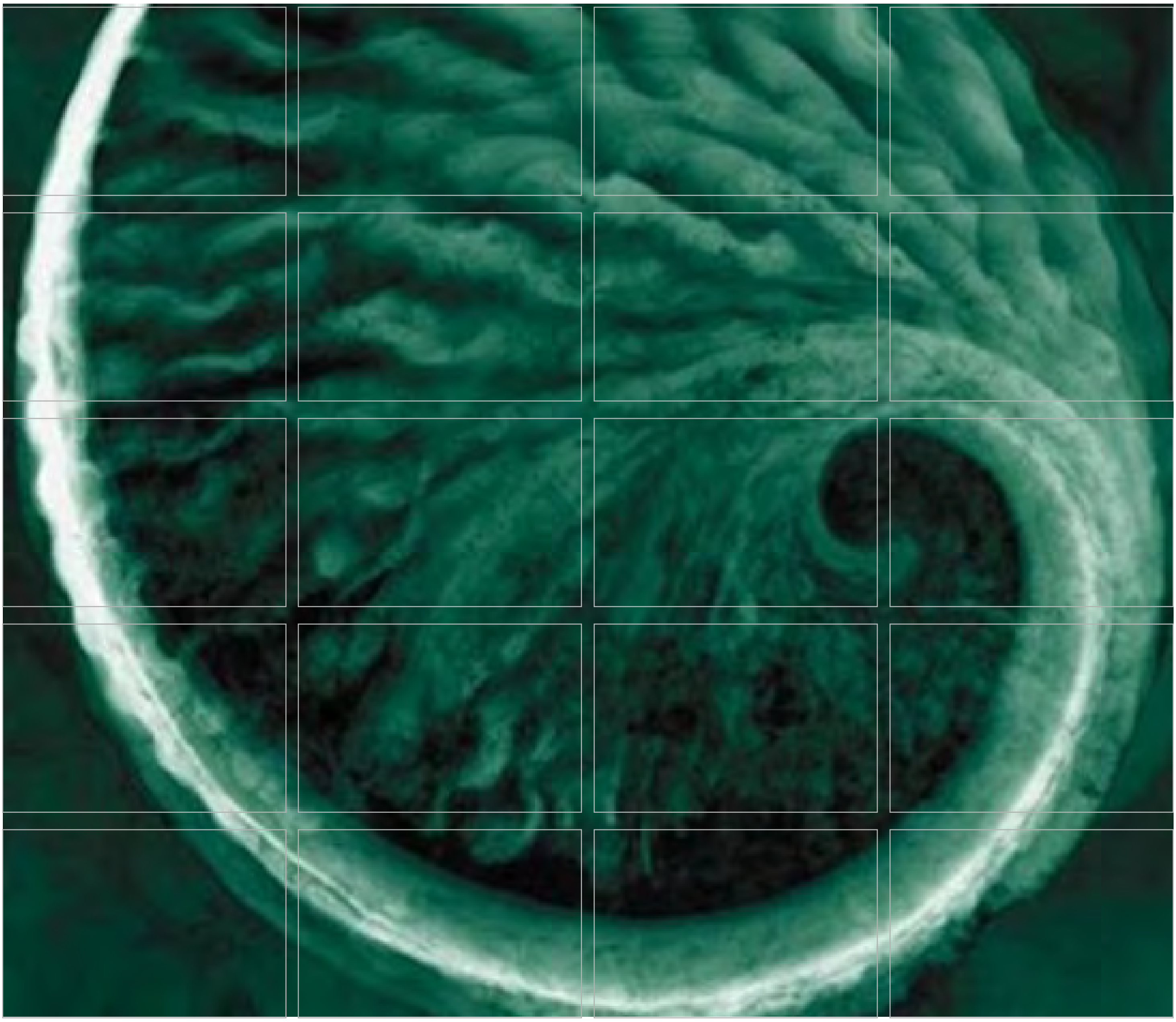

Gloucestershire County Council

Waste Core Strategy Habitats Regulations Assessment

FINAL REPORT

December 2010

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Gloucestershire County Council

Gloucestershire County Council Waste Core Strategy Habitats Regulations Assessment

FINAL REPORT

Reference 0114924
December 2010

Prepared by: Beth Seldon

For and on behalf of
Environmental Resources Management

Approved by: Geraint Bowden

Signed:

Position: Partner

Date: 1st December 2010

CONTENTS

1 INTRODUCTION

1.1 INTRODUCTION

Gloucestershire County Council (GCC) is currently preparing a Waste Core Strategy (WCS) which will set out their approach to waste management within the county between 2012 and 2027.

To date GCC has prepared the following documents:

- WCS Issues and Options (July 2006);
- WCS Preferred Options (January 2008); and
- WCS Site Options Consultation (October 2009). The WCS Site Options included 13 waste sites. Following a consultation response from Natural England further HRA work has been undertaken through this report.

In accordance with Council Directive 92/43/EEC) Article 6(3) and Article 6(4) transposed into UK law by the Conservation of Habitats Species Regulations 2010 (the 2010 Regulations [(1)]), it is necessary for GCC in preparing these documents to consider any potential impacts that might arise on Natura 2000 sites [(2)] and Ramsar sites [(3)], referred to as 'European sites' in this report. This is required to ensure that the strategy will not result in potential significant effects on the European sites and the overall Natura network. This requirement was enforced through amendments in 2007 to the original 1994 Habitat Regulations following a European court ruling [(4)]. This process is referred to in this report as a Habitats Regulations Assessment (HRA). This HRA needs to be undertaken prior to the plan being adopted.

European guidance on assessing plans against the requirements of the Habitats Regulations includes a staged process to the assessment (*Box 1.1*) [(5)].

(1) The 2010 Regulations are a consolidation of previous amendments to the Habitats Regulations.
(2) In May 1992 European Union governments adopted legislation designed to protect the most seriously threatened habitats and species across Europe. This legislation is called the Habitats Directive and complements the Birds Directive adopted in 1979. At the heart of both these Directives is the creation of a network of sites called Natura 2000. The Birds Directive requires the establishment of Special Protection Areas (SPAs) for birds. The Habitats Directive similarly requires Special Areas of Conservation (SACs) to be designated for other species, and for habitats. Together, SPAs and SACs make up the Natura 2000 series. All EU Member States contribute to the network of sites in a Europe-wide partnership from the Canaries to Crete and from Sicily to Finnish Lapland.
(3) Ramsar sites are wetland sites of international importance designated under the Ramsar Convention, signed in Ramsar, Iran, in 1971. It is Government policy that Ramsar sites are also treated as if they are European designated sites in accordance with the Habitats Regulations.
(4) ECJ case C - 6/04, Commission of the European Communities v United Kingdom of Great Britain and Northern Ireland, 20th October 2005.
(5) European Commission Environment Division 2001; Assessment of plans and projects significantly affecting Natura 2000 sites.

Box 1.1 HRA Process

1. Define the plan.

2. Establish that the plan is not necessary to the management of the site for nature conservation purposes.

3. Determine whether the plan is likely to have a significant effect on the site.

4. If the plan is likely to have a significant effect, assess the implications of the plan for the site's Conservation Objectives so as to answer the question *"can it be demonstrated that the plan will not adversely affect the integrity of the site?"* This is referred to as the Appropriate Assessment.

5. If the Appropriate Assessment indicates that no adverse effect will occur the competent authority may proceed to consider the assessment complete. If not, and the plan is consequently undeliverable, policy changes or further consideration of IROPI may be required to demonstrate specific reasons why the plan should be permitted before the plan may be found sound.

Reference should be made to *Table 1* on *Page 6* of the GCC WCS Site Options screening report which describes the key stages of the WCS HRA process.

'Likely significant effect' in this context is any effect that may reasonably be predicted as a consequence of the plan that may affect the conservation or management objectives of the features for which a site was designated [(1)].

The aim of the Habitats Regulations process and therefore the Appropriate Assessment (AA) is to demonstrate that the plan will not have an adverse effect on the integrity of the European designated site. Site integrity is defined as:

"the coherence of its structure and function across its whole area that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified" [(2)]

The decision on whether the site integrity could be adversely affected by the plan should be focussed on and limited to the European site's Conservation Objectives. The Conservation Objectives for the European sites are included in the baseline descriptions presented in *Chapter 2*.

1.2 HRA Background

GCC has undertaken HRA throughout the development of the WCS and has produced the following reports to accompany the progression of the WCS:

(1) Habitats Regulations Guidance Note 3. The Determination of Likely Significant Effect under The Conservation (Natural Habitats &c) Regulations 1994. English Nature, 1999.

(2) European Communities (2000) Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE. EC

- Planning for the Protection of European Sites: Appropriate Assessment. Report on Gloucestershire Waste Core Strategy Issues & Options Paper (May 2007);

- Planning for the Protection of European Sites: Habitats Regulations Assessment (HRA), Appropriate Assessment (AA). Report on Gloucestershire Waste Core Strategy Preferred Options Paper (January 2008);

- Planning for the Protection of European Sites: Habitats Regulations Assessment (HRA), Appropriate Assessment (AA). Evidence Gathering / Baseline Report (Update 2) (August 2009) (1); and

- Planning for the Protection of European Sites: Habitats Regulations Assessment (HRA) Screening Report for WCS Site Options (October 2009).

The findings of the HRA screening report (GCC, October 2009) indicated that the WCS Site Options will require further screening assessment and potentially AA for the purposes of site allocation in the WCS as the potential for impacts to European sites were identified. This was further confirmed through consultation comments received from Natural England and a further meeting between GCC and Natural England in January 2010.

ERM has therefore been commissioned by GCC to provide a report which assists them in undertaking their further assessment, including AA as appropriate of the WCS Site Options, which comprises 13 waste sites.

ERM was also commissioned to carry out a review of the Final Publication Stage WCS for Cabinet (GCC, November 2010) to ensure the final WCS document was deliverable and compliant with the 2010 Regulations.

1.3 *AIM OF THE REPORT*

The report comprises a stand-alone assessment report which considers potential waste facility impacts and HRA guidance to present the methodology, results and findings of necessary additional screening assessment following a review of the baseline and screening assessment findings of the previous GCC reports. The screening assessment includes the findings of further detailed AA where necessary and reports the conclusions where this has been undertaken. The assessment findings are discussed in terms of potential likely significant effects identified for different waste facilities at each of the 13 waste sites and necessary further considerations.

(1) All GCC HRA Reports have been consulted on and verified by Natural England..

The report also documents a review of the Final Publication Stage WCS and demonstrates how the WCS is deliverable in terms of compliance with the 2010 regulations.

1.3.1 *Limitations*

The assessment is limited by the level of planning in which the WCS operates and is a strategic level of assessment. The WCS is intended as a strategic planning document to inform the requirement of waste management facilities across Gloucestershire. The HRA is limited by the high level nature of the WCS and the assessment is consequently based on a series of assumptions including facility design. For example the modelling of air emissions from thermal treatment facilities has assumed a generic Energy from Waste (EfW) as regulated by the Waste Incineration Directive (WID) as a facility with the highest air emissions as a worst case scenario. The need for more detailed assessment at the development control stage due to the high level capability of this assessment is therefore included within the findings and recommendations.

It should be noted that the assessment has been part of an iterative process to inform GCC about Site Options and assist them with the writing of the WCS Publication Document.

1.4 *NOTE ON WASTE FACILITY TYPES*

The delivery of the WCS is likely to require a mix of waste facility types across the Site Options however the focus is on strategic sites for residual Municipal Solid Waste (MSW). The exact waste facility type proposed at each of the Site Options is uncertain, and will be influenced by the findings of this and other assessments and then by subsequent development proposals. The WCS is therefore being developed as technology neutral, and this assessment has considered potential impacts at each of the Site Options which could arise from one of a range of waste facility types with some potential to be developed through the WCS. The waste facility types considered in this assessment have been agreed with GCC and are described in *Chapter 3* and *Annex A.*

The purpose of this report is to inform high level guidance on the likely potential impact of waste sites on European sites and not to provide advice about which waste facility types should be adopted at which sites. The report documents where the assessment indicates that certain facility types may have potential significant adverse impacts on European sites that would need to be addressed by any developer. Where subsequent planning applications for waste sites are made, these applications will still need to demonstrate that they can satisfy the requirements of the Habitats Regulations in consultation with Natural England.

It is possible that following the publication of the WCS and HRA that technological advances in waste facility design may occur. This could allow development of waste facilities at locations which have been deemed likely to have a potential impact on European sites by the assessment in this report. Again this would be dealt with at the planning application stage.

1.5 REPORT STRUCTURE

The remainder of the report is set out as follows:

- *Chapter 2*: European Sites Baseline
- *Chapter 3*: Proposed Waste Sites and Proximity to European Sites
- *Chapter 4*: Scoping for Potential Significant Effects on European Sites
- *Chapter 5*: Screening for Potential Likely Significant Effects and Appropriate Assessment Methodology
- *Chapter 6*: Screening for Potential Likely Significant Effects and Appropriate Assessment
- *Chapter 7*: Summary of Assessment Findings
- *Chapter 8*: In-combination Assessment
- *Chapter 9*: Review of the Final Publication Stage WCS against the 2010 Regulations
- *Chapter 10*: Report Conclusions

Additional supporting information is provided in the following *Annexes*:

- *Annex A*: Waste Facility Impact Identification;
- *Annex B*: Air Dispersion Modelling Report;
- *Annex C*: Appropriate Assessment of Potential Bird Disturbance Effects; and
- *Annex D*: In-combination Assessment.

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Anon (2010) **The Conservation of Habitats and Species Regulations 2010**, Statutory Instrument No. 490.

British Trust for Ornithology (unpublished data) **WeBS (Wetland Bird Survey) Low Tide Count data for the winter 2008/2009 for Severn Estuary**.

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Gloucestershire County Council (2009) **Planning for the Protection of European Sites: Habitats Regulations Assessment (HRA), Appropriate Assessment (AA). Evidence Gathering / Baseline Report (Update 2) (August 2009)** available at: http://www.gloucestershire.gov.uk.

Gloucestershire County Council (2009) **Planning for the Protection of European Sites: Habitats Regulations Assessment (HRA) Screening Report for WCS Site Options (October 2009)** available at: http://www.gloucestershire.gov.uk.

Gloucestershire County Council (2009) **Waste Core Strategy Site Options Consultation (October 2009)** available at:
http://www.gloucestershire.gov.uk/index.cfm?articleid=21884

Natural England & the Countryside Council for Wales (2009) **Advice given under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994, as amended for The Severn Estuary / Môr Hafren European Marine Site.**

The first stage in any HRA is to identify those sites of European nature conservation importance that may be at risk from the proposals. To determine if the proposal is likely to have any potential significant effects on the designated sites the qualifying interest features of each site are reviewed and the following issues are considered:

- Conservation Objectives - conservation management objectives define what constitutes favourable conservation status by defining broad targets which should be met if the feature is judged to be favourable (1).

- Key site sensitivities - the key site sensitivities were established by reviewing information provided within the conservation objectives for the site and identifying the main sensitivities / vulnerabilities for each habitat or species.

- Current condition and threats - information regarding the site condition and threats to the sites' integrities has been taken from the sites' conservation objectives and general knowledge of the sites.

The identification of baseline information relating to European sites has largely been covered by a series of regularly updated 'Evidence gathering / Baseline Reports' by GCC. Natural England and the Environment Agency were consulted as part of the progression of these documents and approved the final baseline report in August 2009. This assessment report uses the baseline information held within those baseline documents at the request of GCC.

Air pollution from thermal treatment facilities is likely to be the most far reaching impact. A notional 15 km buffer has been used as a search radius around each of the 13 waste sites for the purposes of confirming the list of European sites to be considered by the assessment following Environment Agency H1 guidance note(2) (see *Box 4.1*). This 15 km buffer has been considered following previous consultation with Natural England to ensure a worst case scenario approach is followed.

This area comprising a 15 km buffer from the wastes sites is henceforth referred to as the 'Study Area'. As it is possible that potential effects could occur at distances over 15 km, caution has been observed over the strict use of this buffer and a wider area has been searched as necessary to ensure potential impacts from air pollution on more distant European sites have not been

(1) Conservation Objectives are set by NE to ensure that the obligations of the Habitats Directive are met, particularly to ensure that there should be no deterioration or significant disturbance of the qualifying features from their condition at the time the status of the sit

(2) Environment Agency (2010) Horizontal Guidance Note H1- annex F.

missed. Furthermore, the in-combination assessment (see *Chapter 8*) has additionally included a 15 km search buffer around the GCC administrative boundary to ensure potential impacts in surrounding regional areas are fully captured.

Table 2.1 provides a summary of the European sites captured within the Study Area and lists their qualifying interests, Conservation Objectives and current condition and threats. A summary of the key sensitivities of the European sites with the potential to arise from the development of waste management facilities is also provided. Further details regarding potential waste facility impacts are provided in *Section 4.2*. Component SSSIs are also listed for the European sites. The locations of these sites are shown on *Figure 3.1*.

Table 2.1 Summary of European Sites

Site	Summary of Qualifying Features	Summary of Current Vulnerabilities / Conservation Objectives and Key Environmental Conditions to Support Site Integrity	Key Site Sensitivities from General Waste Facility Impacts		
			Water Pollution	Air Pollution	Disturbance
Rodborough Common SAC	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco brometalia)*	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. The grassland is dependent upon the maintenance of an appropriate grazing regime. Current vulnerabilities include: • a decline in cattle grazing (due to the general decline in the livestock industry); and • recreational impacts on areas accessible by cars – localised erosion. Management through the high level stewardship scheme includes: • a project to restore grazing management to the species-rich slopes of the site; • scrub management; and • traffic-calming measures to reduce livestock injury.	✓ Pollution from run-off or change in groundwater levels or water movements.	✓ Atmospheric deposition of nitrogen on calcareous grassland.	X
Dixton Wood SAC	Violet click beetle (*Limoniscus violaceus*)	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. Current vulnerabilities: • the violet click beetle is dependent on the decaying timber of ancient trees on site and outside of the site boundary for feeding; and • impacts on trees on nearby scarp slopes thought to potentially have an affect on site integrity.	✓ Pollution from run-off or change in groundwater levels or water movements. - Old ash trees like damp soil conditions. Site would be affected if waste site resulted in	✓ Atmospheric deposition of nitrogen on ash woodland.	X

Site	Summary of Qualifying Features	Summary of Current Vulnerabilities / Conservation Objectives and Key Environmental Conditions to Support Site Integrity	Key Site Sensitivities from General Waste Facility Impacts		
			Water Pollution	**Air Pollution**	**Disturbance**
		The site is currently managed through a stewardship agreement.	contamination of the soil water.		
Wye Valley & Forest of Dean Bat Sites SAC	Lesser horseshoe bat (*Rhinolophus hipposideros*) Greater horseshoe bat (*Rhinolophus ferrumequinum*)	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. Current vulnerabilities: • within the roost, the bats are vulnerable to disturbance at critical times, structural alteration and changes in the characteristic ventilation patterns; • impacts on features outside of the designated site which the bats depend on, such as intermediate roosts, foraging grounds and hedgerows/tree belts used as commuting routes. Impacts on these features can affect the integrity of the site. The human use of the mine systems are regulated by the Forest Enterprise in consultation with Natural England, including: • Site Management Statements for working mines to conserve bat populations; and • the promotion of Cave Conservation Plans to maintain and enhance the underground environment for bats.	X	✓ Atmospheric deposition of nitrogen on woodland.	✓ Disturbance to roosts or commuting/ foraging habitat. Any loss of woodland.
River Wye SAC	Watercourses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. Current vulnerabilities: • water quality impacts arising from changing	✓ Pollution from run-off.	✓ Atmospheric deposition of nitrogen on mire habitats.	X

Site	Summary of Qualifying Features	Summary of Current Vulnerabilities / Conservation Objectives and Key Environmental Conditions to Support Site Integrity	Key Site Sensitivities from General Waste Facility Impacts		
			Water Pollution	Air Pollution	Disturbance
	Transition mires and quaking bogs White-clawed crayfish Sea lamprey Brook lamprey River lamprey Twaite shad Atlantic salmon Bullhead Otter Allis shad	agricultural land-use within the catchment; • water quality impacts from synthetic sheep-dips and point-source discharges within the catchment; • loss of riparian habitat as a result of changes in agricultural land-use, riverside development and the loss of alder through disease; • fishing trawler activities implicated in the decline of salmon; • increased demand for abstraction from the river this is being addressed through the Environment Agency's Catchment Abstraction Management Strategy as well as the Review of Consents process; and • increasing recreational pressure. Management includes: • targeted agri-environment schemes and improvements in compliance with agricultural Codes of Practice; • review of sewage treatment works process in the catchment; • production of a joint Natural England /Environment Agency/Countryside Council for Wales conservation strategy for the river.			
Wye Valley Woodlands SAC	Beech forests (*Asperulo-Fagetum*) *Tilio-Acerion* forests of slopes, screes and ravines *Taxus baccata* woods of the British Isles Lesser horseshoe bat	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. Current vulnerabilities: • lack of traditional management eg coppice; • increasing deer numbers; and • inappropriate management proposals which would alter the woodland stand types.	X	✓ Atmospheric deposition of nitrogen on woodland.	X

Site	Summary of Qualifying Features	Summary of Current Vulnerabilities / Conservation Objectives and Key Environmental Conditions to Support Site Integrity	Key Site Sensitivities from General Waste Facility Impacts		
			Water Pollution	Air Pollution	Disturbance
	(*Rhinolophus hipposideros)*	Positive management is being promoted through management plans (CCW), Site Management Statements (Natural England) and encouragement of Woodland Grant Schemes to return some woods to active management.			
North Meadow & Clattinger Farm SAC	Lowland hay meadows *Alopecurus pratensis*, *Sanguisorba officinalis*	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. Current vulnerabilities: • decrease in traditional management ie hay-cutting and seasonal cattle grazing, which is uneconomic in the current agricultural climate; and • adjacent extraction and renovation of gravel workings are a potential threat to water levels. Management includes: • Site management plans are being developed to secure the long-term maintenance of the hay meadows; and • extractions and renovation of gravel workings are subject to monitoring and mitigation measures.	✓ Pollution from run-off or change in groundwater levels or water movements.	✓ Atmospheric deposition of nitrogen on grassland - nutrient enrichment.	X
Cotswold Beechwoods SAC	Beech forests *Asperulo-Fagetum* Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia)*	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. Current management: No loss of ancient semi-natural stands. At least current area of recent semi-natural stands maintained, although their location may alter. No loss of ancient woodland	✓ Pollution from run-off or change in groundwater levels or water movements.	✓ Atmospheric deposition of nitrogen on beech woodland.	X

Site	Summary of Qualifying Features	Summary of Current Vulnerabilities / Conservation Objectives and Key Environmental Conditions to Support Site Integrity	Key Site Sensitivities from General Waste Facility Impacts		
			Water Pollution	Air Pollution	Disturbance
		• No reduction in area and any consequent fragmentation without prior consent • a variety of silvicultural practices to maintain the woodland eg selective forestry, group fellings and small-scale coppicing; • age class and structural diversity enhanced through sympathetic Woodland Grant Schemes; and • early removal of planted conifers and other non-native species is encouraged in areas where planting occurred in the 1970's.			
Bredon Hill SAC	Violet click beetle (*Limoniscus violaceus*)	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. Current vulnerabilities: • the lack of a replacement generation of trees for the relatively small number of ancient trees that support the violet click beetle (many younger trees have been removed to increase stock grazing areas). Management agreements are being used to preserve existing tree stocks and to provide replacement planting.	✓ Pollution from run-off or change in groundwater levels or water movements. - Old ash trees like damp soil conditions. Site would be affected if waste site resulted in contamination of the soil water.	✓ Atmospheric deposition of nitrogen on woodland.	X
Walmore Common SPA and Ramsar	Supports internationally important numbers of wintering Bewick's swan (*Cygnus columbianus bewickii*)	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. Current management: • a water level management plan is being prepared to ensure appropriate conditions are	✓ Pollution from run-off or change in groundwater levels or water movements.	✓ Atmospheric deposition of nitrogen on grazing marsh.	✓

Site	Summary of Qualifying Features	Summary of Current Vulnerabilities / Conservation Objectives and Key Environmental Conditions to Support Site Integrity	Key Site Sensitivities from General Waste Facility Impacts		
			Water Pollution	Air Pollution	Disturbance
		retained for the wintering bird interest; • the marsh grassland and ditches will be maintained and enhanced by maintaining high water levels from spring to autumn; • the nearby Timber Preservation plant has contingency plans in the event of accidental spillage.			
Severn Estuary SAC, SPA and Ramsar	SAC: Estuaries Subtidal sandbanks Intertidal mudflats and sandflats Atlantic salt meadows Reefs River lamprey Sea lamprey Twaite shad SPA/Ramsar: Internationally important populations of wintering and migratory waterfowl and waders.	Current vulnerabilities: • large scale interference, including human actions, such as land-claim, aggregate extraction/dredging, physical development, eutrophication and recreational disturbance. Management: • vulnerabilities addressed through existing control measures, including Severn Estuary Strategy and other management schemes. The conservation objectives for the Severn Estuary SAC are to maintain the qualifying features in favourable condition, based on a set of conditions relevant to each features.	✓ Pollution from run-off.	✓ Atmospheric deposition of nitrogen on saltmarsh.	✓ Disturbance of populations of qualifying bird species using the foreshore and any inland areas.
Avon Gorge Woodlands SAC	*Tilio-Acerion* forests of slopes, screes and ravines Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia)*	Specific conservation objectives are not currently available but these should clearly relate to the protection of the qualifying features and supporting site integrity. There are no significant threats to the *Annex I* habitats on this site. Current vulnerabilities: • the presence of non-native trees needs to be	X	✓ Atmospheric deposition of nitrogen on woodland and calcareous grassland.	X

Site	Summary of Qualifying Features	Summary of Current Vulnerabilities / Conservation Objectives and Key Environmental Conditions to Support Site Integrity	Key Site Sensitivities from General Waste Facility Impacts		
			Water Pollution	Air Pollution	Disturbance
		assessed; and • scrub invasion and non-native species (Rosy and Keeled Garlic) on calcareous grasslands is a problem. Current management: • through Site Management Statements; • scrub invasion and non-native species are being addressed through the Avon Gorge and Downs Wildlife Project.			

3 PROPOSED WASTE SITES AND PROXIMITY TO EUROPEAN SITES

GCC has identified 13 proposed waste sites for the potential future development of waste facilities within the WCS Site Options consultation (October to November 2009). Of these waste sites, ten are strategic sites and three are proposed for supporting or smaller facilities. The locations of these sites are shown in *Figure 3.1* (1). Further details on the 13 waste sites are included in the GCC screening and baseline reports.

GCC has defined sites as 'strategic' through the site appraisal work where they are larger than 2 hectares (ha) and have the potential to process at least 50 kilo tonnes of waste per annum (ktpa).

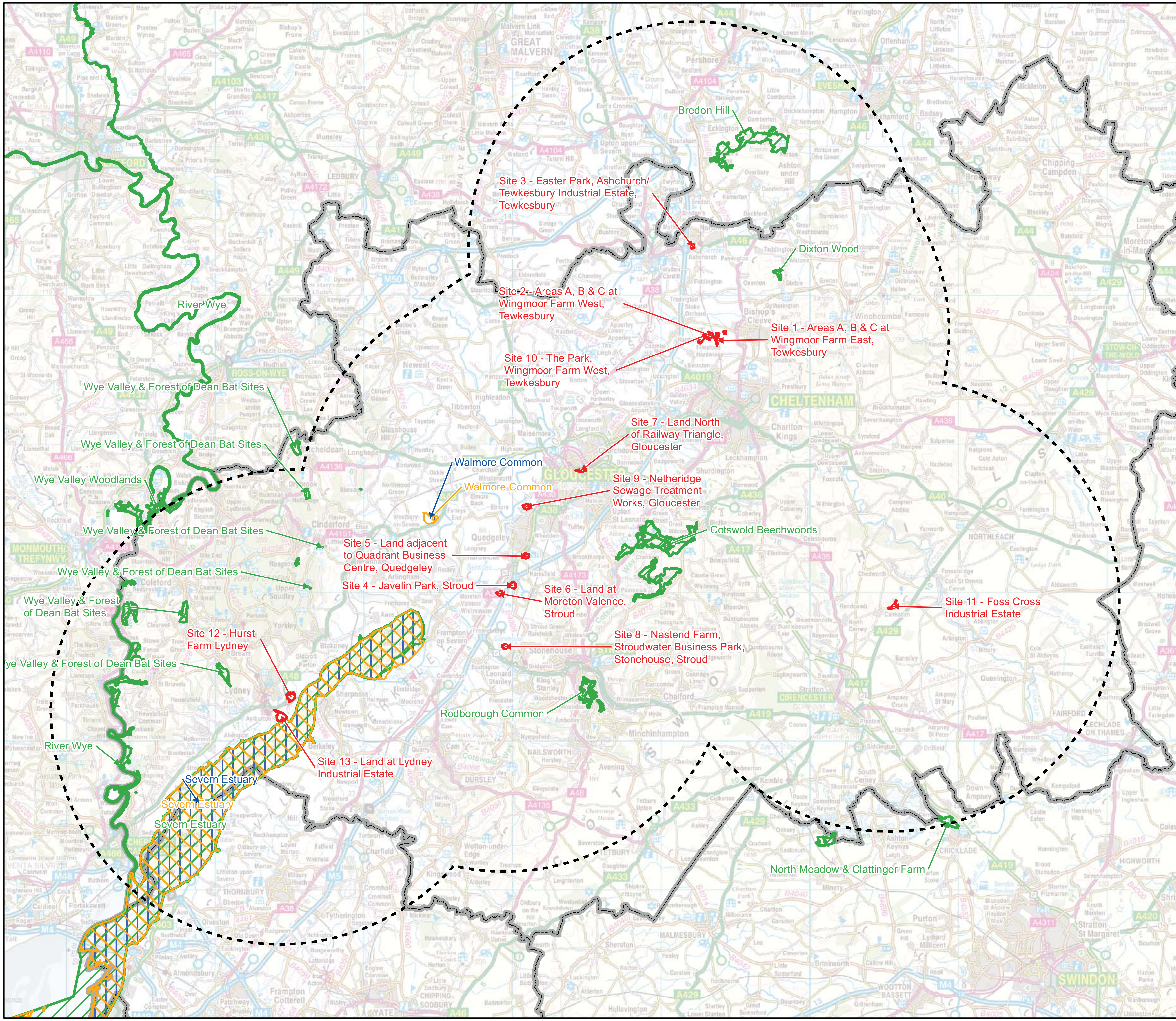
Table3.1 shows the approximate distances between each of the waste sites and European sites within 15 km.

Table 3.1 Distance between the Waste Sites and the European Sites

Waste Sites	European Sites within 15 km	Approx Distance
1 Areas A, B & C at Wingmoor Farm East, Tewkesbury	Dixton Wood Bredon Hill Cotswolds Beechwoods	5.2 km 10.4 km 11.8 km
2 Areas A, B & C at Wingmoor Farm West, Tewkesbury	Dixton Wood Bredon Hill Cotswolds Beechwoods	5.8 km 10.4 km 11.6 km
3 Easter Park, Ashchurch/ Tewkesbury Industrial Estate, Tewkesbury	Bredon Hill Dixton Wood	5.5 km 5.6 km
4 Javelin Park, Stroud	Severn Estuary Walmore Common Cotswold Beechwoods Rodborough Common Wye Valley and Forest of Dean Bat sites	6.3 km 6.7 km 7.1 km 7.6 km 12.4 km
5 Land adjacent to Quadrant Business Centre, Quedgeley	Cotswold Beechwoods Walmore Common Severn Estuary Rodborough Common Wye Valley and Forest of Dean Bat sites	6.0 km 6.3 km 8.0 km 8.9 km 12.9 km
6 Land at Moreton Valence, Stroud	Severn Estuary Walmore Common Rodborough Common Cotswold Beechwoods Wye Valley and Forest of Dean Bat sites	5.3 km 6.3 km 7.6 km 8.0 km 12.2 km

(1) Sites 11, 12 and 13 were referenced 1a, 2a and 3a in the GCC HRA Screening report (October 2009).

Waste Sites	European Sites within 15 km	Approx Distance
7 Land north of Railway Triangle, Gloucester	Cotswold Beechwoods	5.4 km
	Walmore Common	9.8 km
	Rodborough Common	13.6 km
	Wye Valley and Forest of Dean Bat sites	14.4 km
8 Nastend Farm, Stroudwater Business Park, Stonehouse, Stroud	Severn Estuary	5.3 km
	Rodborough Common	5.6 km
	Cotswolds Beechwoods	8.9 km
	Walmore Common	9.4 km
	Wye Valley and Forest of Dean Bat sites	12.7 km
9 Netheridge Sewage Treatment Works, Gloucester	Walmore Common	5.7 km
	Cotswold Beechwoods	6.7 km
	Severn Estuary	10 km
	Rodborough Common	11.6 km
	Wye Valley and Forest of Dean Bat sites	10.4 km
10 The Park, Wingmoor Farm West, Tewkesbury	Dixton Wood	5.9 km
	Bredon Hill	10.4 km
	Cotswolds Beechwoods	11.6 km
11 Foss Cross Industrial Estate, Calmsden	Cotswold Beechwoods	13.4 km
	North Meadow and Clattinger Farm	14.4km
12 Hurst Farm, Lydney	Severn Estuary	0.3 km
	Wye Valley & Forest of Dean Bat Sites	3.8 km
	Wye Valley Woodlands	9.5 km
	River Wye	10.6 km
	Walmore Common	14.2 km
13 Land at Lydney Industrial Estate, Lydney	Severn Estuary	0.2 km
	Wye Valley & Forest of Dean Bat Sites	3.3 km
	Wye Valley Woodlands	8.7 km
	River Wye	10.0 km



KEY:

- Consultation Site
- 15km Buffer of Consultation Site
- Special Protection Area
- Special Area of Conservation
- RAMSAR
- Authority Boundary

TITLE:

Figure 3.1 Location of Waste Sites and European Sites

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DRAWING: DesignatedSites.mxd			REV: 0

ERM
Eaton House
Wallbrook Court
North Hinksey Lane
Oxford, OX2 0QS
Tel: 01865 384800
Fax: 01865 384848

ERM

PROJECTION: British National Grid

File: 0114924Gloucester\HRA\GIS_IG_BS\Maps\DesignatedSites.mxd

4 *SCOPING FOR POTENTIAL SIGNIFICANT EFFECTS ON EUROPEAN SITES*

4.1 *INTRODUCTION*

This chapter draws on the findings of the GCC screening assessment (1) and scopes the generic potential impacts associated with the development of different waste facilities to determine potential significant effects on European sites within the Study Area from the 13 waste sites.

The identification of potential significant effects draws on the known sensitivities of the European sites (see *Table 2.1*), the types of impacts generated by the development of different waste facility types (see *Section 4.2* and *Annex A*), and the connecting pathways between the two.

Where potential likely effects are scoped out, relevant guidance is referenced in support of these conclusions. The potential significant effects requiring further screening to determine whether they are likely to occur are summarised in *Table 4.3*.

4.2 *WASTE FACILITY DEVELOPMENT IMPACTS*

Natural England's consultation response to the GCC screening assessment report (October 2009) identified the need for a more detailed consideration of facility types, and particularly the potential operational impacts on European sites which may arise from these facilities.

The waste facility types which have been considered for development through the WCS are listed in *Annex A (see Section A1.1)*.

A summary of the potential impacts which can result from the range of waste facilities being considered is given in *Table 4.1*.

Table 4.1 Summary of Potential Impacts and Effects on European sites from the Development of Waste Facilities

Potential Impact	Facility Type	Potential Effect	Development Phase
Land take	All	Loss of habitat.	Construction
Air Pollution			
Stack emissions	Thermal treatment, MBT	Direct pollution of habitats and any indirect effects on qualifying species.	Operation

(1) Gloucestershire County Council (2009). Habitats Regulations Assessment (HRA) Screening Report for WCS Site Options. Part 2 - Screening Task B. The report can be read at http://www.gloucestershire.gov.uk/index.cfm?articleid=19453.

Potential Impact	Facility Type	Potential Effect	Development Phase
Traffic emissions	All	Pollution of habitats and any indirect effects on qualifying species.	Construction and operation
Bio-aerosols	MBT	Emissions contribute to climate change causing successional change to habitats and species.	Operation
Dust	All	Smothering of leaves, chemical toxicity of deposited dusts and changes in soil chemistry affecting sensitive flora. Degradation if flora adversely affecting qualifying species. (1)	Construction
Water Pollution			
Ground water	All	Pollution of watercourses from pollutants soaking into groundwater and damaging habitats and indirect effects on qualifying species.	Construction / operation
Surface waters	All	Surface water run-off carrying pollutants (diesel, oil, paint, solvents, cleaners, other harmful chemicals and construction debris and dirt) and damaging habitats and any direct or indirect effects on qualifying species.	Construction / operation
Abstraction	All	Abstraction affecting hydrological regime of habitat and resulting change in habitat communities and indirect effects on species.	Operation
Disturbance			
Noise, visual, human presence	All	Direct disturbance of species sensitive to disturbance effects.	Construction and operation

The impact types listed in *Table 4.1* are discussed below and potential links or potential significant effects between the waste sites and European sites are identified or scoped out.

4.2.1 *Land Take*

None of the waste sites will result in any direct land take from within a European site and therefore this potential impact is ruled out of the assessment.

4.2.2 *Air Pollution*

Stack Emissions

The development of a thermal treatment facility or MBT facility has the potential to affect European sites through air pollution and therefore further consideration is required.

In terms of thermal treatment technologies, an EfW facility is considered to be the worst-case emission source, from an air pollution perspective. This is because during combustion of the handled waste, air pollutants that have an

(1) Source Air Pollution Information System APIS website. www.apis.ac.uk.

impact on ecology (eg NO_X, SO_2, and NH_3) will be emitted as a result of the combustion process, and the emission of the flue gas through a stack (ie a point source) has the potential to result in impacts further afield through dispersion.

In comparison MBT facilities involve no combustion of the actual waste. Instead methane from bio-degradation of the waste is the main pollutant which whilst a potent greenhouse gas does not result in the direct deposition of pollutants on habitats. Any emissions from such facilities are considered to have localised impacts only within a maximum distance of a few hundred metres or so of the facility, and much less with standard mitigation to reduce emissions. The dispersion is minimal as emissions are not generally emitted via point sources. Given that waste site 13 is the closest at 200 m, when considering the above, it is considered unlikely that there would be any potential effects from air pollution arising from an MBT facility. Therefore air pollution impacts from non-combustion related waste facilities are ruled out of the assessment.

Autoclave is an intermediary technology designed to render waste biologically inert, clean metals (ie strip paint), and compact some plastics to aid recycling. However, autoclave achieves only a limited reduction in total waste arisings, and therefore there would still be a need for further treatment such as thermal treatment to process the arisings. The process utilises steam, and therefore there the main emissions associated with autoclave plants are oxides of nitrogen associated with the combustion of fuel (typically gas) in order to raise steam; there are also potentially important emissions of volatile organic compounds. As the technology is likely to be a small element in the waste management chain, and does not remove the need for larger scale final disposal, autoclave was not considered an option in its own right, and it is anticipated that use of autoclave would only be as an integrated element of a large scheme, and would therefore contribute to only a modest increases in overall emissions, if indeed there are any increases in emissions at all.

The Environment Agency has produced guidance (1) for their review of consents work relating to emitting facilities and consideration of potential significant effects on European sites arising from air pollution (*Box 4.1*). This guidance was also considered in the GCC screening assessment. The guidance provides a minimum distance over which different scales of facilities should be considered in terms of potential significant effects on European sites.

(1) Work Instruction: (Appendix 7) – Stage 1 & 2 Assessment of New Integrated Pollution Control (IPC), Pollution Prevention and Control (PPC) Permissions under the Habitats Regulations, Version 6, October 2006, Environment Agency.

Box 4.1 *Environment Agency Guidance*

Emissions to air may have effects over both long and short ranges. For short-range effects of IPC/PPC permissions the following criteria should be used to identify applications that are relevant and require a Stage 2 (1) *assessment.*

- *Any application within the boundary of a European site;*
- *Any centrally dispatched coal or oil-fired power station within 15km of a European site;*
- *Any standard intensive agriculture installation (up to 10x PPC threshold) within*
- *2km of a European site;*
- *Any large intensive agriculture installation (10-20x PPC threshold) within 5km of a European site;*
- *Any very large intensive agriculture installation (>20x PPC threshold) within 10km of a European site;*
- *Any other application within 10km of a European site."*

For the purposes of this study potential effects on European sites up to 15 km from a waste site when considering the development of thermal treatment facilities have been considered as a precautionary approach. This report recognises that stack emissions can have impacts on sites over 15 km if habitats are present that are particularly sensitive to pollutants. This has been considered within the assessment and caution taken when describing the findings.

All of the 13 waste sites have European sites with sensitive habitats falling within a 15 km buffer with nearly all fall within a 10 km buffer and therefore screening assessment to determine whether potential significant effects from air pollution are likely to occur is required for all 13 waste sites (see *Section 5.2*).

Traffic Emissions

Guidance produced by the Highways Agency, Transport Scotland, Welsh Assembly Government and the Department for Regional Development Northern Ireland for *Design of Roads and Bridges – Air Quality* (May 2007) (2), states that:

'The Designated Sites that should be considered for this assessment are those for which the designated features are sensitive to air pollutants, either directly or indirectly, and which could be adversely affected by the effect of local air quality on vegetation within the following nature conservation sites: SACs, SPAs and Ramsar sites. Only designated sites within 200 m of roads affected by the project need be considered.'

(1) Stage 2 assessment within the Environment Agency guidance refers to 'assessing the likely significant effect'.

(2) Design Manual for Roads and Bridges. Volume II Environmental Assessment, Section 3 Environmental Assessment Techniques. Part 1. May 2007.

For the purposes of this assessment it has been assumed that traffic movements to and from the waste sites will use major highways which can accommodate such increased load levels. The main access routes for each of the waste sites have been reviewed on base mapping to locate any that pass within 200 m of European sites however, air pollution deposition is understood to fall away significantly within a couple of hundred metres from a road. Road access for waste site 13 is just over 200 m from the Severn Estuary and therefore it is considered unlikely that there would be potential significant effects from traffic pollution.

None of the major or busy access roads most likely to be used by transport vehicles to and from each of the other waste sites pass within 200 m of any European site. Therefore potential air pollution impacts from traffic emissions are ruled out of the assessment.

Dust

The Interim Advice Note 61/05 (Ref.16), issued by the Highways Agency discusses the potential harmful effects of air pollution, including the dust generated from construction related activities upon ecosystems and provides guidance on the effects assessment. The advice note required the locations of any designated species or habitats within 200 m of a construction site to be clearly identified and mitigation measures applied.

Dust is therefore only likely to have an adverse impact at a local level and in addition mitigation measures are likely to effectively minimise dust to an insignificant level. Mitigation measures include controlling construction dust through fine water sprays, screening the whole site to stop dust spreading, covering or dampening skips, trucks and piles of loose materials.

Site 13 is located approximately 200 m from the Severn Estuary, however it is considered that following the implementation of appropriate standard mitigation measures, the impact of dust is unlikely to have a potential significant effect on the Severn Estuary. In addition qualifying habitats along the Severn Estuary SAC are unlikely to be as sensitive to the potential effects of dust as terrestrial habitats such as grasslands. None of the further 12 waste sites occur within 200 m of European sites. Therefore potential construction dust impacts are ruled out of the assessment.

Bio-aerosols

The potential effect of bio-aerosols is usually of more concern regarding human health and typical distances for the consideration of these potential effects are around 200 m. As none of the wastes sites are closer than 200 m of a European site, the potential impact of aerosols is ruled out of the assessment.

4.2.3 *Water Pollution*

The guidance given within the NE consultation response to the GCC screening assessment suggested that direct and indirect impacts from water pollution through hydrological links require detailed consideration even for relatively distant European sites. In particular groundwater and surface water links present for example in catchments to the Severn Estuary and are located upstream of the Severn Estuary need to be considered. Furthermore potential impacts from abstraction resulting in impacts of the hydrological regime of European sites will require consideration.

Groundwater Pollution

Groundwater links were reviewed from Environment Agency interactive mapping data for aquifers and from the GCC screening and baseline reports. No groundwater links were identified between waste sites 1-11 and European sites and therefore this impact is ruled out of the assessment for these sites.

