions and recommendations

8.6 Potential Impacts, Assessment Techniques & Mitigation Measures

The example information provided in this table is for illustrative purposes only and are not the only impacts that can arise from a decommissioning project.

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Degradation of water quality, surface water and groundwater, caused by accidental spills during decommissioning and subsequent impacts to water quality and aquatic ecology	Calculation of risk from spills – information regarding possible risks usually available through facility or decommissioning, safety cases and other operational risk assessment tools Comparison of any predicted consequences against regulatory limits Identification of sensitive receptors from baseline information	• Temporary bunding or other containment strategy to be introduced in areas where soils/surface water potentially contaminated with oils/fuels, etc • Use of best management practice as outlined in the EA Pollution Prevention Guidance (PPGs) • appropriate design of new or refurbished buildings to modern standards • chemicals storage areas to be cut off from drainage area using large spillage trays and appropriate bunding. • appropriate plans for accidental spillage response to be put into place • regular site environmental audits during decommissioning works

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Alteration of drainage systems by removal or addition of artificial surfaces thereby increasing the risk of flooding	Calculation of changes in surface water runoff from the decommissioning site during different phases. Identification of sensitive receptors from baseline data	• Appropriate surface water drainage system. • Use of a SUDS (Sustainable Urban Drainage System)

Potential Impact	Assessment Techniques, Guidance & Methods	Mitigation Measures
Contamination of construction site run-off water with sediments, oils, chemicals etc. including the release of turbid water or sediment	Use of appropriate risk assessment for construction activities – CDM Regulations, Construction Impact Management Plans and Environmental Management Systems Identification of receptors sensitive to impacts, impact pathways and sources of impact based on baseline data, including the project description	• Site drainage to incorporate suitable traps/grids in any identified susceptible areas to prevent sediments/stones etc. entering drainage system. Also to ensure drainage not overwhelmed in event of unusual event of excess or seasonal rainfall • Temporary bunding or other containment strategy to be introduced in areas where soils/surface water potentially contaminated with oils/fuels etc may flow into surface waters • Placement of buffer strips or geo- filters in-between site works and watercourses • Installation of sumps for collecting turbid site run-off • Run-off generated on site to be controlled within a site drainage management plan, so that turbid water can be treated on-site • Minimise potentially exposed soil areas
Discharge of process water from decommissioning activities, e.g. waste treatment	Process flow models and discharge predictions for new plant Extrapolation of discharge data from existing plant	• Discharges authorised under appropriate legislation

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