Potential groundwater links were identified between waste sites 12 and 13 and the Severn Estuary SAC / SPA / Ramsar via Secondary A Aquifers (1) through superficial deposits and Secondary A Aquifers through bedrock deposit. Therefore any polluting run-off from a waste facility development may potentially have significant effects on the Severn Estuary SAC. This potential impact therefore requires further screening assessment to determine whether potential significant effects are likely to occur for waste sites 12 and 13 (see *Section 6.3*).

Surface Water Pollution

Surface water links were identified from OS base mapping and from the GCC screening and baseline reports. No surface water links have been identified between sites 1, 2, 3, 7, 10 or 11 and European sites and therefore this impact is ruled out of the assessment for these waste sites.

The GCC screening assessment identified potential surface water pathways for water pollution impacts between waste sites 4, 5, 6, 8, 9, 12 and 13 and the Severn Estuary (see *Table 4.2*).

Table 4.2 Pollution Pathways via Surface Water Links

Waste Site	Identified Pollution Pathway Through Water	Approximate Distance	
	Surface Water Link	European Site	Distance
4	Via Beaurepair Brook / Gloucester & Sharpness Canal	Severn Estuary SAC, SPA, Ramsar	20 km

(1) http://www.environment-agency.gov.uk/homeandleisure/117020.aspx. Secondary A Aquifers were previously designated as minor aquifers.

	Identified Pollution Pathway Through Water	Approximate Distance	
5	Via Shorn Brook / Gloucester & Sharpness Canal	Severn Estuary SAC, SPA, Ramsar	20 km
6	Via un-named ditch system/Gloucester & Sharpness Canal	Severn Estuary SAC, SPA, Ramsar	17 km
8	Via ditch system/Gloucester & Sharpness Canal	Severn Estuary SAC, SPA, Ramsar	5.3 km
9	Via Gloucester & Sharpness Canal and River Severn	Severn Estuary SAC, SPA, Ramsar	22 km
12	Via Plummer's Brook	Severn Estuary SAC, SPA, Ramsar	2 km
13	Via Plummer's Brook, Lydney Canal and Harbour	Severn Estuary SAC, SPA, Ramsar	0.2 km

The GCC screening assessment noted that for a number of sites particularly 4, 5, 6 and 9, the effect of dilution over the significant distances identified would be likely to reduce potential pollution via these surface water links to an insignificant level.

In the absence of further investigation or consultation responses from the Environment Agency at that stage, and following comments from Natural England requesting further investigation into hydrological impacts, these potential effects were not scoped out. These potential impacts and relevant mitigation are considered further (see *Section 5.3*) together with the remaining waste sites 8, 12 and 13.

Abstraction

Standard control measures will ensure that abstraction will not impact the watercourses with distant links to European sites (such as the Severn Estuary). Therefore the potential impact of abstraction is ruled out of the assessment.

4.2.4 *Disturbance*

Disturbance can result from a number of different sources as follows:

- noise (construction and operation);
- visual (construction and operation) (including from work on construction sites with people, cranes, lighting, fluorescent jackets *etc)*;
- human presence (construction and operation);
- litter; and

- attracting predators (*eg* through provision of building perches for predatory birds), and pests.

The above sources of disturbance can result in impacts to wildlife, particularly birds. However the Severn Estuary SPA, which is designated for populations of migratory and wintering wildfowl, is the only European site which supports sensitive species and also lies in close proximity to waste sites (see *Tables 2.1* and *3.1*).

A literary review of human and other disturbance impacts on birds has provided an indication of disturbance distances specific to species. Typical wintering and migratory birds present along the Severn Estuary within the Lydney area include lapwing, curlew and wigeon [1].

Natural England Regulation 33 guidance document for the Severn Estuary SPA is also used as a basis for the assessment. In summary, disturbance distances are dependent on the species and a range of factors associated with the setting of the site. In general disturbance distances typically ranged between 100 m to 400 m, with 500 m being mentioned in one paper.

In addition, given that disturbance distances range within the literature, and to consider worst case scenarios, the following Environment Agency Guidance [2] has been used to select waste sites for consideration of potential disturbance effects.

Box 4.2 Environment Agency Guidance

For all other waste management activities [3] these should be assessed for potential impact where:

'The location of the facility falls within 1 km of a European site,…'

Given the suggested disturbance distances provided within the literature are well within the 1 km distance suggested by the Environment Agency guidance, it is concluded that the consideration of waste sites within 1 km of a European provides an adequate precautionary approach.

Waste sites 1-11 occur over 1 km from European sites and therefore disturbance impacts are scoped out for these sites.

Sites 12 and 13 are sites located within 1 km of a European site (the Severn Estuary) and will therefore require further consideration of potential disturbance impacts (see *Section 5.4*).

(1) Information Source: BTO WeBS (Wetland Bird Survey) Low Tide Count data for the winter 2008/2009 for Severn Estuary.
(2) Habitats Directive: Work Instruction (Appendix 6). Further Guidance applying the Habitats Regulations to Waste Management Facilities.
(3) Assumed as excluding thermal treatment facilities for this study.

4.3 POTENTIAL SIGNIFICANT EFFECTS

The findings of the GCC screening assessment identified one waste site, site 11 with no potential significant effects on European sites. It is now considered however that air pollution could potentially result in a significant effect on the Cotswold Beechwoods SAC and therefore this site requires further assessment.

Table 4.3 summarises the potential significant effects on European sites identified for each waste site. Each of these potential effects will require further detailed assessment to determine whether they are likely to occur.

The methodologies for the further screening assessment to determine the likelihood of potential significant effects are described in *Chapter 5*.

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Table 4.3 Summary of Potential Significant Effects

Waste Site	Identified Potential Significant Effect on European Sites	Key Facility Type (Source of Potential Significant Effect) See *Annex A*
1 Areas A, B & C at Wingmoor Farm East, Tewkesbury	Air pollution: • Dixton Wood • Bredon Hill • Cotswold Beechwoods	Air Pollution: • Thermal treatment • MBT • Autoclave
2 Areas A, B & C at Wingmoor Farm West, Tewkesbury	Air pollution: • Dixton Wood • Bredon Hill • Cotswold Beechwoods	Air Pollution: • Thermal treatment • MBT • Autoclave
3 Easter Park, Ashchurch/ Tewkesbury Industrial Estate, Tewkesbury	Air pollution: • Bredon Hill • Dixton Wood	Air Pollution: • Thermal treatment • MBT • Autoclave
4 Javelin Park, Stroud	Air pollution: • Severn Estuary • Walmore Common • Cotswold Beechwoods • Rodborough Common Water pollution: • Severn Estuary	Air Pollution: • Thermal treatment • MBT • Autoclave Water pollution: • All
5 Land adjacent to Quadrant Business Centre, Quedgeley	Air pollution: • Severn Estuary • Walmore Common • Cotswold Beechwoods • Rodborough Common Water pollution: • Severn Estuary	Air Pollution: • Thermal treatment • MBT • Autoclave Water pollution: • All

Waste Site	Identified Potential Significant Effect on European Sites	Key Facility Type (Source of Potential Significant Effect) See *Annex A*
6 Land at Moreton Valence, Stroud	Air pollution: • Severn Estuary • Walmore Common • Cotswold Beechwoods • Rodborough Common Water pollution: • Severn Estuary	Air Pollution: • Thermal treatment • MBT • Autoclave Water pollution: • All
7 Land north of Railway Triangle, Gloucester	Air pollution: • Cotswold Beechwoods • Walmore Common	Air Pollution: • Thermal treatment • MBT • Autoclave Water pollution: • All
8 Nastend Farm, Stroudwater Business Park, Stonehouse, Stroud	Air pollution: • Rodborough Common • Severn Estuary • Cotswold Beechwoods • Walmore Common Water pollution: • Severn Estuary	Air Pollution: • Thermal treatment • MBT • Autoclave Water pollution: • All
9 Netheridge Sewage Treatment Works, Gloucester	Air pollution: • Walmore common • Cotswold Beechwoods • Rodborough Common • Severn Estuary Water pollution: • Severn Estuary	Air Pollution: • Thermal treatment • MBT • Autoclave Water pollution: • All

Waste Site	Identified Potential Significant Effect on European Sites	Key Facility Type (Source of Potential Significant Effect) See *Annex A*
10 The Park, Wingmoor Farm West, Tewkesbury	Air pollution: • Dixton Wood • Bredon Hill • Cotswold Beechwoods	Air Pollution: • Thermal treatment • MBT • Autoclave
11 Foss Cross Industrial Estate, Calmsden	Air pollution [(1)] • Cotswold Beechwoods	Air Pollution: • Thermal treatment • MBT • Autoclave
12 Hurst Farm, Lydney	Air pollution: • Severn Estuary • Wye Valley and Forest of Dean Bat Sites • Wye Valley Woodland • River Wye Water pollution: • Severn Estuary Bird disturbance[(2)] • Severn Estuary	All

(1) This site has been included in the assessment of air pollution following the precautionary principle and due to the sensitivity of European sites within the region.
(2) Previously identified as a through land impact pathway.

Waste Site	Identified Potential Significant Effect on European Sites	Key Facility Type (Source of Potential Significant Effect) See *Annex A*
13 Land at Lydney Industrial Estate, Lydney	Air pollution: • Severn Estuary • Wye Valley and Forest of Dean Bat Sites • Wye Valley Woodland • River Wye Water pollution: • Severn Estuary Bird disturbance[(1)] • Severn Estuary [(2)]	All

(1) Previously identified as a through land impact pathway.

(2) As above.

5 SCREENING FOR POTENTIAL LIKELY SIGNIFICANT EFFECTS AND APPROPRIATE ASSESSMENT METHODOLOGY

5.1 INTRODUCTION

This chapter describes the approach to the screening assessment to determine the final list of potential likely significant effects and inform the scope of any necessary AA. The screening assessment and findings are detailed in *Chapter 6*.

The screening assessment focuses on the impact pathways identified in *Chapter 4* which are summarised as follows:

- **air pollution** from the stacks of thermal treatment facilities which could affect sensitive habitats and species;
- **water pollution** arising through groundwater or surface water connections to a European site; and
- **bird disturbance** due to the construction of facilities which could affect sensitive species and in particular populations of coastal birds. Impacts will be dependent on proximity to the site.

The following sections provide a brief description of the methodology followed and guidance used to assess the likely significance of the identified potential effects on the European sites in the study area.

5.2 AIR POLLUTION

5.2.1 Stack Emissions

The potential likely significance of identified potential air pollution effects is assessed for all 13 waste sites.

Full details of the methodology used, based on Environment Agency guidance (1) are described in *Annex B*. The full list of model runs including throughput capacity, stack height and APIS habitat type used are summarised in *Table 5.1*.

All 13 waste sites were initially modelled using AERMOD. In order to provide a comparison and because the two models deal with the influence of terrain differently, ADMS was used on six sites selected by WPA. These six waste sites were chosen for further modelling because, we have been advised

(1) Work Instruction: (Appendix 7) – Stage 1 & 2 Assessment of New Integrated Pollution Control (IPC), Pollution Prevention and Control (PPC) Permissions under the Habitats Regulations, Version 6, October 2006, Environment Agency.

that based on deliverability and planning considerations, these sites were the most likely to be included in the Publication WCS.

The methodology appropriate to each model is set out in *Annex B*. ADMS was only modelled at 80 m stack as altering the capacity of each facility was considered to be of greater interest for the WCS.

Modelling Parameters

Given the type of facility that will be selected for each location is unknown, the air quality assessment assumes a generic Energy from Waste (EfW) thermal treatment facility as regulated by the Waste Incineration Directive (WID). This is regarded as a facility with the highest expected air emissions.

The Environment Agency and recent published assessments were consulted to generate the most suitable parameters for the generic facility [(1)]. *Table 5.1* contains details of all modelling runs carried out. All the runs included in *Table 5.1* were carried out using AERMOD with ADMS runs marked with an asterisk.

Parameters for the generic facility were firstly set with a throughput at the maximum potential capacity as advised by GCC for each waste site and incrementally reduced where potential significant effects could not be ruled out. In addition, stack heights were incrementally increased (see *Annex B*). This approach has allowed some indication to be given as to the scale of thermal treatment facility that is potentially suitable for development at each of the waste sites in terms of potential air pollution effects.

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(1) Emails between ERM and Alistair Wintle at the Environment Agency dated 29.09.2008 and various phone calls.

Table 5.1 Air Dispersion Modelling Scenarios for Generic Waste Facilities

Waste Sites	Parameters Modelled		European Site	APIS [1] Habitat Designation
	Capacity (ktpa)	Stack Height (m)		
1*	400 ktpa* 200 ktpa* 100 ktpa*	80*, 90, 100 80*, 90, 100 80*, 100	• Dixton Wood (5.2 km)*	• Ash woodland*
2*	400 ktpa* 200 ktpa* 100 ktpa*	80*, 90, 100 80*, 90, 100 80*, 100	• Dixton Wood (5.8 km)*	• Ash woodland*
3	400 ktpa 200 ktpa 100 ktpa	80, 90, 100 80, 90, 100 80, 100	• Bredon Hill (5.5 km) • Dixton Wood (5.6 km)	• Ash woodland
4*	400 ktpa* 200 ktpa* 100 ktpa*	80*, 90, 100 80*, 90, 100 80*, 100	• Severn Estuary (6.3 km) • Walmore Common (6.7 km) • Cotswold Beechwoods (7.1 km)* • Rodborough Common (7.6 km)	• Saltmarsh • Grazing marsh • Beech woodland* • Calcareous grassland
5	400 ktpa 200 ktpa 100 ktpa	80, 90, 100 80, 90, 100 80, 100	• Cotswold Beechwoods (6.0 km) • Walmore Common (6.3 km) • Severn Estuary (8.0 km) • Rodborough Common (8.9 km)	• Saltmarsh • Grazing marsh • Beech woodland • Calcareous grassland
6*	400 ktpa* 200 ktpa* 100 ktpa*	80*, 90, 100 80, 90, 100 80*, 100	• Severn Estuary (5.3 km) • Walmore Common (6.3 km) • Cotswold Beechwoods (8.0 km)* • Rodborough Common (7.9 km)	• Saltmarsh • Grazing marsh • Beech woodland* • Calcareous grassland
7*	400 ktpa* 200 ktpa* 100 ktpa*	80*, 90, 100 80*, 90, 100 80*, 100	• Cotswold Beechwoods (5.4 km)* • Walmore Common (9.8 km)	• Grazing marsh • Beech woodland*
8*	400 ktpa*	80*, 90, 100	• Severn Estuary (5.3 km)	• Saltmarsh

(1) www.apis.ac.uk

	Parameters Modelled			
	200 ktpa*	80*, 90, 100		
	100 ktpa*	80*, 100		
9	400 ktpa 200 ktpa 100 ktpa	80, 90, 100 80, 90, 100 80, 100	• Walmore Common (5.7 km) • Cotswold Beechwoods (6.7 km) • Severn Estuary (10 km)	• Saltmarsh • Grazing marsh • Beech woodland
10*	400 ktpa* 200 ktpa* 100 ktpa*	80*, 90, 100 80*, 90, 100 80*, 100	• Dixton Wood (5.9 km)*	• Ash woodland*
11	100 ktpa 50 ktpa	80, 90, 100 80, 100	• Cotswold Beechwoods (14 km)	• Beech woodland
12	100 ktpa 50 ktpa	80, 90, 100 80, 100	• Severn Estuary (0.3 km) • Wye Valley & Forest of Dean Bats (3.8 km) • Wye Valley Woodlands (9.5 km)	• Saltmarsh • Beech woodland • Ash woodland
13	100 ktpa 50 ktpa	80, 90, 100 80, 100	• Severn Estuary (0.2 km) • Wye Valley & Forest of Dean Bats (3.3 km) • Wye Valley Woodlands (8.7 km)	• Saltmarsh • Beech woodland • Ash woodland

* These scenarios were run using AERMOD and ADMS

5.3 *WATER POLLUTION*

The potential likely significance of identified potential surface water pollution effects is assessed for waste sites 4, 5, 6, 8, 9, 12 and 13. In addition, the likely significance of identified potential ground water pollution effects is assessed for waste sites 12 and 13.

The surface water links are identified and discussed in *Section 6.2* in terms of proximity to the European sites and potential dilution effects. Ground water links are also identified and mapped.

Standard development control and mitigation measures are discussed together with protection policy are discussed in *Section 6.3*.

A summary of targeted mitigation measures are then discussed for specific sites where standard development control is considered insufficient to rule out potential significant effects.

5.4 *BIRD DISTURBANCE*

Annex C presents the appropriate assessment of disturbance impacts relating to qualifying birds at the Severn Estuary SPA and Ramsar for waste sites 12 and 13. The appropriate assessment is focussed on and limited to the Conservation Objectives for the SPA / Ramsar and determines whether the development of a facility on waste sites 12 or 13 will have potential significant effects and where identified, whether the potential significant effect would have an adverse effect on the integrity of the designated site. The assessment approach is set out as follows:

- a review of relevant Severn Estuary SPA and Ramsar qualifying interest features and Conservation Objectives (*Section D1.2*);
- a review of the baseline conditions including qualifying bird species near Lydney (the location of waste sites 12 and 13), and the key habitats in the area used by bird species (*Section D1.3*);
- the identification of likely sources of disturbance impacts to birds which may result from development at waste sites 12 and 13 (*Section D1.4*);
- an assessment of the likely impacts (*Section D1.5*); and
- a consideration of possible mitigation measures (*Section D1.6*).

The assessment has assumed that any development on waste sites 12 and 13 will include standard (and accepted) measures to control and mitigate impacts arising from activities likely to result in general disturbance to wildlife during construction and operation.

6 SCREENING FOR POTENTIAL LIKELY SIGNIFICANT EFFECTS AND APPROPRIATE ASSESSMENT

6.1 INTRODUCTION

This chapter sets out the findings of the screening assessment and further appropriate assessment which includes consideration of detailed and targeted mitigation measures. A detailed discussion of the limitations of this strategic study, assumptions and issues inherent in the various assessment methodologies are also presented and should be considered carefully when interpreting the findings in terms of deliverance of the WCS.

6.2 AIR POLLUTION

6.2.1 Summary of Findings

The air dispersion modelling assessment (*Annex B*) has shown that if the development of a thermal treatment facility was considered at the generic parameters used, potential significant effects on European sites cannot be ruled out at this stage for certain waste sites when using both the AERMOD and ADMS models.

Tables 6.1, *6.2* and *6.3* summarise the results of the air dispersion modelling for both AERMOD and ADMS where a question mark indicates it has not been possible at this stage to rule out potential significant effects from stack emissions and a tick indicates potential significant effects can be ruled out at this stage.

It should be noted that a question mark does not preclude the development of the facilities indicated however it does suggest that further assessment would be required at the planning application stage to demonstrate no potential significant effects. For example, if development of a thermal treatment facility was pursued in the future at such waste sites, further assessment would be required to incorporate more specific plant design parameters such as (but not limited to) abatement measures, specific exhaust characteristics and building downwash effects (mitigation measures are discussed further in *Section 6.2.2*).

The development of thermal treatment facilities at the following waste sites is not considered likely to give rise to potential significant effects alone or in-combination with background levels(1) on European sites, using the current model assumptions shown at WID limits:

(1) See *Annex B* for an explanation of background levels.

AERMOD

- Waste site 7, with 200 ktpa waste throughput and stack height of 100 m; and
- Waste site 11, with 100 ktpa waste throughput and stack height of 80m.

ADMS

- Waste site 7, with 400 ktpa waste throughput and stack height of 80 m;
- Waste sites 1, 2, 6, 7 and 10, with 200 ktpa waste throughput and stack height of 80 m; and
- Waste site 1, 2, 4, 6, 7, 8 and 10 with 100 ktpa waste throughput and stack height of 80 m.

Table 6.1 ***Summary of Air Dispersion Modelling Results AERMOD***

Waste Sites	400 ktpa Thermal Treatment Facility			200 ktpa Thermal Treatment Facility			100 ktpa Thermal Treatment Facility		
	80 m Stack Height	90 m Stack Height	100 m Stack Height	80 m Stack Height	90 m Stack Height	100 m Stack Height	80 m Stack Height	90 m Stack Height (1)	100 m Stack Height
1	?	?	?	?	?	?	?	N/A	?
2	?	?	?	?	?	?	?	N/A	?
3	?	?	?	?	?	?	?	N/A	?
4	?	?	?	?	?	?	?	N/A	?
5	?	?	?	?	?	?	?	N/A	?
6	?	?	?	?	?	?	?	N/A	?
7	?	?	?	?	?	✓	✓	N/A	✓
8	?	?	?	?	?	?	?	N/A	?
9	?	?	?	?	?	?	?	N/A	?
10	?	?	?	?	?	?	?	N/A	?

Table 6.2 ***Summary of Air Dispersion Modelling Results for Waste Sites 11-13 AERMOD***

Waste Sites	100 ktpa Thermal Treatment Facility			50 ktpa Thermal Treatment Facility		
	80 m Stack Height	90 m Stack Height	100 m Stack Height	80 m Stack Height	90 m Stack Height (2)	100 m Stack Height
11	✓	✓	✓	✓	N/A	✓
12	?	?	?	?	N/A	?
13	?	?	?	?	N/A	?

(1) The Air Dispersion Modelling (*Annex C*) did not model sites at 100 ktpa, 90 m stack height as results at 100 m stack height had already indicated the outcome

(2) The Air Dispersion Modelling (*Annex C*) did not model sites at 50 ktpa, 90 m stack height as results at 100 m stack height had already indicated the outcome.

Table 6.3 Summary of Air Dispersion Modelling Results for ADMS

Waste Sites	400 ktpa Facility / 80 m Stack Height	200 ktpa Facility / 80 m Stack Height	100 ktpa Facility / 80 m Stack Height
1	?	✓	✓
2	?	✓	✓
4	?	?	✓
6	?	✓	✓
7	✓	✓	✓
8	?	?	✓
10	?	✓	✓

✓ Not likely to give rise to a significant effect alone or in-combination.
? Cannot conclude no likely significant effect (based on assessment findings).

6.2.2 *Consideration of Use of Conservative Modelling Parameters*

It is noted that the emissions have been modelled at the WID limits, which is the maximum allowable emissions under UK law. In reality, most thermal treatment facilities (EfW plants) emit at much lower emissions rates for many pollutants.

In addition the application of mitigation measures is standard practice to reduce pollutant emission rates (*eg* using selective non-catalytic reduction (ammonia/ urea) for decreasing NO_X emissions) or acid gas removal systems (dry/semi-dry/wet) for decreasing SO_2 emissions). Ground level concentrations of pollutants (and acid/nitrogen deposition) can also be reduced by increased dispersion (*eg* using higher stack heights than the ones currently modelled).

The impacts will also be influenced by other mitigation factors such as building downwash and operation hours. As the level of mitigation required is project and plant specific, it is not feasible at this current strategic level waste strategy stage to evaluate each proposed site in such detail.

Therefore, using a conservative approach, it has been necessary to apply the WID emission limits in the first instance and to use the corresponding results as a basis for further work.

6.2.3 *Consideration of Habitat Critical Loads for Pollutants Modelled*

Habitat specific potential impacts are summarised in *Table 6.4* which indicate that the impact to woodlands from nitrogen are generally unclear however it is likely that the lower plant communities are more sensitive. Dixton Wood habitats are known to support lower plants and fungi which support the qualifying species (violet click beetle) however further investigation into likely impacts should be explored at the planning stage with Natural England.

In the case of certain European sites such as the Cotswold Beechwoods, Dixton Wood and Bredon Hill, the identified potential likely significant effects from stack emissions from the development of a thermal treatment facility is due to the fact that existing baseline levels are already above the habitat critical loads [1] for pollutants such as nitrogen deposition.

In such cases, because the critical loads are already so elevated, unless any facility can demonstrate an insignificant effect (defined as project-only emissions contributing to ≤1% of the critical load and <70% with background levels, see *Annex B*), it is concluded that the waste site will have a potential likely significant effect at this stage of assessment.

Therefore, more stringent mitigation measures will likely have to be applied at waste sites potentially impacting European sites with elevated baseline levels, when compared to European sites with low baseline levels.

6.2.4 Consideration of the Sensitivity of the Qualifying Features to Air Pollution

Dixton Wood SAC is discussed in terms of potential effects of air pollution on the qualifying features, however this also relates to the Cotswold Beechwoods which comprise ancient woodland habitat but do not have the violet click beetle as a qualifying feature. These two sites are considered given that these are the European sites potentially affected by air pollution within this assessment (see *Annex B*).

Dixton Wood SAC is designated an SAC due to the presence of the violet click beetle an Annex II species under EC Habitats Directive. The Conservation Objectives for Dixton Wood SAC include, subject to natural change, to maintain the Broadleaved, Mixed and Yew Woodland (UK BAP Habitat type categories) habitat in favourable condition, with no loss of ancient semi-natural stands, no loss of ancient woodland and no reduction in the number of veteran trees. The woodland itself is not the designating feature for the SAC but the notified deadwood invertebrates require woodland as a habitat at this site and suitable veteran trees to provide the deadwood.

The violet click beetle develops in the decaying wood of very large, old hollow ash tress in the (in Worcestershire/Gloucestershire border sites) (and beech trees in the Windsor Forest). Currently, the only site attributes that it is understood that the species needs are related to the abundance and condition of the ancient trees within which it develops. There are almost certainly other features important to adults for whom there is currently a lack of information, for example nectar sources and flight lines.

A number of site specific targets exist for violet click beetle within the Conservation Objects for Dixton Woods SAC including;

- maintaining the regeneration potential of the woodland,
- aim for regeneration of multiple cohorts of trees if possible, rather than single large regeneration events such that contiguous stands are

(1) As detailed on the APIS website. See Appendix C.

maintained within which the violet click beetle is likely to disperse and colonize,

- a significant proportion (ideal %age to be determined by research) of trees >80cm dbh with external signs of decay, eg fungal fruiting bodies, decay/wood-mould cavities and obvious hollowing,

- monitoring and maintaining the condition, stability and distribution of ancient trees,

- monitoring and managing the number of individual veteran tree, structure of the population, the aspect and exposure of the trees, with remedial pollarding or restoration to the trees where required,

- availability of nectar resource,

- levels of competition from shrubs, other trees and allelopapthic species including rhododendron and bracken,

- quantity, size and dynamics of available fallen dead wood,

It is considered that very few of these targets relate to or are affected directly or indirectly by nitrogen levels, with the exception of the levels of competition from shrubs trees and allelopapthic species. It is considered that continuing management of these species at Dixton Wood could overcome any potential increase in growth due to nitrogen levels.

No specific mention of the potential direct or indirect impact of nitrogen deposition was found during literature research, although long term changes in the environment such as pollution or climate change can affect the fungi that contribute to decay as stated in the Worcestershire Biodiversity Action Plan (BAP) (1). In addition, the Worcestershire BAP suggests that long-term changes in the environment, such as pollution, may affect fungi that contribute to decay in trees and it is stated that the survival of the beetle is largely dependent on maintaining and improving the age structure of the trees in which it lives.

The Woodland Trust (2) state that many fungi species of ancient woodland which naturally hollow the heart wood of trees have very restricted distributions. The Woodland Trust state that the loss of habitat is still a major concern in the conservation of fungi and that major losses appeared to be happening due to acidification and increased nitrogen levels in soils.

A review of literature has shown that there may be a link between air pollution and the presence of fungi which the violet click beetle is reliant on. Therefore, without further specialist research into this link, the precautionary

(1) http://www.worcestershire.gov.uk/cms/environment-and-planning/biodiversity.aspx
(2) http://woodlandtrustshop.com/

approach needs to be followed and the potential effects of air pollution cannot be ruled out on this basis for Dixton Wood SAC.

6.2.5 *Consideration of Potential Mitigation Options*

If needed, in order to reduce pollutants the developer could potentially commit in their application for an Environmental Permit to an additional emission limit as a monthly average and to annual operating hours, for example for oxides of nitrogen (NOx). The combination of these measures may be expressed in terms of a total tonnage limit. It would serve to reduce the maximum permitted emissions by a certain percentage and could therefore reduce the predicted contribution to a given European site (<1% of the benchmark).

Table 6.4 Effect of Airborne Pollutants on Habitat Types

Habitat Type	Key Effects of Pollutant on Habitat Type		
	Nutrient Nitrogen Deposition	**Acid Deposition**	**Heavy Metals**
Woodland	• Woodlands effectively scavenge air pollutants, with the result that inputs of nitrogen deposition to woodlands are generally larger than for other habitat types.	• Deposition of acidifying air pollutants is primarily seen as affecting the soils of woodland habitats, where effective inputs of sulphuric and nitric acids lead to leaching of base cations.	• Heavy metals (especially lead, cadmium, copper, mercury and zinc) can, at high concentrations, have toxic effects on plants.
	• There has been a long-running debate regarding the extent to which actual "forest decline" occurs as a result of nitrogen deposition (e.g. Schulze et al. 1989, van der Eerden et al. 1998, Wilson and Skeffington 1994a,b).	• The resulting soil acidification can lead to mobilisation of naturally occurring aluminium in the soil, which may have toxic effects on plant roots, leading to problems of tree health (UKCLAG 1994).	• Symptoms include reduced root growth, and inhibition of various physiological processes including transpiration, respiration and photosynthesis. However large variations in inter-species sensitivity and bioavailability heavy metals must be taken into account when assessing possible effects.
	• What is clear is that the most sensitive elements are actually the woodland ground flora and epiphyte [1] communities, which are particularly relevant in defining conservation status.	• Although a base, ammonia may also lead to acidification, since its oxidation by soil bacteria also produces nitric acid.	• Heavy metals can accumulate over a long period in the organic layer and top soil leading to contamination of soil organisms, especially those that play a role in the formation of the soil.

(1) A plant which relies on other plants, in this case trees for support, but is not parasitic.

Habitat Type	Key Effects of Pollutant on Habitat Type		
	Nutrient Nitrogen Deposition	**Acid Deposition**	**Heavy Metals**
	• Changes in forest ground flora have been clearly documented as a result of enhanced nitrogen deposition near farms (Pitcairn et al. 1998) and are also expected to occur in regions with high wet deposition of ammonium and nitrate.	• Other effects of acid deposition on woodlands include: o Reduced tree growth, reduced needle growth and canopy loss. Nojd and Reames (1996) found older trees to be more susceptible than younger ones, with growth reduction occurring further from the pollution source. o Reduced mycorrhizal activity, vitality and frequency (Munzenberger et al. 1996). o Effects on soil properties and processes, for example reduced pH, increased Al availability and low microbial activity (Rudawska et al. 1995).	• Furthermore, acidification of soils can cause the mobilisation of these accumulations in the soil where they can be taken up by plant and animal species of the forest ecosystems (Rademacher 2001).
Grassland	• Nitrogen deposition is of particular concern for semi-natural grasslands that are not fertilised. In these situations, plant species composition is adapted to nutrient poor conditions, with low productivity.	• Critical loads may be estimated for the effects of acid deposition on to grasslands, depending on soil type	-
	• Enhanced nitrogen supply from atmospheric deposition tends to favour the growth of some grasses at the expense of other herbs, bryophytes and lichens, which may be of more conservation interest (e.g. Bobbink and Roelofs 1995, UBA 1996).	• Most at risk are grasslands which are already moderately acidic, while base rich calcareous grasslands are resistant to acid deposition, due to a high weathering potential.	-

Habitat Type	Key Effects of Pollutant on Habitat Type		
	Nutrient Nitrogen Deposition	**Acid Deposition**	**Heavy Metals**
	• Management regimes may obscure or modify some of the relationships between atmospheric deposition and habitat change. Intensive management can offset higher N inputs to a certain extent from high N inputs (especially urine) and by removal through grazing, mowing or harvesting.	• A particular concern is where small base rich areas occur in otherwise acid grasslands, as it has been suggested that these, and the associated species communities may be rather sensitive to acid inputs (e.g. Bobbink and Roelofs 1995, UBA 1996).	-
Coastal Habitats and Species	• Many coastal habitats (e.g. rocky cliffs, coastal grasslands) are not under agricultural management with fertilisers and therefore potentially sensitive to nitrogen deposition. Similarly, salt water ecosystems, such as salt marshes or estuarine habitats may be under the dual threat of nutrient inputs from river inputs and atmospheric deposition. • Although there is little information on the critical loads for such ecosystems (Hornung et al. 1995), there has been substantial interest in defining inputs as a result of these concerns (e.g. OSPARCOM 1993, UBA 1996).	- -	• Atmospheric deposition of Persistent Organic Compounds (POPs) and heavy metals can contribute together with riverine inputs to impacts on coastal and marine ecosystems. • The main receptors are fish, piscivorous birds, marine mammals and sediment-dwelling invertebrates (Bosveld & van den Berg 1994; Munroe et al. 1994, Pearse et al. 1979). • Control of POP emissions in Europe has been particularly driven by the concerns of transboundary air pollutant transport and deposition to marine environments.

Habitat Type	Key Effects of Pollutant on Habitat Type		
	Nutrient Nitrogen Deposition	**Acid Deposition**	**Heavy Metals**
	• In marine ecosystems the important receptors are phytoplankton, sediment-dwelling organisms and fish. By contrast, some coastal environments are naturally highly eutrophic as a result of guano and NH_3 deposition from sea bird colonies (e.g. Mizutani and Wada 1988, Sutton et al. 1999).	-	Since POPs tend to accumulate with an affinity for fatty tissue and are preferentially deposited in cold environments, Arctic marine food chains have been seen as particularly at risk.

6.3 *WATER POLLUTION*

Potential hydrological links with European sites through surface water have been identified at 7 of the 13 waste sites. These include waste sites 4, 5, 6, 8, 9, 12 and 13. The length of the potential surface water pathway between the waste site and the European site is detailed in *Table 4.2*. Policy and mitigation measures together with the potential effect of dilution are considered in the following sections.

6.3.1 *Consideration of Water Environment Protection Policy*

Abstractions and discharges will inevitably be required to meet the water and wastewater requirements for the facilities in the region. During the design and planning stages, abstraction and discharge needs will be progressed in accordance with current water policy in England, notably *the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, Water Resources Act 1991, Water Act 2003* and *the Surface Waters (Dangerous Substances) (Classification) Regulations, 1997* and 1998.

Review of policy pertaining to the water environment should be conducted as facility plans progress. This will ensure that the implications of advances in legislation are fully understood, and that the facilities meet, or exceed, the requirements with regards to abstractions, discharges, water efficiency and runoff. In the immediate forthcoming period, it should be noted that changes due to the *Floods Directive (2007/60/EC)* and *Floods and Water Bill* (in draft, 2010) are anticipated. Directives, such as the *Dangerous Substances Directive (76/464/EEC)*, will be repealed by the WFD in 2013.

Consideration of Consents and Development Control

As no direct abstraction or surface water drainage would occur without appropriate consent approval, which would take account of water quality, water availability, Environmental Quality Standards (EQS), River Quality Objectives (RQOs), species, sites and habitats of ecological importance, it is considered that the risks of any potential ecological impacts occurring will be minimised and managed appropriately through standard mitigation measures and control measures (see below).

Potential indirect impacts through surface or groundwater to sewers and watercourses would occur only if appropriately consented by the water operator.

Due to the nature of the hydrological environment, and the interrelationships between groundwater and surface water quality, flow, channel form, topography and ecology, reference should also be made to the Strategic Flood Risk Assessment of the Preferred Waste Options for Gloucestershire, and to the recommendations contained therein.

Mitigation Measures for the Protection of the Water Environment

Table 6.5 presents general mitigation measures relevant to different waste facilities during different stages of the development taken as an excerpt from *Annex A*. This draws together guidance from various sources.

Table 6.5 Excerpt from Annex A – Facility-specific Impacts and Generic Mitigation relating to Water Pollution

Facility Type	Potential Impact	Generic Mitigation
Modern Thermal Treatment (MTT) Energy from Waste (EfW) / Incineration (I) and Advanced Thermal Treatment (ATT) (including Pyrolysis and Gasification technologies).	Thermal technologies use minimal amounts of water and discharge minor amounts to sewers.	Standard measures should include capture and treatment/disposal of run-off and leachate, appropriate drainage, bunding wash down washers should prove effective at avoiding releases to waterways and are effective control and mitigation measures.
General biological and mechanical treatment - (MBT)	Limited potential for impact on water resources as operations and storage of materials is enclosed / undercover hence rainfall is unlikely to come into contact with potential pollutants.	Mechanical treatment - controlled surface drainage, capture and treatment of run-off and wash-down water are effective mitigation measures. Biological treatment – see OWC, IVC and AD.
Open Windrow Composting (OWC) and In Vessel Composting (IVC)	Leachate and run-off from compost heaps has a high content of organic substances.	Leachate should be captured and undergo recirculation and / or treatment prior to release (e.g. to sewers) to prevent contamination of surface and groundwaters. Enclosed operations significantly reduce environmental nuisance and pollution risk as it can help to prevent water coming into contact with waste.
Anaerobic Digestion (AD)	Waste water produced during dewatering of solid digestate can contain high concentrations of metals, dissolved nitrogen and organic material.	Potential for pollution if left untreated, this is mitigated by on site drainage, containment and collection systems for waste water, surface and run-off waters and onsite treatment where necessary. Alternatively waste water may be able to be disposed of to sewer and treated at sewage works.

Facility Type	Potential Impact	Generic Mitigation
Materials Recycling Facility/ Material Recovery Facility (MRF)	Limited potential for impact on water resources due to nature of operations and materials. Residual liquids (e.g. from bottles and cans) can potentially pose a pollution risk to water resources.	Appropriate site drainage and capture and treatment of run-off and wash down waters are effective mitigation measures.
Waste Transfer Station	Nature of waste collected at depot may have potential risk to water resources.	Enclosed operations reduce exposure of potential pollutants to water, capture and treatment of runoff. Wash-down waters are effective mitigation measures
Household recycling centre	Limited potential for impact on water resources due to nature of operations and materials. Residual liquids and organic leachate from green waste can potentially pose risk to water resources.	Undertaking operations in enclosed or undercover area, appropriate site drainage and capture and treatment of run-off and wash down waters are effective mitigation measures.

Further generic standard mitigation and control measures for the development of waste management facilities are given in *Table 6.6*. The exact scope of mitigation will be agreed between relevant statutory bodies and developers depending on the technology solution proposed.

6.3.2 *Summary of Surface and Groundwater Pollution Findings*

Waste Sites 4, 5, 6, 8 and 9

With the consideration of policy, licensing, development control and mitigation described the risk of any pollution entering the watercourses is considered to be limited. Therefore when considering the additional dilution factor introduced over distances of 5 km, it is considered that the potential impact would be insignificant. Therefore for water pollution impacts are ruled out of the assessment for waste sites 4, 5, 6, 8 and 9.

Table 6.6 *Generic Development Mitigation Measures for the Protection of the Water Environment* [(1)]

Element	Measures
CONSTRUCTION STAGE	
Waste Water and Groundwater	• PPG 21: Pollution Incident Response Planning, over-arching Pollution Prevention and Emergency Response Plans and site / activity specific procedures developed for the proposed facility • All waste water and site discharges shall only be permitted where the effluent quality and discharge location is acceptable to Environment Agency. • Any polluted water shall pass through treatment facilities such as sediment traps and/or settlement lagoons, as appropriate, before being discharged. • All drainage and treatment facilities shall be regularly inspected and maintained and a full record will be kept of inspection, maintenance and measures to sustain equipment performance. • Prior to any excavation below the water table, including site de-watering, Environment Agency shall be informed of the works to be conducted. • BS 6031:1981 Code of Practice for Earthworks, regarding the general control of site drainage shall be complied with. • Areas of exposed ground and stockpiles shall be minimised and covered where necessary to reduce mobilisation by water or air. • Geotextiles shall be used as necessary to shield spoil mounds. • Water containing silt shall not be discharged directly into watercourses. • Water will be stored in settlement lagoons or tanks, filtered, or discharged to foul sewer (with agreement of the relevant water authority and Environment Agency). • Water will not be encouraged to infiltrate the site to minimise the potential for contaminant mobilisation. The only instances where this may be permitted will be if soakaway areas located within clean fill have been identified and constructed in agreement with Environment Agency. • Any water that has come into contact with contaminated materials shall be disposed of in accordance with the Water Resources Act 1991 (as amended by the Water Act 2003) and the Water Industry Act 1991 (as amended by the Water Act 2003) (if disposed to the public sewer) to the satisfaction of Environment Agency and the water authority. • All works, abstractions and discharges will be conducted in accordance with the requirements of all relevant regulations and PPGs, such as PPG1: General Guide to the Prevention of Pollution, PPG5: Works In, Near or Liable to Affect Watercourses and PPG 6: Working at Construction and Demolition sites. • Regulatory requirements and the measures outlined within PPGs should be integrated with a Code of Construction Practice (CoCP) for the site. • Sulphate resistant concretes (as detailed within the Code of Practice for Concrete Design BS 5328) will be used throughout the site due to the potential for impacts to surface water and groundwater. • Any development with a requirement to undertake piling or to utilise other foundation designs using penetrative methods or other similar specialist activities, such as grouting, should be undertaken in accordance with detailed Method Statement to minimise risk of impacts to groundwater quality and flow and must be carried out with the consent of GCC and Environment Agency.

(1) Guidance taken from a range of approved planning application sources.

Element	Measures
	• Due regard shall be taken of underlying aquifers, and to the Environment Agency Groundwater Protection Policy. • In all instances, appropriate protection of aquifers shall be undertaken, following liaison with the Environment Agency regarding the piling and construction techniques to be employed. • Details of appropriate measures to prevent groundwater contamination shall be agreed with the Environment Agency, in writing, prior to commencement of the relevant scheme works.
Storage and Use of Materials with the Potential to Pollute	• Provisions shall be made to ensure that potential contaminants stored on the site are controlled in accordance with the Control of Substances Hazardous to Health (COSHH) Regulations 2002 and are properly isolated and bunded (with at least 110% capacity) and that no oil or other contaminants are allowed to reach watercourses or groundwater, including aquifers. • These facilities shall be regularly inspected (especially after heavy rain) to ensure there is no damage or leaks. • Storage locations for such materials should be positioned away from watercourses and agreed with the Environment Agency. • All surface water or other contaminated water which accumulates in a bunded area shall be removed by manually controlled positive lift pumps and not by means of a gravity drain. • Such water will be removed from site and discharged in public sewer in consultation with the water authority. • All refuelling and routine maintenance of vehicles and plant will be undertaken offsite at a suitable facility or in a designated bunded area. • Spill response kits containing equipment appropriate to the quantity and types of materials present on site shall be available and easily accessible in the event of a fuel spillage and personnel will be trained in their use.
Control and Management of Foul Drainage	• Foul water and sewage effluents produced by the construction workforce shall be contained by temporary foul drainage facilities to be installed. All foul water shall be disposed of off-site by a licensed contractor.
Works in the Vicinity of Water	• Suitable precautions shall be taken to prevent the entry of pollutants including sediments and dust into any bodies of water and any incidents shall be reported to the Environment Agency in accordance with incident reporting procedures. • Crossings of watercourses shall be designed and constructed so as not to impede the flow, obstruct the movement of floodwater or exacerbate erosion of the channel and banks. • If any treatment is required in the vicinity of surface water receptors or if intrusive works are required, procedures will be developed and agreed based upon the area concerned and the potential for migration within fractured sediments or aquifers.
Potential Additional Risk Management Measures and Monitoring	• Specific water quality and flow monitoring programmes could be developed to ensure that any watercourses are not being adversely affected by construction activities or site treatments. • Gauges can be used on site to allow ground stability to be monitored where necessary. • Procedures will be developed in consultation with the Environment Agency to be implemented in the event that a risk to water quality is identified. Procedures will include commitments with regard to incident reporting, retention and the treatment of waters.

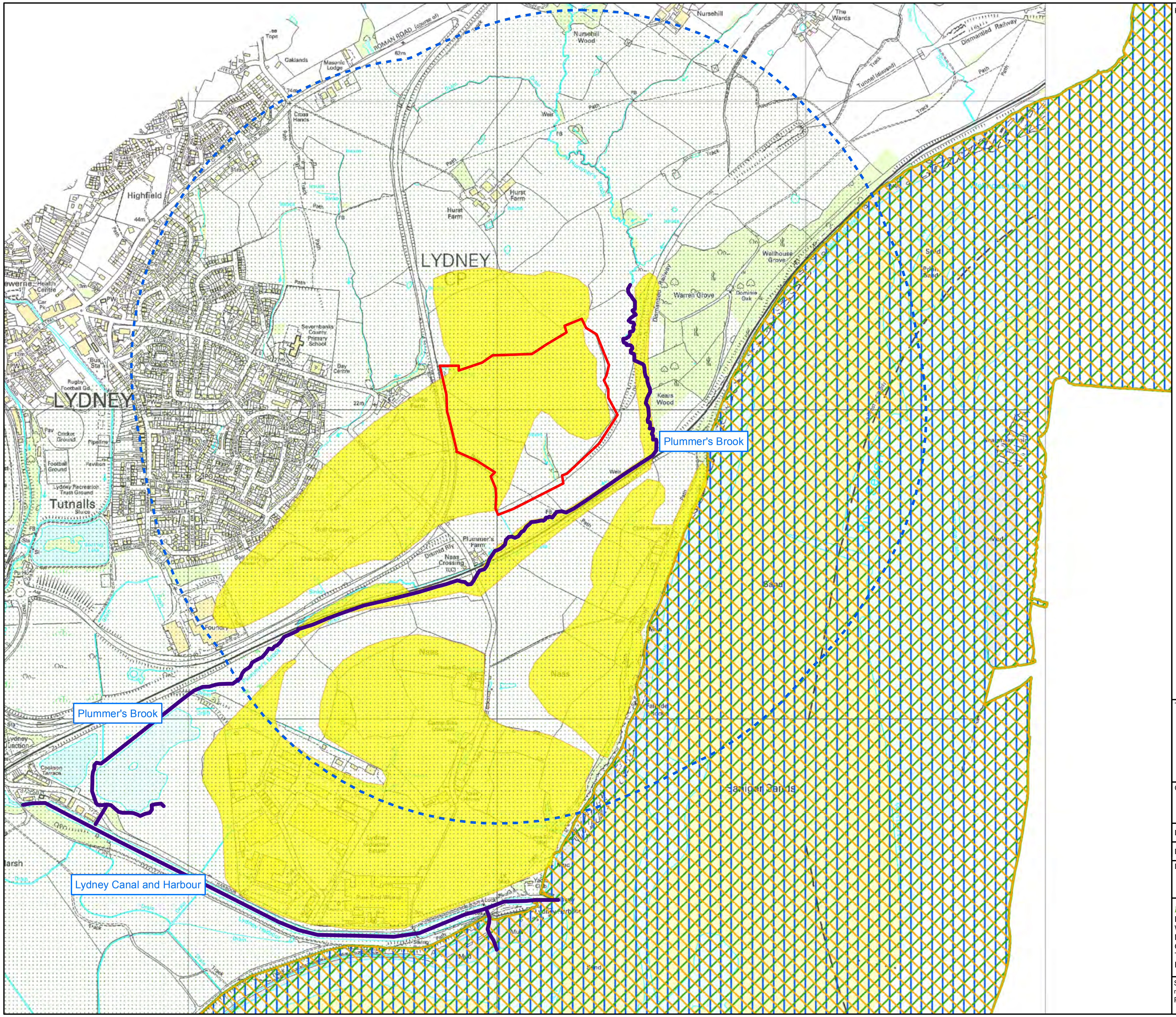
Element	Measures
	• Dust suppression and erosion minimisation procedures can be developed and implemented. Specific procedures will be implemented during the phases of construction involving works adjacent to, and in the immediate vicinity of watercourses.
OPERATIONAL STAGE	
water use, treatment and disposal.	• No abstraction from watercourses. • Use of mains public supply for amenities and critical applications (such as flue gas cleaning system, backup supply, cleaning and distribution in the fire fighting hydrant network. • Use of rainwater collected from roofs or buildings and roads that would replace mains water for some applications and be used as process water. • Process use of clean, re-circulated water for bottom ash quenching, wash down etc. • No discharge of liquid effluent into the mains sewer. • Waste water treatment will be carried out for chemically contaminated water from boiler blow-down, de-minealization unit, cleaning/draining of equipment etc and re-used in the process. • Waste water from offices and staff facilities will be discharged to a septic tank before being tinkered off-site for disposal to a sewage works. Accidental spillages and clean-up water would also be treated prior to release. • Any water from a waste bunker to be separately collected for treatment and/or disposal off site. • On-site water treatment could comprise pH correction and separation of suspended solids. No discharge to ground or groundwater and no effluent discharge. • Surface water runoff to be managed in accordance with SUDs and runoff rates agreed with the Internal Drainage Board (IDB). • Clean surface water (rainwater) from roofs and roads will be captured and stored for use in the process.

Waste Sites 12 and 13

Waste sites 12 and 13 are considered further given that their close proximity to the Severn Estuary and therefore lack of any significant dilution factor should pollution enter a surface or ground water link. *Figures 6.1* and *6.2* illustrate the local hydrological environment relating to waste sites 12 and 13. The connection between waste site 12 and the Severn Estuary via Plummer's Brook and waste site 13 via Plummer's Brook and Lydney Canal and Harbour is shown.

A search of the Environment Agency mapping website (1) shows that waste sites 12 and 13 fall within the catchment of Secondary A aquifers (formally classed as minor aquifers) which comprise permeable layers capable of supporting ground water at a local scale. These, in some cases form an important source of base flow to rivers and therefore there is clearly a link to the Severn Estuary. The area of Secondary A aquifer containing waste site 13 is linked directly to the Severn Estuary, however there is not a direct link between waste site 12 and the Severn Estuary.

(1) The Environment Agency groundwater and aquifer mapping. http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e



KEY:
- Consultation Site
- 1km Buffer of Consultation Site
- Special Protection Area
- Special Area of Conservation
- RAMSAR
- Secondary A Aquifer - superficial deposit designation (formely classified as minor aquifer)
- Secondary A Aquifer - bedrock deposit designation (formely classified as minor aquifer)
- Surface Water Pollution Pathway approximately 0-2km

N
W E
S

0 550
Metres

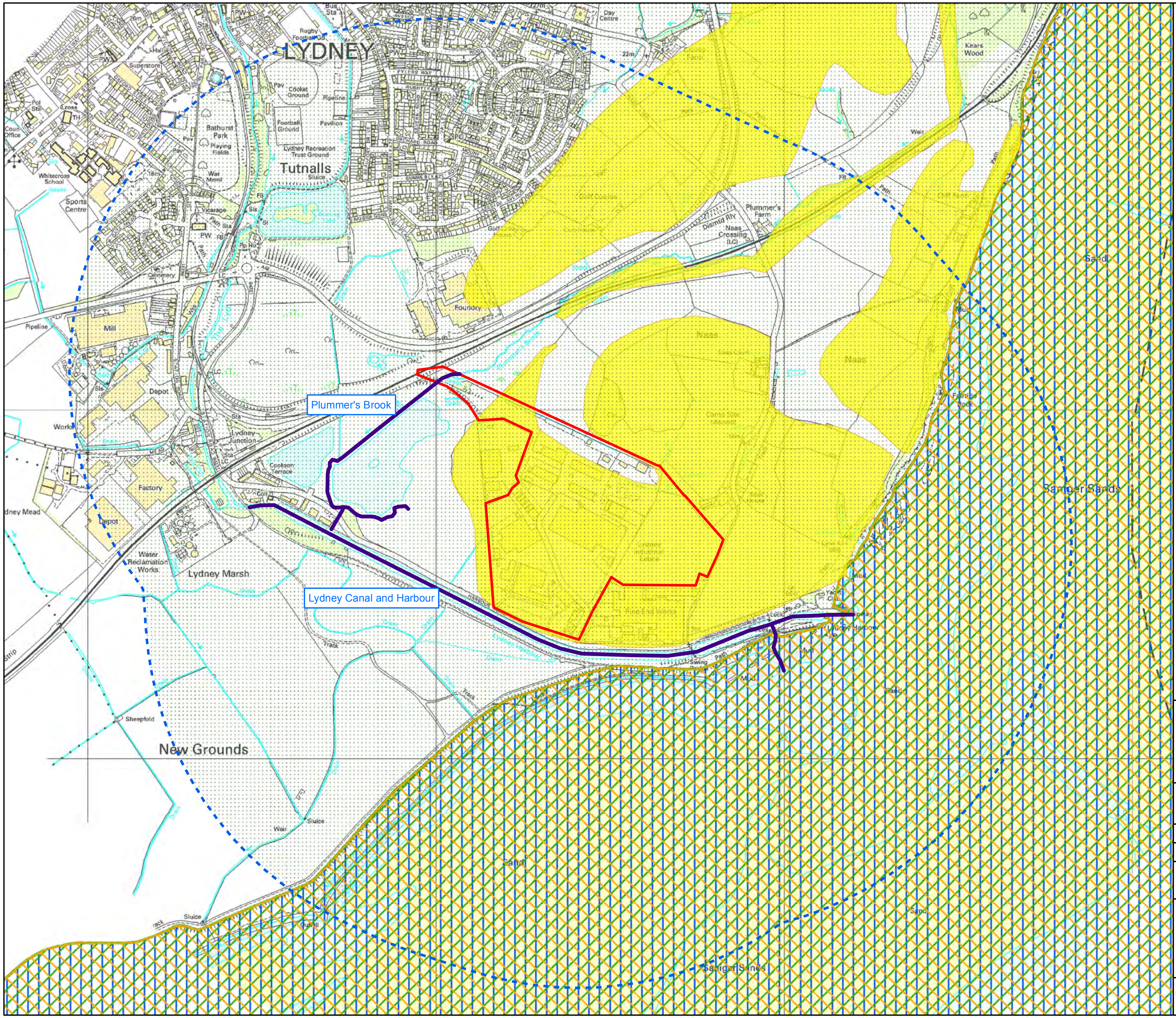
TITLE:
Figure 6.1
Site 12 Ground and Surface Water Pollution Pathways

CLIENT: Gloucestershire County Council		SIZE: A3
DATE: 01/09/2010	CHECKED:	PROJECT: 0114924
DRAWN: IG	APPROVED:	SCALE: As Scale Bar
DRAWING: DesignatedSites_12.mxd		REV: 0

ERM
Eaton House
Wallbrook Court
North Hinksey Lane
Oxford, OX2 0QS
Tel: 01865 384800
Fax: 01865 384848

PROJECTION: British National Grid

File: 0114924Gloucester\HRA\GIS_IG_BS\Maps\DesignatedSites_12.mxd



KEY:

- Consultation Site
- 1km Buffer of Consultation Site
- Special Protection Area
- Special Area of Conservation
- RAMSAR
- Secondary A Aquifer - superficial deposit designation (formerly classified as minor aquifer)
- Secondary A Aquifer - bedrock deposit designation (formerly classified as minor aquifer)
- Surface Water Pollution Pathway approximately 0-2km

N
W E
S

0 500
Metres

TITLE:
Figure 6.2
Site 13 Ground and Surface Water Pollution Pathways

CLIENT: Gloucestershire County Council		SIZE: A3
DATE: 01/09/2010	CHECKED:	PROJECT: 0114924
DRAWN: IG	APPROVED:	SCALE: 1:300,000
DRAWING: DesignatedSites_13.mxd		REV: 0

ERM
Eaton House
Wallbrook Court
North Hinksey Lane
Oxford, OX2 0QS
Tel: 01865 384800
Fax: 01865 384848

PROJECTION: British National Grid

Table 6.7 summarises targeted mitigation measures which would need to be implemented to conclude no potential likely significant effect on the Severn Estuary from the development of wastes sites 12 and 13. These measures should not be viewed as comprehensive given the strategic level of this assessment and they would need to be investigated in detail at the planning application stage.

Table 6.7 Targeted Water Pollution Mitigation for Waste Sites 12 and 13

Mitigation Element	Waste Site 12	Waste Site 13
Positioning	Development should be restricted to outside the Secondary A aquifer zone where possible which comprises the central southern part of the site.	Development should be restricted to outside the Secondary A aquifer zone where possible which comprises the central northern part of the site or to the extreme northwest of the site.
Construction and operational Measures	Production of a Construction Site Water and Drainage Plan (CWSDP) for approval with the Environment Agency and GCC prior to the commencement of works. The CWSDP shall take full account of the requirements of the Pollution Prevention Guidelines (PPGs). Production of a suitable method statement to account for how works will be undertaken and what measures will be implemented to prevent contamination of watercourses by construction materials for example wet concrete or silt. Isolated Sustainable Urban Drainage Systems (SUDS), such as filtration tanks, will be implemented during construction in consultation the Environment Agency.	

With the consideration of standard and targeted control measures to avoid pollution from facilities proposed at waste sites 12 or 13 reaching the identified groundwater and surface water pathways, it is concluded that no potential likely significant effects are expected from water pollution. Therefore water pollution impacts for waste sites 12 and 13 are ruled out of the assessment.

6.4 BIRD DISTURBANCE

Potential bird disturbance effects were identified at waste sites 12 and 13 which are in close proximity to the Severn Estuary SPA and Ramsar site and the foreshore at these locations is used by qualifying species. It was concluded that these potential effects could not be screened out without consideration of the impact on the Conservation Objectives relating to the qualifying interest features of the SPA and Ramsar site. Therefore an Appropriate Assessment of the potential likely effects of disturbance from the construction and operation of facilities at waste sites 12 and 13 has been carried out (see *Annex C*).

Annex C concludes that due to the presence of physical barriers such as the railway and tree belts, potential impacts from the development of a waste facility at waste site 12 are not likely to have an adverse effect on the integrity of the European site and therefore no further mitigation measures are proposed for this site.

Mitigation measures could be implemented at waste site 13 to avoid adverse affects on the integrity of the European site from disturbance and such measures are set out below and in *Annex C*. The actual options will depend largely on the specifics of the development proposals which cannot be assessed at this stage. It is also likely that supplementary bird survey work will be required to ascertain more up to date details about bird numbers, distribution and their changing activities and behaviour through the tidal cycle and across the year.

- Ensure the construction personnel do not go onto the coastal habitats.

- Use screening around the site which is erected during periods when birds are absent from the adjacent habitats (*eg* summer months).

- Minimise the use of large cranes and the time at which the construction workforce is operating at heights, especially wearing fluorescent jackets.

- Direct lighting into the work sites and avoid spillage onto the estuarine habitats.

- Avoid intermittent noise sources during periods of high sensitivity (*eg* passage months).

- Programme construction works so that key parts of the work most likely to cause disturbance are undertaken at times of the year when the coastal habitats are not used (or are less well used) by waders such as the summer months.

- Avoid working practices which are likely to cause disturbance to birds around periods of high tide when birds are generally closer to the development sites.

- Cessation of construction work over the winter months during periods of hard weather (as agreed with Natural England and Local Planning Authority).

7 SUMMARY OF ASSESSMENT FINDINGS

7.1 OVERVIEW OF THE STUDY AREA CONSTRAINTS

Whilst the previous GCC screening assessment focused on the Site Options, this assessment has also identified areas within Gloucestershire which lie over 15 km from any of the European sites located within Gloucestershire or neighbouring counties, and may therefore be potentially less sensitive in terms of potential impacts to European sites from air pollution. The 15 km buffer follows Environment Agency guidance for their review of consents work for the consideration of emitting plants.

These areas beyond 15km are however constrained in other ways for the development of waste facilities, for example due to the presence of the Cotswolds AONB, poor road networks and being located at a distance from Gloucestershire's main waste arisings. In addition this should be treated with caution as potential pollution effects on sites with qualifying habitats with elevated baseline critical loads for modelled pollutants (eg nitrogen at Dixton Wood SAC and the Cotswold Beechwoods SAC) indicates that potential significant effects could result over the 15 km buffer used (see *Section 6.2.3*).

7.2 OVERVIEW OF THE SCREENING AND APPROPRIATE ASSESSMENT FINDINGS

7.2.1 *Potential Air Pollution Effects*

When considering thermal treatment facilities, AERMOD concludes that the development of a thermal treatment facility at waste sites 7 and 11 will have no likely significant effect from air pollution at the stated parameters and ADMS indicates that waste sites 1, 2, 4, 6, 7, 8 and 10 are unlikely to result significant effects from air pollution at the stated parameters (see *Section 7.2.4*). Further air dispersion modelling will be necessary for waste sites where it cannot be concluded there would be no likely significant effect at this stage (see *Section 9*).

7.2.2 *Potential Water Pollution Effects*

The screening assessment concluded no likely significant effect from water pollution for waste sites 1, 2, 4, 5, 6, 7, 8, 9 and 10 when considering standard mitigation measures. The screening assessment also concluded that significant effects identified for waste sites 12 and 13 could be mitigated when considering targeted mitigation measures as set out in (*Section 6.3.2*).

7.2.3 *Potential Bird Disturbance Effects*

The screening assessment concluded that potential significant effects of bird disturbance at the Severn Estuary SPA and Ramsar site were likely to occur for waste sites 12 and 13 and therefore further Appropriate Assessment was carried out (*Annex C*). The Appropriate Assessment concluded no adverse effects on the integrity of the European site from bird disturbance for waste site 12 and for waste site 13 when considering appropriate mitigation as set out in *Section 6.4*.

7.2.4 *Summary of Findings*

A summary of the findings of the screening and appropriate assessment for each waste site are given in *Table 7.1* and *7.2*. *Table 7.1* includes air pollution assessment findings using AERMOD and *Table 7.2* includes air pollution assessment findings using ADMS given that they are both considered to be equally valid.

The summary tables also give an indication of the need for the consideration of potential in-combination effects. In-combination impacts are considered where no likely significant effects are concluded or where it cannot be concluded there will be no likely significant effects but in-combination with effects from other plans and projects significant effects may be confirmed.

7.2.5 *Conclusions*

- The assessment has found that all 13 waste sites will have no likely significant effects on European sites when considering facilities other than thermal treatment.

- The assessment found that waste sites 7 and 11 would have no likely significant effects on European sites at certain facility parameters when considering thermal treatment and drawing on the findings of the AERMOD modelling.

- The assessment has found that waste sites 1, 2, 4, 6, 7, 8 and 10 would have no likely significant effects on European sites at certain facility parameters when considering thermal treatment and drawing on the findings of the ADMS modelling.

- Further assessment would be required at the planning application stage for the promotion of any sites where it cannot be concluded that there would be no likely significant effects from air pollution (see *Section 9*).

- It should be noted that appropriate targeted mitigation measures will be required to avoid effects via water pollution for waste sites 12 and 13 and to avoid adverse effects on the integrity of the European site through bird disturbance for waste site and 13.

Table 7.1 Findings of the Screening and Appropriate Assessment for Each Waste Site Considering AERMOD for Air Pollution Findings

Waste Site	Thermal Treatment Facility (potential air pollution effects)	Any other Waste Facility (potential water pollution and bird disturbance effects)	Are Targeted Water Pollution Mitigation Measures Required?	Are Bird Disturbance Mitigation Measures Required?
1 Areas A, B & C at Wingmoor Farm East, Tewkesbury	Cannot conclude no LSE Stack Emissions	No LSE	No	No
2 Areas A, B & C at Wingmoor Farm West, Tewkesbury	Cannot conclude no LSE Stack Emissions	No LSE	No	No
3 Easter Park, Ashchurch/ Tewkesbury Industrial Estate, Tewkesbury	Cannot conclude no LSE Stack Emissions	No LSE	No	No
4 Javelin Park, Stroud	Cannot conclude no LSE Stack Emissions	No LSE	No	No
5 Land adjacent to Quadrant Business Centre, Quedgeley	Cannot conclude no LSE Stack Emissions	No LSE	No	No
6 Land at Moreton Valence, Stroud	Cannot conclude no LSE Stack Emissions	No LSE	No	No
7 Land north of Railway Triangle, Gloucester	No LSE at 200 ktpa, 100 m stack	No LSE	No	No
8	Cannot conclude no LSE Stack Emissions	No LSE	No	No
9	Cannot conclude no LSE Stack Emissions	No LSE	No	No
10	Cannot conclude no LSE Stack Emissions	No LSE	No	No
11	No LSE at 100 ktpa, 80 m stack	No LSE	No	No
12	Cannot conclude no LSE Stack Emissions	No LSE	**Yes**	No
13	Cannot conclude no LSE Stack Emissions	No LSE	**Yes**	**Yes**

Cannot conclude no LSE (likely significant effect) for the development of a thermal treatment facility from stack emissions at the parameters modelled.

No LSE is identified for the development of a thermal treatment facility from stack emissions at the parameters given, however it could not be concluded no LSE for the other parameters modelled.
No LSE is identified for the development of a facility other than thermal treatment from water pollution or adverse effects on integrity for bird disturbance.

Table 7.2 Findings of the Screening and Appropriate Assessment for Each Waste Site Considering ADMS for Air Pollution Findings

Waste Site	Thermal Treatment Facility (air pollution effects)	Any other Waste Facility (water pollution and bird disturbance effects)	Are Water Pollution Mitigation Measures Required?	Are Bird Disturbance Mitigation Measures Required?
1	No LSE at 200 ktpa, 80 m stack	No LSE	No	No
2	No LSE at 200 ktpa, 80 m stack	No LSE	No	No
4	No LSE at 100 ktpa, 80 m stack	No LSE	No	No
6	No LSE at 200 ktpa, 80 m stack	No LSE	No	No
7	No LSE at 400 ktpa, 80 m stack	No LSE	No	No
8	No LSE at 100 ktpa, 80 m stack	No LSE	No	No
10	No LSE at 200 ktpa, 80 m stack	No LSE	No	No

Cannot conclude no LSE for the development of a thermal treatment facility from stack emissions at the parameters modelled.
No LSE is identified for the development of a thermal treatment facility from stack emissions at the parameters given, however it could not be concluded there were no LSE for the other parameters modelled.
No LSE is identified for the development of a facility other than thermal treatment from water pollution or adverse effects on integrity for bird disturbance.

8 *IN-COMBINATION ASSESSMENT*

8.1 *INTRODUCTION*

Figure 8.1 shows the extent of the area considered for the consideration of potential in-combination effects from other plans and projects. This includes an area 15 km from the Gloucestershire County boundary to ensure plans and projects in the surrounding authorities are considered.

In-combination effects were considered for all waste sites with the following conclusions:

- waste sites where it is concluded there would be no likely significant effect on European sites; and
- waste sites where it cannot be concluded that there would be no likely significant effect on European sites.

When considering potential air pollution effects, the AERMOD findings have been assumed as a worst case scenario.

The final list of waste sites considered within the assessment of potential in-combination effects includes the following:

- Waste sites 4, 5, 6, 7, 8, 9 and 11 for potential air pollution effects on the Cotswold Beechwoods SAC;
- Waste sites 1, 2, 3 and 10 for potential air pollution effects on Dixton Wood SAC;
- Waste sites 12 and 13 for potential air pollution effects on the Severn Estuary SAC, SPA and Ramsar; and
- Waste sites 4, 5, 6, 8, 9, 12 and 13 for potential water pollution and bird disturbance effects on the Severn Estuary SAC, SPA and Ramsar.

The full list of plans and projects considered are given in *Annex D*. For the majority of other plans and projects it was concluded there were no pollution pathways and therefore they are unlikely to result in in-combination effects.

In addition, the protection of European sites through policy is considered in *Section 8.2*.

8.2 *CONSIDERATION OF PROTECTION OF EUROPEAN SITES THROUGH POLICY*

The main focus for much of the future development in Gloucestershire is through the adopted District Local Plans (see *Annex D)*.

All development plans include policies which make a commitment to preventing risks to the integrity of European sites and it is expected that the Development Framework Documents will contain similar policies to ensure that their implementation safeguards the interests of European sites.

8.3 *CONCLUSION OF THE IN-COMBINATION ASSESSMENT*

Annex D identifies a number of potential effects for the consideration of impacts in-combination with those identified in this assessment on certain European sites.

A number of potential effects from certain waste sites which were screened out of this assessment as insignificant are considered unlikely to act in-combination to result in a significant effects:

- Waste sites 7 and 11 for potential air pollution effects on the Cotswold Beechwoods SAC; and

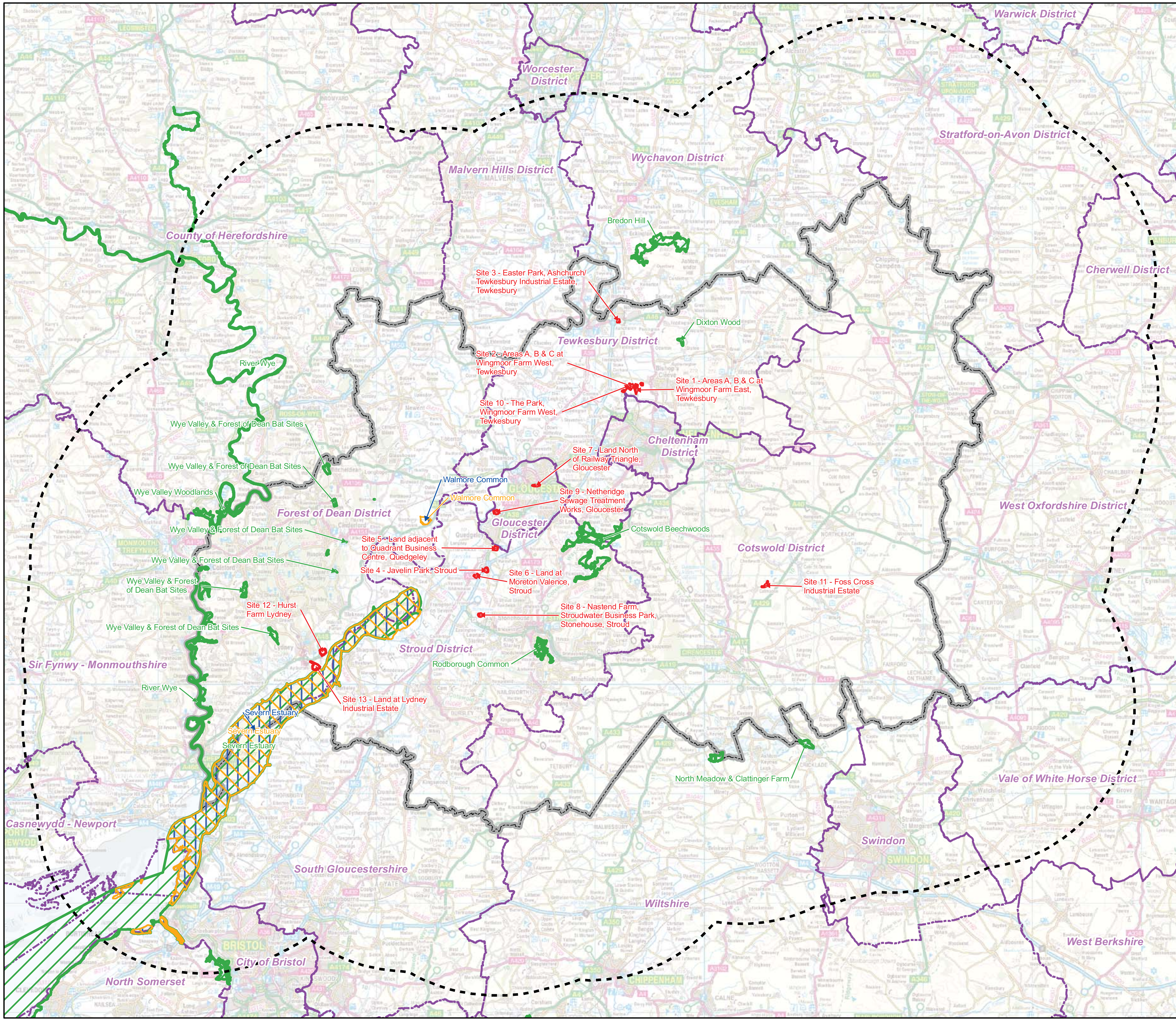
- Waste sites 4, 5, 6, 8, 9, 12 and 13 for potential water pollution and bird disturbance effects on the Severn Estuary SAC, SPA and Ramsar.

No specific sources of in-combination effects were identified for waste sites where it cannot currently be concluded that there would be no likely significant effect. Such waste sites will need to demonstrate no likely significant effects through policy and development control:

- Waste sites 4, 5, 6, 8 and 9 for potential air pollution effects on the Cotswold Beechwoods SAC;

- Waste sites 1, 2, 3 and 10 for potential air pollution effects on Dixton Wood SAC; and

- Waste sites 12 and 13 for potential air pollution effects on the Severn Estuary SAC, SPA and Ramsar.



KEY:

- Consultation Site
- Special Protection Area
- Special Area of Conservation
- RAMSAR
- Gloucestershire County Boundary
- 15km Buffer of Gloucestershire County Boundary
- District and Borough Boundary

TITLE:

Figure 8.1
In-Combination Assessment Study Area

CLIENT: Gloucestershire County Council		SIZE: A3
DATE: 12/10/2010	CHECKED:	PROJECT: 0114924
DRAWN: IG	APPROVED:	SCALE: As Scale Bar
DRAWING: DesignatedSites_15km.mxd		REV: 0

ERM
Eaton House
Wallbrook Court
North Hinksey Lane
Oxford, OX2 0QS
Tel: 01865 384800
Fax: 01865 384848

ERM

PROJECTION: British National Grid

File: 0114924Gloucester\HRA\GIS_IG_BS\Maps\DesignatedSites_15km.mxd

9 REVIEW OF THE FINAL PUBLICATION STAGE WCS AGAINST THE 2010 REGULATIONS

The report so far has considered development of waste facilities at Site Options 1 to 13 and identified potential impacts on European sites to indicate if likely significant effects are predicted considering recommended mitigation as appropriate and where it could not be concluded there would be no likely significant effect, whether adverse effects on the integrity of European sites were expected. The findings of this assessment have been used to inform the development of the Final Publication WCS (GCC, November 2010).

The overall aim of this report is to assess the Publication WCS against the 2010 Regulations to conclude that with the various protections, provisions and caveats in the WCS whether it can be ascertained that the plan (either alone or in-combination with other plans and projects) will not adversely affect the integrity of any European site.

The policies, supporting text and appendices within the Final Publication WCS (GCC, November 2010) have therefore been reviewed against the findings of the HRA of the Site Options to ensure the plan is compliant and deliverable in terms of the 2010 Regulations.

The review has concluded that the WCS is compliant with the 2010 Regulations.

The following sections document the review of relevant policies and include necessary justification behind the conclusion.

9.1 CONSIDERATION OF RELEVANT POLICIES WITHIN THE WCS

Table 9.1 includes a summary of the key policies considered in terms of the 2010 Regulations. Policies relating to specific Site Options are considered to be the most relevant.

Table 9.1 Summary of WCS Policies Considered

Relevant WCS Sections	Consideration of Compliance with the 2010 Regulations
Vision	Reference to residual waste being managed through a number of strategic waste recovery sites (>50,000 tonnes/year) located in the centre of the county has been assessed through the HRA of the Site Options. Reference to local facilities (<50,000 tonnes/year) has been assessed through HRA of the Site Options. The 'Vision' section is considered to be compliant with the 2010 Regulations.
Strategic Objectives	Strategic Objective 3 – this is discussed in WCS4 (*Section 9.2*). Strategic Objective 5 – the HRA concludes that the WCS is compliant with the 2010 Regulations and as such recommends that the WCS is deliverable without adversely affecting European sites. The 'Strategic Objectives' are considered to be compliant with the 2010 Regulations.
Policy WCS1 – Waste Reduction	Policy WCS1 is considered to be compliant with the 2010 Regulations. No further comments.
Policy WCS2 – Recycling & Composting	Provision of recycling and composting / anaerobic digestion (including bulking and transfer) facilities has been assessed through HRA of the Site Options. Policy WCS2 is considered to be compliant with the 2010 Regulations.
Policy WCS3 – Inert Waste Recycling & Recovery	Provision of inert recycling and recovery facilities has been assessed through HRA of the Site Options. Policy WCS3 is considered to be compliant with the 2010 Regulations.
Policy WCS4 – Other Recovery	The findings of the HRA of the site options allow this policy to be delivered with necessary caveats. This is discussed in detail in *Section 9.2*. Policy WCS4 is considered to be compliant with the 2010 Regulations.

Relevant WCS Sections	Consideration of Compliance with the 2010 Regulations
Policy WCS5 – Waste Water	Provision of recycling and recovery of hazardous waste has been assessed through HRA of the Site Options. Policy WCS5 is considered to be compliant with the 2010 Regulations.
Policy WCS6 – Hazardous Waste	Provision of inert recycling and recovery facilities has been assessed through HRA of the Site Options. Policy WCS6 is considered to be compliant with the 2010 Regulations.
Policy WCS7 – Cumulative Impact	The HRA has included a consideration of potential in-combination effects and therefore Policy WCS7 is considered to be compliant with the 2010 Regulations.
Policy WCS8 – Safeguarding Sites for Waste Management	Policy WCS8 is considered to be compliant with the 2010 Regulations. No further comments.
Policy WCS9 – Flood Risk	Potential water pollution effects have been considered within the HRA. Policy WCS9 is considered to be compliant with the 2010 Regulations.
Policy WCS10 – Green Belt	Policy WCS10 is considered to be compliant with the 2010 Regulations. No further comments.
Policy WCS11 – Areas of Outstanding Natural Beauty	Policy WCS11 is considered to be compliant with the 2010 Regulations. No further comments.
Policy WCS12 – Nature Conservation (Biodiversity & Geodiversity)	The HRA has included reference to Conservation Objectives relating to component SSSIs where necessary. Policy WCS12 is considered to be compliant with the 2010 Regulations.
Policy WCS13 – Design	The HRA includes reference to design considerations relating to air emissions and mitigation measures relating to water pollution and bird disturbance. Policy WCS13 is considered to be compliant with the 2010 Regulations.
Policy WCS14 – Sustainable Transport	The HRA includes consideration of potential effects from traffic emissions and potential in-combination effects. Policy WCS14 is considered to be compliant with the 2010 Regulations.

Policy WCS4 is the main policy detailing site allocations and therefore this is discussed in greater detail in *Section 9.2*.

9.2 *Deliverability of Core Policy WCS4 with Regard to the 2010 Regulations*

Policy WCS4 sets out the capacity need for recovery within Gloucestershire and includes site allocations for delivery within Zone C (see WCS Figure 6 and *Section 9.2*). This is therefore the key policy for consideration in terms of the Habitats Regulations. Policy WCS4 states a need to divert waste from landfill in the period to 2027 and in order to achieve this; the Waste Planning Authority (WPA) will need to make provision for the following waste recovery capacity:

- Municipal Solid Waste (MSW) 150 ktpa / year; and
- Commercial and Industrial Waste (C&I) 143 – 193 ktpa / year.

The HRA identified and assessed potential significant effects on European sites for the 13 waste sites which included potential air pollution effects, water pollution and bird disturbance. These potential effects were assessed alone and then in-combination with other plans and projects as appropriate. The HRA work concluded no likely significant effects from potential water pollution and bird disturbance effects for any of the 13 waste sites when appropriate mitigation measures are developed to address water pollution for waste sites 12 and 13 and to address bird disturbance for waste site 13 to ensure no adverse effects on the integrity of the European site.

The air pollution assessment could not conclude no likely significant effects for some of the waste sites at some of the modelled parameters and therefore the findings are considered below in terms of the deliverability of the WCS in terms of compliance with the 2010 Regulations. The air dispersion modelling findings are considered firstly with regard to the AERMOD model findings and secondly the ADMS model findings. Both models were used in the assessment as each of the models adopts a different approach to the treatment of dispersion over terrain. This is an important characteristic of the geographical location of European sites across the County. Experience shows that in some circumstances, divergent results are obtained from each model, as was proven in this case. As both models have been tested and validated in conditions where terrain is important the findings of both have been considered as set out below.

9.3 *Strategic Residual Waste Recovery Facilities*

The WCS sets out the final list of site allocations being bought forward by GCC which are given the same numbers as the Site Options considered in this report for clarity. Four sites are allocated for strategic waste recovery facilities (> 50 ktpa) within Zone C (see WCS, Policy WCS4). These are:

- Waste site 1, Wingmoor Farm East;

- Waste site 2, Wingmoor Farm West – Area A & B. NB – Area A is named waste site 10, The Park within this report;
- Waste site 4, Javelin Park; and
- Waste site 6, Land at Moreton Valence

9.3.1 *AERMOD Results*

The findings of the air dispersion modelling using AERMOD concluded that at the parameters modelled, it could not be concluded that there would be no potential likely significant effects for the four waste sites allocated for strategic residual waste recovery facilities within Zone C (waste sites 1, 2 [incorporating 10] and 6). It is considered that the detailed findings of the AERMOD air dispersion modelling report for waste sites 1, 2 [incorporating 10] and 6 should be noted and further more detailed assessment carried out at the planning application stage to demonstrate no adverse effects on European sites from air pollution. In addition to the allocated sites, waste sites 3, 4, 8 and 9 will require further assessment at the planning application stage for the potential effects of air pollution where it could not be concluded that there would be no likely significant effect within this assessment if they are to be promoted. The air dispersion modelling using AERMOD concluded that Site 7 had no likely significant effects at 200ktpa / 100m stack. Therefore the findings indicate that the required capacity for MSW and C&I strategic recovery (150 ktpa (approx) for MSW and 193 ktpa for C&I) within Zone C could potentially be delivered in part through this single site.

9.3.2 *ADMS Results*

The findings of the air dispersion modelling using ADMS indicate that three of these four waste sites allocated for strategic residual waste recovery facilities within Zone C (Site 1, 2 [incorporating 10] and 6) are not likely to have significant effects on European sites when modelled at 200 ktpa / 80 m stack. Site 4 is not likely to have significant effects on European sites when modelled at 200 ktpa / 80 m stack.

Therefore when considering potential scenarios presented by WCS4 to deliver the requirement of 150 ktpa (approx) for MSW and potentially 193 ktpa for C&I, the findings of the air dispersion modelling using ADMS demonstrate that this can be delivered at one or more sites or a combination of sites. Further waste sites where it cannot currently be concluded that there will be no likely significant effect may also be possible once the facility design is available. Developers will still need to demonstrate no likely significant effect on European sites alone or in-combination at the planning application stage as stated in the HRA report.

If any thermal waste proposals come forward on the non-allocated sites in Zone C i.e. Sites 3, 5, 7, 8, 9 the ADMS and AERMOD results detailed in this HRA report relating to these sites should be considered.

9.4 NON-STRATEGIC RECOVERY SITES (WITHIN AND OUTSIDE ZONE C)

If further non-strategic sites (<50 ktpa) are required for recovery within or outside Zone C, these could potentially be delivered through the remaining (i.e. non-allocated) waste sites which were assessed within the HRA. The findings of the air dispersion modelling for these waste sites using the AERMOD and ADMS models will need to be considered. Specific recommendations for the outside Zone C waste sites 11, 12 and 13 are discussed below.

9.4.1 ADMS Results

Waste Sites 11, 12 and 13 were not modelled through ADMS.

9.4.2 AERMOD Results

The air dispersion modelling using AERMOD concluded that at the parameters modelled for the strategic assessment for waste sites 12 and 13 potential significant effects were likely. Therefore, if waste sites 12 and 13 are proposed the detailed findings of the air dispersion modelling using AERMOD should be noted and further assessment carried out at the planning application stage to demonstrate no likely significant effects. The air dispersion modelling using AERMOD concluded that site 11 however had no likely significant effects at 100 ktpa/80 m stack. Therefore the findings indicate that, if this is required, non-strategic recovery outside Zone C could be delivered in part through this site when considering the AERMOD findings.

Based on the above consideration of the findings of both the ADMS and AERMOD modelling, it is considered that WCS4 is potentially deliverable and compliant with regard to the 2010 Regulations following the assessment carried out.

10 REPORT CONCLUSIONS

This assessment has been an iterative process working alongside and informing the contents of the GCC WCS Site Options and policies. The final aim of this study has been to carry out a review of the Final Publication WCS in terms of compliance with the 2010 Regulations. *Chapter 9* sets out this review and explains how the policies and site options are deliverable.

10.1 ASSESSMENT OF THE WCS AGAINST THE HABITATS REGULATIONS

It is concluded that the WCS and associated policies will have no likely significant effects alone or in-combination on any European designated sites for nature conservation. Therefore the WCS is considered to be compliant with the 2010 Regulations.

10.2 ASSESSMENT OF THE WCS SITE OPTIONS AGAINST THE HABITATS REGULATIONS

10.2.1 Waste Sites Concluding No Adverse Effects on the Integrity of European Sites

- The appropriate assessment concludes that there will be no adverse effect on the integrity of European sites through the development of any facility types at waste site 12.

- The appropriate assessment concludes that there will be no adverse effect on the integrity of European sites through the development of any facility types at waste site 13 when appropriate mitigation measures for bird disturbance are developed.

10.2.2 Waste Sites Concluding No Likely Significant Effect

Thermal Treatment Facilities Only

- The screening assessment concludes that no likely significant effects will arise from development of thermal treatment waste facilities at certain parameters at waste sites 7 and 11 when considering AERMOD findings for potential air pollution effects.

- The screening assessment concludes that no likely significant effects will arise from development of thermal treatment waste facilities at certain parameters at waste sites 1, 2, 4, 6, 7, 8 and 10 when considering ADMS findings for potential air pollution effects when appropriate mitigation measures for water pollution are developed for certain sites (see *Section 10.1.3*).

.

All other Facilities

The screening assessment concludes that no likely significant effects will arise from the development of other waste facilities at waste sites 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 when appropriate mitigation measures for water pollution are developed for certain sites (see *Section 10.1.3*).

10.2.3 *Waste Sites where it Cannot Be Concluded that there will be No Likely Significant Effect*

Thermal Treatment Facilities Only

The screening assessment concludes that it cannot be concluded that there will be no likely significant effects from development at waste sites 1, 2, 3, 4, 5, 6, 8, 9, 10, 12 and 13 when considering AERMOD findings for potential air pollution effects.

10.2.4 *Waste Sites Where Likely Significant Effects are Concluded*

Any Waste Facility

No likely significant effects were confirmed for the development of any waste facility at any of the 13 waste sites through the screening assessment.

10.2.5 *Mitigation*

Any Waste Facility

Appropriate mitigation measures will need to be developed to address potential water pollution effects for the development of any waste facility at waste sites 12 and 13.

Appropriate mitigation measures will need to be developed to address potential bird disturbance effects for the development of any waste facility at waste site 13.

10.2.6 *Assessment Limitations*

It is important to note the limitations of this study given the high level strategic nature of the WCS within which it has to operate and inform site options and policy.

As the detailed design of waste management facilities are not available at this stage, the precautionary principle adopted for HRA applies which requires a worst case scenario to be adopted for each part of the assessment.

In particular, the air dispersion modelling to inform potential likely significant effects for thermal treatment from stack emissions has a number of precautionary caveats involving the use of conservative modelling parameters, and gives results in the absence of mitigation which may serve to minimise potential impacts to an insignificant level.

In addition, following the precautionary principle it has been necessary to look at potential water pollution effects for waste sites which are remote from European sites. In practice a facility would not be permitted to operate unless mitigation measures were in place to avoid pollution of watercourses and had been approved by the EA.

Similarly where bird disturbance impacts are likely, avoidance and mitigation measures will be needed for waste site 13 to demonstrate there will be no adverse impact on European sites. These measures are difficult to quantify until precise design details are known.

Therefore where potential likely significant effects are identified for each part of the assessment at this stage, it does should not necessarily mean that these waste sites are not suitable for the development of a waste facility. Instead the findings of this study should inform the scope of the assessment required at the planning application stage once detailed a design is known.

10.2.7 Next Steps

Consultation with NE and the EA has formed part of the HRA process and consultation on this assessment will be carried out to complete the process.

Annex A

Waste Facility Impact Identification

A1 WASTE FACILITY IMPACT IDENTIFICATION

A1.1 SPECIFIC WASTE FACILITY OPERATIONAL IMPACTS

The WCS is technology neutral and GCC has adopted a technology neutral position in terms of its Residual Waste Project procurement process. At the time of writing two 'core technologies' have come forward from the remaining four bidders and these have been approved by the County Council Cabinet (1). These are:

- Modern Thermal Treatment / Energy from Waste / Incineration.
- Mechanical Biological Treatment (MBT) which includes a range of technologies, including composting, anaerobic digestion and bio-drying.

Based on the Cabinet Decision and additionally, in order to cover any future commercial and industrial waste uses that could come forward on these sites, GCC consider that the following facilities should be included in the assessment:

- Modern Thermal Treatment / Energy from Waste / Incineration;
- Advanced Thermal Treatment (including Pyrolysis and Gasification technologies;
- Autoclave; and
- Mechanical Biological Treatment (MBT) which includes a range of technologies, including composting, anaerobic digestion and bio-drying.

For the purposes of this assessment, it is assumed that any of the facilities listed in *Table A1.1* could be developed at any of the 13 waste sites.

Potential impacts listed in *Table A1.1* in are derived from ERM waste specialists' knowledge of waste facility impacts, recent planning applications (2) and Northamptonshire County Council Minerals and Waste Framework (3).

Standard control and mitigation measures assumed as standard within the normal operation of a waste facility are given in *Table A1.1.* Impacts are ruled out where it is considered that standard control measures will adequately mitigate the impact.

(1) Cabinet Date: 16 December 2009.
(2) Environmental Statement. Energy from Waste Facility, Trident Park, Cardiff. SLR for Viridor Waste Management. November 2008.
(3) Recently been found sound at examination and was adopted on 20th May 2010

Table A1.1 Waste Facilities and Associated Impacts

Facility	**Description** (1)	**Impacts and Standard Mitigation Requirements** (2)		
		Air Emissions (including dust)	***Protection of Water Resources***	***Disturbance***
Modern Thermal Treatment (MTT) Energy from Waste (EfW) / Incineration (I) and Advanced Thermal Treatment (ATT) (including Pyrolysis and Gasification technologies).	Waste management processes involving medium and high temperatures to recover energy from the waste. ATT includes pyrolysis and gasification based processes.	**Impacts** 1) Air emissions include carbon dioxide, acid gases, heavy metals, particulates and dioxins / dibenzofurans. 2) Limited potential for dust and ash release (mainly through accidental spillage and fugitive emissions). 3) Air emissions associated with emission from vehicles (haulage). **Standard Mitigation and Control Measures** 1) Proposals must satisfy criteria set out in the EC Waste Incineration Directive 2000 and require air pollution control systems. Licensing and regulation ensures effective pollution prevention control and mitigation measures are implemented to maintain operations within air emission standards. 2) Mitigation measures include covering ash, damping down and enclosed operations.	**Impacts** 1) Thermal technologies use minimal amounts of water and discharge minor amounts to sewers. **Standard Mitigation and Control Measures** 1) Standard measures should include capture and treatment/disposal of run-off and leachate, appropriate drainage, bunding wash down washers should prove effective at avoiding releases to waterways and are effective control and mitigation measures.	**Impacts** 1) Noise, light, human presence, litter, bird disturbance (where close to an SPA). **Standard Mitigation and Control Measures** 1) Standard control measures could include restricted directional lighting and fencing.

(1) Taken from Mechanical Biological Treatment of Municipal Solid Waste, Defra 2007 and Advanced Thermal Treatment of Municipal Solid Waste, Defra 2007.

(2) Source: Northamptonshire County Council Minerals and Waste Framework - Issues and Options

Facility	Description (1)	Impacts and Standard Mitigation Requirements (2)		
		Air Emissions (including dust)	*Protection of Water Resources*	*Disturbance*
Mechanical Biological Treatment (MBT)	Waste is usually mechanical treated (shredding or sorting) and then subjected to a biological treatment stage (this can be composting, IVC or anaerobic digestion). An MBT may or may not split organics from non-organics depending on the configuration of the plant. The plant may produce refuse derived fuel and/or stabilised organic material for composting for use on land (*only on contaminated land, not on agricultural*) as well as potential recyclate streams.	**Impacts** 1) Organic compounds and bio-aerosols from biological treatment processes and dust. 2) Air emissions associated with vehicle emissions from haulage. **Standard Mitigation and Control Measures** 1) Undertaking operations in controlled conditions and an enclosed area, sensitive working and strategic design are effective measures.	**Impacts** 1) Limited potential for impact on water resources as operations and storage of materials is enclosed / undercover hence rainfall is unlikely to come into contact with potential pollutants. **Standard Mitigation and Control Measures** 1) Controlled surface drainage, capture and treatment of run-off and wash-down water are effective mitigation measures.	**Impacts** 1) Noise, light, human presence, litter, bird disturbance (where close to an SPA). **Standard Mitigation and Control Measures** 1) Standard control measures could include restricted seasonal working, directional lighting and fencing.
Open Windrow Composting (OWC) In Vessel Composting (IVC)	Green waste is shredded and left in the open to mature. It is turned regularly. The compost can be used on land (*only on contaminated land, not on agricultural*) subject to appropriate controls. The aerobic decomposition of shredded and mixed organic waste within an enclosed container	**Impacts** 1) Potential for bio aerosol effects within 250m of operations. In vessel composting facilities feature part or all of composting processes in enclosed areas (including a concrete base). 2) Open windrow is usually undertaken in the open air on a concrete base. Potential for dust from heaps, processing and haulage. **Standard Mitigation and Control Measures** 1) Mitigation measures may reduce	**Impacts** Leachate and run-off from compost heaps has a high content of organic substances. **Standard Mitigation and Control Measures** Leachate should be captured and undergo recirculation and / or treatment prior to release (eg to sewers) to prevent contamination of surface and ground waters. Enclosed operations significantly reduce environmental nuisance and pollution risk as it can help to prevent water coming into contact with waste.	**Impacts** 1) Noise, light, human presence, litter, bird disturbance (where close to an SPA). **Standard Mitigation and Control Measures** 1) Standard control measures could include restricted seasonal

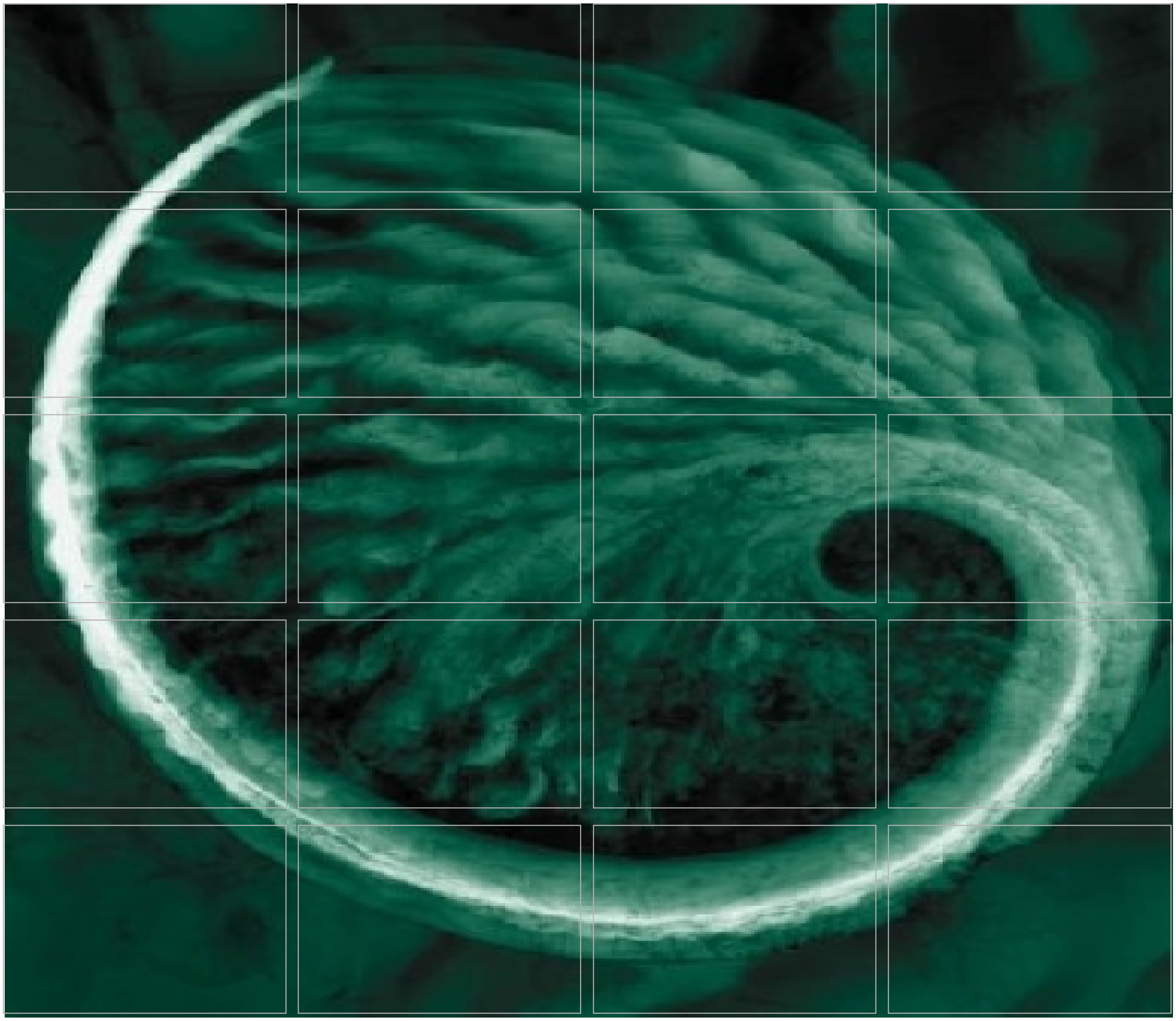
Facility	Description (1)	Impacts and Standard Mitigation Requirements (2)		
		Air Emissions (including dust)	*Protection of Water Resources*	*Disturbance*
		this distance. Enclosed operations reduce potential effects. 2) This is able to be mitigated through damping down during dry conditions, use of physical barriers or alternatively where possible enclosed operations preferred as well as sensitive / strategic operations (avoid operations during windy conditions). Low potential for fugitive emissions.		working, directional lighting and fencing.
Anaerobic Digestion	The anaerobic decomposition of shredded and mixed organic waste within an enclosed container, where the control systems for material degradation are fully automated	**Impacts** 1) Potential release of bio-aerosols, and bio gas emissions. **Standard Mitigation and Control Measures** 1) Operations undertaken in enclosed area hence emissions are controlled. Limited potential for dust. Air filtration and good operating standards (unloading, transport) are effective management measures. However some fugitive emission may arise. Feedstock is converted to biogas, gas must be burnt and can be used to generate heat and power. Results in compost product and liquor (recycled, treated, or used as liquid fertiliser).	**Impacts** 1) Waste water produced during dewatering of solid digestate can contain high concentrations of metals, dissolved nitrogen and organic material. **Standard Mitigation and Control Measures** 1) Potential for pollution if left untreated, this is mitigated by on site drainage, containment and collection systems for waste water, surface and run-off waters and onsite treatment where necessary. Alternatively waste water may be able to be disposed of to sewer and treated at sewage works.	**Impacts** 1) Noise, light, human presence, litter, bird disturbance (where close to an SPA). **Standard Mitigation and Control Measures** 1) Standard control measures could include restricted seasonal working, directional lighting and fencing.
Materials Recycling Facility/ Material Recovery Facility	Dedicated facility for the sorting / separation of recyclable materials.	**Impacts** 1) Air emissions are mainly associated with emission from vehicles (haulage).	**Impacts** 1) Limited potential for impact on water resources due to nature of operations and materials.	**Impacts** 1) Noise, light, human presence, litter, bird

Facility	Description (1)	Impacts and Standard Mitigation Requirements (2)		
		Air Emissions (including dust)	*Protection of Water Resources*	*Disturbance*
(MRF)		**Standard Mitigation and Control Measures** 1) Limited potential for release of dust and other fugitive emissions due to nature of operations (enclosed with sealed surface e.g. concrete base) and materials (non-biodegradable).	Residual liquids (e.g. from bottles and cans) can potentially pose a pollution risk to water resources. **Standard Mitigation and Control Measures** 1) Appropriate site drainage and capture and treatment of run-off and wash down waters are effective mitigation measures.	disturbance (where close to an SPA). **Standard Mitigation and Control Measures** 1) Standard control measures could include restricted seasonal working, directional lighting and fencing.
Waste Transfer Station	A facility to which waste is taken for onward transfer for treatment, recycling or landfill elsewhere.	**Impacts** 1) Air emissions relating to waste transfer would be primarily associated with vehicle emissions from haulage, with low potential for dust and fugitive emissions.	**Impacts** 1) Nature of waste collected at depot may have potential risk to water resources, **Standard Mitigation and Control Measures** 1) Enclosed operations reduce exposure of potential pollutants to water, capture and treatment of runoff. Wash-down waters are effective mitigation measures.	**Impacts** 1) Noise, light, human presence, litter, bird disturbance (where close to an SPA). **Standard Mitigation and Control Measures** 1) Standard control measures could include restricted seasonal working, directional lighting and fencing.

Facility	Description (1)	Impacts and Standard Mitigation Requirements (2)		
		Air Emissions (including dust)	*Protection of Water Resources*	*Disturbance*
Household recycling centre	A facility where the public can bring waste for recycling and/or disposal. Includes oversize, awkward, hazardous and WEEE wastes.	**Impacts** 1) Air emissions are mainly associated with emission from vehicles (haulage). Limited potential for release of dust, fugitive emissions and bio-aerosols. **Standard Mitigation and Control Measures** 1) Enclosed operations and a high rate of turnaround (avoid degradation of waste and release of bio-aerosols) are effective control measures.	**Impacts** 1) Limited potential for impact on water resources due to nature of operations and materials. Residual liquids and organic leachate from green waste can potentially pose risk to water resources. **Standard Mitigation and Control Measures** 1) Undertaking operations in enclosed or undercover area, appropriate site drainage and capture and treatment of run-off and wash down waters are effective mitigation measures.	**Impacts** 1) Noise, light, human presence, litter, bird disturbance (where close to an SPA). **Standard Mitigation and Control Measures** 1) Standard control measures could include restricted seasonal working, directional lighting and fencing.

Annex B

Air Dispersion Modelling Report



Annex B – Air Dispersion Modelling Report

Final Report

December 2010

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Annex B – Air Dispersion Modelling Report

Reference 0114924

December 2010

Prepared by: Beth Seldon

For and on behalf of
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Approved by: Roger Barrowcliffe

Signed:

Position: Partner

Date: 1st December 2010

CONTENTS

B1 *AIR DISPERSION MODELLING*

B1.1 INTRODUCTION

This *Technical Annex* presents the details and results of the air dispersion modelling for emissions from a hypothetical waste thermal treatment facility (*ie* an Energy-from-Waste (EfW) plant) at a number of potential locations. This work has been carried out in support of the Habitats Regulations Assessment (HRA) for the Gloucestershire County Council's (GCC) Waste Core Strategy (WCS) for determining the potential impacts upon the surrounding European designated sites. The European sites for nature conservation have been selected in consultation with the GCC's Waste Planning Authority (WPA) and include the following:

- Special Areas of Conservation (SAC);
- Special Protection Areas (SPAs); and
- Ramsar sites.

The determination of potential impacts upon the surrounding European designated sites is based on comparing the relative magnitude of the predicted Process Contribution (PC) in terms of toxic effects (pollution impacts from air pollutants), acid deposition and nutrient nitrogen deposition against established critical levels and site-relevant critical loads. In addition, sensitivity analysis has also been carried out for the following parameters to determine the influence on the magnitude of the PCs:

- Varying the waste tonnages to be processed by the EfW plant;
- Varying the stack height; and
- Using two dispersion models with different treatment of terrain.

B1.2 ASSESSMENT METHODOLOGY

B1.2.1 *Dispersion Models*

Two dispersion models are widely used and recognised by the Environment Agency (EA) in the United Kingdom (UK); one being the AERMOD model promulgated by the United States Environmental Protection Agency, the other being the ADMS model developed by the Cambridge Environmental Research Consultants Ltd. Both models are "new generation" in that they apply up-to-date physics using parameterisations of the boundary layer structure based on the Monin-Obukhov length and the boundary layer height. Extensive validation studies have been carried out for both models.

However, both models treat terrain effects on plume dispersion in a different way. In AERMOD, the dividing streamline concept is adopted, whereby a weighted average is calculated for a terrain-following plume and a terrain-impacting plume. In ADMS, a flow field and turbulence field are calculated by the model and the plume is dispersed within those.

In the first instance, as an extensive number of model runs were needed, AERMOD has been selected as the principal model to be used for this study due to the faster model run times compared to ADMS. However, for a selection of potential waste sites, additional runs were carried out using ADMS to provide an insight into the influence of terrain.

B1.2.2 *Modelling Scenarios*

Modelling Approach

The 13 potential waste sites that have been evaluated for the HRA using AERMOD are as follows:

1. Areas A, B and C at Wingmoor Farm East, Tewkesbury Borough
2. Areas A, B and C at Wingmoor Farm West, Tewkesbury Borough
3. Easter Park, Ashchurch/ Tewkesbury Industrial Estate, Tewkesbury Borough
4. Javelin Park, Haresfield, Stroud District
5. Land adjacent to Quadrant Business Centre, Quedgeley, Stroud District
6. Land at Moreton Valence, Stroud District
7. Land north of Railway Triangle, Gloucester
8. Nastend Farm, Stroudwater Business Park, Stonehouse, Stroud District
9. Netheridge Sewage Treatment Works, Gloucester
10. The Park, Wingmoor Farm West, Tewkesbury Borough
11. Foss Cross Industrial Estate, Calmsden, Cotswold District
12. Hurst Farm, Lydney, Forest of Dean District
13. Land at Ldyney Industrial Estate, Lydney, Forest of Dean District

As modelling has been conducted for a hypothetical facility without an actual engineering design, certain assumptions have to be made. Therefore, the conclusions of this study are limited and based only on the assumed model inputs described below. Further modelling will be required of any developer during the planning and environmental permitting stage, which will be based on the actual design parameters for a proposed facility.

For example, the exit volumetric flow rate has been pro-rated from an actual similar facility [(1)] based on the annual waste tonnage. In the evaluation of air quality impacts from an actual plant, stack height is usually optimised based on factors such as building downwash, visibility impacts, engineering considerations and reducing impacts on receptors to an insignificant level. As

(1) The volumetric flowrate used in this assessment is pro-rated from the volumetric flowrate for Rufford Energy Recovery Facility, Veolia Environmental Services. Integrated Pollution Prevention and Control (IPPC) Application, prepared by ERM for submission to the Environment Agency, November 2007. Environmental permit granted in June 2009. Volumetric flowrate for the Rufford facility was at 57.6 m^3/s for a waste throughput of 180,000 tpa. This flowrate has been approved by discussion with the EA in the West of England Partnership (WOEP) Joint Waste Core Strategy prepared by ERM in September 2009.

an initial assumption for this high-level screening study, the base stack height has been assumed to be at 80 m.

For each of these waste site options, the European sites within 15 km of the waste site have been assessed. For Sites 1 to 10, the assessment has assumed the following initial waste throughput and stack height:

- thermal treatment: 400 ktpa with a stack height of 80 m

For Sites 11 to 13, the assessment has assumed the following initial waste throughput and stack height:

- thermal treatment: 100 ktpa with a stack height of 80 m

The proposed initial waste throughputs and stack heights are the worst-case inputs; therefore, if impacts are acceptable (see *Section B1.4*) using these initial inputs for a modelled pairing of EfW potential site and European sites, then there is no further need to carry out further model runs for lower waste throughputs and higher stack heights for this particular pairing. If further model runs are needed, they have been carried out with the following hierarchy until an acceptable impact is reached:

- Step 1: Incrementally increasing stack height by 10 m (up to 100 m) for the initial waste throughput;

- Step 2 (if Step 1 does not produce acceptable impacts): Incrementally reducing waste throughputs for Sites 1 to 10 to 200 ktpa and 100 ktpa, and for Sites 11 to 13 to 50 ktpa. Stack heights will be kept constant at 80 m for all runs; and

- Step 3 (if Step 2 does not produce acceptable impacts): Increasing stack height to 100 m for Sites 1 to 10 at 200 ktpa and 100 ktpa and for Sites 11 to 13 at 50 ktpa.

In the interests of time and cost, it has not been feasible to model for all combinations of potential waste sites and European sites. Building on the premise that greater distances between an emission source and a receptor would result in lower ground level concentrations due to increased dispersion, the modelling has focused on the modelling of the nearest/ most sensitive European sites to each potential waste site. Implicit in this approach is that if impacts are acceptable at the nearest/most sensitive European sites, impacts at more distant and less sensitive European sites will also be acceptable. Some judgement is required here, since there may be some more distant locations that experience greater impacts through the effect of terrain on the dispersing plume.

The AERMOD modelling has been carried out for European sites that are nearest to each potential site location. These locations are shown in *Figure 3.1* in the main report. The European sites corresponding to each of the potential waste sites that have been modelled using AERMOD are shown in *Table B1.1*.

Table B1.1 ***European Sites Corresponding to Each Potential EfW Site Location (AERMOD)***

	Dixton Wood	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
Site 1 (Wingmoor Farm East, Area A)*	√							
Site 2 (Wingmoor Farm West, Area C)*	√							
Site 3 (Easter Park)	√	√						
Site 4 (Javelin Park)			√	√	√	√		
Site 5 (Quadrant Business Centre)			√	√	√	√		
Site 6 (Moreton Valence)			√	√	√	√		
Site 7 (Railway Triangle)				√	√			
Site 8 (Nastend Farm)			√	√	√	√		
Site 9 (Netheridge Sewage Treatment Works)			√	√	√			
Site 10 (The Park)	√							
Site 11 (Foss Cross Industrial Estate)					√			
Site 12 (Hurst Farm)			√				√	√
Site 13 (Lydney Industrial Estate)			√				√	√

* The area nearest to the modelled European sites among the three potential areas that forms the potential EfW site location

As a sensitivity test for terrain influence, selected potential waste sites have also been modelled using ADMS for a set stack height of 80m, and waste throughputs of 400 ktpa, 200 ktpa and 100 ktpa. Specific waste sites were selected due to the significance of the terrain located between the site and the European site. Only those European sites recognised as being most sensitive in terms of impacts from the selected waste sites from the AERMOD modelling were used. The European sites corresponding to each of the potential waste sites that have been modelled using ADMS are shown in *Table B1.2*.

Table B1.2 European Sites Corresponding to Each Potential EfW Site Location (ADMS)

	Dixton Wood	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
Site 1 (Wingmoor Farm East, Area A)*	√							
Site 2 (Wingmoor Farm West, Area C)*	√							
Site 4 (Javelin Park)					√			
Site 6 (Moreton Valence)					√	√		
Site 7 (Railway Triangle)					√			
Site 8 (Nastend Farm)					√	√		
Site 10 (The Park)	√							

* The area nearest to the modelled European sites among the three potential areas that forms the potential EfW site location

Routine Emissions

The EfW facility is specified to achieve the applicable limits on releases to air, based upon Annex V of the Waste Incineration Directive (WID) (2000/76/EC). Emission limit values, as specified in the WID for daily mean concentrations, are used to calculate the routine emissions rates of pollutants from the EfW facility.

The assumed stack parameters and emissions rates (as calculated from WID) are summarised in *Table B1.3*. It has been assumed that there are two flues corresponding to two incineration streams. The two stacks were further assumed to be in close proximity to take advantage of increased momentum flux and buoyancy, and therefore an "effective" combined stack has been used in the modelling. Energy from Waste plants are typically constructed with multiple process lines, either two or three dependant upon the required plant capacity. This modular approach is used to allow the process to continue to operate when one process line is off-line for routine maintenance. The use of two emission points therefore reflects the actual plant design, and whether these are in one or two stacks makes no significant difference to the model.

The modelling results presented in later sections of this report are based on the set of assumed modelling inputs in *Table B1.3*.

Table B1.3 Stack Parameters and Emissions Rates

Parameters	Stack (Corresponding to Each Potential Site)			
Stack Parameters				
Location (OS grid)	Site 1 – 394291, 227509			
	Site 2 – 393400, 227294			
	Site 3 – 392138, 233301			
	Site 4 - 380054, 210497			
	Site 5 – 380928, 212472			
	Site 6 – 379124, 209960			
	Site 7 – 384614, 218226			
	Site 8 – 379512, 206382			
	Site 9 – 380924, 215797			
	Site 10 – 393153, 227381			
	Site 11 – 405621, 209121			
	Site 12 – 365112, 202989			
	Site 13 – 364414, 201686			
Stack height (m)	80, 90, 100 (a)			
Effective exit diameter (m)	2.83			
Exit temperature (°C)	140			
Emissions Concentration (c)				
HCl (mg Nm^{-3})	10			
HF (mg Nm^{-3})	1.0			
SO_2 (mg Nm^{-3})	50			
NO_X (mg Nm^{-3})	200			
NH_3 (mg Nm^{-3}) (d)	10			
Volumetric Flow Rates	*400 ktpa*	*200 ktpa*	*100 ktpa*	*50 ktpa*
Actual volumetric flow rate (Am^3 s^{-1}) (b)	128	64	32	16
Normalised volumetric flow rate (Nm^3 s^{-1}) (c)	104	52	26	13
Emission Rates	*400 ktpa*	*200 ktpa*	*100 ktpa*	*50 ktpa*
HCl (g s^{-1})	1.04	0.520	0.260	0.130
HF (g s^{-1})	0.104	0.0520	0.0260	0.0130
SO_2 (g s^{-1})	5.20	2.60	1.30	0.650
NO_X (g s^{-1})	20.8	10.41	5.20	2.60
NH_3 (g s^{-1})	1.04	0.520	0.260	0.130

(a) Assumed heights.
(b) Assumed to have 6% O_2 and 18% moisture. The different volumetric flow rates have been pro-rated based on the varying waste throughputs.
(c) Normalised to 11% O_2 and dry conditions.
(d) Assumed concentration for NH_3, which is not part of WID limits.

Non-routine Emissions

A technically complex process, such as an EfW plant, is highly unlikely to operate for a protracted period of time without some non-routine events occurring. These events are typically short term (a few minutes) but have the potential to result in short term elevated emissions. These events can occur for a number of reasons, such as disturbances/ failures of the pollution abatement equipment or measurement devices, during which the emissions to air may exceed the prescribed emission limit values.

Under non-routine operation, the WID does not allow incineration of waste for a period of more than four hours uninterrupted where emission limit values are exceeded. In reality, non-routine events are detected by the process controllers, either due to deviations in typical emissions as measured by the continuous emissions monitoring systems (CEMS) installed on the plant or through monitoring of the process itself (ie combustion chamber temperature). On this basis, non-routine events can be swiftly identified and rectified. In most cases a non-routine operation will not necessitate closure of a stream.

In addition, the EA exercises a high level of regulatory control over EfW plants in all areas, including that of non-routine operations. Within the Environmental Permit required for any EfW plant to operate, the EA will stipulate a maximum period of time throughout the year where elevated emissions can occur due to non-routine emissions, typically 60 hours throughout an 8760 hour (1 year) operating period. This stipulation ensures that the process operator has the flexibility to respond to inevitable occasional failures and recognises that elevated emissions will typically only occur for a few minutes, as a problem is rectified.

In light of this, the potential impacts from non-routine emissions, if any, are likely to be of a very short duration. Therefore, no specific consideration of the potential impacts associated with non-routine emissions have been taken into account, and air dispersion modelling has not been carried out for non-routine emissions.

B1.2.3 Meteorological Data

The meteorological data from the Brize Norton meteorological station have been used. This dataset was selected as it is one of the nearest meteorological observing stations to all the evaluated EfW facilities' potential locations where 5 recent years (2005 – 2009) of complete hourly meteorological data are available. There are a limited number of Meteorological Office stations in the UK that are capable of generating a suitable dataset for dispersion modelling. Such stations have to make sufficiently frequent observations of cloud cover in order to estimate atmospheric stability every hour.

The location of the Brize Norton meteorological station is sufficiently representative of the climate at the locations of the EfW and the European sites, in that it has a similar surrounding land use, terrain and a non-coastal location. The synoptic weather patterns experienced by Gloucestershire and Oxfordshire are very similar.

The wind roses are shown in *Figure B1.1*. The predominant winds are from the southwest direction, similar to what is experienced in most parts of England.

B1.2.4 Terrain Data

The movement of air across and over terrain can have a potentially significant impact on the dispersion of emissions. The European sites and the associated locations for the EfW facility are generally located in areas with significant variations in elevation. On this basis, terrain data have been included in the modelling and accounted for in the assessment.

The treatment of dispersion over and around terrain features varies between models and this can lead to divergent predictions in some circumstances where the terrain features are significant. In this modelling study, several of the receptor locations are on hills of approximately 200 m in height and the way that the model calculates the plume trajectory when it reaches these locations becomes very important. If the model assumes that the plume impinges on the terrain in many atmospheric conditions, then ground level concentrations will be high. On the other hand, if the model assumes that the plume rises over the terrain, concentrations at the ground will be low. The sensitivity of the model results to this aspect was tested by the use of two models, ie AERMOD and ADMS.

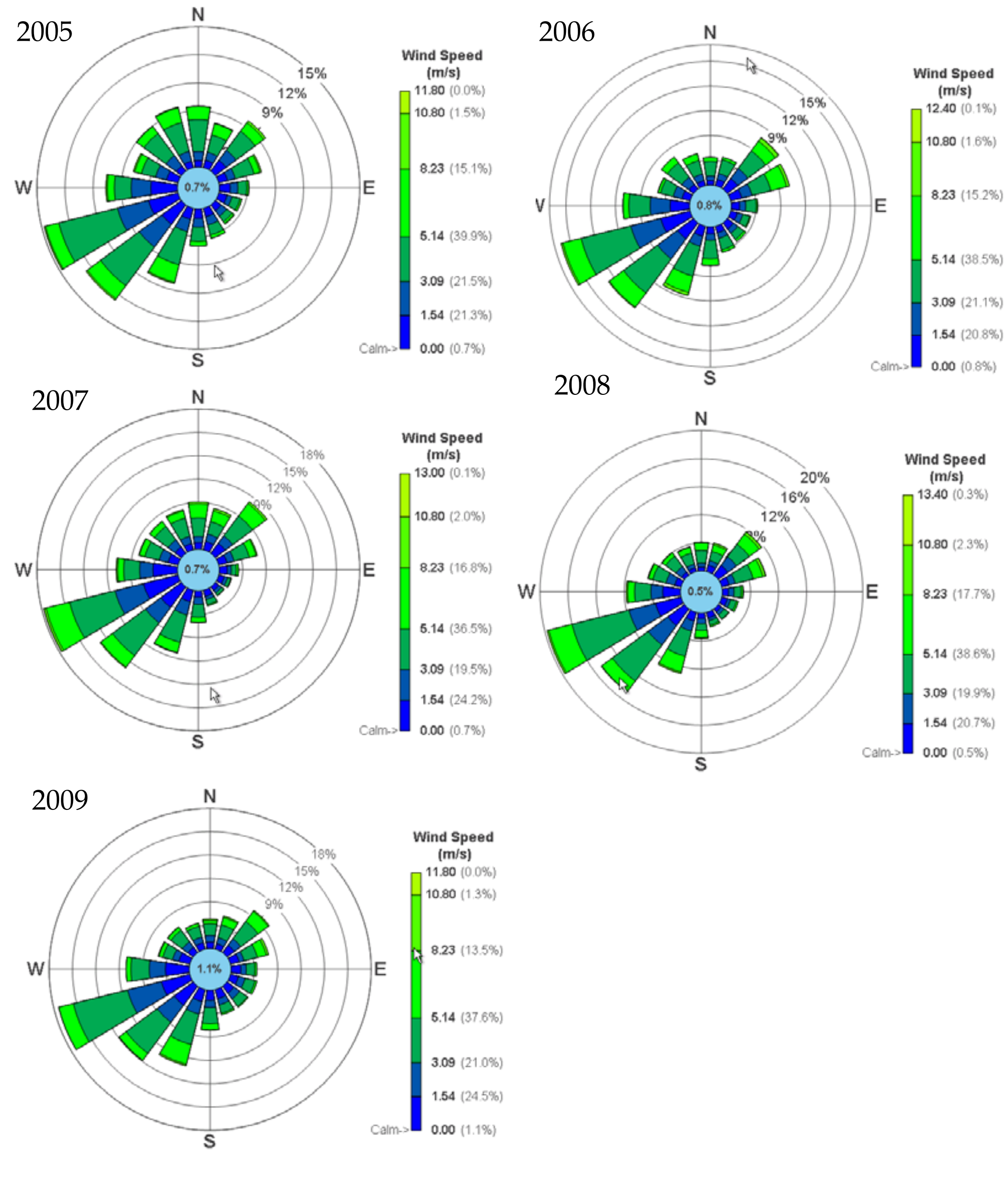
B1.2.5 Surface Options

The surface options for the dispersion modelling are defined in the preparation of the meteorological data by the albedo, Bowen ratio and roughness length. These parameters are related to the surrounding land use.

The albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The Bowen ratio is a measure of the partitioning of solar energy between evaporating water and heating the air. Surface roughness is related to the height of obstacles to the wind flow.

The predominant surfaces within the area are for urban land use, grasslands and water surface (for locations near to the Severn Estuary).

Figure B1.1 Wind Roses for Brize Norton (2005 - 2009)



Source: UK Meteorological Office

B1.3 *ASSESSMENT CRITERIA – CRITICAL LEVELS AND CRITICAL LOADS*

The assessment criteria are divided into critical levels and critical loads, which are obtained from the Air Pollution Information System (APIS) (1) website. The APIS database is an online support tool which provides a comprehensive source of information on air pollution and its effects on habitats and species, including critical loads and levels, as well as baseline deposition and concentration data.

APIS has been developed (and funded) as a partnership consisting of the Centre for Ecology and Hydrology (CEH), the UK pollution regulatory agencies (the Environment Agency and the Scottish Environment Protection

(1) www.apis.ac.uk

Agency) and conservation agencies (including the Countryside Council for Wales, Environment Heritage Service, English Nature, the Joint Nature Conservation Committee, Scotland and Northern Ireland Forum for Environmental Research, and Scottish Natural Heritage) [(1)].

The information in APIS is used to inform assessments required under the Habitats Regulations or other legislation. However, it is not the purpose of APIS to provide guidance or policies for undertaking such assessments, which are covered separately by the conservation and regulatory agencies.

Critical levels are the ambient threshold levels for direct toxic effects of pollutant concentrations (NO_X, SO_2, NH_3 and HF) through atmospheric uptake above which harmful effects can be shown on a habitat or species, according to current knowledge. Critical loads are the threshold level for the deposition of a pollutant above which harmful indirect effects can be shown on a habitat or species, according to present knowledge. Critical loads are set for deposition of acid and nutrient nitrogen.

The APIS database has been used to obtain the critical levels which are not habitat-dependent, and the site-relevant acid and nutrient nitrogen critical loads which support the conservation objectives of the respective European sites. Site-relevant critical loads are based on the critical load function (CLF), which modifies the empirical critical load (based mainly on soil type) by allowing for non-marine base cation deposition and base cation uptake by vegetation. A separate critical load is provided for nitrogen (N) and sulphur (S). In the case of nutrient nitrogen, the critical loads are given as a range, *eg* 10-20 kg N/ha/yr.

The assessment criteria for the European sites are presented in *Table B1.4* and *Table B1.5* for critical levels and critical loads, respectively.

(1) http://www.apis.ac.uk/introduction.html

Table B1.4 European Sites and Critical Levels [(a)]

European Sites	Interest Features	Critical Levels (μg m^{-3}) (Applicable to All European Sites)
Dixton Wood (SAC)	Violet click beetle	NO_X : 30 (annual mean) SO_2 : 20 (annual mean) NH_3 : 3300 (hourly mean) [(b)] 70 (daily mean) [(b)] 23 (monthly mean) [(b)] 3 (annual mean) (excluding woodlands) 1 (annual mean) (woodlands only) HF : < 5 (daily mean) < 0.5 (weekly mean) < 0.2 – 0.3 (monthly mean) < 0.2 – 0.3 (3-monthly mean)
Bredon Hill (SAC)	Violet click beetle	
Severn Estuary (SAC, SPA, Ramsar)	Tundra swan, greater white-fronted goose, common shelduck, gadwall, dunlin, common redshank, waterfowl assemblage	
Walmore Common (SPA/ Ramsar)	Tundra swan	
Cotswold Beechwoods (SAC)	Beech forests, semi-natural dry grasslands and scrubland facies: on calcareous substrates	
Rodborough Common (SAC)	Semi-natural dry grasslands and scrubland facies: on calcareous substrates	
Wye Valley & Forest of Dean Bats (SAC)	Lesser horseshoe bat, greater horseshoe bat	
Wye Valley Woodlands (SAC)	Beech forests, mixed woodland, yew-dominated woodland, lesser horseshoe bat	

(a) Source: APIS, unless otherwise stated (www.apis.ac.uk).
(b) Source: H1 Horizontal Guidance Note, Appendix F: Air Emissions, Environment Agency, Version April 2010. (http://publications.environment-agency.gov.uk/pdf/GEHO0510BSNI-e-e.pdf)

Table B1.5 ***European Sites and Site-Relevant Critical Loads for Acid and Nutrient Nitrogen Deposition Rates*** *(a)*

European Sites	Interest Feature	Acid Deposition Critical Loads (keq ha^{-1} yr^{-1})	Nutrient Nitrogen Deposition Critical Loads (kg N ha^{-1} yr^{-1})
Dixton Wood (SAC)	Violet click beetle	2.58	10 to 15
Bredon Hill (SAC)	Violet click beetle	2.55	10 to 15
Severn Estuary (SAC, SPA, Ramsar)	Tundra swan, greater white-fronted goose, common shelduck, gadwall, dunlin, common redshank, waterfowl assemblage	The broad habitats associated with the species of interest are not sensitive to acidity	20 to 30 (Littoral sediment – habitat for common shelduck, dunlin, common redshank) The broad habitats associated with the rest of the species of interest are not sensitive to nutrient nitrogen
Walmore Common (SPA/ Ramsar)	Tundra swan	The broad habitats associated with the species of interest are not sensitive to acidity	The broad habitats associated with the species of interest are not sensitive to nutrient nitrogen
Cotswold Beechwoods (SAC)	Beech forests, semi-natural dry grasslands and scrubland facies: on calcareous substrates	2.68 (Beech forests) 4.76 (Grasslands)	10 to 15 (Beech forests) 15 to 25 (Grasslands)
Rodborough Common (SAC)	Semi-natural dry grasslands and scrubland facies: on calcareous substrates	4.75	15 to 25
Wye Valley & Forest of Dean Bats (SAC)	Lesser horseshoe bat, greater horseshoe bat	0.99	10 to 15
Wye Valley Woodlands (SAC)	Beech forests, mixed woodland, yew-dominated woodland, lesser horseshoe bat	1.22	10 to 15

(a) Source: APIS.

B1.4 *ASSESSING ACIDIFICATION IMPACTS*

B1.4.1 *Acidification Processes*

Soil is acidified slowly as a result of natural processes. This has been going on since the end of the last ice age, but has been greatly accelerated by forestry and acid deposition. The most serious consequences can be summarised in the following three points.

Plant nutrients are leached out. Nutrients important to plants, particularly base cations (mainly magnesium, potassium and calcium), are leached out by the additional acid. This, combined with lower pH levels, can lead to the displacement of sensitive species of plants. Growth in woodlands can be affected by the reduction in the availability of nutrients, although it does seem that coniferous trees in symbiosis with mycorrhizal fungi and bacteria can speed up weathering to some extent themselves if needed.

Toxic metals are freed. When soil is acidified it increases the concentration of free aluminium ions in the water held within the soil, and these ions are potentially toxic to the root systems of plants. The mobility of many heavy metals also increases when soil becomes more acidic. Perhaps the most serious consequence of the higher metal concentrations is their negative effect on many of the bacterial decomposers that live in the soil.

Phosphates become bound. Increasing levels of dissolved aluminium also affect plants indirectly. The "released" aluminium ions are able to bind the vital nutrient phosphorus (in the form of aluminium phosphate) and make it less accessible to plants. The shortage of phosphate is aggravated by the fact that decomposition in the soil slows down under acidic conditions. In addition to phosphate, certain important micro nutrients – such as molybdenum, boron and selenium – also become less accessible to plants when soil is acidified.

In describing and quantifying acidification, therefore, the important factors are related to soil chemistry and, in particular, the availability of the base cations and the concentrations of aluminium ions in the soil. At a given site, the susceptibility to additional acid deposition will depend strongly on the soil type; a nutrient rich alkaline soil will have the buffering capacity to absorb additional acid and avoid the effects described above. A naturally acidic and thin soil, however, will not have this capacity and the base cations are readily stripped out of the soil.

B1.4.2 Calculating Critical Loads for Acidification

Once an understanding of the processes that result in damage to trees and plants had been gained by researchers in the 1980s and 1990s, it became possible to define the problem in terms of a threshold deposition rate, above which increasing levels of harm occur and below which an ecosystem is essentially unaffected. This threshold was called a critical load. For acidification processes, it was natural to express the critical load in terms of total acidity, in units of hydrogen ions deposited per hectare per year (keq ha^{-1} $year^{-1}$).

The critical load for a location could be calculated with knowledge of the geology and soil properties, since the critical load is largely a function of the balance between the base cations provided by the mineral weathering of the underlying rocks and the removal of these base cations through leaching.

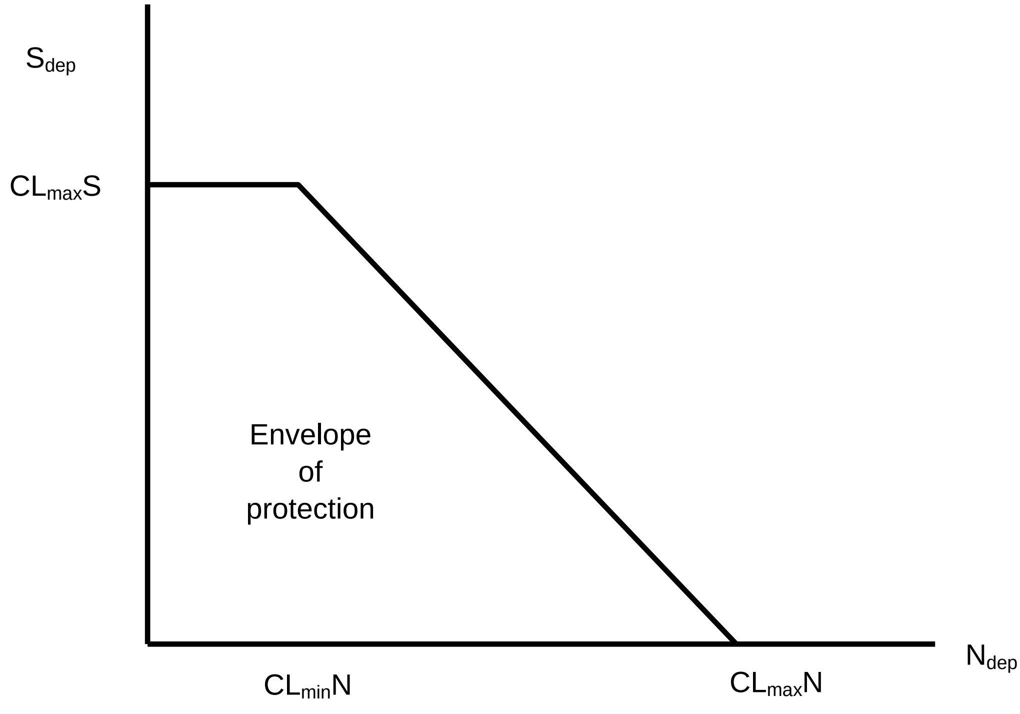
B1.4.3 *The Critical Load Function*

The expression of a critical load became more sophisticated with the adoption of the Critical Loads Function (CLF), developed by Posch et al, (1995) (1). The CLF defines combinations of sulphur and nitrogen deposition that will not cause harmful effects, ie a critical load 'boundary' expressed in terms of components of sulphur and nitrogen deposition. These critical load components incorporate data on base cation and nitrogen uptake, non-marine base cation deposition, nitrogen immobilisation and leaching and denitrification.

Details on the methods used to derive these critical load values for the UK can be found in Hall *et al*. (2003b & 2004b) (2).

The CLF is a three-node line graph representing the acidity critical load, where the intercepts of the CLF on the sulphur and nitrogen axes define the sulphur and nitrogen critical load values ($CL_{max}S$, $CL_{min}N$ and $CL_{max}N$ (shown on the graph below). Combinations of sulphur and nitrogen deposition above the CLF exceed the critical load, while all areas on or below the CLF line represent an "envelope of protection" where critical loads are not exceeded.

Figure B1.2 *CLF Graph*



(1) Posch, M., de Smet, P.A.M., Hettelingh, J.-P. & Downing, R. (eds.) (1995). Calculation and mapping of critical thresholds in Europe: Status Report 1995. Coordination Centre for Effects, National Institute of Public Health and the Environment (RIVM), Bilthoven, The Netherlands. Available online at: http://www.mnp.nl/cce/

(2) Hall, J., Ullyett, J., Heywood, L., Broughton, R., Fawehinmi, J. & 31 UK experts. (2003a). Status of UK critical loads: Critical loads methods, data and maps. February 2003. Report to Defra (Contract EPG 1/3/185). http://critloads.ceh.ac.uk

The CLF was adopted because it has become clear that sulphur and nitrogen are processed very differently by ecosystems. Whereas all the sulphur deposition could contribute to acid deposition, not all of the nitrogen deposited will. Some of it is taken up and stored in the ecosystem or immediately released. The non acidifying part of the N deposition is $CL_{min}N$. $CL_{max}N$ is equal to $CL_{max}S$ and $CL_{min}N$. Another way of expressing this approach is to say that the CL for acidity is given approximately by $CL_{max}S + CL_{min}N$.

Using the CLF, any acidity exceedences are calculated by the Centre for Ecology and Hydrology (CEH) for the habitat critical load values in each 1km square in which they occur across the country and these can be found on the APIS web site.

It should be noted that the critical loads data are derived from empirical or steady-state mass balance methods, which are used to define long-term critical loads for systems at steady-state. Therefore, exceedence is an indication of the potential for harmful effects to systems at steady-state. This means that current exceedence does not necessarily equate with damage. In addition, achievement of non-exceedance of critical loads does not mean the ecosystems have recovered. Chemical recovery will not necessarily be accompanied by biological recovery; and the timescales for both chemical and biological recovery could be very long, particularly for the most sensitive ecosystems.

B1.5 IMPACT SIGNIFICANCE CRITERIA

The impact significance criteria used in this assessment are divided into significance for long-term impacts and significance for short-term impacts. Long-term impacts are evaluated for NO_X, SO_2, NH_3, acid deposition and nutrient nitrogen deposition. Short-term impacts are evaluated for NH_3 and HF.

For long-term (*ie* annual average) impacts, the impact significance criteria are taken from those developed jointly by the Environment Agency and Natural England and are described below [(1)]:

- Where the predicted PC within the emission footprint in any part of the European site is ≤ 1% of the relevant long-term benchmark (environmental assessment level, critical level or critical load), the emission is '*not likely to have a significant impact alone or in combination irrespective of the background levels*'.

- Where the predicted PC within the emission footprint in any part of the European site is > 1% of the relevant long-term benchmark, further

(1) (Appendix 7), Stage 1 and 2 Assessment of new PIR Permissions under the Habitats Regulations, Environment Agency, Version 05/06/07.

consideration is given to the PC in combination with the background concentrations.

- The predicted environmental concentration (PEC) is calculated by adding the predicted PC to the appropriate background concentration (obtained from APIS) (1).

- Where the PEC within the emission footprint in any part of the European site is ≤ 70% of the relevant long-term benchmark, the emission is '*not likely to have a significant impact*'.

- Where the PEC within the emission footprint in any part of the European site is > 70% of the relevant long-term benchmark, the emission '*cannot be concluded not likely to have a significant impact*' at this stage of the assessment.

For short-term potential impacts (typically, short term averaging periods refer to a period of 24 hours or less), the impacts significance criteria are described as below (1):

- Where the predicted PC within the emission footprint in any part of the European site is ≤ 10% of the relevant short-term benchmark, the emission is '*not likely to have a significant impact alone or in-combination*'.

- Where the predicted PC within the emission footprint in any part of the European site is > 10% of the relevant short-term benchmark, the emission '*cannot be concluded not likely to have a significant impact*'.

Results of the impact assessment are discussed in relation to these significance thresholds.

B1.6 BACKGROUND CONDITIONS

Background conditions (ambient concentrations, nutrient nitrogen deposition and acid deposition) for the European sites are presented in *Table B1.6* and *Table B1.7*. The background ambient concentrations for air pollutants (NO_X, SO_2 and NH_3) have been obtained from the APIS website using the coordinates of the sites' respective central locations for critical levels. For critical loads, the background acid and nutrient nitrogen deposition rates have been obtained based on a site-relevant search on APIS.

For NH_3, two sets of critical levels have been used (1 µg m^{-3} and 3 µg m^{-3}), with the conservative 1 µg m^{-3} value used for woodlands/forest-based sites. This is based on the advice of Natural England, whereby certain qualifying features of these sites are dependent on the lower plants (lichens and bryophytes). Though not explicitly listed as a qualifying feature, these lower

(1) The PEC includes the additional contribution which could be made from authorised processes which are yet to be constructed. For this initial screening stage, this has not been included in the PEC due to lack of timely information. This will be refined at a later stage if such information becomes available.

plants are essential to the amenity of the site and are very sensitive to NH_3 and are therefore covered under the Habitat Regulations.

Table B1.6 Background Conditions vs. Critical Levels *[(a)]*

European Sites	Interest Features	NO_X Baseline Conditions ($\mu g\ m^{-3}$)	SO_2 Baseline Conditions ($\mu g\ m^{-3}$)	NH_3 Baseline Conditions ($\mu g\ m^{-3}$)
Dixton Wood (SAC)	Violet click beetle	14.3	1.9	**1.8**
Bredon Hill (SAC)	Violet click beetle	13.1	2.1	**1.8**
Severn Estuary (SAC, SPA, Ramsar)	Tundra swan, greater white-fronted goose, common shelduck, gadwall, dunlin, common redshank, waterfowl assemblage	21	2.8	2.6
Walmore Common (SPA/ Ramsar)	Tundra swan	13.1	1.4	2.6
Cotswold Beechwoods (SAC)	Beech forests, semi-natural dry grasslands and scrubland facies: on calcareous substrates	15	1.5	**1.5 (for beech forests only)**
Rodborough Common (SAC)	Semi-natural dry grasslands and scrubland facies: on calcareous substrates	17.5	2.5	1.6
Wye Valley & Forest of Dean Bats (SAC)	Lesser horseshoe bat, greater horseshoe bat	11	2	**1.4**
Wye Valley Woodlands (SAC)	Beech forests, mixed woodland, yew-dominated woodland, lesser horseshoe bat	13.5	1.2	**1.5**
Critical Levels		*30*	*20*	*1 (woodlands/ forests only, for protection of lichens)* *[(b)]* *3*

(a) Source: APIS, based on the central coordinates of the site using location search. Annual mean concentrations only. Exceedances of the critical loads are shown in bold text.
(b) Following advice from Natural England, several woodland/ forest-based sites have qualifying features which are dependent on the lower plants (lichens and bryophytes), which are in turn, sensitive to NH_3. Though not qualifying features, these lower plants are essential to the amenity of the site and therefore covered under the Habitat Regulations. Hence the most stringent NH_3 critical level has been used.

Table B1.7 Background Conditions vs. Critical Loads [(a)]

European Sites	Interest Features	Acid Deposition (keq ha-1 yr-1)		Nutrient Nitrogen Deposition (kg N ha-1 yr-1)	
		Baseline Conditions	**Critical Loads**	**Baseline Conditions**	**Critical Loads**
Dixton Wood (SAC)	Violet click beetle	1.93	2.58	**22.7**	10 to 15
Bredon Hill (SAC)	Violet click beetle	1.79	2.55	**20.7**	10 to 15
Severn Estuary (SAC, SPA, Ramsar)	Tundra swan, greater white-fronted goose, common shelduck, gadwall, dunlin, common redshank, waterfowl assemblage	1.11	The broad habitats associated with the species of interest are not sensitive to acidity	11.1	20 to 30 (Littoral sediment – habitat for common shelduck, dunlin, common redshank) The broad habitats associated with the rest of the species of interest are not sensitive to nutrient nitrogen
Walmore Common (SPA/ Ramsar)	Tundra swan	1.57	The broad habitats associated with the species of interest are not sensitive to acidity	17.2	The broad habitats associated with the species of interest are not sensitive to nutrient nitrogen
Cotswold Beechwoods (SAC)	Beech forests, semi-natural dry grasslands and scrubland facies: on calcareous substrates	2.29	2.68 (Beech forests) 4.76 (Grasslands)	**25.8 (Beech forests)** **16.2 (Grasslands – exceeding lower range)**	10 to 15 (Beech forests) 15 to 25 (Grasslands)
Rodborough Common (SAC)	Semi-natural dry grasslands and scrubland facies: on calcareous substrates	1.53	4.75	**15.7 (Exceeding lower range)**	15 to 25
Wye Valley & Forest of Dean Bats (SAC)	Lesser horseshoe bat, greater horseshoe bat	**2.25**	0.99	**25.2**	10 to 15

European Sites	Interest Features	Acid Deposition (keq ha^{-1} yr^{-1})		Nutrient Nitrogen Deposition (kg N ha^{-1} yr^{-1})	
		Baseline Conditions	Critical Loads	Baseline Conditions	Critical Loads
Wye Valley Woodlands (SAC)	Beech forests, mixed woodland, yew-dominated woodland, lesser horseshoe bat	**1.94**	1.22	**21.4**	10 to 15
(a) Source: APIS, using site-relevant search. Annual deposition rates only. Exceedances of the critical loads are shown in bold text.					

It can be seen from the tables above that, for some European sites, the baseline conditions on their own have already exceeded the critical levels and critical loads, eg the baseline nutrient nitrogen deposition rate for Dixton Wood SAC has exceeded the critical load This is by no means an isolated geographical occurrence, as other parts of England have demonstrated similar exceedances.

Where such exceedances exist, an EfW facility at any waste site cannot demonstrate an insignificant impact on its own unless its contribution (PC) ≤1% of the critical level or critical load. In these circumstances, it cannot be concluded that the EfW facility is not likely to have a potential significant impact at this stage of the assessment, based on the impact significance criteria in *Section B1.4*.

In such cases where the PEC is already >100% of the critical load, the PC will need to be reduced to < 1% of critical load before any thermal treatment option at that site can be considered viable. More stringent mitigation measures (which may not necessarily be technologically feasible in all cases) will have to be applied, in order to achieve this. In certain cases, even with mitigation measures, the potential impacts may not be sufficiently reduced to enable a thermal treatment facility to operate at some development sites.

B1.7 CALCULATION OF ACID DEPOSITION RATES

Contributions to acid deposition have been derived from the maximum modelled ground level concentration (GLC) obtained from modelling. Acid deposition can occur through dry and wet mechanisms. However, according to EA guidance [(1)], for short-range effects, NO_2 and SO_2 wet deposition is less significant when compared with dry deposition. Therefore, for NO_2 and SO_2, only dry deposition has been assessed. However, for HCl, both dry and wet deposition rates have been assessed, as HCl has strong solubility, strong dissociation in solution and high reactivity (it can restrict the washout of other gases, especially SO_2). HF was not included in the acidification calculations as

(1) Spanton, A.M., Hall, D.J. and Powlesland, C.B. Calculation of Near-field Critical Load Exceedance from Generating Stations, Environment Agency, May 2008.

it is emitted in comparatively small amounts and has weak dissociation in solution when compared to the other pollutants.

Dry deposition rates were calculated using methods recommended by the Environment Agency (EA) [1], as follows:

- Step 1: Calculate dry deposition flux.

Dry deposition flux ($\mu g\ m^{-2}\ s^{-1}$) = GLC ($\mu g\ m^{-3}$) × Deposition velocity ($m\ s^{-1}$)

The deposition velocities set out in *Table B1.2*, as recommended by the EA, have been used.

Table B1.2 Dry Deposition Velocities ($m\ s^{-1}$)

Pollutants	**Grassland**	**Forest**
SO_2	0.012	0.024
NO_2	0.0015	0.003
NH_3	0.02	0.03
HCl	0.025	0.06

- Step 2: Convert units from $\mu g\ m^{-2}\ s^{-1}$ to units of $kg\ ha^{-1}\ yr^{-1}$ by multiplying the dry deposition flux by standard conversion factors in *Table B1.3.*

Table B1.3 Conversion Factors from $\mu g\ m^{-2}\ s^{-1}$ to $kg\ ha^{-1}\ yr^{-1}$

Pollutants	**From $\mu g\ m^{-2}\ s^{-1}$ to $kg\ ha^{-1}\ yr^{-1}$**
SO_2	157.7
NO_2	96
NH_3	259.7
HCl	306.7

- Step 3: Convert to unit of equivalents ($keq\ ha^{-1}\ yr^{-1}$) which is a measure of how acidifying the chemical species can be, by multiplying the dry deposition flux in units of $kg\ ha^{-1}\ yr^{-1}$ by the standard conversion factors in *Table B1.4.*

Table B1.4 Conversion Factors from $kg\ ha^{-1}\ yr^{-1}$ to $keq\ ha^{-1}\ yr^{-1}$

Pollutants	**From $kg\ ha^{-1}\ yr^{-1}$ to $keq\ ha^{-1}\ yr^{-1}$**
S	0.0625
N	0.071428
Cl	0.0282

- Step 4: Calculate wet deposition flux for Cl only via use of dry to wet deposition ratio

Cl wet deposition flux = Cl dry deposition flux × wet-to-dry deposition ratio

(1) AQTAG06 – Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air, Environment Agency, produced 06/02/04, Version 8.

According to an EA report [1], within a few km of the stack the wet deposition of HCl is comparable to the dry deposition of HCl; with increasing distance, the wet deposition fraction becomes a smaller fraction of the total HCl deposition. The wet-to-dry deposition ratio for Cl is therefore conservatively assumed to be 1 at the point where the maximum GLC occurs.

- Step 5: Add dry and wet Cl deposition (keq ha^{-1} yr^{-1}) to determine total Cl acid deposition.

- Step 6: Add predicted dry N and S and total Cl (wet and dry) deposition (keq ha^{-1} yr^{-1}) to determine total acid deposition.

B1.8 CALCULATION OF NUTRIENT NITROGEN DEPOSITION RATES

Contributions to nutrient nitrogen deposition have been derived from the maximum incremental ground level concentration obtained from modelling for NO_2 and NH_3 only. Dry deposition rates of nitrogen were calculated by first calculating the dry deposition flux (µg m^{-2} s^{-1}) and converting that to kg ha^{-1} yr^{-1} of nitrogen. Wet deposition of nitrogen in the near-field has not been considered as the contribution of dry deposition dominates.

Dry deposition rates were calculated using methods recommended by the Environment Agency (EA) [2], as follows:

- Step 1: Calculate dry deposition flux.

Dry deposition flux (µg m^{-2} s^{-1}) = GLC (µg m^{-3}) × Deposition velocity (m s^{-1})

The dry deposition velocities for NO_2 and NH_3 are provided in *Table B1.2*.

- Step 2: Convert units from µg m^{-2} s^{-1} to units of kg ha^{-1} yr^{-1} by multiplying the dry deposition flux by standard conversion factors for NO_2 and NH_3 in *Table B1.3.*

(1) Spanton, A.M., Hall, D.J. and Powlesland, C.B. Calculation of Near-Field Critical Load Exceedance from Generating Stations. Published by Environment Agency, Bristol. May 2008.

(2) AQTAG06 – Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air, Environment Agency, produced 06/02/04, Version 8.

B2 MODELLING RESULTS AND IMPACT ASSESSMENT

B2.1 OVERVIEW

The impact assessment has primarily been undertaken using AERMOD. Additional sensitivity testing was undertaken for some sites using the alternative model ADMS, given that AERMOD predicts higher concentrations for receptors on elevated terrain than might have been anticipated. This section presents the results of full assessment using AERMOD and then following on from this, the results of the ADMS sensitivity testing.

B2.2 IMPACT ASSESSMENT USING AERMOD

Table B2.1 presents a summary of the long-term modelling results using AERMOD for toxic effects (SO_2, NO_X and NH_3), acid deposition and nutrient nitrogen deposition, with the detailed modelling results presented in *Appendix 1*. It is noted that cells in *Table B2.1* marked as "green" and "yellow" are considered to have acceptable impacts, in accordance with the impacts significant criteria presented in *Section B1.4.*

For short-term toxic effects from HF and NH_3, a similar summary of modelling results has not been presented, as all of the PCs are below < 10% of the respective critical levels, meaning that the potential impacts are considered to be insignificant.

The results of the analysis demonstrate that two sites are predicted to have insignificant impacts on habitats at most capacities and stack heights tested, as follows:

- Site 7 Railway Triangle - on this site, a capacity of ≤200ktpa and a stack height of 100m would be insignificant in terms of potential impacts on habitats.

- Site 11 Foss Cross Industrial Estate - on this site, a capacity of ≤100ktpa and a minimum stack height of 80m would be insignificant in terms of potential impacts on habitats.

All other sites considered result in potentially significant impacts on habitat sites at all waste throughput capacities and at all stack heights tested.

B2.3 IMPACT ASSESSMENT USING ADMS

The waste site – European site combinations that were modelled using ADMS have been presented in *Table B1.2*. The summary of the ADMS results are presented in *Table B2.1*. Detailed ADMS modelling results are presented in

Appendix 1. The results of the ADMS modelling illustrate that for the waste sites assessed, for waste throughputs of 400/ 200/ 100 ktpa and a stack height of 80 m, all of the modelled potential waste sites will show insignificant impacts for all evaluated parameters at varying waste throughputs, as follows:

- At ≤400 ktpa of waste throughput, Site 7 Railway Triangle is predicted to show an insignificant impact;

- At ≤200 ktpa of waste throughput, Site 1 Wingmoor Farm East, Site 2 Wingmoor Farm West, Site 6 Moreton Valence, Site 7 Railway Triangle and Site 10 The Park are predicted to show insignificant impacts; and

- At ≤100 ktpa of waste throughput, Site 1 Wingmoor Farm East, Site 2 Wingmoor Farm West, Site 4 Javelin Park, Site 6 Moreton Valence, Site 7 Railway Triangle, Site 8 Nastend Farm and Site 10 The Park are predicted to show insignificant impacts.

Table B2.1 Summary of Modelling Results

Key

Green	PC ≤1% of critical level/critical load
Yellow	PC >1% but PEC ≤70% of critical level/critical load
Orange	PC > 1% and PEC > 70% of critical level/critical load
Grey	Not modelled
Dark grey	No assessment criteria

SO_2

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Green	Yellow	Grey	Grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Green	Green	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Green	Yellow	Grey	Grey	Grey
Site 10 (The Park)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 90 m								
Site 1 (Wingmoor Farm East, Area A)	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Green	Yellow	Grey	Grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Green	Green	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Green	Yellow	Grey	Grey	Grey
Site 10 (The Park)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 100 m								
Site 1 (Wingmoor Farm East, Area A)	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Green	Yellow	Grey	Grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Green	Green	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Green	Yellow	Grey	Grey	Grey
Site 10 (The Park)	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
(AERMOD) Waste throughput - 200 ktpa (Sites 1 - 10), 50 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey

NO_X

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Yellow	Yellow	Grey	Grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Green	Yellow	Yellow	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Green	Yellow	Yellow	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Green	Green	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Green	Yellow	Yellow	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Green	Yellow	Grey	Grey	Grey
Site 10 (The Park)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Orange	Grey	Grey	Grey	Yellow	Green
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 90 m								
Site 1 (Wingmoor Farm East, Area A)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Green	Yellow	Grey	Grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Green	Yellow	Yellow	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Green	Yellow	Yellow	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Green	Green	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Green	Yellow	Yellow	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Green	Yellow	Grey	Grey	Grey
Site 10 (The Park)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Orange	Grey	Grey	Grey	Yellow	Green
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 100 m								
Site 1 (Wingmoor Farm East, Area A)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Green	Yellow	Grey	Grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Green	Yellow	Yellow	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Green	Yellow	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Green	Yellow	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Green	Yellow	Yellow	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Green	Yellow	Grey	Grey	Grey
Site 10 (The Park)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Orange	Grey	Grey	Grey	Yellow	Green
(AERMOD) Waste throughput - 200 ktpa (Sites 1 - 10), 50 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Yellow	Grey	Grey	Grey	Grey	Grey	Grey	Grey

NH_3

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Orange	Yellow	Grey	Grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Green	Orange	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Green	Orange	Yellow	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Green	Orange	Grey	Grey	Grey
Site 10 (The Park)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Green	Grey	Grey	Grey	Orange	Green
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 90 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Orange	Yellow	Grey	Grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Green	Orange	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Green	Orange	Grey	Grey	Grey
Site 10 (The Park)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Green	Grey	Grey	Grey	Orange	Green
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 100 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Green	Yellow	Grey	Grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Green	Orange	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Green	Orange	Green	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Green	Orange	Grey	Grey	Grey
Site 10 (The Park)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Green	Grey	Grey	Grey	Orange	Green
(AERMOD) Waste throughput - 200 ktpa (Sites 1 - 10), 50 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Grey	Grey	Grey	Grey	Grey	Grey

Nitrogen Deposition

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Orange	Orange	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Dark grey	Orange	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Dark grey	Orange	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Dark grey	Orange	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Dark grey	Orange	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Dark grey	Orange	Orange	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Dark grey	Orange	Grey	Grey	Grey
Site 10 (The Park)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Dark grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Dark grey	Grey	Grey	Orange	Orange
Site 13 (Lydney Industrial Estate)	Grey	Grey	Green	Dark grey	Grey	Grey	Orange	Orange
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 90 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Orange	Orange	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Dark grey	Orange	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Dark grey	Orange	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Dark grey	Orange	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Dark grey	Orange	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Dark grey	Orange	Orange	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Dark grey	Orange	Grey	Grey	Grey
Site 10 (The Park)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Dark grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Dark grey	Grey	Grey	Orange	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Green	Dark grey	Grey	Grey	Orange	Orange
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 100 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Orange	Orange	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Green	Dark grey	Orange	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Green	Dark grey	Orange	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Green	Dark grey	Orange	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Grey	Dark grey	Orange	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Green	Dark grey	Orange	Orange	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Green	Dark grey	Orange	Grey	Grey	Grey
Site 10 (The Park)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Grey	Dark grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Green	Dark grey	Grey	Grey	Green	Green
Site 13 (Lydney Industrial Estate)	Grey	Grey	Green	Dark grey	Grey	Grey	Orange	Orange
(AERMOD) Waste throughput - 200 ktpa (Sites 1 - 10), 50 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Grey	Dark grey	Grey	Grey	Grey	Grey

Acid Deposition

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Orange	Orange	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Dark grey	Dark grey	Orange	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Dark grey	Dark grey	Orange	Grey	Grey	Grey
Site 10 (The Park)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Dark grey	Dark grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Dark grey	Dark grey	Grey	Grey	Orange	Orange
Site 13 (Lydney Industrial Estate)	Grey	Grey	Dark grey	Dark grey	Grey	Grey	Orange	Orange
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 90 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Orange	Orange	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Dark grey	Dark grey	Orange	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Dark grey	Dark grey	Orange	Grey	Grey	Grey
Site 10 (The Park)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Dark grey	Dark grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Dark grey	Dark grey	Grey	Grey	Orange	Orange
Site 13 (Lydney Industrial Estate)	Grey	Grey	Dark grey	Dark grey	Grey	Grey	Orange	Orange
(AERMOD) Waste throughput - 400 ktpa (Sites 1 - 10), 100 ktpa (Sites 11 - 13); Stack Height - 100 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 3 (Easter Park)	Green	Orange	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 4 (Javelin Park)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 5 (Quadrant Business Centre)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 6 (Moreton Valence)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 7 (Railway Triangle)	Grey	Grey	Dark grey	Dark grey	Orange	Grey	Grey	Grey
Site 8 (Nastend Farm)	Grey	Grey	Dark grey	Dark grey	Orange	Green	Grey	Grey
Site 9 (Netheridge Sewage Treatment Works)	Grey	Grey	Dark grey	Dark grey	Orange	Grey	Grey	Grey
Site 10 (The Park)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 11 (Foss Cross Industrial Estate)	Grey	Grey	Dark grey	Dark grey	Green	Grey	Grey	Grey
Site 12 (Hurst Farm)	Grey	Grey	Dark grey	Dark grey	Grey	Grey	Orange	Orange
Site 13 (Lydney Industrial Estate)	Grey	Grey	Dark grey	Dark grey	Grey	Grey	Orange	Orange
(AERMOD) Waste throughput - 200 ktpa (Sites 1 - 10), 50 ktpa (Sites 11 - 13); Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey
Site 2 (Wingmoor Farm West, Area C)	Orange	Grey	Dark grey	Dark grey	Grey	Grey	Grey	Grey

	SO_2								NO_X								NH_3								Nitrogen Deposition								Acid Deposition							
	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
Site 3 (Easter Park)																																								
Site 4 (Javelin Park)																																								
Site 5 (Quadrant Business Centre)																																								
Site 6 (Moreton Valence)																																								
Site 7 (Railway Triangle)																																								
Site 8 (Nastend Farm)																																								
Site 9 (Netheridge Sewage Treatment Works)																																								
Site 10 (The Park)																																								
Site 11 (Foss Cross Industrial Estate)																																								
Site 12 (Hurst Farm)																																								
Site 13 (Lydney Industrial Estate)																																								
(AERMOD) Waste throughput - 100 ktpa (Sites 1 - 10); Stack Height - 80 m																																								
Site 1 (Wingmoor Farm East, Area A)																																								
Site 2 (Wingmoor Farm West, Area C)																																								
Site 3 (Easter Park)																																								
Site 4 (Javelin Park)																																								
Site 5 (Quadrant Business Centre)																																								
Site 6 (Moreton Valence)																																								
Site 7 (Railway Triangle)																																								
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Site 9 (Netheridge Sewage Treatment Works)																																								
Site 10 (The Park)																																								
Site 11 (Foss Cross Industrial Estate)																																								
Site 12 (Hurst Farm)																																								
Site 13 (Lydney Industrial Estate)																																								
(AERMOD) Waste throughput - 200 ktpa (Sites 1 - 10), 50 ktpa (Sites 11 - 13); Stack Height - 100 m																																								
Site 1 (Wingmoor Farm East, Area A)																																								
Site 2 (Wingmoor Farm West, Area C)																																								
Site 3 (Easter Park)																																								
Site 4 (Javelin Park)																																								
Site 5 (Quadrant Business Centre)																																								
Site 6 (Moreton Valence)																																								
Site 7 (Railway Triangle)																																								
Site 8 (Nastend Farm)																																								
Site 9 (Netheridge Sewage Treatment Works)																																								
Site 10 (The Park)																																								
Site 11 (Foss Cross Industrial Estate)																																								
Site 12 (Hurst Farm)																																								
Site 13 (Lydney Industrial Estate)																																								
(AERMOD) Waste throughput - 100 ktpa (Sites 1 - 10); Stack Height - 100 m																																								
Site 1 (Wingmoor Farm East, Area A)																																								
Site 2 (Wingmoor Farm West, Area C)																																								
Site 3 (Easter Park)																																								
Site 4 (Javelin Park)																																								
Site 5 (Quadrant Business Centre)																																								
Site 6 (Moreton Valence)																																								
Site 7 (Railway Triangle)																																								
Site 8 (Nastend Farm)																																								
Site 9 (Netheridge Sewage Treatment Works)																																								
Site 10 (The Park)																																								

SO_2

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 400 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					green	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 200 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					green	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 100 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					green	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								

NO_X

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 400 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					yellow			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					yellow	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 200 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					green	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 100 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					green	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								

NH_3

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 400 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	orange							
Site 2 (Wingmoor Farm West, Area C)	orange							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					orange			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					orange	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					orange	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	orange							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 200 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					orange	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 100 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					green	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								

Nitrogen Deposition

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 400 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	orange							
Site 2 (Wingmoor Farm West, Area C)	orange							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					orange			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					orange	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					orange	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	orange							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 200 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					orange			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					orange	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 100 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					green	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								

Acid Deposition

Site	Dixton Woods	Bredon Hill	Severn Estuary	Walmore Common	Cotswold Beechwoods	Rodborough Common	Wye Valley & Forest of Dean Bats	Wye Valley Woodlands
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 400 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					orange			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					orange	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					orange	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 200 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					green	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								
(ADMS) Waste throughput - 100 ktpa; Stack Height - 80 m								
Site 1 (Wingmoor Farm East, Area A)	green							
Site 2 (Wingmoor Farm West, Area C)	green							
Site 3 (Easter Park)								
Site 4 (Javelin Park)					green			
Site 5 (Quadrant Business Centre)								
Site 6 (Moreton Valence)					green	green		
Site 7 (Railway Triangle)					green			
Site 8 (Nastend Farm)					green	green		
Site 9 (Netheridge Sewage Treatment Works)								
Site 10 (The Park)	green							
Site 11 (Foss Cross Industrial Estate)								
Site 12 (Hurst Farm)								
Site 13 (Lydney Industrial Estate)								

B3 CONCLUSIONS

The outcome of the dispersion modelling exercise is a means of evaluating the suitability of the development sites in terms of their *potential* for causing an impact on the European ecological sites. It is very important that these results are seen in their proper context; that is, the result of a modelling process and assessment procedure in which the outcomes are dependent on the assumptions used. Whilst it is very easy to take quantitative results and use them to draw hard conclusions, any judgement on the suitability of individual development sites must be made in the full knowledge of the extent to which the results could be altered by adopting a different set of assessment methods.

In particular, the evaluation of potential impacts at those European sites on elevated terrain and sensitive to acid deposition is strongly dependent on the choice of dispersion model. Inspection of the results reveals that the European sites displaying the most significant potential impacts are those on elevated terrain features. In these cases, the threshold of 1% of the assessment criterion is exceeded in large part because of the way that AERMOD responds to the underlying terrain in its simulation of the plume trajectory. Most of the SACs that display a significant potential impact are at some considerable distance from the potential development sites and *without* the effect of terrain would be predicted to experience an *insignificant* impact. The sensitivity of these predictions to choice of model (and its treatment of terrain) has been tested by the use of an alternative model, namely ADMS.

Both AERMOD and ADMS are widely used for regulatory applications in the UK are both are acceptable to the Environment Agency. Each of these models adopts a different approach to the treatment of dispersion over terrain and it is not entirely surprising that, in some circumstances, divergent results are obtained. Both models have also been tested and validated in conditions where terrain is important and the developers of each model would argue that their model performs well. In comparing the two approaches, it can be observed that ADMS employs a more sophisticated technique that involves the use of a separate module in which the wind flow over the terrain is calculated explicitly for each separate hour of the model run. AERMOD takes a simpler approach, in which the plume is deemed either to impinge on the hillside or to miss it completely.

The most robust predictions, in respect of the computational process used here, are for the gaseous concentrations of SO_2 and NO_x. These are direct model outputs and can be compared with a simple assessment criterion. The values for acid and nutrient nitrogen deposition rates, on the other hand, depend on additional calculations which are subject to further uncertainties in the choice of deposition velocity, in particular.

The occurrences of long-term NH_3 exceedences should be viewed in terms of the very stringent critical level of 1 µg m^{-3} used for the protection of lichens and bryophytes at woodlands/forest-related habitats. Background concentrations of NH_3 are highly uncertain but are often taken to be at or above the critical level, thus automatically ensuring that the PEC is greater than 100% of this critical level. NH_3 in a gaseous form has a short lifespan in the atmosphere due to its high reactivity, resulting in potential ground level impacts within a few hundred metres of a source (actual distances depend on atmospheric conditions and flue gas release conditions). Therefore, unless the European site is located within a few hundred metres of an EfW facility, the potential impacts are likely to be overestimated.

Finally, it is noted that the findings of the assessment are based only on the current assumptions used to define the source, including specific waste throughputs, stack heights and WID emission limits for maximum operational flexibility. Such a high level approach has been necessary at this strategic waste assessment level to narrow down the list of potential waste sites for further detailed assessment.

In reality, most thermal treatment facilities (EfW plants) emit at much lower emissions rates for many of the pollutants considered here with the application of abatement technology to reduce pollutant emission rates (eg using selective non-catalytic reduction (ammonia/ urea) for removing NO_X or acid gas removal systems (dry/semi-dry/wet) for removing SO_2). Additionally, ground level concentrations of pollutants (and acid/nitrogen deposition) can be reduced by increased dispersion (eg using higher stack heights than the ones currently modelled). The potential impacts will also be influenced by other factors such as building downwash and operation hours.

On a case-by-case basis, the findings of the air dispersion modelling in this assessment do not preclude the development of thermal treatment facilities at any waste site where this report indicates they may give rise to potentially significant impacts. Further consideration of pollution control mitigation could reduce potential impacts such that they are insignificant and there could be over-riding planning or strategic considerations that favour certain waste sites. Further assessment would be required in such cases.

Appendix 1

Detailed Modelling Results for AERMOD and ADMS

Table 1.1 Long-Term (Annual) Critical Levels Assessment for European Sites [a]

Parameter	Critical Level (µg m^{-3})	Process Contribution (PC) from EfW Facility (µg m^{-3})	PC as a % of Critical Level	Background Conditions [b]	PEC (µg m^{-3}) [c]	PEC as a % of Critical Level
Wingmoor East – for Dixton Wood (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.2464	**1.23%**	1.9	2.15	10.73%
NO_X	30	0.9856	**3.29%**	14.3	15.29	50.95%
NH_3	1	0.04928	**4.93%**	1.8	1.85	**184.93%**
Wingmoor East – for Dixton Wood (SAC) at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.1681	0.84%	-	-	-
NO_X	30	0.6725	**2.24%**	14.3	14.97	49.91%
NH_3	1	0.03363	**3.36%**	1.8	1.83	**183.36%**
Wingmoor East – for Dixton Wood (SAC) at 400 ktpa waste throughput, 100 m stack height						
SO_2	20	0.1077	0.54%	-	-	-
NO_X	30	0.4309	**1.44%**	14.3	14.73	49.10%
NH_3	1	0.02154	**2.15%**	1.8	1.82	**182.15%**
Wingmoor East – for Dixton Wood (SAC) at 200ktpa waste throughput, 80 m stack height						
SO_2	20	0.2032	**1.02%**	1.9	2.10	10.52%
NO_X	30	0.8128	**2.71%**	14.3	15.11	50.38%
NH_3	1	0.04064	**4.06%**	1.8	1.84	**184.06%**
Wingmoor East – for Dixton Wood (SAC) at 200ktpa waste throughput, 100 m stack height						
SO_2	20	0.04928	0.25%	-	-	**-**
NO_X	30	0.19711	0.66%	-	-	**-**
NH_3	1	0.009855	0.99%	-	-	**-**
Wingmoor East – for Dixton Wood (SAC) at 100ktpa waste throughput, 80 m stack height						
SO_2	20	0.1255	0.63%	-	-	-
NO_X	30	0.5019	**1.67%**	14.3	14.80	49.34%
NH_3	1	0.02510	**2.51%**	1.8	1.83	**182.51%**
Wingmoor East – for Dixton Wood (SAC) at 100ktpa waste throughput, 100 m stack height						
SO_2	20	0.08677	0.43%	-	-	-
NO_X	30	0.3471	**1.16%**	14.3	14.65	48.82%
NH_3	1	0.01735	**1.74%**	1.8	1.82	**181.74%**
Wingmoor West – for Dixton Wood (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.2929	**1.46%**	1.9	2.19	10.96%

Parameter	Critical Level (μg m-3)	Process Contribution (PC) from EfW Facility (μg m-3)	PC as a % of Critical Level	Background Conditions (b)	PEC (μg m-3) (c)	PEC as a % of Critical Level
NO_X	30	1.171	**3.90%**	14.3	15.47	51.57%
NH_3	1	0.05857	**5.86%**	1.8	1.86	**185.86%**
Wingmoor West – for Dixton Wood (SAC) at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.2121	**1.06%**	1.9	2.11	10.56%
NO_X	30	0.8486	**2.83%**	14.3	15.15	50.50%
NH_3	1	0.0424	**4.24%**	1.8	1.84	**184.24%**
Wingmoor West – for Dixton Wood (SAC) at 400 ktpa waste throughput, 100 m stack height						
SO_2	20	0.1427	0.71%	-	-	-
NO_X	30	0.5707	**1.90%**	14.3	14.87	49.57%
NH_3	1	0.0285	**2.85%**	1.8	1.83	**182.85%**
Wingmoor West – for Dixton Wood (SAC) at 200 ktpa waste throughput, 80 m stack height						
SO_2	20	0.2327	**1.16%**	1.9	2.13	10.66%
NO_X	30	0.9306	**3.10%**	14.3	15.23	50.77%
NH_3	1	0.04653	**4.65%**	1.8	1.85	**184.65%**
Wingmoor West – for Dixton Wood (SAC) at 200 ktpa waste throughput, 100 m stack height						
SO_2	20	0.06477	0.32%	-	-	-
NO_X	30	0.2591	0.86%	-	-	-
NH_3	1	0.01295	**1.30%**	1.8	1.81	**181.30%**
Wingmoor West – for Dixton Wood (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.1715	0.86%	-	-	-
NO_X	30	0.6861	**2.29%**	14.3	14.99	49.95%
NH_3	1	0.03430	**3.43%**	1.8	1.83	**183.43%**
Wingmoor West – for Dixton Wood (SAC) at 100 ktpa waste throughput, 100 m stack height						
SO_2	20	0.1075	0.54%	-	-	-
NO_X	30	0.4300	**1.43%**	14.3	14.73	49.10%
NH_3	1	0.02150	**2.15%**	1.8	1.82	**182.15%**
Easter Park – for Bredon Hill (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.2580	**1.29%**	2.1	2.36	11.79%
NO_X	30	1.032	**3.44%**	13.1	14.13	47.11%
NH_3	3	0.05161	**1.72%**	1.8	1.85	61.72%
Easter Park – for Dixton Wood (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.07967	0.40%	-	-	-
NO_X	30	0.3187	**1.06%**	14.3	14.62	48.73%

Parameter	Critical Level (µg m-3)	Process Contribution (PC) from EfW Facility (µg m-3)	PC as a % of Critical Level	Background Conditions (b)	PEC (µg m-3) (c)	PEC as a % of Critical Level
NH_3	1	0.01593	**1.59%**	1.8	1.82	**181.59%**
Easter Park – for Dixton Wood (SAC) at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.06317	0.32%	-	-	-
NO_X	30	0.2527	0.84%	-	-	-
NH_3	1	0.01263	**1.26%**	1.8	1.81	**181.26%**
Easter Park – for Dixton Wood (SAC) at 400 ktpa waste throughput, 100 m stack height						
SO_2	20	0.04772	0.24%	-	-	-
NO_X	30	0.1909	0.64%	-	-	-
NH_3	1	0.00954	0.95%	-	-	-
Easter Park – for Dixton Wood (SAC) at 200 ktpa waste throughput, 80 m stack height¥						
SO_2	20	0.06158	0.31%	-	-	-
NO_X	30	0.2463	0.82%	-	-	-
NH_3	1	0.01232	**1.23%**	1.8	1.812	**181.23%**
Easter Park – for Dixton Wood (SAC) at 200 ktpa waste throughput, 100 m stack height¥						
SO_2	20	0.02061	0.10%	-	-	-
NO_X	30	0.08242	0.27%	-	-	-
NH_3	1	0.004121	0.41%	-	-	-
Easter Park – for Dixton Wood (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.01992	0.10%	-	-	-
NO_X	30	0.07967	0.27%	-	-	-
NH_3	1	0.003983	0.40%	-	-	-
Javelin Park – for Severn Estuary (SAC, SPA, Ramsar)at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.02118	0.11%	-	-	-
NO_X	30	0.08471	0.28%	-	-	-
NH_3	3	0.00424	0.14%	-	-	-
Javelin Park – for Walmore Common (SPA, Ramsar)at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.01192	0.06%	-	-	-
NO_X	30	0.04766	0.16%	-	-	-
NH_3	3	0.00238	0.08%	-	-	-
Javelin Park – for Cotswold Beechwoods (SAC)at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.5007	**2.50%**	1.5	2.001	10.00%
NO_X	30	2.003	**6.68%**	15	17.002	56.68%
NH_3	1	0.1001	**10.01%**	1.5	1.600	**160.01%**

Parameter	Critical Level ($\mu g\ m^{-3}$)	Process Contribution (PC) from EfW Facility ($\mu g\ m^{-3}$)	PC as a % of Critical Level	Background Conditions [(b)]	PEC ($\mu g\ m^{-3}$) [(c)]	PEC as a % of Critical Level
Javelin Park – for Cotswold Beechwoods (SAC)at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.458	**2.29%**	1.5	1.958	9.79%
NO_X	30	1.834	**6.11%**	15	16.834	56.11%
NH_3	1	0.09168	**9.17%**	1.5	1.592	53.06%
Javelin Park – for Cotswold Beechwoods (SAC) at 200 ktpa waste throughput, 80 m stack height						
SO_2	20	0.2652	**1.33%**	1.5	1.765	8.83%
NO_X	30	1.061	**3.54%**	15	16.061	53.54%
NH_3	1	0.05304	**5.30%**	1.5	1.553	**155.30%**
Javelin Park – for Cotswold Beechwoods (SAC) at 200 ktpa waste throughput, 100 m stack height						
SO_2	20	0.1423	0.71%	-	-	-
NO_X	30	0.5694	**1.90%**	15	15.57	51.90%
NH_3	1	0.02847	**2.85%**	1.5	1.53	**152.85%**
Javelin Park – for Cotswold Beechwoods (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.1514	0.76%	-	-	-
NO_X	30	0.6057	**2.02%**	15	15.61	52.02%
NH_3	1	0.03028	**3.03%**	1.5	1.53	**153.03%**
Javelin Park – for Cotswold Beechwoods (SAC) at 100 ktpa waste throughput, 100 m stack height						
SO_2	20	0.1686	0.84%	-	-	-
NO_X	30	0.6746	**2.25%**	15	15.67	52.25%
NH_3	1	0.03373	**3.37%**	1.5	1.53	**153.37%**
Javelin Park – for Rodborough Common (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.08539	0.43%	-	-	-
NO_X	30	0.3416	**1.14%**	17.5	17.842	59.47%
NH_3	3	0.01708	0.57%	-	-	-
Quadrant – for Cotswold Beechwoods (SAC)at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.4403	**2.20%**	1.5	1.940	9.70%
NO_X	30	1.761	**5.87%**	15	16.761	55.87%
NH_3	1	0.08805	**8.81%**	1.5	1.588	**158.81%**
Quadrant – for Cotswold Beechwoods (SAC)at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.4030	**2.01%**	1.5	1.9030	9.51%
NO_X	30	1.612	**5.37%**	15	16.6118	55.37%
NH_3	1	0.08059	**8.06%**	1.5	1.5806	**158.06%**
Quadrant – for Cotswold Beechwoods (SAC)at 400 ktpa waste throughput, 100 m stack height						

Parameter	Critical Level (µg m-3)	Process Contribution (PC) from EfW Facility (µg m-3)	PC as a % of Critical Level	Background Conditions (b)	PEC (µg m-3) (c)	PEC as a % of Critical Level
SO_2	20	0.3578	**1.79%**	1.5	1.86	9.29%
NO_X	30	1.431	**4.77%**	15	16.43	54.77%
NH_3	1	0.07156	**7.16%**	1.5	1.57	**157.16%**
Quadrant – for Cotswold Beechwoods (SAC) at 200ktpa waste throughput, 80 m stack height						
SO_2	20	0.2493	**1.25%**	1.5	1.75	8.75%
NO_X	30	0.9971	**3.32%**	15	16.00	53.32%
NH_3	1	0.04985	**4.99%**	1.5	1.55	**154.99%**
Quadrant – for Cotswold Beechwoods (SAC) at 200ktpa waste throughput, 100 m stack height						
SO_2	20	0.1264	0.63%	-	-	-
NO_X	30	0.5056	**1.69%**	15	15.51	51.69%
NH_3	1	0.02528	**2.53%**	1.5	1.53	**152.53%**
Quadrant – for Cotswold Beechwoods (SAC) at 100ktpa waste throughput, 80 m stack height						
SO_2	20	0.1353	0.68%	-	-	-
NO_X	30	0.5414	**1.80%**	15	15.54	51.80%
NH_3	1	0.02707	**2.71%**	1.5	1.53	**152.71%**
Quadrant – for Cotswold Beechwoods (SAC) at 100ktpa waste throughput, 100 m stack height						
SO_2	20	0.1554	0.78%	-	-	-
NO_X	30	0.6216	**2.07%**	15	15.54	52.07%
NH_3	1	0.03108	**3.11%**	1.5	1.53	**153.11%**
Quadrant – for Walmore Common (SPA, Ramsar)at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.01384	0.07%	-	-	-
NO_X	30	0.05537	0.18%	-	-	-
NH_3	3	0.002768	0.09%	-	-	-
Quadrant – for Severn Estuary (SAC, SPA, Ramsar)at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.02243	0.11%	-	-	-
NO_X	30	0.08971	0.30%	-	-	-
NH_3	3	0.004486	0.15%	-	-	**-**
Quadrant – for Rodborough Common (SAC)at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.04355	0.22%	-	-	-
NO_X	30	0.17421	0.58%	-	-	**-**
NH_3	3	0.00871	0.29%	-	-	**-**

Parameter	Critical Level (µg m-3)	Process Contribution (PC) from EfW Facility (µg m-3)	PC as a % of Critical Level	Background Conditions (b)	PEC (µg m-3) (c)	PEC as a % of Critical Level
Moreton – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.02342	0.12%	-	-	-
NO_X	30	0.09366	0.31%	-	-	-
NH_3	3	0.004683	0.16%	-	-	-
Moreton – for Walmore Common (SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.01306	0.07%	-	-	-
NO_X	30	0.05224	0.17%	-	-	**-**
NH_3	3	0.00261	0.09%	-	-	**-**
Moreton – for Rodborough Common (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.08414	0.42%	-	-	-
NO_X	30	0.33656	**1.12%**	17.5	17.837	59.46%
NH_3	3	0.01683	0.56%	-	-	-
Moreton – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.4451	**2.23%**	1.5	1.945	9.73%
NO_X	30	1.7804	**5.93%**	15	16.780	55.93%
NH_3	1	0.08902	**8.90%**	1.5	1.589	**158.90%**
Moreton – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.4176	**2.09%**	1.5	1.918	9.59%
NO_X	30	1.6705	**5.57%**	15	16.671	55.57%
NH_3	1	0.08353	**8.35%**	1.5	1.584	**158.35%**
Moreton – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 100 m stack height						
SO_2	20	0.3783	**1.89%**	1.5	1.878	9.39%
NO_X	30	1.513	**5.04%**	15	16.513	55.04%
NH_3	1	0.07566	**7.57%**	1.5	1.576	**157.57%**
Moreton – for Cotswold Beechwoods (SAC) at 200 ktpa waste throughput, 80 m stack height						
SO_2	20	0.2307	**1.15%**	1.5	1.731	8.65%
NO_X	30	0.9226	**3.08%**	15	15.923	53.08%
NH_3	1	0.04613	**4.61%**	1.5	1.546	**154.61%**
Moreton – for Cotswold Beechwoods (SAC) at 200 ktpa waste throughput, 100 m stack height						
SO_2	20	0.2566	**1.28%**	1.5	1.757	8.78%
NO_X	30	1.026	**3.42%**	15	16.026	53.42%
NH_3	1	0.05131	**1.71%**	1.5	1.551	**155.13%**
Moreton – for Cotswold Beechwoods (SAC) at 100 ktpa waste throughput, 80 m stack height						

Parameter	Critical Level (µg m-3)	Process Contribution (PC) from EfW Facility (µg m-3)	PC as a % of Critical Level	Background Conditions (b)	PEC (µg m-3) (c)	PEC as a % of Critical Level
SO_2	20	0.1349	0.67%	-	-	-
NO_X	30	0.5396	**1.80%**	15	15.54	51.80%
NH_3	1	0.02698	**2.70%**	1.5	1.53	**152.70%**
Moreton – for Cotswold Beechwoods (SAC) at 100 ktpa waste throughput, 100 m stack height						
SO_2	20	0.1153	0.58%	-	-	-
NO_X	30	0.4613	**1.54%**	15	15.46	51.54%
NH_3	1	0.02306	**2.31%**	1.5	1.52	**152.31%**
Railway – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.06837	0.34%	-	-	-
NO_X	30	0.2735	0.91%	-	-	-
NH_3	1	0.01367	**1.37%**	1.5	1.514	**151.37%**
Railway – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.06406	0.32%	-	-	-
NO_X	30	0.2562	0.85%	-	-	-
NH_3	1	0.01281	**1.28%**	1.5	1.513	**151.28%**
Railway – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 100 m stack height						
SO_2	20	0.09049	0.45%	-	-	-
NO_X	30	0.3620	**1.21%**	15	15.362	51.21%
NH_3	1	0.01810	**1.81%**	1.5	1.518	**151.81%**
Railway – for Cotswold Beechwoods (SAC) at 200 ktpa waste throughput, 80 m stack height						
SO_2	20	0.04730	0.24%	-	-	-
NO_X	30	0.1892	0.63%	-	-	-
NH_3	1	0.00946	0.95%	-	-	**-**
Railway – for Cotswold Beechwoods (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.03172	0.16%	-	-	-
NO_X	30	0.1269	0.42%	-	-	-
NH_3	1	0.006343	0.63%	-	-	**-**
Railway – for Walmore Common (SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.01722	0.09%	-	-	-
NO_X	30	0.06889	0.23%	-	-	-
NH_3	3	0.00344	0.11%	-	-	**-**
Nastend – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.01504	0.08%	-	-	-

Parameter	Critical Level ($\mu g\ m^{-3}$)	Process Contribution (PC) from EfW Facility ($\mu g\ m^{-3}$)	PC as a % of Critical Level	Background Conditions (b)	PEC ($\mu g\ m^{-3}$) (c)	PEC as a % of Critical Level
NO_X	30	0.06015	0.20%	-	-	-
NH_3	3	0.00301	0.10%	-	-	**-**
Nastend – for Rodborough Common (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.15829	0.79%	-	-	-
NO_X	30	0.63316	**2.11%**	17.5	18.133	60.44%
NH_3	3	0.03166	**1.06%**	1.6	1.632	54.39%
Nastend – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.3705	**1.85%**	1.5	1.870	9.35%
NO_X	30	1.482	**4.94%**	15	16.482	54.94%
NH_3	1	0.07410	**7.41%**	1.5	1.574	**157.41%**
Nastend – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.3560	**1.78%**	1.5	1.856	9.28%
NO_X	30	1.424	**4.75%**	15	16.424	54.75%
NH_3	1	0.07119	**7.12%**	1.5	1.571	**157.12%**
Nastend – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 100 m stack height						
SO_2	20	0.3207	**1.60%**	1.5	1.821	9.10%
NO_X	30	1.283	**4.28%**	15	16.283	54.28%
NH_3	1	0.06415	**6.41%**	1.5	1.564	**156.41%**
Nastend – for Cotswold Beechwoods (SAC) at 200 ktpa waste throughput, 80 m stack height						
SO_2	20	0.2315	**1.16%**	1.5	1.732	8.66%
NO_X	30	0.9261	**3.09%**	15	15.926	53.09%
NH_3	1	0.04631	**4.63%**	1.5	1.546	**154.63%**
Nastend – for Cotswold Beechwoods (SAC) at 200 ktpa waste throughput, 100 m stack height						
SO_2	20	0.1081	0.54%	-	-	-
NO_X	30	0.4326	**1.44%**	15	15.43	51.44%
NH_3	1	0.02163	**2.16%**	1.5	1.52	**152.16%**
Nastend – for Cotswold Beechwoods (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.1410	0.71%	1.5	1.64	8.21%
NO_X	30	0.5641	**1.88%**	15	15.56	51.88%
NH_3	1	0.02821	**2.82%**	1.5	1.53	**152.82%**
Nastend – for Cotswold Beechwoods (SAC) at 100 ktpa waste throughput, 100 m stack height						
SO_2	20	0.1206	0.60%	-	-	-
NO_X	30	0.4826	**1.61%**	15	15.48	51.61%

Parameter	Critical Level ($\mu g\ m^{-3}$)	Process Contribution (PC) from EfW Facility ($\mu g\ m^{-3}$)	PC as a % of Critical Level	Background Conditions [(b)]	PEC ($\mu g\ m^{-3}$) [(c)]	PEC as a % of Critical Level
NH_3	1	0.02413	**2.41%**	1.5	1.52	**152.41%**
Nastend – for Walmore Common (SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.01327	0.07%	-	-	-
NO_X	30	0.05308	0.18%	-	-	-
NH_3	3	0.00265	0.09%	-	-	-
Netheridge – for Walmore Common (SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.01592	0.08%	-	-	-
NO_X	30	0.06369	0.21%	-	-	-
NH_3	3	0.00318	0.11%	-	-	**-**
Netheridge – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.2341	**1.17%**	1.5	1.73	8.67%
NO_X	30	0.9364	**3.12%**	15	15.94	53.12%
NH_3	1	0.04682	**4.68%**	1.5	1.55	**154.68%**
Netheridge – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.2178	**1.09%**	1.5	1.72	8.59%
NO_X	30	0.8713	**2.90%**	15	15.87	52.90%
NH_3	1	0.04356	**4.36%**	1.5	1.54	**154.36%**
Netheridge – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 100 m stack height						
SO_2	20	0.2072	**1.04%**	1.5	1.71	8.54%
NO_X	30	0.8286	**2.76%**	15	15.83	52.76%
NH_3	1	0.04143	**4.14%**	1.5	1.54	**154.14%**
Netheridge – for Cotswold Beechwoods (SAC) at 200 ktpa waste throughput, 80 m stack height						
SO_2	20	0.1313	0.66%	-	-	-
NO_X	30	0.5250	**1.75%**	15	15.53	51.75%
NH_3	1	0.02625	**2.63%**	1.5	1.53	**152.63%**
Netheridge – for Cotswold Beechwoods (SAC) at 200 ktpa waste throughput, 100 m stack height						
SO_2	20	0.06909	0.35%	-	-	-
NO_X	30	0.2764	0.92%	-	-	-
NH_3	1	0.01382	**1.38%**	1.5	1.51	151.38%
Netheridge – for Cotswold Beechwoods (SAC) at 100 ktpa stack height, 80 m stack height						
SO_2	20	0.07630	0.38%	-	-	-
NO_X	30	0.3052	**1.02%**	15	15.31	51.02%
NH_3	1	0.01526	**1.53%**	1.5	1.52	**151.53%**

Parameter	Critical Level ($\mu g\ m^{-3}$)	Process Contribution (PC) from EfW Facility ($\mu g\ m^{-3}$)	PC as a % of Critical Level	Background Conditions [b]	PEC ($\mu g\ m^{-3}$) [c]	PEC as a % of Critical Level
Netheridge – for Cotswold Beechwoods (SAC) at 100 ktpa stack height, 100 m stack height						
SO_2	20	0.08215	0.41%	-	-	-
NO_X	30	0.3286	**1.10%**	15	15.33	51.10%
NH_3	1	0.01643	**1.64%**	1.5	1.52	151.64%
Netheridge – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.01488	0.07%	-	-	-
NO_X	30	0.05953	0.20%	-	-	-
NH_3	3	0.00298	0.10%	-	-	-
The Park – for Dixton Wood (SAC) at 400 ktpa waste throughput, 80 m stack height						
SO_2	20	0.3292	**1.65%**	1.9	2.23	11.15%
NO_X	30	1.317	**4.39%**	14.3	15.62	52.06%
NH_3	1	0.06585	**6.58%**	1.8	1.87	**186.58%**
The Park – for Dixton Wood (SAC) at 400 ktpa waste throughput, 90 m stack height						
SO_2	20	0.2510	**1.25%**	1.9	2.15	10.75%
NO_X	30	1.004	**3.35%**	14.3	15.30	51.01%
NH_3	1	0.05019	**5.02%**	1.8	1.85	**185.02%**
The Park – for Dixton Wood (SAC) at 400 ktpa waste throughput, 100 m stack height						
SO_2	20	0.1708	0.85%	-	-	-
NO_X	30	0.6831	**2.28%**	14.3	14.98	49.94%
NH_3	1	0.03416	**3.42%**	1.8	1.83	**183.42%**
The Park – for Dixton Wood (SAC) at 200 ktpa waste throughput, 80 m stack height						
SO_2	20	0.2468	**1.23%**	1.9	2.14	10.73%
NO_X	30	0.9872	**3.29%**	14.3	15.29	50.96%
NH_3	1	0.04936	**4.94%**	1.8	1.85	**184.94%**
The Park – for Dixton Wood (SAC) at 200 ktpa waste throughput, 100 m stack height						
SO_2	20	0.07717	0.39%	-	-	-
NO_X	30	0.3087	**1.03%**	14.3	14.61	48.70%
NH_3	1	0.01543	**1.54%**	1.8	1.82	**181.54%**
The Park – for Dixton Wood (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.1724	0.86%	-	-	-
NO_X	30	0.6896	**2.30%**	14.3	14.99	49.97%
NH_3	1	0.03448	**3.45%**	1.8	1.83	**183.45%**
The Park – for Dixton Wood (SAC) at 100 ktpa waste throughput, 100 m stack height						

Parameter	Critical Level (μg m-3)	Process Contribution (PC) from EfW Facility (μg m-3)	PC as a % of Critical Level	Background Conditions (b)	PEC (μg m-3) (c)	PEC as a % of Critical Level
SO_2	20	0.1211	0.61%	-	-	-
NO_X	30	0.4846	**1.62%**	14.3	14.78	49.28%
NH_3	1	0.02423	**2.42%**	1.8	1.82	**182.42%**
Foss Cross – for Cotswold Beechwoods (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.00957	0.05%	-	-	-
NO_X	30	0.03830	0.13%	-	-	-
NH_3	1	0.00191	0.19%	-	-	-
Hurst – for Severn Estuary (SAC, SPA, Ramsar) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.05174	0.26%	-	-	-
NO_X	30	0.2069	0.69%	-	-	**-**
NH_3	3	0.01035	0.34%	-	-	**-**
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.04639	0.23%	-	-	-
NO_X	30	0.1856	0.62%	-	-	**-**
NH_3	1	0.00928	0.93%	-	-	-
Hurst – for Wye Valley Woodlands (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.03731	0.19%	-	-	-
NO_X	30	0.1492	0.50%	-	-	**-**
NH_3	1	0.00746	0.75%	-	-	-
Lydney – for Severn Estuary (SAC, SPA, Ramsar) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.09166	0.46%	-	-	-
NO_X	30	0.3666	**1.22%**	21 (d)	21.37	**71.22%**
NH_3	3	0.01833	0.61%	-	-	-
Lydney – for Severn Estuary (SAC, SPA, Ramsar) at 100 ktpa waste throughput, 90 m stack height						
SO_2	20	0.08391	0.42%	-	-	-
NO_X	30	0.3356	**1.12%**	21 (d)	21.34	**71.12%**
NH_3	3	0.01678	0.56%	-	-	-
Lydney – for Severn Estuary (SAC, SPA, Ramsar) at 100 ktpa waste throughput, 100 m stack height						
SO_2	20	0.07675	0.38%	-	-	-
NO_X	30	0.3070	**1.02%**	21 (d)	21.31	**71.02%**
NH_3	3	0.01535	0.51%	-	-	**-**
Lydney – for Severn Estuary (SAC, SPA, Ramsar) at 50 ktpa waste throughput, 80 m stack height						
SO_2	20	0.05950	0.30%	-	-	-

Parameter	Critical Level ($\mu g\ m^{-3}$)	Process Contribution (PC) from EfW Facility ($\mu g\ m^{-3}$)	PC as a % of Critical Level	Background Conditions (b)	PEC ($\mu g\ m^{-3}$) (c)	PEC as a % of Critical Level
NO_X	30	0.2380	0.79%	-	-	-
NH_3	3	0.01190	0.40%	-	-	**-**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.07881	0.39%	-	-	-
NO_X	30	0.3152	**1.05%**	11	11.315	37.72%
NH_3	1	0.01576	**1.58%**	1.4	1.416	**141.58%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) at 100 ktpa waste throughput, 90 m stack height						
SO_2	20	0.07903	0.40%	-	-	-
NO_X	30	0.3161	**1.05%**	11	11.316	37.72%
NH_3	1	0.01581	**1.58%**	1.4	1.416	**141.58%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) at 100 ktpa waste throughput, 100 m stack height						
SO_2	20	0.07714	0.39%	-	-	-
NO_X	30	0.3086	**1.03%**	11	11.309	37.70%
NH_3	1	0.01543	**1.54%**	1.4	1.415	**141.54%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) at 50 ktpa waste throughput, 80 m stack height						
SO_2	20	0.05181	0.26%	-	-	-
NO_X	30	0.2072	0.69%	-	-	-
NH_3	1	0.01036	**1.04%**	1.4	1.410	**141.04%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) at 50 ktpa waste throughput, 100 m stack height						
SO_2	20	0.04191	0.21%	-	-	-
NO_X	30	0.1676	0.56%	-	-	-
NH_3	1	0.008382	0.84%	-	-	**-**
Lydney – for Wye Valley Woodlands (SAC) at 100 ktpa waste throughput, 80 m stack height						
SO_2	20	0.04943	0.25%	-	-	-
NO_X	30	0.1977	0.66%	-	-	-
NH_3	1	0.00989	0.99%	-	-	**-**

(a) Listed only for pollutants with established critical levels for the protection of vegetation and ecosystems. PCs > 1% and PECs > 70% of the assessment criteria are in bold text.
(b) Based on site centre, unless otherwise stated.
(c) PEC = PC + Background conditions. Background conditions and PEC are shown only when PC exceeds 1% of the assessment criteria.
(d) Worst-case background conditions taken for the areas with saltmarshes.

Table 1.2 Short-Term Critical Levels Assessment for European Sites [(a)]

Parameter	Critical Level (µg m^{-3})	Process Contribution (PC) from EfW Facility (µg m^{-3})	PC as a % of Critical Level
Wingmoor East – for Dixton Wood (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.06888	1.38%
	0.2 – 0.3 (Monthly)	0.00978	4.89%
NH_3	3300 (Hourly)	5.4643	0.166%
	270 (Daily)	0.68882	0.255%
	23 (Monthly)	0.09781	0.43%
Wingmoor West – for Dixton Wood (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.08643	1.73%
	0.2 – 0.3 (Monthly)	0.01038	5.19%
NH_3	3300 (Hourly)	5.66674	0.172%
	270 (Daily)	0.86435	0.32%
	23 (Monthly)	0.10382	0.45%
Easter Park – for Bredon Hill (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.08555	1.71%
	0.2 – 0.3 (Monthly)	0.01099	5.49%
NH_3	3300 (Hourly)	7.39682	0.224%
	270 (Daily)	0.85546	0.32%
	23 (Monthly)	0.10986	0.478%
Easter Park – for Dixton Wood (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.03631	0.73%
	0.2 – 0.3 (Monthly)	0.00289	1.44%
NH_3	3300 (Hourly)	3.39655	0.103%
	270 (Daily)	0.36309	0.13%
	23 (Monthly)	0.02887	0.126%
Javelin Park – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.01103	0.22%
	0.2 – 0.3 (Monthly)	0.00150	0.50%
NH_3	3300 (Hourly)	0.72887	0.022%
	270 (Daily)	0.11028	0.04%
	23 (Monthly)	0.01498	0.065%

Parameter	Critical Level (μg m-3)	Process Contribution (PC) from EfW Facility (μg m-3)	PC as a % of Critical Level
Javelin Park – for Walmore Common (SPA, Ramsar)at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.00679	0.14%
	0.2 – 0.3 (Monthly)	0.00054	0.27%
NH_3	3300 (Hourly)	0.78764	0.024%
	270 (Daily)	0.06787	0.025%
	23 (Monthly)	0.00537	0.023%
Javelin Park – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.10384	2.08%
	0.2 – 0.3 (Monthly)	0.02144	10.72%
NH_3	3300 (Hourly)	6.35953	0.193%
	270 (Daily)	1.03844	0.38%
	23 (Monthly)	0.21445	0.93%
Javelin Park – for Rodborough Common (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.03625	0.73%
	0.2 – 0.3 (Monthly)	0.00391	1.96%
NH_3	3300 (Hourly)	3.75420	0.114%
	270 (Daily)	0.36252	0.13%
	23 (Monthly)	0.03912	0.17%
Quadrant – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.13675	2.74%
	0.2 – 0.3 (Monthly)	0.01715	8.57%
NH_3	3300 (Hourly)	7.55081	0.229%
	270 (Daily)	1.36751	0.51%
	23 (Monthly)	0.17147	0.75%
Quadrant – for Walmore Common (SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.00541	0.11%
	0.2 – 0.3 (Monthly)	0.00061	0.31%
NH_3	3300 (Hourly)	0.76172	0.023%
	270 (Daily)	0.05410	0.02%
	23 (Monthly)	0.00612	0.03%
Quadrant – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.00682	0.14%
	0.2 – 0.3 (Monthly)	0.00139	0.69%
NH_3	3300 (Hourly)	0.49634	0.015%

Parameter	Critical Level (µg m-3)	Process Contribution (PC) from EfW Facility (µg m-3)	PC as a % of Critical Level
	270 (Daily)	0.06816	0.03%
	23 (Monthly)	0.01388	0.06%
Quadrant – for Rodborough Common (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.01846	0.37%
	0.2 – 0.3 (Monthly)	0.00213	1.07%
NH_3	3300 (Hourly)	2.08007	0.063%
	270 (Daily)	0.18459	0.07%
	23 (Monthly)	0.02132	0.09%
Moreton – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.01103	0.22%
	0.2 – 0.3 (Monthly)	0.00173	0.87%
NH_3	3300 (Hourly)	0.83805	0.025%
	270 (Daily)	0.11035	0.04%
	23 (Monthly)	0.01733	0.08%
Moreton – for Walmore Common (SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.00843	0.17%
	0.2 – 0.3 (Monthly)	0.00063	0.31%
NH_3	3300 (Hourly)	0.82413	0.025%
	270 (Daily)	0.08431	0.03%
	23 (Monthly)	0.00629	0.03%
Moreton – for Rodborough Common (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.04537	0.91%
	0.2 – 0.3 (Monthly)	0.00402	2.01%
NH_3	3300 (Hourly)	3.71041	0.112%
	270 (Daily)	0.45374	0.17%
	23 (Monthly)	0.04022	0.17%
Moreton – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.09871	1.97%
	0.2 – 0.3 (Monthly)	0.02013	10.06%
NH_3	3300 (Hourly)	5.66813	0.172%
	270 (Daily)	0.98709	0.37%
	23 (Monthly)	0.20126	0.88%
Railway – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.04854	0.97%

Parameter	Critical Level (μg m-3)	Process Contribution (PC) from EfW Facility (μg m-3)	PC as a % of Critical Level
	0.2 – 0.3 (Monthly)	0.00384	1.92%
NH_3	3300 (Hourly)	4.12188	0.125%
	270 (Daily)	0.48537	0.18%
	23 (Monthly)	0.03842	0.17%
Railway – for Walmore Common (SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.00468	0.09%
	0.2 – 0.3 (Monthly)	0.00076	0.38%
NH_3	3300 (Hourly)	0.48758	0.015%
	270 (Daily)	0.04676	0.02%
	23 (Monthly)	0.00760	0.03%
Nastend – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.00789	0.16%
	0.2 – 0.3 (Monthly)	0.00072	0.36%
NH_3	3300 (Hourly)	0.81069	0.025%
	270 (Daily)	0.07892	0.03%
	23 (Monthly)	0.00719	0.03%
Nastend – for Rodborough Common (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.06577	1.32%
	0.2 – 0.3 (Monthly)	0.00756	3.78%
NH_3	3300 (Hourly)	4.66625	0.141%
	270 (Daily)	0.65773	0.24%
	23 (Monthly)	0.07557	0.33%
Nastend – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.07692	1.54%
	0.2 – 0.3 (Monthly)	0.01733	8.67%
NH_3	3300 (Hourly)	4.91289	0.149%
	270 (Daily)	0.76915	0.28%
	23 (Monthly)	0.17334	0.75%
Nastend – for Walmore Common (SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.00533	0.11%
	0.2 – 0.3 (Monthly)	0.00060	0.30%
NH_3	3300 (Hourly)	0.46265	0.014%
	270 (Daily)	0.05326	0.02%
	23 (Monthly)	0.00596	0.03%

Parameter	Critical Level (µg m-3)	Process Contribution (PC) from EfW Facility (µg m-3)	PC as a % of Critical Level
Netheridge – for Walmore Common (SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.00796	0.16%
	0.2 – 0.3 (Monthly)	0.00081	0.41%
NH_3	3300 (Hourly)	0.76951	0.023%
	270 (Daily)	0.07955	0.03%
	23 (Monthly)	0.00814	0.04%
Netheridge – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.09502	1.90%
	0.2 – 0.3 (Monthly)	0.00942	4.71%
NH_3	3300 (Hourly)	6.25344	0.189%
	270 (Daily)	0.95019	0.35%
	23 (Monthly)	0.09416	0.41%
Netheridge – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.00590	0.12%
	0.2 – 0.3 (Monthly)	0.00135	0.67%
NH_3	3300 (Hourly)	0.55334	0.017%
	270 (Daily)	0.05902	0.02%
	23 (Monthly)	0.01348	0.06%
The Park – for Dixton Wood (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.08273	1.65%
	0.2 – 0.3 (Monthly)	0.01207	6.03%
NH_3	3300 (Hourly)	5.58391	0.169%
	270 (Daily)	0.82733	0.31%
	23 (Monthly)	0.12067	0.52%
Foss Cross – for Cotswold Beechwoods (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.02012	0.40%
	0.2 – 0.3 (Monthly)	0.00205	1.03%
NH_3	3300 (Hourly)	2.31304	0.07%
	270 (Daily)	0.20121	0.07%
	23 (Monthly)	0.02051	0.09%
Hurst – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.04022	0.80%
	0.2 – 0.3 (Monthly)	0.01104	5.52%
NH_3	3300 (Hourly)	2.5253	0.077%

Parameter	Critical Level (µg m-3)	Process Contribution (PC) from EfW Facility (µg m-3)	PC as a % of Critical Level
	270 (Daily)	0.40223	0.15%
	23 (Monthly)	0.11043	0.48%
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.12671	2.53%
	0.2 – 0.3 (Monthly)	0.01	5.00%
NH_3	3300 (Hourly)	8.82165	0.267%
	270 (Daily)	1.26706	0.47%
	23 (Monthly)	0.1	0.43%
Hurst – for Wye Valley Woodlands (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.14112	2.82%
	0.2 – 0.3 (Monthly)	0.0071	3.55%
NH_3	3300 (Hourly)	8.02989	0.243%
	270 (Daily)	1.41122	0.52%
	23 (Monthly)	0.07098	0.31%
Lydney – for Severn Estuary (SAC, SPA, Ramsar) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.04544	0.91%
	0.2 – 0.3 (Monthly)	0.01724	8.62%
NH_3	3300 (Hourly)	2.80541	0.085%
	270 (Daily)	0.45437	0.17%
	23 (Monthly)	0.17244	0.75%
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.23191	4.64%
	0.2 – 0.3 (Monthly)	0.02017	10.09%
NH_3	3300 (Hourly)	14.964	0.453%
	270 (Daily)	2.3191	0.86%
	23 (Monthly)	0.20172	0.88%
Lydney – for Wye Valley Woodlands (SAC) at 400 ktpa waste throughput, 80 m stack height			
HF	5 (Daily)	0.14856	2.97%
	0.2 – 0.3 (Monthly)	0.01199	5.99%
NH_3	3300 (Hourly)	9.4369	0.286%
	270 (Daily)	1.4856	0.55%
	23 (Monthly)	0.11990	0.52%

(a) Listed only for pollutants with established critical levels for the protection of vegetation and ecosystems. . PCs are in bold text if > 10% of the assessment criteria.

Table 1.3 Long-Term Acid Deposition Rates for the European Sites [a]

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) [b]	PEC (keq ha^{-1} yr^{-1}) [b]	PEC as a % of Critical Load
Wingmoor East – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 80 m stack*	Violet click beetle	2.58	0.1060	**4.11%**	1.93	2.04	**79%**
Wingmoor East – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 90 m stack*	Violet click beetle	2.58	0.07232	**2.80%**	1.93	2.00	**78%**
Wingmoor East – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 100 m stack*	Violet click beetle	2.58	0.04633	**1.80%**	1.93	1.98	**77%**
Wingmoor East – for Dixton Wood (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Violet click beetle	2.58	0.08740	**3.39%**	1.93	2.02	**78%**
Wingmoor East – for Dixton Wood (SAC) *at 200 ktpa waste throughput, 100 m stack height*	Violet click beetle	2.58	0.04239	**1.64%**	1.93	1.97	**76%**
Wingmoor East – for Dixton Wood (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Violet click beetle	2.58	0.05397	**2.09%**	1.93	1.98	**77%**
Wingmoor East – for Dixton Wood (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Violet click beetle	2.58	0.03732	**1.45%**	1.93	1.97	**76%**

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) (b)	PEC (keq ha^{-1} yr^{-1}) (b)	PEC as a % of Critical Load
Wingmoor West – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 80 m stack*	Violet click beetle	2.58	0.1260	**4.88%**	1.93	2.06	**80%**
Wingmoor West – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 90 m stack*	Violet click beetle	2.58	0.09125	**3.54%**	1.93	2.02	**78%**
Wingmoor West – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 100 m stack*	Violet click beetle	2.58	0.06137	**2.38%**	1.93	1.99	**77%**
Wingmoor West – for Dixton Wood (SAC) *at 200ktpa waste throughput, 80 m stack height*	Violet click beetle	2.58	0.1000	**3.88%**	1.93	2.03	**79%**
Wingmoor West – for Dixton Wood (SAC) *at 200ktpa waste throughput, 100 m stack height*	Violet click beetle	2.58	0.05572	**2.16%**	1.93	1.99	**77%**
Wingmoor West – for Dixton Wood (SAC) *at 100ktpa waste throughput, 80 m stack height*	Violet click beetle	2.58	0.07378	**2.86%**	1.93	2.00	**78%**
Wingmoor West – for Dixton Wood (SAC) *at 100ktpa waste throughput, 100 m stack height*	Violet click beetle	2.58	0.04624	**1.79%**	1.93	1.98	**77%**
Easter Park – for Bredon Hill (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Violet click beetle	2.55	0.1110	**4.35%**	1.79	1.90	**75%**

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) (b)	PEC (keq ha^{-1} yr^{-1}) (b)	PEC as a % of Critical Load
Easter Park – for Bredon Hill (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Violet click beetle	2.55	0.1008	**3.95%**	1.79	1.89	**74%**
Easter Park – for Bredon Hill (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Violet click beetle	2.55	0.08687	**3.41%**	1.79	1.88	**74%**
Easter Park – for Bredon Hill (SAC) *at 200ktpa waste throughput, 80 m stack height*	Violet click beetle	2.55	0.07300	**2.86%**	1.79	1.86	**73%**
Easter Park – for Bredon Hill (SAC) *at 200ktpa waste throughput, 100 m stack height*	Violet click beetle	2.55	0.06304	**2.47%**	1.79	1.85	**73%**
Easter Park – for Bredon Hill (SAC) *at 100ktpa waste throughput, 80 m stack height*	Violet click beetle	2.55	0.03792	**1.49%**	1.79	1.83	**72%**
Easter Park – for Bredon Hill (SAC) *at 100ktpa waste throughput, 100 m stack height*	Violet click beetle	2.55	0.03976	**1.54%**	1.79	1.83	**71%**
Easter Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Violet click beetle	2.58	0.03427	**1.33%**	1.93	1.96	**76%**
Easter Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Violet click beetle	2.58	0.02717	**1.05%**	1.93	1.96	**76%**

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) [(b)]	PEC (keq ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
Easter Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Violet click beetle	2.58	0.02052	0.80%	-	-	**-**
Javelin Park – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Beech Woodland	2..68	0.2154	**8.04%**	2.29	2.51	**93%**
	Calcareous Grassland	4.76	0.1170	**2.46%**	1.53	1.65	35%
Javelin Park – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Beech Woodland	2..68	0.1972	**7.36%**	2.29	2.49	**93%**
	Calcareous Grassland	4.76	0.1071	**2.25%**	1.53	1.64	34%
Javelin Park – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Beech Woodland	2..68	0.1772	**6.61%**	2.29	2.47	**92%**
	Calcareous Grassland	4.76	0.09624	**2.02%**	1.53	1.63	34%
Javelin Park – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Beech Woodland	2..68	0.1141	**4.26%**	2.29	2.40	**90%**
	Calcareous Grassland	4.76	0.06196	**1.30%**	1.53	1.59	33%
Javelin Park – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 100 m stack height*	Beech Woodland	2..68	0.1225	**4.57%**	2.29	2.41	**88%**
	Calcareous Grassland	4.76	0.06651	**1.40%**	1.53	1.60	33%
Javelin Park – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	2..68	0.06513	**2.43%**	2.29	2.36	**90%**
	Calcareous Grassland	4.76	0.03537	0.74%	-	-	-
Javelin Park – for Cotswold Beechwoods (SAC) *at 100*	Beech Woodland	2..68	0.07254	**2.71%**	2.29	2.36	**88%**

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) (b)	PEC (keq ha^{-1} yr^{-1}) (b)	PEC as a % of Critical Load
ktpa waste throughput, 100 m stack height	Calcareous Grassland	4.76	0.03940	0.83%	-	-	-
Javelin Park – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	4.75	0.01995	0.42%	-	-	**-**
Quadrant – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 80 stack height*	Beech Woodland	2.68	0.1894	**7.07%**	2.29	2.48	**93%**
	Calcareous Grassland	4.76	0.1029	**2.16%**	1.53	1.63	34%
Quadrant – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 90 stack height*	Beech Woodland	2.68	0.1733	**6.47%**	2.29	2.46	**92%**
	Calcareous Grassland	4.76	0.09414	**1.98%**	1.53	1.62	34%
Quadrant – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Beech Woodland	2.68	0.1539	**5.74%**	2.29	2.44	**91%**
	Calcareous Grassland	4.76	0.08359	**1.76%**	1.53	1.61	34%
Quadrant – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.1072	**4.00%**	2.29	2.40	**89%**
	Calcareous Grassland	4.76	0.05823	**1.22%**	1.53	1.59	33%
Quadrant – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 100 m stack height*	Beech Woodland	2.68	0.1087	**4.06%**	2.29	2.40	**90%**
	Calcareous Grassland	4.76	0.05906	**1.24%**	1.53	1.59	33%
Quadrant – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.05822	**2.17%**	2.29	2.35	**88%**
	Calcareous Grassland	4.76	0.03162	0.66%	-	-	-

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) (b)	PEC (keq ha^{-1} yr^{-1}) (b)	PEC as a % of Critical Load
Quadrant – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.06684	**2.49%**	2.29	2.36	**88%**
	Calcareous Grassland	4.76	0.03630	0.76%	-	-	-
Quadrant – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	4.75	0.01017	0.21%	-	-	-
Moreton – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	4.75	0.01966	0.41%	-	-	-
Moreton – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.1915	**7.14%**	2.29	2.48	**93%**
	Calcareous Grassland	4.76	0.1040	**2.18%**	1.53	1.63	34%
Moreton – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Beech Woodland	2.68	0.1796	**6.70%**	2.29	2.47	**92%**
	Calcareous Grassland	4.76	0.09757	**2.05%**	1.53	1.63	34%
Moreton – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Beech Woodland	2.68	0.1627	**6.07%**	2.29	2.45	**92%**
	Calcareous Grassland	4.76	0.08838	**1.86%**	1.53	1.62	34%
Moreton – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.09921	**3.70%**	2.29	2.39	**89%**
	Calcareous Grassland	4.76	0.05388	**1.13%**	1.53	1.58	33%
Moreton – for Cotswold Beechwoods (SAC) *at 200*	Beech Woodland	2.68	0.1104	**4.12%**	2.29	2.40	**90%**

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) (b)	PEC (keq ha^{-1} yr^{-1}) (b)	PEC as a % of Critical Load
ktpa waste throughput, 100 m stack height	Calcareous Grassland	4.76	0.05994	**1.26%**	1.53	1.59	33%
Moreton – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.05803	**2.17%**	2.29	2.35	**88%**
	Calcareous Grassland	4.76	0.03152	0.66%	-	-	-
Moreton – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Beech Woodland	2.68	0.04960	**1.85%**	2.29	2.34	**87%**
	Calcareous Grassland	4.76	0.02694	0.57%	-	-	-
Railway – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.02941	**1.10%**	2.29	2.32	**87%**
	Calcareous Grassland	4.76	0.01597	0.34%	-	-	-
Railway – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Beech Woodland	2.68	0.02755	**1.03%**	2.29	2.32	**86%**
	Calcareous Grassland	4.76	0.01496	0.31%	-	-	-
Railway – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Beech Woodland	2.68	0.03892	**1.45%**	2.29	2.32	**87%**
	Calcareous Grassland	4.76	0.02114	0.44%	-	-	-
Railway – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.02035	0.76%	-	-	**-**
	Calcareous Grassland	4.76	0.01105	0.23%	-	-	-
Nastend – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	4.75	0.03698	0.78%	-	-	**-**

Sites	**Interest Features**	**Critical Load (keq ha^{-1} yr^{-1})**	**Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})**	**PC as a % of Critical Load**	**Background Conditions (keq ha^{-1} yr^{-1}) (b)**	**PEC (keq ha^{-1} yr^{-1}) (b)**	**PEC as a % of Critical Load**
Nastend – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.1594	**5.95%**	2.29	2.45	**91%**
	Calcareous Grassland	4.76	0.08655	**1.82%**	1.53	1.62	34%
Nastend – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Beech Woodland	2.68	0.1531	**5.71%**	2.29	2.44	**91%**
	Calcareous Grassland	4.76	0.08316	**1.75%**	1.53	1.61	34%
Nastend – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Beech Woodland	2.68	0.1380	**5.15%**	2.29	2.43	**91%**
	Calcareous Grassland	4.76	0.07493	**1.57%**	1.53	1.60	34%
Nastend – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.09959	**3.72%**	2.29	2.39	**89%**
	Calcareous Grassland	4.76	0.05409	**1.14%**	1.53	1.59	33%
Nastend – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 100 m stack height*	Beech Woodland	2.68	0.09303	**3.47%**	2.29	2.38	**89%**
	Calcareous Grassland	4.76	0.05053	**1.06%**	1.53	1.58	33%
Nastend – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.06066	**2.26%**	2.29	2.35	**88%**
	Calcareous Grassland	4.76	0.0295	0.69%	-	-	-
Nastend – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Beech Woodland	2.68	0.05189	**1.94%**	2.29	2.34	**87%**
	Calcareous Grassland	4.76	0.02818	0.59%	-	-	-
Netheridge – for Cotswold Beechwoods (SAC) *at 400*	Beech Woodland	2.68	0.1007	**3.76%**	2.29	2.39	**89%**

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) (b)	PEC (keq ha^{-1} yr^{-1}) (b)	PEC as a % of Critical Load
ktpa waste throughput, 80 m stack height	Calcareous Grassland	4.76	0.05469	**1.15%**	1.53	1.58	33%
Netheridge – for Cotswold Beechwoods (SAC) *at 400*	Beech Woodland	2.68	0.09369	**3.50%**	2.29	2.68	**89%**
ktpa waste throughput, 90 m stack height	Calcareous Grassland	4.76	0.05089	**1.07%**	1.53	1.58	33%
Netheridge – for Cotswold Beechwoods (SAC) *at 400*	Beech Woodland	2.68	0.08910	**3.32%**	2.29	2.38	**89%**
ktpa waste throughput, 100 m stack height	Calcareous Grassland	4.76	0.04839	**1.02%**	1.53	1.58	33%
Netheridge – for Cotswold Beechwoods (SAC) *at 200*	Beech Woodland	2.68	0.05646	**2.11%**	2.29	2.35	**88%**
ktpa waste throughput, 80 m stack height	Calcareous Grassland	4.76	0.03066	0.64%	-	-	-
Netheridge – for Cotswold Beechwoods (SAC) *at 200*	Beech Woodland	2.68	0.05944	**2.22%**	2.29	2.35	**88%**
ktpa waste throughput, 100 m stack height	Calcareous Grassland	4.76	0.03228	0.68%	-	-	-
Netheridge – for Cotswold Beechwoods (SAC) *at 100*	Beech Woodland	2.68	0.03282	**1.22%**	2.29	2.32	**87%**
ktpa waste throughput, 80 m stack height	Calcareous Grassland	4.76	0.01782	0.37%	-	-	-
Netheridge – for Cotswold Beechwoods (SAC) *at 100*	Beech Woodland	2.68	0.03534	**1.32%**	2.29	2.33	**87%**
ktpa waste throughput, 100 m stack height	Calcareous Grassland	4.76	0.01919	0.40%	-	-	-
The Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Violet click beetle	2.58	0.1416	**5.49%**	1.93	2.07	**80%**

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) (b)	PEC (keq ha^{-1} yr^{-1}) (b)	PEC as a % of Critical Load
The Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Violet click beetle	2.58	0.1079	**4.18%**	1.93	2.04	**79%**
The Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Violet click beetle	2.58	0.07346	**2.85%**	1.93	2.00	**78%**
The Park – for Dixton Wood (SAC) *at 200ktpa waste throughput, 80 m stack height*	Violet click beetle	2.58	0.1062	**4.11%**	1.93	2.04	**79%**
The Park – for Dixton Wood (SAC) *at 200ktpa waste throughput, 100 m stack height*	Violet click beetle	2.58	0.06639	**2.57%**	1.93	2.00	**77%**
The Park – for Dixton Wood (SAC) *at 100ktpa waste throughput, 80 m stack height*	Violet click beetle	2.58	0.07416	**2.87%**	1.93	2.00	**77%**
The Park – for Dixton Wood (SAC) *at 100ktpa waste throughput, 100 m stack height*	Violet click beetle	2.58	0.05211	**2.02%**	1.93	1.98	**77%**
Foss Cross – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	2.68	0.004118	0.15%	-	-	**-**
	Calcareous Grassland	4.76	0.002237	0.05%	-	-	**-**

Sites	**Interest Features**	**Critical Load (keq ha^{-1} yr^{-1})**	**Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})**	**PC as a % of Critical Load**	**Background Conditions (keq ha^{-1} yr^{-1}) (b)**	**PEC (keq ha^{-1} yr^{-1}) (b)**	**PEC as a % of Critical Load**
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Lesser and greater horseshoe bats	0.99	0.01995	**2.02%**	2.25	2.27	**229%**
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 90 m stack height*	Lesser and greater horseshoe bats	0.99	0.01762	**1.78%**	2.25	2.27	**229%**
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Lesser and greater horseshoe bats	0.99	0.01365	**1.38%**	2.25	2.26	**229%**
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 50 ktpa waste throughput, 80 m stack height*	Lesser and greater horseshoe bats	0.99	0.01219	**1.23%**	2.25	2.26	**229%**
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 50 ktpa waste throughput, 100 m stack height*	Lesser and greater horseshoe bats	0.99	0.009669	0.98%	-	-	**-**
Hurst – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	1.22	0.01605	**1.32%**	1.94	1.96	**160%**
Hurst – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 90 m stack height*	Beech Woodland	1.22	0.01410	**1.16%**	1.94	1.95	**160%**

Sites	Interest Features	Critical Load (keq ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (keq ha^{-1} yr^{-1}) (b)	PEC (keq ha^{-1} yr^{-1}) (b)	PEC as a % of Critical Load
Hurst – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Beech Woodland	1.22	0.01249	**1.02%**	1.94	1.95	**160%**
Hurst – for Wye Valley Woodlands (SAC) *at 50 ktpa waste throughput, 80 m stack height*	Beech Woodland	1.22	0.01014	0.83%	-	-	**-**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Lesser and greater horseshoe bats	0.99	0.03390	**3.42%**	2.25	2.28	**231%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 90 m stack height*	Lesser and greater horseshoe bats	0.99	0.03399	**3.43%**	2.25	2.28	**231%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Lesser and greater horseshoe bats	0.99	0.03318	**3.35%**	2.25	2.28	**231%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 50 ktpa waste throughput, 80 m stack height*	Lesser and greater horseshoe bats	0.99	0.02228	**2.25%**	2.25	2.27	**230%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 50 ktpa waste throughput, 100 m stack height*	Lesser and greater horseshoe bats	0.99	0.01803	**1.82%**	2.25	2.27	**229%**

Sites	**Interest Features**	**Critical Load (keq ha^{-1} yr^{-1})**	**Process Contribution (PC) from EfW Facility (keq ha^{-1} yr^{-1})**	**PC as a % of Critical Load**	**Background Conditions (keq ha^{-1} yr^{-1}) (b)**	**PEC (keq ha^{-1} yr^{-1}) (b)**	**PEC as a % of Critical Load**
Lydney – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	1.22	0.02126	**1.74%**	1.94	1.96	**161%**
Lydney – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 90 m stack height*	Beech Woodland	1.22	0.02056	**1.69%**	1.94	1.96	**161%**
Lydney – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Beech Woodland	1.22	0.01966	**1.61%**	1.94	1.96	**161%**
Lydney – for Wye Valley Woodlands (SAC) *at 50 ktpa waste throughput, 80 m stack height*	Beech Woodland	1.22	0.01269	**1.04%**	1.94	1.95	**160%**
Lydney – for Wye Valley Woodlands (SAC) *at 50 ktpa waste throughput, 100 m stack height*	Beech Woodland	1.22	0.01132	0.93%	-	-	**-**

(a) PCs > 1% and PECs > 70% of the assessment criteria are in bold text.
(b) PEC = PC + Background conditions. Background conditions and PEC are shown only when PC exceeds 1% of the assessment criteria.

Table1.4 Long-Term Nutrient Nitrogen Deposition Rates for the European Sites [(a)]

Sites	Habitats	Critical Load (kg N ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (kg N ha^{-1} yr^{-1})	PEC (kg N ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
Wingmoor East – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.6678	**4.45 – 6.68 %**	22.7	23.4	**156- 234 %**
Wingmoor East – for Dixton Wood (SAC) *at 400ktpa waste throughput, 90 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.4557	**3.04 – 4.56%**	22.7	23.2	**154 – 232%**
Wingmoor East – for Dixton Wood (SAC) *at 400ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.2919	**1.95 – 2.92%**	22.7	23.0	**153 – 230%**
Wingmoor East – for Dixton Wood (SAC) *at 200ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.5507	**3.67 – 5.51%**	22.7	23.3	**155 – 233%**
Wingmoor East – for Dixton Wood (SAC) *at 200ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.2671	**1.78 – 2.67%**	22.7	23.0	**153 – 230%**
Wingmoor East – for Dixton Wood (SAC) *at 100ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.3401	**2.27 – 3.40%**	22.7	23.0	**154 – 230%**
Wingmoor East – for Dixton Wood (SAC) *at 100ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.2352	**1.57 – 2.35%**	22.7	22.9	**153 – 229%**

Sites	Habitats	Critical Load (kg N ha-1 yr-1)	Process Contribution (PC) from EfW Facility (kg N ha-1 yr-1)	PC as a % of Critical Load	Background Conditions (kg N ha-1 yr-1)	PEC (kg N ha-1 yr-1) (b)	PEC as a % of Critical Load
Wingmoor West – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.79369	**5.29 – 7.94 %**	22.7	23.5	**157 – 235 %**
Wingmoor West – for Dixton Wood (SAC) *at 400ktpa waste throughput, 90 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.5750	**3.83 – 5.75%**	22.7	23.3	**155 – 234%**
Wingmoor West – for Dixton Wood (SAC) *at 400ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.3867	**2.58 – 3.87%**	22.7	23.1	**154 – 231%**
Wingmoor West – for Dixton Wood (SAC) *at 200ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.6305	**4.20 – 6.31%**	22.7	23.3	**156 – 233%**
Wingmoor West – for Dixton Wood (SAC) *at 200ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.3510	**2.34 – 3.51%**	22.7	23.1	**154 – 231%**
Wingmoor West – for Dixton Wood (SAC) *at 100ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.4649	**3.10 – 4.65%**	22.7	23.2	**154 – 232%**
Wingmoor West – for Dixton Wood (SAC) *at 100ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.2913	**3.10 – 4.65%**	22.7	23.0	**153 – 230%**
Easter Park – for Bredon Hill (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grasslands : 15 to 25	0.4167	**1.67 – 2.78 %**	20.7	21.1	**84 – 141 %**

Sites	**Habitats**	**Critical Load (kg N ha^{-1} yr^{-1})**	**Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})**	**PC as a % of Critical Load**	**Background Conditions (kg N ha^{-1} yr^{-1})**	**PEC (kg N ha^{-1} yr^{-1}) [(b)]**	**PEC as a % of Critical Load**
Easter Park – for Bredon Hill (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grasslands : 15 to 25	0.3783	**1.51 – 2.52%**	20.7	21.1	**84– 141%**
Easter Park – for Bredon Hill (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grasslands : 15 to 25	0.3261	**1.30 – 2.17%**	20.7	21.0	**84 – 140%**
Easter Park – for Bredon Hill (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grasslands : 15 to 25	0.2741	**1.10 – 1.83%**	20.7	21.0	**84 – 140%**
Easter Park – for Bredon Hill (SAC) *at 200 ktpa waste throughput, 100 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grasslands : 15 to 25	0.2367	0.95 – **1.58%**	20.7	21.0	**84 – 140%**
Easter Park – for Bredon Hill (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grasslands : 15 to 25	0.1423	0.57 – 0.95%	-	-	-
Easter Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.7937	**5.29 – 7.94 %**	22.7	23.5	**157 – 235 %**
Easter Park – for Dixton Wood (SAC) *at 400ktpa waste throughput, 90 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.5750	**3.83 – 5.75%**	22.7	23.3	**155 – 233%**
Easter Park – for Dixton Wood (SAC) *at 400ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.3867	**2.58 – 3.87%**	22.7	23.1	**154 – 231%**

Sites	Habitats	Critical Load (kg N ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (kg N ha^{-1} yr^{-1})	PEC (kg N ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
Easter Park – for Dixton Wood (SAC) *at 200ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.6305	**4.20 – 6.31%**	22.7	23.3	**156 – 233%**
Easter Park – for Dixton Wood (SAC) *at 200ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.3511	**2.34 – 3.51%**	22.7	23.1	**154 – 231%**
Easter Park – for Dixton Wood (SAC) *at 100ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.4649	**3.10 – 4.65%**	22.7	23.2	**154 – 232%**
Easter Park – for Dixton Wood (SAC) *at 100ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.2913	**1.94 – 2.91%**	22.7	23.0	**153 – 230%**
Javelin Park – for Severn Estuary (SAC, SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Saltmarsh	Pioneer and low mid-salt marshes : 30 to 40	0.03420	0.09 - 0.11 %	-	-	-
Javelin Park – for Walmore Common (SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Grazing Marsh	Low and medium altitude hay meadows : 20 to 30	0.01924	0.06 – 0.10%	-	-	-
Javelin Park – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Beech Woodland Calcareous Grassland	Deciduous forests : 10 to 15 Sub-Atlantic semi-dry calcareous grassland : 15 to 25	1.3571 0.8086	**9.05 – 13.57%** **5.39 – 8.09 %**	25.8 16.2	27.2 17.0	**181 – 272 %** **113 – 170 %**
Javelin Park – for Cotswold Beechwoods (SAC) *at 400*	Beech Woodland	Deciduous forests : 10 to 15	1.2423	**8.28 – 12.42%**	25.8	27.0	**180 – 270%**

Sites	Habitats	Critical Load (kg N ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (kg N ha^{-1} yr^{-1})	PEC (kg N ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
ktpa waste throughput, 90 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.7402	**4.93 – 7.40%**	16.2	16.9	**113 – 169%**
Javelin Park – for Cotswold Beechwoods (SAC) *at 400*	Beech Woodland	Deciduous forests : 10 to 15	1.1165	**7.44 – 11.17%**	25.8	25.8	**179 – 269%**
ktpa waste throughput, 100 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.6652	**4.43 – 6.65%**	16.2	16.9	**112 – 169%**
Javelin Park – for Cotswold Beechwoods (SAC) *at 200*	Beech Woodland	Deciduous forests : 10 to 15	0.7188	**4.79 – 7.19%**	25.8	26.5	**177 – 265%**
ktpa waste throughput, 80 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.4283	**2.86 – 4.28%**	16.2	16.6	**111 – 166%**
Javelin Park – for Cotswold Beechwoods (SAC) *at 200*	Beech Woodland	Deciduous forests : 10 to 15	0.7716	**5.14 – 7.72%**	25.8	26.6	**177 – 266%**
ktpa waste throughput, 100 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.4597	**3.06 – 4.60%**	16.2	16.4	**110 – 165%**
Javelin Park – for Cotswold Beechwoods (SAC) *at 100*	Beech Woodland	Deciduous forests : 10 to 15	0.4104	**2.74 – 4.10%**	25.8	26.2	**175 – 262%**
ktpa waste throughput, 80 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.2445	**1.63 – 4.10%**	16.2	16.5	**110 – 165%**
Javelin Park – for Cotswold Beechwoods (SAC) *at 100*	Beech Woodland	Deciduous forests : 10 to 15	0.4571	**3.05 – 4.57%**	25.8	26.3	**175 – 263%**
ktpa waste throughput, 100 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.2723	**1.82 – 4.57%**	16.2	16.5	**110 – 165%**
Javelin Park – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.1379	0.55 – 0.92 %	-	-	-
Quadrant – for Cotswold Beechwoods (SAC) *at 400*	Beech Woodland	Deciduous forests : 10 to 15	1.1932	**7.95 – 11.93 %**	25.8	27.0	**180 – 270 %**
ktpa waste throughput, 80 m stack height	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.7110	**4.74 – 7.11 %**	16.2	16.9	**113 – 169 %**

Sites	Habitats	Critical Load (kg N ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (kg N ha^{-1} yr^{-1})	PEC (kg N ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
Quadrant – for Cotswold Beechwoods (SAC) *at 400ktpa waste throughput, 90 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	1.092	**7.28 – 10.92%**	25.8	26.9	**179 – 269%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.6507	**4.34 – 6.51%**	16.2	16.9	**112 – 169%**
Quadrant – for Cotswold Beechwoods (SAC) *at 400ktpa waste throughput, 100 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.9697	**6.46 – 9.70%**	25.8	26.8	**178 – 268%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.5778	**3.85 – 5.78%**	16.2	16.8	**112 – 168%**
Quadrant – for Cotswold Beechwoods (SAC) *at 200ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.6756	**4.50 – 6.76%**	25.8	26.5	**177 – 265%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.4025	**2.68 – 4.03%**	16.2	16.6	**111 – 166%**
Quadrant – for Cotswold Beechwoods (SAC) *at 200ktpa waste throughput, 100 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.6852	**4.57 – 6.85%**	25.8	26.5	**177 – 265%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.4082	**2.72 – 4.08%**	16.2	16.6	**111 – 166%**
Quadrant – for Cotswold Beechwoods (SAC) *at 100ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.3668	**2.45 – 3.67%**	25.8	26.2	**174 – 262%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.2186	**1.46 – 3.67%**	16.2	16.4	**109 – 164%**
Quadrant – for Cotswold Beechwoods (SAC) *at 100ktpa waste throughput, 100 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.4211	**2.81 – 4.21%**	25.8	26.2	**175 – 262%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.2509	**1.67 – 4.21%**	16.2	16.2	**110 – 165%**
Quadrant – for Walmore Common (SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Grazing Marsh	Low and medium altitude hay meadows : 20 to 30	0.02235	0.07 – 0.11 %	-	-	**-**

Sites	Habitats	Critical Load (kg N ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (kg N ha^{-1} yr^{-1})	PEC (kg N ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
Quadrant – for Severn Estuary (SAC, SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Saltmarsh	Pioneer and low mid-salt marshes : 30 to 40	0.03622	0.09 – 0.12 %	-	-	**-**
Quadrant – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.07033	0.28 – 0.47 %	-	-	**-**
Moreton – for Severn Estuary (SAC, SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Saltmarsh	Pioneer and low mid-salt marshes : 30 to 40	0.03781	0.09 – 0.13 %	-	-	**-**
Moreton – for Walmore Common (SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Grazing Marsh	Low and medium altitude hay meadows : 20 to 30	0.02109	0.07 – 0.11%	-	-	**-**
Moreton – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.1359	0.54 – 0.91 %	-	-	**-**
Moreton – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	1.2063	**8.04 – 12.06 %**	25.8	27.0	**180 – 270 %**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.7188	**4.79 – 7.19 %**	16.2	16.9	**113 – 169 %**
Moreton – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	1.1319	**7.55 – 11.32%**	25.8	26.9	**180 – 269%**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.6744	**4.50 – 6.74%**	16.2	16.9	**113 – 169%**
Moreton – for Cotswold Beechwoods (SAC) *at 400*	Beech Woodland	Deciduous forests : 10 to 15	1.0253	**6.84 – 10.25%**	25.8	26.8	**179 – 268%**

Sites	Habitats	Critical Load (kg N ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (kg N ha^{-1} yr^{-1})	PEC (kg N ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
ktpa waste throughput, 100 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.6109	**4.07 – 6.11%**	16.2	16.8	**112 – 168%**
Moreton – for Cotswold Beechwoods (SAC) *at 200*	Beech Woodland	Deciduous forests : 10 to 15	0.6251	**4.17 – 6.25%**	25.8	26.4	**176 – 264 %**
ktpa waste throughput, 80 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.3724	**2.48 – 3.72 %**	16.2	16.6	**110 - 166 %**
Moreton – for Cotswold Beechwoods (SAC) *at 200*	Beech Woodland	Deciduous forests : 10 to 15	0.6953	**4.64 – 6.95%**	25.8	26.5	**177 – 265%**
ktpa waste throughput, 100 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.4143	**2.76 – 4.14%**	16.2	16.6	**111 – 166%**
Moreton – for Cotswold Beechwoods (SAC) *at 100*	Beech Woodland	Deciduous forests : 10 to 15	0.3656	**2.44 – 3.66%**	25.8	26.2	**174 – 262%**
ktpa waste throughput, 80 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.2178	**1.45 – 2.18%**	16.2	16.4	**109 – 164%**
Moreton – for Cotswold Beechwoods (SAC) *at 100*	Beech Woodland	Deciduous forests : 10 to 15	0.3126	**2.08 – 3.13%**	25.8	26.1	**174 – 261%**
ktpa waste throughput, 100 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.1862	**1.24 – 1.86%**	16.2	16.2	**109 – 164%**
Railway – for Cotswold Beechwoods (SAC) *at*	Beech Woodland	Deciduous forests : 10 to 15	0.1853	**1.24 – 1.85%**	25.8	26.0	**173 – 260%**
400ktpa waste throughput, 80 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.1104	0.74 – **1.10%**	16.2	16.3	**109 – 163%**
Railway – for Cotswold Beechwoods (SAC) *at*	Beech Woodland	Deciduous forests : 10 to 15	0.1736	**1.16 – 1.74%**	25.8	26.0	**173 – 260%**
400ktpa waste throughput, 90 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.1034	0.69 – **1.03%**	16.2	16.3	**109 – 163%**
Railway – for Cotswold Beechwoods (SAC) *at*	Beech Woodland	Deciduous forests : 10 to 15	0.2452	**1.63 – 2.45%**	25.8	26.0	**174 – 260%**
400ktpa waste throughput, 100 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.1461	0.97 – **1.46%**	16.2	16.3	**109 – 163%**

Sites	Habitats	Critical Load (kg N ha-1 yr-1)	Process Contribution (PC) from EfW Facility (kg N ha-1 yr-1)	PC as a % of Critical Load	Background Conditions (kg N ha-1 yr-1)	PEC (kg N ha-1 yr-1) (b)	PEC as a % of Critical Load
Railway – for Cotswold Beechwoods (SAC) *at 200ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.1282	0.85 – **1.28%**	25.8	25.9	**173 – 259%**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.0764	0.51 – 0.76%	-	-	**-**
Railway – for Cotswold Beechwoods (SAC) *at 200ktpa waste throughput, 100 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.1046	0.70 – **1.05%**	25.8	25.9	**173 – 259%**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.06235	0.42 – 0.62%	-	-	**-**
Railway – for Cotswold Beechwoods (SAC) *at 100ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.08595	0.57 – 0.86%	-	-	-
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.05121	0.46 – 0.69%	-	-	-
Railway – for Walmore Common (SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Grazing Marsh	Low and medium altitude hay meadows : 20 to 30	0.02781	0.09 – 0.14 %	-	-	-
Nastend – for Severn Estuary (SAC, SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Saltmarsh	Pioneer and low mid-salt marshes : 30 to 40	0.02428	0.06 – 0.08 %	-	-	-
Nastend – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.2556	**1.02 – 1.70 %**	15.7	16.0	64 – **106 %**
Nastend – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.2354	0.94 – **1.57%**	15.7	15.9	63 – **106%**

Sites	Habitats	Critical Load (kg N ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (kg N ha^{-1} yr^{-1})	PEC (kg N ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
Nastend – for Rodborough Common (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.2090	0.84 – **1.39%**	15.7	15.9	63 – **106%**
Nastend – for Rodborough Common (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.1814	0.73 – **1.21%**	15.7	15.9	64 – **106%**
Nastend – for Rodborough Common (SAC) *at 200 ktpa waste throughput, 100 m stack height*	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.1465	0.59 – 0.98%	-	-	**-**
Nastend – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	1.0041	**6.69 – 10.04 %**	25.8	26.8	**179 – 268 %**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.5983	**2.39 – 6.69%**	16.2	16.8	67 – **112%**
Nastend – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.9648	**6.43 – 9.65%**	25.8	26.8	**178 – 268%**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.5748	**2.30 – 6.43%**	16.2	16.8	67 – **112%**
Nastend – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.8693	**5.80 – 8.69%**	25.8	26.7	**179 – 267%**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.5179	**2.07 – 5.80%**	16.2	16.7	67 – **111%**
Nastend – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.6275	**4.18 – 6.27%**	25.8	26.4	**176 – 264%**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.3739	**1.50 – 2.49%**	16.2	16.6	66 – **110%**
Nastend – for Cotswold Beechwoods (SAC) *at 200*	Beech Woodland	Deciduous forests : 10 to 15	0.5862	**3.91 – 5.86%**	25.8	26.4	**176 – 264%**

Sites	Habitats	Critical Load (kg N ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (kg N ha^{-1} yr^{-1})	PEC (kg N ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
ktpa waste throughput, 100 m stack height	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.3493	**1.40 – 2.33%**	16.2	16.5	66 – **110%**
Nastend – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.3822	**2.55 – 3.82%**	25.8	26.2	**175 – 262%**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.2277	0.91 – **1.52%**	16.2	16.4	66 – **110%**
Nastend – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.3270	**2.18 – 3.27%**	25.8	26.1	**174 – 261%**
	Calcareous Grassland	Sub-Atlantic semi-dry calcareous grassland : 15 to 25	0.1948	0.78 – **1.30%**	16.2	16.4	66 – **109%**
Nastend – for Walmore Common (SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Grazing Marsh	Low and medium altitude hay meadows : 20 to 30	0.02143	0.07 – 0.11 %	-	-	-
Netheridge – for Walmore Common (SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Grazing Marsh	Low and medium altitude hay meadows : 20 to 30	0.02571	0.09 – 0.13 %	-	-	-
Netheridge – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.6345	**4.23 – 6.34 %**	25.8	26.4	**176 – 264%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.3780	**2.52 – 6.34 %**	16.2	16.6	**111 – 166%**
Netheridge – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.5903	**3.94 – 5.90%**	25.8	26.4	**176 – 264%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.3517	**2.34 – 5.90%**	16.2	16.6	**110 – 166%**
Netheridge – for Cotswold Beechwoods (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.5614	**3.74 – 5.61%**	25.8	26.4	**176 – 264%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.3345	**2.23 – 5.61%**	16.2	16.5	**110 – 165%**

Sites	**Habitats**	**Critical Load (kg N ha^{-1} yr^{-1})**	**Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})**	**PC as a % of Critical Load**	**Background Conditions (kg N ha^{-1} yr^{-1})**	**PEC (kg N ha^{-1} yr^{-1}) (b)**	**PEC as a % of Critical Load**
Netheridge – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.3557	**2.37 – 3.56%**	25.8	26.2	**174 – 262%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.2120	**1.41 – 3.56%**	16.2	16.4	**109 – 164%**
Netheridge – for Cotswold Beechwoods (SAC) *at 200 ktpa waste throughput, 100 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.3745	**2.50 – 3.74%**	25.8	26.2	**175 – 262%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.2231	**1.49 – 3.74$**	16.2	16.4	**109 – 164%**
Netheridge – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.2068	**1.38 – 2.07%**	25.8	26.0	**173 – 260%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.1232	0.82 – **1.23%**	16.2	16.3	**109 – 163%**
Netheridge – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.2226	**1.48 – 2.23%**	25.8	26.0	**173 – 260%**
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.1327	0.88 – **1.33%**	16.2	16.2	**109 – 163%**
Netheridge – for Severn Estuary (SAC, SPA, Ramsar) *at 400 ktpa waste throughput, 80 m stack height*	Saltmarsh	Pioneer and low mid-salt marshes : 30 to 40	0.02403	0.06 -0.08 %	-	-	-
The Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.8923	**5.95 – 8.92 %**	22.7	23.6	**157 – 236 %**
The Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 90 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.6802	**4.53 – 6.80%**	22.7	23.4	**156 – 234%**

Sites	Habitats	Critical Load (kg N ha^{-1} yr^{-1})	Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})	PC as a % of Critical Load	Background Conditions (kg N ha^{-1} yr^{-1})	PEC (kg N ha^{-1} yr^{-1}) [(b)]	PEC as a % of Critical Load
The Park – for Dixton Wood (SAC) *at 400 ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.4628	**3.09 – 4.63%**	22.7	23.2	**154 – 232%**
The Park – for Dixton Wood (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.6689	**4.46 – 6.69%**	22.7	23.4	**158 – 234%**
The Park – for Dixton Wood (SAC) *at 200 ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.4183	**2.79 – 4.18%**	22.7	23.1	**154 – 231%**
The Park – for Dixton Wood (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.4673	**3.12 – 4.67%**	22.7	23.2	**154 – 232%**
The Park – for Dixton Wood (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Ash woodland	Deciduous forests (trees) : 10 to 15	0.3283	**2.19 – 3.28%**	22.7	23.0	**154 – 230%**
Foss Cross – for Cotswold Beechwoods (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech Woodland	Deciduous forests : 10 to 15	0.02595	0.17 – 0.26 %	-	-	-
	Calcareous Grassland	Sub-atlantic semi-dry calcareous grassland : 15 to 25	0.01546	0.01 – 0.26 %	-	-	**-**
Hurst – for Severn Estuary (SAC, SPA, Ramsar) *at 100 ktpa waste throughput, 80 m stack height*	Saltmarsh	Pioneer and low mid-salt marshes : 30 to 40	0.08354	0.21 – 0.28 %	-	-	-

Sites	**Habitats**	**Critical Load (kg N ha^{-1} yr^{-1})**	**Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})**	**PC as a % of Critical Load**	**Background Conditions (kg N ha^{-1} yr^{-1})**	**PEC (kg N ha^{-1} yr^{-1}) (b)**	**PEC as a % of Critical Load**
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.1257	0.84 – **1.26 %**	25.2	25.3	**169 – 253 %**
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 90 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.1110	0.74 – **1.11%**	25.2	25.3	**169 – 253%**
Hurst – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.08603	0.57 – 0.86%	-	-	**-**
Hurst – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.1011	0.67 – **1.01 %**	21.4	21.5	**143 – 215%**
Hurst – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 90 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.08885	0.59 – 0.89%	-	-	**-**
Lydney – for Severn Estuary (SAC, SPA, Ramsar) *at 100 ktpa waste throughput, 80 m stack height*	Saltmarsh	Pioneer and low mid-salt marshes : 30 to 40	0.1480	0.37 – 0.49 %	-	-	**-**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.2136	**1.42 – 2.14 %**	25.2	25.4	**169 – 254 %**

Sites	**Habitats**	**Critical Load (kg N ha^{-1} yr^{-1})**	**Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})**	**PC as a % of Critical Load**	**Background Conditions (kg N ha^{-1} yr^{-1})**	**PEC (kg N ha^{-1} yr^{-1}) (b)**	**PEC as a % of Critical Load**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 90 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.2142	**1.43 – 2.14%**	25.2	25.4	**169 - 254%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.2091	**1.39 – 2.09%**	25.2	25.4	**169 – 254%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 50 ktpa waste throughput, 80 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.1404	0.94 – **1.40%**	25.2	25.3	**169 – 253%**
Lydney – for Wye Valley and Forest of Dean Bat Sites (SAC) *at 50 ktpa waste throughput, 100 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.1136	0.76 – **1.14%**	25.2	25.3	**169 – 253%**
Lydney – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 80 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.1340	0.89 – **1.34%**	21.4	21.5	**144 - 215 %**
Lydney – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 90 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.1295	0.86 – **1.30%**	21.4	21.5	**144 – 215%**
Lydney – for Wye Valley Woodlands (SAC) *at 100 ktpa waste throughput, 100 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.1239	0.83 – **1.24%**	21.4	21.5	**143 – 215%**

Sites	**Habitats**	**Critical Load (kg N ha^{-1} yr^{-1})**	**Process Contribution (PC) from EfW Facility (kg N ha^{-1} yr^{-1})**	**PC as a % of Critical Load**	**Background Conditions (kg N ha^{-1} yr^{-1})**	**PEC (kg N ha^{-1} yr^{-1}) (b)**	**PEC as a % of Critical Load**
Lydney – for Wye Valley Woodlands (SAC) *at 50 ktpa waste throughput, 80 m stack height*	Beech / Ash Woodland	Deciduous forests : 10 to 15	0.07996	0.53 – 0.80%	-	-	-

(a) PCs > 1% and PECs > 70% of the assessment criteria are in bold text.
(b) PEC = PC + Background conditions. Background conditions and PEC are shown only when PC exceeds 1% of the assessment criteria.

Table 1.5 ADMS Modelling Results for 400 ktpa, 200 ktpa and 100 ktpa Waste Throughputs at 80 m Stack Height [(a)(b)]

Parameters	Dixton Wood			Cotswolds Beechwood			Rodborough Common		
	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa
SO_2 (μg m^{-3})									
Site 1 – Wingmoor Farm East	PC: 0.05807 (0.29%)	PC: 0.03136 (0.16%)	PC: 0.01684 (0.08%)	-	-	-	-	-	-
Site 2 – Wingmoor Farm West	PC: 0.05784 (0.29%)	PC: 0.03123 (0.16%)	PC: 0.01677 (0.08%)	-	-	-	-	-	-
Site 4 – Javelin Park	-	-	-	PC: 0.08008 (0.40%)	PC: 0.04324 (0.22%)	PC: 0.02322 (0.12%)	-	-	-
Site 6 – Morton Valence	-	-	-	PC: 0.06682 (0.33%)	PC: 0.03608 (0.18%)	PC: 0.01938 (0.10%)	PC: 0.01517 (0.08%)	PC: 0.008190 (0.04%)	PC: 0.004398 (0.02%)
Site 7 – Railway Triangle	-	-	-	PC: 0.01955 (0.10%)	PC: 0.01056 (0.05%)	PC: 0.005669 (0.03%)	-	-	-
Site 8 – Nastend Farm	-	-	-	PC: 0.09878 (0.49%)	PC: 0.05334 (0.27%)	PC: 0.02865 (0.14%)	PC: 0.02308 (0.12%)	PC: 0.01246 (0.06%)	PC: 0.006693 (0.03%)
Site 10 – The Park	PC: 0.05993 (0.30%)	PC: 0.03236 (0.16%)	PC: 0.01738 (0.09%)	-	-	-	-	-	-
NO_X (μg m^{-3})									
Site 1 – Wingmoor Farm East	PC: 0.2323 (0.77%)	PC: 0.1254 (0.42%)	PC: 0.06736 (0.22%)	-	-	-	-	-	-
Site 2 – Wingmoor Farm West	PC: 0.2314 (0.77%)	PC: 0.1249 (0.42%)	PC: 0.06710 (0.22%)	-	-	-	-	-	-
Site 4 – Javelin Park	-	-	-	PC: 0.03203 **(1.07%)** PEC: 15.32 (51%)	PC: 0.1730 (0.58%)	PC: 0.09289 (0.31%)	-	-	-

Parameters	Dixton Wood			Cotswolds Beechwood			Rodborough Common		
	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa
Site 6 – Morton Valence	-	-	-	PC: 0.2673 (0.89%)	PC: 0.1443 (0.48%)	PC: 0.07752 (0.26%)	PC: 0.06066 (0.20%)	PC: 0.03276 (0.11%)	PC: 0.01759 (0.06%)
Site 7 – Railway Triangle	-	-	-	PC: 0.07819 (0.26%)	PC: 0.04222 (0.14%)	PC: 0.02267 (0.08%)	-	-	-
Site 8 – Nastend Farm	-	-	-	PC: 0.3951 **(1.32%)** PEC: 15.40 (51%)	PC: 0.2134 (0.71%)	PC: 0.1146 (0.38%)	PC: 0.09232 (0.31%)	PC: 0.04985 (0.17%)	PC: 0.02677 (0.09%)
Site 10 – The Park	PC: 0.2397 (0.80%)	PC: 0.1295 (0.43%)	PC: 0.06952 (0.23%)	-	-	-	-	-	-
NH_3 ($\mu g\ m^{-3}$)									
Site 1 – Wingmoor Farm East	PC: 0.01161 **(1.16%)** PEC: 1.81 **(181%)**	PC: 0.00627 (0.63%)	PC: 0.00337 (0.34%)	-	-	-	-	-	-
Site 2 – Wingmoor Farm West	PC: 0.01157 **(1.16%)** PEC: 1.81 **(181%)**	PC: 0.006247 (0.62%)	PC: 0.003355 (0.34%)	-	-	-	-	-	-
Site 4 – Javelin Park	-	-	-	PC: 0.1602 **(1.60%)** PEC: 1.52 **(152%)**	PC: 0.008648 (0.86%)	PC: 0.004644 (0.46%)	-	-	-
Site 6 – Morton Valence	-	-	-	PC: 0.01336 **(1.34%)** PEC: 1.51 **(151%)**	PC: 0.007217 (0.72%)	PC: 0.003876 (0.39%)	PC: 0.003033 (0.10%)	PC: 0.001638 (0.05%)	PC: 0.0008796 (0.03%)
Site 7 – Railway Triangle	-	-	-	PC: 0.03909 (0.39%)	PC: 0.002111 (0.21%)	PC: 0.001134 (0.11%)	-	-	-

Parameters	Dixton Wood			Cotswolds Beechwood			Rodborough Common		
	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa
Site 8 – Nastend Farm	-	-	-	PC: 0.01976 **(1.98%)** PEC: 1.52 **(152%)**	PC: 0.01067 **(1.07%)** PEC: 1.51 **(151%)**	PC: 0.005729 (0.57%)	PC: 0.00462 (0.15%)	PC: 0.002493 (0.08%)	PC: 0.001339 (0.04%)
Site 10 – The Park	PC: 0.01199 **(1.20%)** PEC: 1.81 **(181%)**	PC: 0.00647 (0.65%)	PC: 0.003476 (0.35%)	-	-	-	-	-	-
Acid Deposition (keq ha^{-1} yr^{-1})									
Site 1 – Wingmoor Farm East	PC: 0.02498 (0.97%)	PC: 0.01349 (0.52%)	PC: 0.007243 (0.28%)	-	-	-	-	-	-
Site 2 – Wingmoor Farm West	PC: 0.02488 (0.96%)	PC: 0.01344 (0.52%)	PC: 0.007215 (0.28%)	-	-	-	-	-	-
Site 4 – Javelin Park	-	-	-	*Forests* PC: 0.03444 **(1.29%)** PEC: 2.32 **(87%)** *Grasslands* PC: 0.01871 (0.39%)	*Forests* PC: 0.01860 (0.69%) *Grasslands* PC: 0.01010 (0.21%)	*Forests* PC: 0.00999 (0.37%) *Grasslands* PC: 0.005425 (0.11%)	-	-	-

Parameters	Dixton Wood			Cotswolds Beechwood			Rodborough Common		
	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa
Site 6 – Morton Valence	-	-	-	*Forests* PC: 0.02874 **(1.07%)** PEC: 2.32 **(87%)** *Grasslands* PC: 0.01561 (0.33%)	*Forests* PC: 0.01552 (0.58%) *Grasslands* PC: 0.008430 (0.18%)	*Forests* PC: 0.008336 (0.31%) *Grasslands* PC: 0.004527 (0.10%)	PC: 0.00354 (0.075%)	PC: 0.00191 (0.040%)	PC: 0.00103 (0.022%)
Site 7 – Railway Triangle	-	-	-	*Forests* PC: 0.008408 (0.31%) *Grasslands* PC: 0.00457 (0.10%)	*Forests* PC: 0.004540 (0.17%) *Grasslands* PC: 0.002466 (0.05%)	*Forests* PC: 0.002438 (0.09%) *Grasslands* PC: 0.00132 (0.03%)	-	-	-
Site 8 – Nastend Farm	-	-	-	*Forests* PC: 0.04249 **(1.59%)** PEC: 2.33 **(87%)** *Grasslands* PC: 0.02308 (0.48%)	*Forests* PC: 0.02294 (0.86%) *Grasslands* PC: 0.01246 (0.26%)	*Forests* PC: 0.01232 (0.46%) *Grasslands* PC: 0.006692 (0.14%)	PC: 0.005392 (0.11%)	PC: 0.002912 (0.061%)	PC: 0.001564 (0.03%)
Site 10 – The Park	PC: 0.02578 (1.00%)	PC: 0.01392 (0.54%)	PC: 0.00748 (0.29%)	-	-	-	-	-	-
Nutrient Nitrogen Deposition (kg N ha^{-1} yr^{-1})									

Parameters	Dixton Wood			Cotswolds Beechwood			Rodborough Common		
	400 ktpa	**200 ktpa**	**100 ktpa**	**400 ktpa**	**200 ktpa**	**100 ktpa**	**400 ktpa**	**200 ktpa**	**100 ktpa**
Site 1 – Wingmoor Farm East	PC: 0.1574 **(1.05 – 1.57%)** PEC: 22.86 **(152 – 229%)**	PC: 0.08498 (0.57 – 0.85%)	PC: 0.04564 (0.30 – 0.46%)	-	-	-	-	-	-
Site 2 – Wingmoor Farm West	PC: 0.1568 **(1.05 – 1.57%)** PEC: 22.86 **(152 – 229%)**	PC: 0.08465 (0.56 – 0.85%)	PC: 0.04546 (0.30 – 0.45%)	-	-	-	-	-	-
Site 4 – Javelin Park	-	-	-	*Forests* PC: 0.2170 **(1.45 – 2.17%)** PEC: 41.12 **(274 – 411%)** *Grasslands* PC: 0.1293 (0.86 - **2.17%**) PEC: 20.53 **(137 – 205%)**	*Forests* PC: 0.1172 (0.78 – **1.17%**) PEC: 41.12 **(274 – 411%)** *Grasslands* PC: 0.06983 (0.47 – 0.70%)	*Forests* PC: 0.06294 (0.42 – 0.63%) *Grasslands* PC: 0.0375 (0.15 – 0.25%)	-	-	-
Site 6 – Morton Valence	-	-	-	*Forests* PC: 0.1811 **(1.21 – 1.81%)** PEC: 25.98 **(173 – 260%)** *Grasslands* PC: 0.1079 (0.43 – 0.72%)	*Forests* PC: 0.0978 (0.65 – 0.98%) *Grasslands* PC: 0.05827 (0.23 – 0.39%)	*Forests* PC: 0.05252 (0.35 – 0.53%) *Grassland* PC: 0.03129 (0.13 – 0.21%)	PC: 0.02449 (0.10 – 0.16%)	PC: 0.01332 (0.05 – 0.09%)	PC: 0.0071 (0.05 – 0.07%)

Parameters	Dixton Wood			Cotswolds Beechwood			Rodborough Common		
	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa	400 ktpa	200 ktpa	100 ktpa
Site 7 – Railway Triangle	-	-	-	*Forests* PC: 0.05298 (0.35 – 0.53%) *Grasslands* PC: 0.03156 (0.13 – 0.21%)	*Forests* PC: 0.02861 (0.19 – 0.29%) *Grasslands* PC: 0.01704 (0.07 – 0.11%)	*Forests* PC: 0.01536 (0.10 – 0.15%) *Grasslands* PC: 0.00915 (0.04 – 0.06%)	-	-	-
Site 8 – Nastend Farm	-	-	-	*Forests* PC: 0.2677 **(1.78 – 2.68%)** PEC: 26.07 **(174 – 261%)** *Grasslands* PC: 0.1595 (0.64 – **1.06%**) PEC: 16.36 (65 – **109%**)	*Forests* PC: 0.1446 (0.96 – **1.45%**) PEC: 25.94 **(173 – 259%)** *Grasslands* PC: 0.08614 (0.34 – 0.57%)	*Forests* PC: 0.07764 (0.52 – 0.78%) *Grasslands* PC: 0.04626 (0.19 – 0.31%)	PC: 0.03727 (0.15 – 0.25%)	PC: 0.02012 (0.13 – 0.20%)	PC: 0.01081 (0.07 – 0.11%)
Site 10 – The Park	PC: 0.1624 **(1.08 – 1.62%)** PEC: 22.86 **(152 – 229%)**	PC: 0.08771 (0.58 – 0.88%)	PC: 0.04711 (0.31 – 0.47%)	-	-	-	-	-	-

(a) PCs > 1% and PECs > 70% of the assessment criteria are in bold text.
(b) PEC = PC + Background conditions. Background conditions and PEC are shown only when PC exceeds 1% of the assessment criteria.

Table 1.6 ADMS vs AERMOD Modelling Results (400 ktpa Throughput, 80 m Stack Height) [(a)(b)]

Parameter	**Dixton Wood**		**Cotswolds Beechwood**		**Rodborough Common**	
	ADMS	**AERMOD**	**ADMS**	**AERMOD**	**ADMS**	**AERMOD**
SO_2 (µg m^{-3})						
Site 1 – Wingmoor Farm East	PC: 0.05807 (0.29%)	PC: 0.2464 **(1.23%)** PEC: 2.15 (11%)	-	-	-	-
Site 2 – Wingmoor Farm West	PC: 0.05784 (0.29%)	PC: 0.2929 **(1.46%)** PEC: 2.19 (11%)	-	-	-	-
Site 4 – Javelin Park	-	-	PC: 0.08008 (0.40%)	PC: 0.5007 **(2.50%)** PEC: 2.0 (10%)	-	-
Site 6 – Morton Valence	-	-	PC: 0.06682 (0.33%)	PC: 0.4451 **(2.23%)** PEC: 1.95 **(10%)**	PC: 0.01517 (0.08%)	PC: 0.08414 (0.42%)
Site 7 – Railway Triangle	-	-	PC: 0.01955 (0.10%)	PC: 0.06837 (0.34%)	-	-
Site 8 – Nastend Farm	-	-	PC: 0.09878 (0.49%)	PC: 0.3705 **(1.85%)** PEC: 1.87 **(9%)**	PC: 0.02308 (0.12%)	PC: 0.1583 (0.79%)
Site 10 – The Park	PC: 0.05993 (0.30%)	PC: 0.3292 **(1.65%)** PEC: 2.23 **(11%)**	-	-	-	-
NO_X (µg m^{-3})						

Parameter	Dixton Wood		Cotswolds Beechwood		Rodborough Common	
	ADMS	AERMOD	ADMS	AERMOD	ADMS	AERMOD
Site 1 – Wingmoor Farm East	PC: 0.2323 (0.77%)	PC: 0.9856 **(3.29%)** PEC: 15.29 (51%)	-	-	-	-
Site 2 – Wingmoor Farm West	PC: 0.2314 (0.77%)	PC: 1.171 **(3.90%)** PEC: 15.47 (52%)	-	-	-	-
Site 4 – Javelin Park	-	-	PC: 0.03203 **(1.07%)** PEC: 15.32 (51%)	PC: 2.003 **(6.68%)** PEC: 17.0 (57%)	-	-
Site 6 – Morton Valence	-	-	PC: 0.2673 (0.89%)	PC: 1.780 **(5.93%)** PEC: 16.78 56%)	PC: 0.06066 (0.20%)	PC: 0.3366 **(1.12%)** PEC: 17.84 (59%)
Site 7 – Railway Triangle	-	-	PC: 0.07819 (0.26%)	PC: 0.2735 (0.91%)	-	-
Site 8 – Nastend Farm	-	-	PC: 0.3951 **(1.32%)** PEC: 15.40 (51%)	PC: 1.482 **(4.94%)** PEC: 16.48 (55%)	PC: 0.09232 (0.31%)	PC: 0.6332 **(1.06%)** PEC: 18.13 (60%)
Site 10 – The Park	PC: 0.2397 (0.80%)	PC: 1.317 **(4.39%)** PEC: 15.62 (52%)	-	-	-	-
NH_3 (μg m^{-3})						
Site 1 – Wingmoor Farm East	PC: 0.01161 **(1.16%)** PEC: 1.81 **(181%)**	PC: 0.04928 **(4.93%)** PEC: 1.85 **(185%)**	-	-	-	-

Parameter	Dixton Wood		Cotswolds Beechwood		Rodborough Common	
	ADMS	AERMOD	ADMS	AERMOD	ADMS	AERMOD
Site 2 – Wingmoor Farm West	PC: 0.01157 **(1.16%)** PEC: 1.81 **(181%)**	PC: 0.05857 **(5.86%)** PEC: 1.86 **(186%)**	-	-	-	-
Site 4 – Javelin Park	-	-	PC: 0.1602 **(1.60%)** PEC: 1.52 **(152%)**	PC: 0.1001 **(10%)** PEC: 1.60 **(160%)**	-	-
Site 6 – Morton Valence	-	-	PC: 0.01336 **(1.34%)** PEC: 1.51 **(151%)**	PC: 0.08902 **(8.90%)** PEC: 1.59 **(159%)**	PC: 0.003033 (0.10%)	PC: 0.01683 (0.56%)
Site 7 – Railway Triangle	-	-	PC: 0.03909 (0.39%)	PC: 0.01367 **(1.37%)** PEC: 1.51 **(151%)**	-	-
Site 8 – Nastend Farm	-	-	PC: 0.01976 **(1.98%)** PEC: 1.52 **(152%)**	PC: 0.07410 **(2.47%)** PEC: 1.57 (52%)	PC: 0.00462 (0.15%)	
Site 10 – The Park	PC: 0.01199 **(1.20%)** PEC: 1.81 **(181%)**	PC: 0.06585 **(6.58%)** PEC: 1.87 **(187%)**	-	-	-	-
Acid Deposition (keq ha^{-1} yr^{-1})						
Site 1 – Wingmoor Farm East	PC: 0.02498 (0.97%)	PC: 0.1060 **(4.11%)** PEC: 2.04 **(79%)**	-	-	-	-

Parameter	Dixton Wood		Cotswolds Beechwood		Rodborough Common	
	ADMS	AERMOD	ADMS	AERMOD	ADMS	AERMOD
Site 2 – Wingmoor Farm West	PC: 0.02488 (0.96%)	PC: 0.1260 **(4.88%)** PEC: 2.06 **(80%)**	-	-	-	-
Site 4 – Javelin Park	-	-	*Forests* PC: 0.03444 **(1.29%)** PEC: 2.32 **(87%)** *Grasslands* PC: 0.01871 (0.39%)	*Forests* PC: 0.2154 **(8.04%)** PEC: 2.51 **(93%)** *Grasslands* PC: 0.1170 **(2.46%)** PEC: 1.65 (35%)	-	-
Site 6 – Morton Valence	-	-	*Forests* PC: 0.02874 **(1.07%)** PEC: 2.32 **(87%)** *Grasslands* PC: 0.01561 (0.33%)	*Forests* PC: 0.1915 **(7.14%)** PEC: 2.48 **(93%)** *Grasslands* PC: 0.1040 **(2.18%)** PEC: 1.63 (34%)	PC: 0.00354 (0.075%)	PC: 0.01966 (0.41%)

Parameter	Dixton Wood		Cotswolds Beechwood		Rodborough Common	
	ADMS	AERMOD	ADMS	AERMOD	ADMS	AERMOD
Site 7 – Railway Triangle	-	-	*Forests* PC: 0.008408 (0.31%) *Grasslands* PC: 0.00457 (0.10%)	*Forests* PC: 0.02941 **(1.10%)** PEC: 2.32 **(87%)** *Grasslands* PC: 0.01597 (0.34%)	-	-
Site 8 – Nastend Farm	-	-	*Forests* PC: 0.04249 **(1.59%)** PEC: 2.33 **(87%)** *Grasslands* PC: 0.02308 (0.48%)	*Forests* PC: 0.1594 **(5.95%)** PEC: 2.45 **(91%)** *Grasslands* PC: 0.08655 **(1.82%)** PEC: 1.62 (34%)	PC: 0.005392 (0.11%)	PC: 0.03698 (0.78%)
Site 10 – The Park	PC: 0.02578 (1.00%)	PC: 0.1416 **(5.49%)** PEC: 2.07 **(80%)**	-	-	-	
Nutrient Nitrogen Deposition (kg N ha^{-1} yr^{-1})						
Site 1 – Wingmoor Farm East	PC: 0.1574 **(1.05 – 1.57%)** PEC: 22.86 **(152 – 229%)**	PC: 0.6678 **(4.45 -6.68%)** PEC: 23.4 **(156 – 234%)**	-	-	-	-

Parameter	Dixton Wood		Cotswolds Beechwood		Rodborough Common	
	ADMS	AERMOD	ADMS	AERMOD	ADMS	AERMOD
Site 2 – Wingmoor Farm West	PC: 0.1568 **(1.05 – 1.57%)** PEC: 22.86 **(152 – 229%)**	PC: 0.7937 **(5.29 – 7.94%)** PEC: 23.5 **(157– 235%)**	-	-	-	-
Site 4 – Javelin Park	-	-	*Forests* PC: 0.2170 **(1.45 – 2.17%)** PEC: 26.02 **(173 – 260%)** ***Grasslands*** PC: 0.1293 (0.52 – 0.86%)	*Forests* PC: 1.3571 **(9.05 – 13.57%)** PEC: 27.2 **(181 – 272%)** ***Grasslands*** PC: 0.8086 **(5.39 – 8.09%)** PEC: 17.0 **(113 – 170%)**	-	-
Site 6 – Morton Valence	-	-	*Forests* PC: 0.1811 **(1.21 – 1.81%)** PEC: 25.98 **(173 – 260%)** ***Grasslands*** PC: 0.1079 (0.43 – 0.72%)	*Forests* PC: 1.206 **(8.04 – 12.06%)** PEC: 27.0 **(180 – 270%)** ***Grasslands*** PC: 0.7188 **(4.79 – 7.19%)** PEC: 16.9 **(113 – 169%)**	PC: 0.02449 (0.10 – 0.16%)	PC: 0.1359 (0.54 – 0.91%)

Parameter	**Dixton Wood**		**Cotswolds Beechwood**		**Rodborough Common**	
	ADMS	**AERMOD**	**ADMS**	**AERMOD**	**ADMS**	**AERMOD**
Site 7 – Railway Triangle	-	-	*Forests* PC: 0.05298 (0.35 – 0.53%) *Grasslands* PC: 0.03156 (0.13 – 0.21%)	*Forests* PC: 0.1853 **(1.24 – 1.85%)** PEC: 26.0 **(173 – 260%)** *Grasslands* PC: 0.1104 (0.74 – **1.10%**) PEC: 16.3 **(109 – 163%)**	-	
Site 8 – Nastend Farm	-	-	*Forests* PC: 0.2677 **(1.78 – 2.68%)** PEC: 26.07 **(174 – 261%)** ***Grasslands*** PC: 0.1595 (0.64 – **1.06%**) PEC: 16.36 (65 – **109%**)	*Forests* PC: 1.004 **(6.69 – 10.04%)** PEC: 26.8 **(179 – 268%)** ***Grasslands*** PC: 0.5983 **(2.39 – 6.69%)** PEC: 16.8 (67 – **112%**)	PC: 0.03727 (0.15 – 0.25%)	PC: 0.2556 **(1.02 – 1.70%)** PEC: 16.0 (64 – **106%**)
Site 10 – The Park	PC: 0.1624 **(1.08 – 1.62%)** PEC: 22.86 **(152 – 229%)**	PC: 0.8923 **(5.95 – 8.92%)** PEC: 23.6 **(157 – 236%)**	-	-	-	-

(a) PCs > 1% and PECs > 70% of the assessment criteria are in bold text.
(b) PEC = PC + Background conditions. Background conditions and PEC are shown only when PC exceeds 1% of the assessment criteria.

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Annex C

Appropriate Assessment of Bird Disturbance Effects

C1 INTRODUCTION

Likely significant effects on the Severn Estuary SPA and Ramsar site have been identified for waste sites 12 and 13 in terms of bird disturbance effects which could arise during the construction and operation stages of development. These effects could have the potential to adversely affect the integrity of the SPA and Ramsar site and therefore further assessment, known as appropriate assessment is required. The appropriate assessment will be focused on and limited too the European site's conservation objectives and will determine whether an adverse effect on the integrity of the site is expected alone or in-combination following the consideration of mitigation measures as appropriate.

The approach to the assessment for bird disturbance effects on the Severn Estuary SPA and Ramsar site from waste sites 12 and 13 is set out as follows:

- a review of relevant Severn Estuary SPA and Ramsar site qualifying interest features and Conservation Objectives (*Section C2*);
- a review of the baseline conditions including qualifying bird species near Lydney (the location of waste sites 12 and 13), and the key habitats in the area used by bird species (*Section C3*);
- the identification of likely sources of disturbance impacts to birds which may result from development at waste sites 12 and 13 (*Section C4*);
- an assessment of the likely impacts (*Section C4.2*); and
- a consideration of possible mitigation measures (*Section C4.3*).

C2 REVIEW OF THE SEVERN ESTUARY SPA AND RAMSAR SITE QUALIFYING INTEREST FEATURES AND CONSERVATION OBJECTIVES

Conservation Objectives for the Severn Estuary SPA and Ramsar site are set out in the Natural England Regulation 33 guidance The following sections summarise the qualifying interest features and Conservation Objectives of the Severn Estuary SPA and Ramsar site. Th

The Severn Estuary SPA covers an area of 73, 715 ha and the Ramsar site covers an area of 24,663 ha, both being located between England and Wales. The site is largely composed of wetland habitats:

- intertidal mudflats and sandflats;
- saltmarsh and Atlantic salt meadows fringing the coast backed by grazing marsh and freshwater and brackish ditches; and
- rocky platforms and islands.

The SPA and Ramsar site qualifies under *Articles 4.1* and *4.2* for supporting regularly occurring *Annex I* species, migratory species and a waterfowl assemblage along with other features not directly relevant to this assessment. Relevant qualifying interest features are described in *Box C2.1*. In addition to the SPA and Ramsar site qualifying interests, a summary of the relevant Conservation Objectives for the SPA and Ramsar site is presented in *Box C2.2*.

This assessment primarily draws on the most recent recognised Conservation Objectives and bird population numbers published within the Natural England Conservation Objectives set out in the Severn Estuary Regulation 33 guidance document(1).

Since the original designation of the SPA in 1995 there have been updates to the population numbers of the qualifying interest species. The first of these was undertaken in 2001 as part of the national SPA Review (2). The British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) data is the primary information source which has been used to inform this assessment. The latest published figures on wildfowl and wader counts are also available from the Wildfowl and Wetlands Trust which date from 1984 to 2007. As these data give an indication of more recent population data for the Severn Estuary, they are also considered within this assessment. *Section C3.2* sets out the data reviewed to inform this assessment.

(1)The Severn Estuary Special Protection Area European Marine Site. English Nature & the Countryside Council for Wales' advice for the Severn Estuary SPA given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994, as amended. June 2009.
(2) Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds). 2001. The UK SPA network: its scope and content. JNCC, Peterborough.

Box C2.1 Relevant Severn Estuary SPA and Ramsar Site Qualifying Features

Relevant SPA Interest Features

Internationally important population of regularly occurring Annex 1 Species (qualifying under Article 4.1 of the EU Birds Directive):

Interest feature 1: Bewick's Swan.

As Bewick's swan have not been recorded in the Lydney area, the consideration of interest feature 1 is not relevant).

Internationally important populations of regularly occurring migratory species (qualifying under Article 4.2 of the EU Birds Directive):

Interest feature 2: Over-wintering European white-fronted goose.

As European white-fronted goose have not been recorded in the Lydney area, the consideration of interest feature 2 is not relevant).

Interest feature 3: Over-wintering dunlin.

Dunlin, 44,624 individuals representing at least 3.2% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean (1991/2 – 1995/6).

Interest feature 4: Over-wintering redshank.

Redshank, 2,330 individuals representing at least 1.6% of the wintering East Atlantic - wintering population (5 year peak mean (1991/2 – 1995/6).

Interest feature 5: Over-wintering shelduck.

Shelduck figures: 3,330 individuals representing at least 1.1% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6).

Interest feature 6: Over-wintering gadwall.

Gadwall, figures: 330 individuals representing 2.8% of the wintering Northwestern Europe population (5 year peak mean 1988/9 to 1992/3).

Interest feature 7: Internationally important assemblage of waterfowl (qualifying under Article 4.2 of the EU Birds Directive) by regularly supporting more than 20,000 waterfowl:

Over winter, the area regularly supports 93,986 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Gadwall, Shelduck, Wigeon, Dunlin, Curlew, Redshank, Lapwing, Teal, Tufted Duck, Grey Plover and Mallard. The following are also included, however have not been recorded in the Lydney area: Pintail, Bewick's Swan, Shoveler, Pochard, White-fronted Goose and Whimbrel.

Relevant Ramsar Site Interest Features

Interest feature 3: Internationally important populations (regularly supporting >1% of the individuals in a population of one species): Bewick's swan.
As Bewick's swan have not been recorded in the Lydney area, the consideration of Ramsar interest feature 3 is not relevant).

Interest feature 4: Internationally important populations (regularly supporting >1% of the individuals in a population of one species): white-fronted goose.
As White-fronted goose have not been recorded in the Lydney area, the consideration of Ramsar interest feature 4 is not relevant).

Interest feature 5: Internationally important populations (regularly supporting >1% of the individuals in a population of one species): dunlin.

Interest feature 6: Internationally important populations (regularly supporting >1% of the individuals in a population of one species): redshank.

Interest feature 7: Internationally important populations (regularly supporting >1% of the individuals in a population of one species): shelduck.

Interest feature 8: Internationally important populations (regularly supporting >1% of the individuals in a population of one species): gadwall.

In addition populations identified subsequent to designation and relevant to this assessment include ringed plover (spring/autumn), teal (winter) and pintail (winter). Pintail have not been recorded in the Lydney area and therefore the consideration of this species in this interest feature is not relevant.

Interest feature 9: Internationally important assemblage of waterfowl.
Qualifies as it supports an assemblage of 70,919 waterfowl (1998/99-2002/2003 5 year peak mean).

Feature incorporates:

- Waterfowl which contribute to the total peak winter count by regularly supporting in winter over 20,000 waterfowl (1988/89 to 1992/93 average peak count was 68.026 waterfowl: 17,502 wildfowl and 50.524 waders).
- The internationally important wintering populations listed in interest features 5-8.
- The migratory passage species ringed plover, dunlin, whimberel and redshank.
- The nationally important populations identified under other notable features criterion including wigeon, teal, pintail, pochard, tufted duck, ringed plover, grey plover, curlew and spotted redshank. As pintail, pochard and spotted redshank have not been recorded in the Lydney area and therefore the consideration of these species in this interest feature is not relevant.

All of the qualifying species have been recorded within the study area, with the exception of Bewick's swan, white-fronted goose, pintail, pochard and spotted redshank. These species are therefore not considered further within this assessment.

Box C2.2 SPA and Ramsar Site Conservation Objectives for Relevant Species

SPA

Relevant Conservation Objectives for Interest Features 3 (Dunlin), 4 (Redshank), 5 (Shelduck) and 6 (Gadwall):
The Conservation Objective is to maintain the following over-wintering species populations and their supporting habitats in a favourable condition, as defined below.

The interest features will be considered to be in a favourable condition when, subject to natural processed, each of the following conditions are met (conditions are relevant to the assessment):

- The 5 year peak mean population size for the over-wintering dunlin, redshank, shelduck and gadwall populations are no less than 44,624 (dunlin), 2,330 (redshank), 3,330 (shelduck) and 330 (gadwall) individuals respectively (5 year peak mean 1991/2 – 1995/6 for dunlin, redshank, shelduck and 1988/9 and 1992/3 for gadwall);
- The extent of saltmarsh and associated strandlines is maintained – dunlin, redshank and shelduck (saltmarsh only).
- The extent of intertidal mudflats and sandflats is maintained – dunlin, redshank, shelduck and gadwall.

- The extent of hard substrate (rocky shore) habitats is maintained – dunlin, redshank and shelduck.
- Unrestricted sightlines of >200 m at feeding and roosting sites are maintained – dunlin, redshank, shelduck and gadwall.
- Aggregations of dunlin, redshank, shelduck and gadwall at feeding or roosting sites are not subject to significant disturbance.

Relevant Conservation Objectives for Interest feature 7:
The Conservation Objective is to maintain the waterfowl assemblage and its supporting habitats in a favourable condition, as defined below.

The interest feature waterfowl assemblage will be considered to be in a favourable condition when, subject to natural processes, each of the following conditions are met:

- The five year peak mean population size for the waterfowl assemblage is no less than 93,986 individual waterfowl (5 year peak mean 1991/2 - 1995/6).
- The extent of saltmarsh and their associated strandlines is maintained.
- The extent of intertidal mudflats and sandflats is maintained.
- The extent of hard substrate habitats is maintained.
- Unrestricted bird sightlines of >500 m at feeding and roosting sites are maintained.
- Waterfowl aggregations at feeding or roosting sites are not subject to significant disturbance.

Ramsar

Relevant Conservation Objectives for Interest Features 5 (Dunlin), 6 (Redshank), 7 (Shelduck) and 8 (Gadwall):

The Conservation Objectives for Interest features 5 (Dunlin), 6 (Redshank), 7 (Shelduck) and 8 (Gadwall) of the Severn Estuary Ramsar Site are to maintain the feature in favourable condition, as defined by the Conservation Objective for the SPA interest features 3, 4, 5 and 6 (see above SPA Conservation Objectives).

Relevant Conservation Objectives for Interest Feature 9:
The Conservation Objective for interest feature 9 (internationally important assemblage of waterfowl) of the Severn Estuary Ramsar Site is to maintain the feature in favourable condition, as defined by the Conservation Objective for the SPA interest feature 7, with special reference to the individual species listed and their population figures (see above SPA Conservation Objectives).

A range of measures and targets have also been developed to supplement the Conservation Objectives and assist in the determination of favourable condition status, and these have been referred to as necessary. These targets are intended to inform the scope and nature of the AA, but do not provide a comprehensive basis for doing so on their own, and therefore they are considered alongside issues specific to the construction and operation of waste management facilities at waste sites 12 and 13.

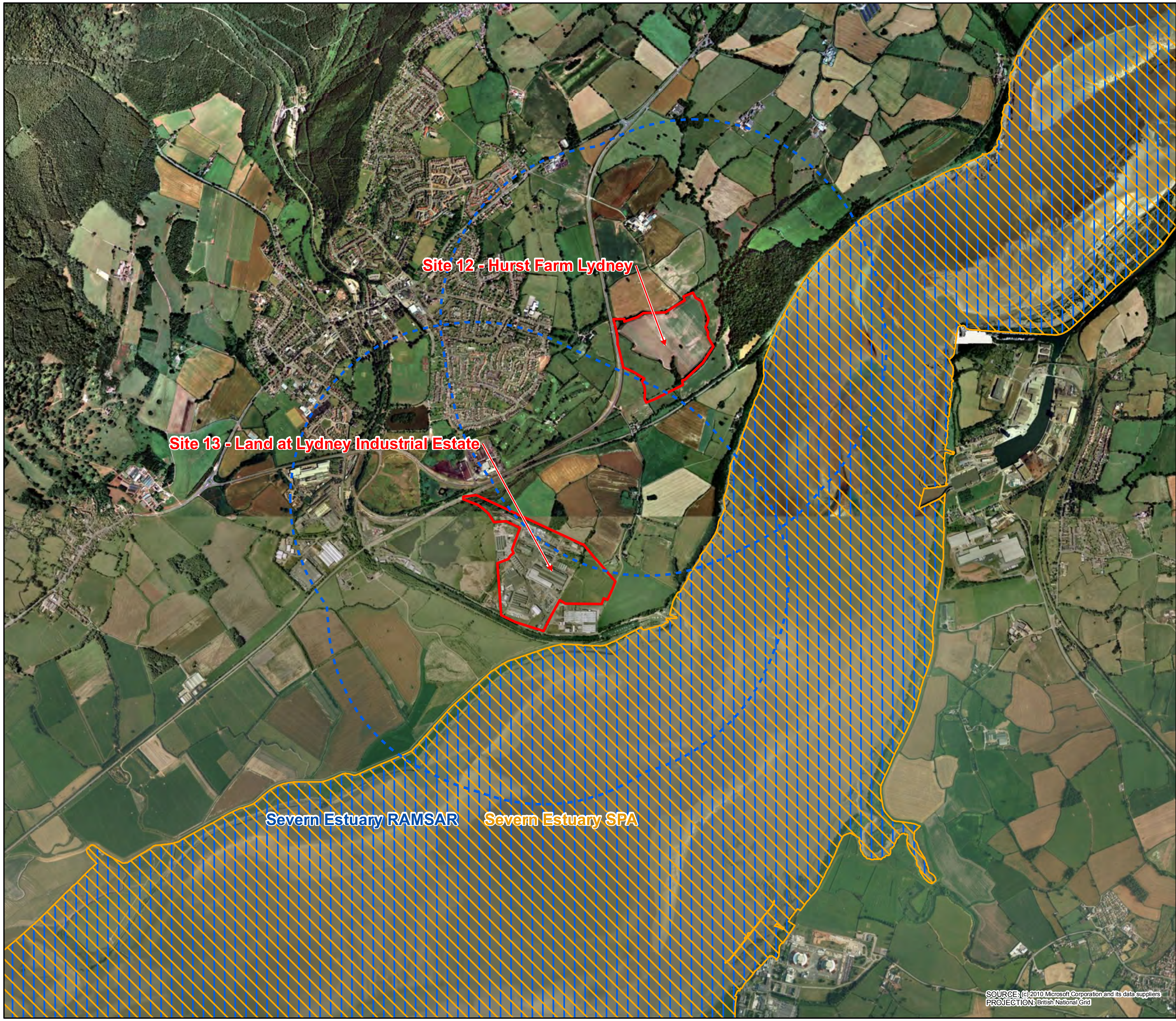
C3 *A REVIEW OF THE BASELINE CONDITIONS INCLUDING QUALIFYING HABITATS AND BIRDS NEAR LYDNEY*

The Conservation Objectives at a site level focus on maintaining both the populations of the qualifying species, the assemblage and the habitats used by them. It is therefore the aim of this baseline section to recognise both the bird species for which the SPA and Ramsar site is designated and the habitats that support them both individually, and within the context of the wider SPA and Ramsar site.

C3.1 *ASSESSMENT STUDY AREA*

For the purposes of the baseline context and impact assessment, the area of Lydney including the SPA and Ramsar site within proximity of waste sites 12 and 13 is referred to hereafter in this Annex as the 'study area'. The study area includes shoreline up to 1 km from the northerly-most and southerly-most parts of waste sites 12 and 13 (see *Figure C3.1*). This 1 km buffer is in accordance with the Environment Agency guidance (1) discussed in *Section 4.2.2* of the main report and used to identify disturbance impact buffers by the Environment Agency for their review of consents work.

(1)Work Instruction: (Appendix 7) – Stage 1 & 2 Assessment of New Integrated Pollution Control (IPC), Pollution Prevention and Control (PPC) Permissions under the Habitats Regulations, Version 6, October 2006, Environment Agency.



KEY:

- Consultation Site
- 1km Buffer of Consultation Site
- Special Protection Area
- RAMSAR

N W E S

0 1 Kilometres

TITLE:
Figure C3.1
Extent of Study Area

CLIENT: Gloucestershire County Council		SIZE: A3
DATE: 14/10/2010	CHECKED:	PROJECT: 0114924
DRAWN: IG	APPROVED:	SCALE: As Scale Bar
DRAWING: Site12_13_Aerial.mxd		REV: 0

ERM
Eaton House
Wallbrook Court
North Hinksey Lane
Oxford, OX2 0QS
Tel: 01865 384800
Fax: 01865 384848

SOURCE: (c) 2010 Microsoft Corporation and its data suppliers
PROJECTION: British National Grid

File: 0114924GloucesterHRAGIS_IG_BS\Maps\Site12_13_Aerial.mxd

C3.2 DATA SOURCES

Details about the use of the Severn Estuary and the study area by birds, and known current levels of disturbance, have been obtained from the British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) data and published data from the Wildfowl & Wetlands Trust Reports (1) and the Wader Study Group (WSG) as follows:

- Wildfowl and Wader Counts – 1984/85 – 2006/07, Wildfowl & Wetlands Trust Reports 1984-2006 – annual totals for qualifying species and the assemblage for the whole Severn Estuary;
- WebS Core Counts (high tide) – 2008/2009, BTO - peak and mean densities per species, per survey sector (2);
- WeBS Low Tide Counts – winter 1992-93 to 1998-99, *Wader Study Group, Estuarine Waterbirds at Low Tide* – counts for the whole estuary and summary report;
- Monthly Low Tide Counts - winter 2008/2009, BTO - monthly totals, mean counts and density per species for the whole Severn Estuary; and
- Monthly Low Tide Counts – winter 2008/2009, BTO - peak and mean densities per species, per survey sector.

C3.3 POPULATION COUNTS FOR THE WHOLE SEVERN ESTUARY – REGULATION 33 GUIDANCE DATA

Table C3.7 includes data taken from the Natural England Regulation 33 guidance document (3) which is sourced from BTO WeBS data and annual reports.

The survey data includes total population counts for the qualifying species across the whole Severn Estuary from 1984/85 to 2006/07. Assemblage counts are also provided from 1993/94 to 2006/07 (*Table C3.7*). Gaps in the data are shown.

The data summarised below includes ten qualifying species (either a qualifying interest alone or as part of the assemblage). These species are understood to be present within the study area following a review of the data from the sources summarised in *Section C3.2*.

(1) Severn Estuary count data taken from Published Wildfowl & Wetlands reports 1984-2006. Provided by email from Charlotte Padgenham (Natural England).
(2) NB - Core Count data was not available for these survey sectors for 2004-2007
(3) Natural England - Severn Estuary Regulation 33 Advice guidance document. Supplementary Documents: Appendix 11 – Summary of peak birds counts for the Severn Estuary Ramsar site and SPA (1988/9-2006/7) – data from BTO WeBS Counts and Annual Reports. http://www.naturalengland.org.uk/Images/App11-Summary_of_peak_counts_1988-2007_tcm6-11842.pdf

Table C3.1 SPA Regulation 33 Guidance Total Population Counts for Relevant Species across the Whole Severn Estuary 1988/89 to 2006/07

Year	Relevant Qualifying Bird Species										Assemblage
	Dunlin	Shelduck	Redshank	Gadwall	Wigeon	Curlew	Teal	Tufted Duck	Grey Plover	Mallard	
1988/9	44,311	2,568	2,627	290	4,557	2,706	1,253	990	673	3,916	-
1989/90	44,170	2,678	2,199	384	4,017	2,945	3,507	1,004	521	4,036	-
1990/91	58,705	4,202	2,400	347	3,935	2,734	1,884	821	1,405	3,639	-
1991/2	42,056	3,505	2,841	293	3,527	3,812	2,528	778	449	4,136	-
1992/3	35,611	2,560	2,924	332	3,838	4,555	1,986	967	894	3,277	80,941
1993/4	41,209	2,627	1,328	252	3,947	3,646	3,743	571	647	3,145	79,872
1994/5	50,638	4,466	2,032	270	5,689	5,307	4,288	662	767	2,870	100,998
1995/6	26,150	3,508	2,526	265	6,267	2,727	3,806	1,004	368	2,383	71,042
1996/7	29,420	4,117	2,072	281	11,548	2,001	2,665	610	519	3,088	80,323
1997/8	26,851	2,371	1,853	250	5,304	2,903	2,880	382	436	2,101	69,979
1998/9	37,172	3,150	2,134	208	4,011	2,404	3,772	662	176	2,465	75,608
1999/00	20,700	1,996	1,306	294	3,459	2,190	4,719	906	708	2,767	69,286
2000/1	17,417	2,912	1,750	298	5,789	2,038	5,151	625	260	3,265	62,768
2001/2	20,401	3,776	2,616	250	5,579	2,164	4,449	454	359	2,761	60,735
2002/3	25,734	2,191	1,735	253	7,019	2,495	3,748	475	386	2,936	68,658
2003/4	23,801	2,579	1,865	292	9,110	2,898	3,006	659	275	2,701	68,657
2004/5	16,069	3,460	2,516	194	8,058	2,613	3,466	528	287	3,353	64,054
2005/6	19,561	4,182	1,930	297	6,249	2,514	5,293	630	561	3,884	79,950
2006/7	16,625	3,711	2,362	241	9,343	3,230	4,233	564	207	3,661	66,022
2007/8*	16,072	(5,414)	1,962	240	10,008	2,560	5,428	-	428	2,954	72,088
2008/9*	25,993	3,826	2,970	(197)	8,672	3,396	4,710	-	595	3,073	85,631
Mean	30,413	2,808	1,953	254	6,187	2,945	3,161	700	520	3,162	73,918 / 73,656**

Brackets indicate incomplete counts.

*2007/8 and 2008/9 data taken from BTO WeBS Annual Report for 2008/9.

** figure quoted in the BTO WeBS Annual Report for 2008/9.

- no data provided.

The data indicates that of the qualifying species identified as occurring in the study area, across the whole estuary dunlin are the most populous with a mean peak count (1998/89 to 2008/9) of 30,413, wigeon and mallard are the next most populous with 6,187 and 3,162, followed by teal with 3,161, curlew with 2,970, shelduck with 2,808 and redshank with 1,953. Gadwall are the least populous with a mean peak count of 254 followed by grey plover and tufted duck with 520 and 700 respectively. The mean peak assemblage count is approximately 73,000. A high peak assemblage count of 100,998 was recorded 1994/95.

C3.4 YEAR ROUND POPULATION COUNTS AT HIGH TIDE FOR THE STUDY AREA - WEBS CORE COUNT SURVEY DATA

The WeBS core count data provides an indication of wader distribution across the Severn Estuary within specific survey sectors (see *Box C3.1*) throughout the year. Data has been obtained from the BTO covering four specific survey sectors which overlap the study area. Relevant qualifying interest species for the study area are considered.

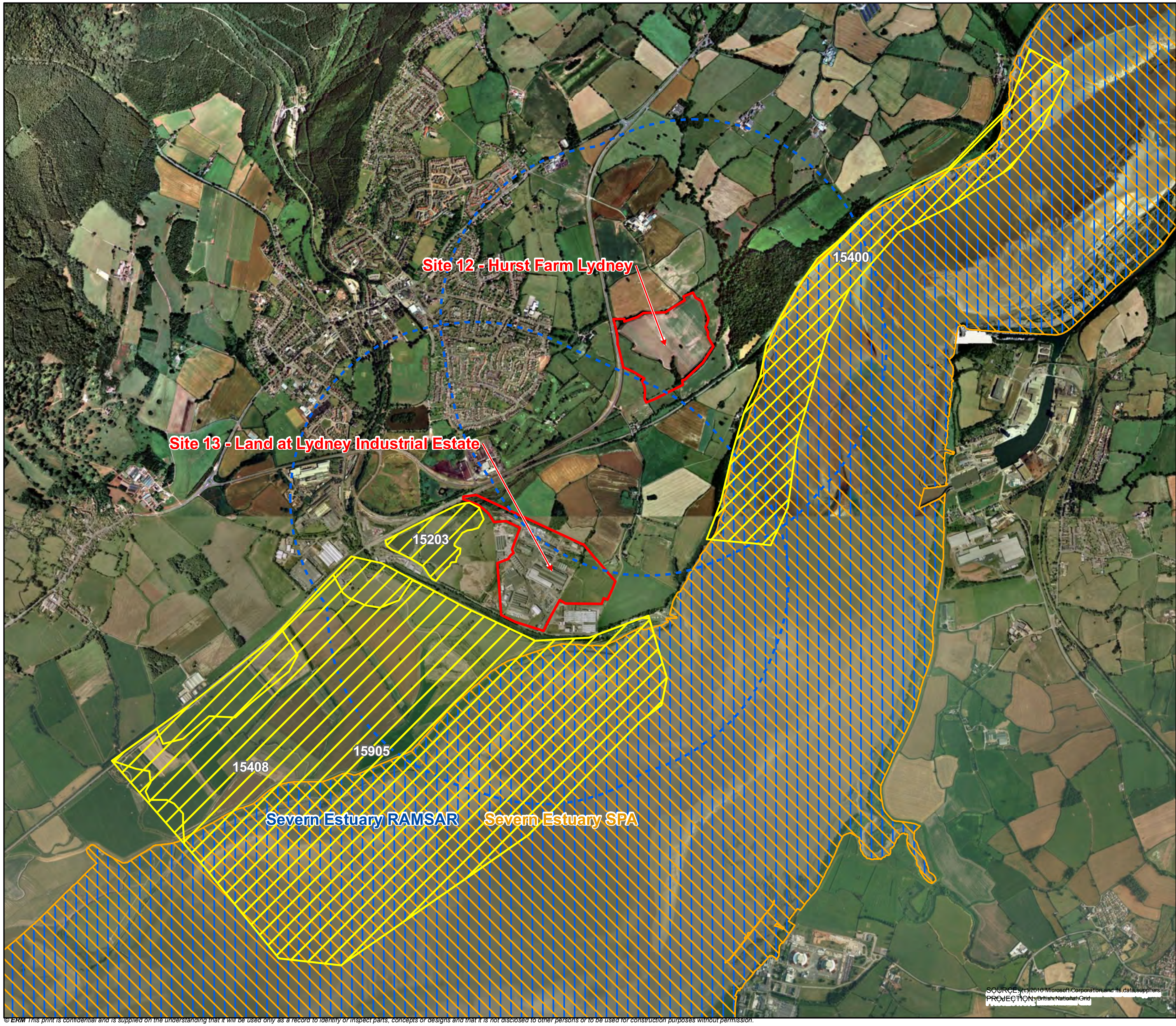
Box C3.1 Explanation of WeBS Core Count Surveys

Core Counts

Core Counts are conducted at a wide variety of wetlands throughout the UK, both coastal and inland. Around 2,500 sites are covered annually. Counts are made once monthly, normally on pre-selected dates, concentrating on the winter period, although counts from all months are available for some sites. Counts on estuaries are usually made at high tide when birds are most easily counted at roosts.

C3.4.1 Location of WeBS Core Count Survey Sectors Overlapping the Study Area

Figure C3.2 shows the study area and the four selected WeBS core count survey sectors. The locations of waste sites 12 and 13 are to be assessed in relation to the survey sectors are shown. *Table C3.1* lists the closest distances of each of waste sites 12 and 13 to the individual survey sectors.



KEY:
- Consultation Site
- 1km Buffer of Consultation Site
- Survey Sectors
- Special Protection Area
- RAMSAR

N
W E
S

0 1
Kilometres

TITLE:
Figure C3.2
Location of Core Count Survey Sectors

CLIENT: Gloucestershire County Council		SIZE: A3
DATE: 14/10/2010	CHECKED:	PROJECT: 0114924
DRAWN: IG	APPROVED:	SCALE: As Scale Bar
DRAWING: SurveySector_Both_Aerial.mxd		REV: 0

ERM
Eaton House
Wallbrook Court
North Hinksey Lane
Oxford, OX2 0QS
Tel: 01865 384800
Fax: 01865 384848

SOURCE: (c) 2010 Microsoft Corporation and its data suppliers
PROJECTION: British National Grid

File: 0114924GloucesterHRAGIS_IG_BS\Maps\SurveySector_Both_Aerial.mxd

Table C3.2 Proximity of Core Count (High Tide) Survey Sectors to Waste Sites 12 and 13

Survey Sector	Waste Site 12	Waste Site 13
15400	300 m	580 m
15203	1.1 km	5.5 m
15905	1.2 km	50 m
15408	1.2 km	50 m

C3.4.2 High Tide Distribution within the Study Area

The core count data have been used to illustrate the qualifying interest species present which may use high tide habitats along the shore and within proximity of the study area and therefore those most likely to be susceptible to any development impacts.

Table C3.2 summarises peak counts for qualifying species (either qualifying alone or as part of the assemblage) across the four survey sectors covering the study area. The data indicates that of the species qualifying alone, dunlin, redshank, shelduck and gadwall are present within the study area.

Of these species dunlin and shelduck are present during the spring as well as during the winter months.

The data indicates that the most populous qualifying species within the study area is dunlin followed by shelduck and redshank. The most populated of the four survey sectors are 15905 and 15408 located to the southwest of waste site 13. Table C3.3 shows populations of relevant species within the core count survey sectors which are greater than 1% of the national population. Those representing greater than 1% of the national population are highlighted in bold text.

Dunlin, shelduck and redshank recorded within the survey sectors utilise intertidal habitat such as mudflats and non-tidal habitats such as saltmarsh (which is located in a small area along the shoreline within 50 m of waste site 13) as their preferred habitat.

Table C3.3 *BTO Core Count (High Tide) Summaries across the Indentified Survey Sectors for Selected SPA and Ramsar Site Qualifying Birds Species during 2008/2009*

Species	Monthly Average Count												Autumn Peak Count	Winter Peak Count	Spring Peak Count	National Importance of the Site for each Species		
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun				Autumn cf National Threshold	Winter cf National Threshold	Spring cf National Threshold
15400																		
Dunlin	-	-	0	0	-	0	0	5	0		0	0	-	5 (Feb)	-	0%	0%	0%
Redshank	-	-	0	2	-	4	1	9	1		0	0	2 (Oct)	9 (Feb)	-	0%	1%	0%
Shelduck	-	-	0	0	-	1	0	2	0		5	2	-	-	5 (May)	-	-	1%
Wigeon	-	-	0	0	-	14	0	15	0	-	1	1	-	15 (Feb)	-	-	-	-
Teal	-	-	0	0	-	4	0	0	0	-	0	0	-	4 (Dec)	-	-	-	-
Mallard	-	-	55	34	-	17	0	19	5	-	0	0	55 (Sep)	19 (Feb)	-	-	-	-
15203																		
Shelduck	-	-	-	-	-	-	0	0	2	0	1	0	-	2 (Mar)	1 (May)0	N/A	0%	0%
Gadwall	-	-	-	-	-	-	4	2	0	0	0	0	-	4 (Jan)	-	N/A	0%	2%
Teal	-	-	-	-	-	-	0	22	5	0	0	0	-	22 (Feb)	-	N/A	1%	0%
Mallard	-	-	-	-	-	-	15	40	4	2	11	7	-	40 (Feb)	11 (May)	N/A	1%	0%
Tufted duck	-	-	-	-	-	-	33	44	24	11	16	10	-	44 (Feb)	16 (May)	N/A	**5%**	**2%**
15905																		
Shelduck	-	0	0	0	1	14	2	55	40	23	36	28	-	-	36 (May)	0%	**7%**	**5%**
Dunlin	-	0	29	0	0	40	34	561	22	0	92	0	29 (Sep)	561 (Feb)	92 (May)	1%	**10%**	**2%**
Redshank	-	0	10	2	18	12	3	29	38	18	31	20	10 (Sep)	38 (Mar)	31 (May)	1%	**3%**	**3%**
15408																		
Dunlin	-	-	0	0	60	500	600	200	0	0	15	0	-	600 (Jan)	-	0%	**11%**	0%
Redshank	-	-	0	0	0	0	0	9	4		8	0	-	1 (Jan)	-	0%	0%	0%
Shelduck	-	-	0	0	0	0	0	9	4	0	8	0	-	9 (Feb)	8 (May)	1%	1%	0%

Figures given indicate the percentage of the relevant qualifying level represented by the peak count for each species in question. Eg 50% indicates that the peak count is half that required for the site to qualify as nationally important for the species in question.

C3.5 WINTERING POPULATION COUNTS AT LOW TIDE FOR THE STUDY AREA - WEBS LOW TIDE SURVEY DATA

The WeBS low tide count data provide an indication of wintering distribution of the relevant qualifying species across the whole SPA and Ramsar site and specifically within the study area (see *Box C3.2*). In addition, the data provides an indication of the habitat types present in BV605 and BV607 and therefore an indication of low tide habitats present across the study area. Relevant qualifying interest species for the study area are considered together with their favoured habitat.

Box C3.2 Explanation of WeBS Low Tide Surveys

Low Tide Counts

Low Tide Counts are conducted at most large estuaries in at least one winter every six years, with up to four counts being made through the period November - February. The exposed substrate at low tide is divided into small count areas (sectors) enabling the distribution of feeding and roosting birds to be determined in fine detail. Low Tide Counts are designed to complement estuarine Core Counts, and are principally concerned with illustrating bird distributions. In this way it is possible to ascertain which parts of estuaries, inlets or bays are important for birds. Count data are usually averaged across the winter, to produce relative density maps. Data are provided at two spatial scales – the whole estuary level and the individual sector level. Peak and mean counts for each winter are then produced as part of a standard data request.

C3.5.1 Location of WeBS Low Tide Count Survey Sectors Overlapping the Study Area

WeBS low tide count data was available for survey sectors covering the study area, and comprisedBV605 and BV607. Their locations are shown on *Figure C3.3*.

Figure C3.1 ***Location of BTO Low Tide Survey Sectors BV605 and BV607 Overlapping the Study Area***

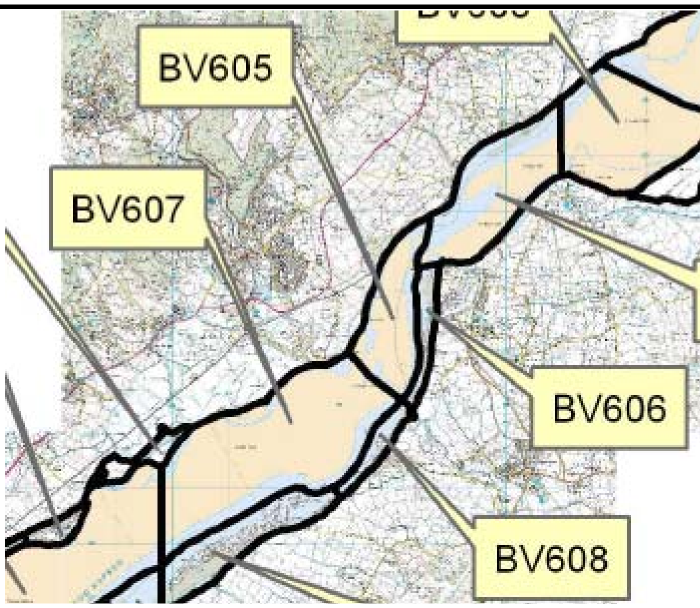


Figure C3.3 shows the Avonmouth area and WeBS survey sectors considered. The locations of low tide survey sectors BV605 and BV607 which overlap with the study area are shown on *Figure C3.3*. *Table C3.3* lists the closest distances of each of waste sites 12 and 13 to the individual survey sectors.

Table C3.4 ***Proximity of Survey Sectors to Waste Sites 12 and 13***

Survey Sector	Location Relative to Waste Sites 12 and 13
BV 605	300 m from waste site 12
BV 607	50 m from waste site 13

C3.5.2 Habitats within the Study Area

Table C3.4 includes details of the extent of different general habitat types (as defined by the BTO) within each survey sector broken down into intertidal, sub-tidal and non-tidal zones (1). The table also lists the months where survey counts were carried out.

Table C3.5 ***Summary of Broad Habitat Areas (ha) covered in Survey Sectors for the Monthly Low Tide WeBS Counts 2008/2009***

Survey Sector	Intertidal (ha)	Sub-tidal (ha)	Non-tidal (ha)	Total (ha)	Months counted
BV605	166	84	0	250	Nov, Dec, Jan, Feb
BV607	602	180	0	782	Nov, Dec, Jan, Feb
Total	768	264	0	1032	-

Table C3.4 shows intertidal and sub-tidal habitats are the most extensive habitats across the study area as recorded during the WeBS low tide surveys,

(1) Intertidal habitat includes mudflat and sandflat; sub-tidal habitat is under water at low tide and non-tidal habitats include saltmarsh, inland lagoons, etc.

with non-tidal habitats representing the least extensive habitats. Intertidal habitat represents the key habitat for qualifying interest species with a large area (166ha) being present within BV605 which is 300 m from waste site 12 and a larger area (602 ha) present in BV607 within close proximity, 50 m from waste site 13.

Appendix 8 of the Regulation 33 advice for the Severn Estuary was also reviewed to determine the approximate areas of habitats of importance for the qualifying interest species. *Appendix 8* indicates that expansive areas of intertidal mudflats and sandflats occur within BV605 which provide important feeding areas but with no saltmarsh or rocky shore habitat occurring in-between the survey sector and waste site 12.

Appendix 8 of the Regulation 33 advice for the Severn Estuary indicates that a thin strip of approximately 20 m wide of saltmarsh and rocky shore habitat occurs in between BV607 and waste site 13 with expansive areas of intertidal mudflats and sandflats beyond this.

Saltmarsh provides important feeding and roosting areas throughout the estuary, especially for redshank and shelduck, which feed on invertebrate species in the sediments. The saltmarshes (and especially upper saltmarshes) throughout the estuary provide safe havens from the tides which flood the mudflats twice a day and there is little human disturbance. The low growing vegetation provides suitable communal roosting habitat for bird species such as redshank and shelduck, which prefer to roost on areas of short vegetation as this allows good visibility. The area of saltmarsh within 200 m of waste site 13 is however limited in size.

C3.5.3 Low Tide Bird Distribution within the Study Area

The WeBS Low Tide data provided by BTO have been used to illustrate the use of habitats within the study area which might be used by qualifying interest bird species of the SPA and Ramsar site, and also to set them in the context of the wider Severn Estuary SPA and Ramsar site. Further details about the WeBS Low Tide Count survey data are given in *Box C3.2*.

WSG Low Tide Counts for the Severn Estuary

The WSG gives an indication of the distribution of the relevant qualifying interest species across the whole SPA and Ramsar site and highlights general areas of importance.

The WSG report suggests that within the areas covered by the counts, the highest bird densities were found between the River Usk and Cardiff and between Chittening north to Oldbury which are a distance from the study area.

The WSG report states that shelduck, curlew and redshank were widespread throughout the SPA and Ramsar site. Shelduck, curlew and redshank were concentrated to the south of the study area, at Oldbury, approximately 10 km away.

WeBS Low Tide Counts for the Whole Severn Estuary

The WeBS low tide count data provide a more recent indication of wintering distribution across the whole SPA and Ramsar site and specifically within the study area (see following section). Relevant qualifying interest species for the study area are considered.

The peak counts for the whole Severn Estuary, for the qualifying interest bird species known to occur in the sectors near the waste sites are summarised in *Table C3.5.* These indicate that redshank are the most populous of the relevant species across the estuary. Curlew and shelduck have similar lower numbers.

Table C3.6 ***Low Tide Peak Count Summaries across the Whole Severn Estuary (Winter 2002/2003) for Selected SPA and Ramsar Site Qualifying Birds Species***

Species	Preferred Habitat	Total Area of Preferred Habitat (ha)	Peak Count	Month of PeakCount	Mean Site Count	Mean Site Density of the SPA and Ramsar Site	Percentage of the Overall SPA Population*
Curlew	Intertidal & non-tidal	19,765	3,615	November	3588	0.18	3.8%
Redshank	Intertidal & non-tidal	2,439	19,765	February	1637	0.08	21%
Shelduck	All habitats	31,154	3,495	February	2812	0.09	3.72%

**NB – the overall SPA population is taken as the figure quoted in the SPA review* (93,986)

WeBS Low Tide Counts by Survey Sector

The low tide counts by survey sector give an indication of key species within the study area, and therefore those most likely to be susceptible to any development impacts *Table C3.6*.

Curlew are the key species across the two survey sectors with shelduck and redshank comprising only a small number of records.

Curlew, shelduck and redshank recorded within the survey sectors utilise intertidal habitat such as mudflats and non-tidal habitats such as saltmarsh (which is located in a small area along BV607) as their preferred habitat.

Table C3.7 Low Tide Peak Count Summaries of SPA and Ramsar Site Qualifying Species by Survey Sector

Sector Code	Species	Preferred Habitat	Area of preferred habitat (ha)	Peak Count	Peak Density	Mean Count	Mean Density	Percentage of the Overall Qualifying SPA Population*
BV605	Shelduck	All habitats	250	3	0.01	1	0.00	0.09
	Curlew*	intertidal and non-tidal	166	2	0.01	1	0.00	0.002
	Redshank	intertidal and non-tidal	166	1	0.1	0	0.00	0.04
	Total			**6**		**2**		
BV607	Shelduck	All habitats	782	1	0.00	0	0.00	0.03
	Curlew*	intertidal and non-tidal	602	250	0.42	130	0.22	0.27
	Total			**251**		**130**		

* - *Curlew are nota a qualifying feature alone and therefore the percentage of the overall assemblage (93, 986) is considered.*

C4 IDENTIFICATION OF EXISTING AND EXPECTED LIKELY SOURCES OF DISTURBANCE WHICH MAY RESULT FROM DEVELOPMENT AT WASTE SITES 12 AND 13

The development of waste facilities at waste sites 12 and 13 will not involve any land take from the Severn Estuary SPA and Ramsar site. The likely impacts will arise during construction and operation from disturbance effects and any cumulative effects in-combination with current disturbance activities already experienced in the location of the study area.

Specific impacts which are likely to result in disturbance of wader populations have been identified. For example, Natural England discuss noise and visual presence and in particular sudden movements and sudden noises as a key sensitivity and vulnerability for the qualifying over-wintering bird populations within their Regulation 33 guidance. The guidance describes how noise and visual disturbance can have the effect of displacing birds from their feeding grounds.

Disturbance can prevent birds from feeding and in response they either a) decrease their energy intake at their present (disturbed) feeding site through displacement activity, or b) move to an alternative less favoured feeding site. Such responses affect energy budgets and thus survival (Natural England, Regulation 33 guidance). However a paper by Goss–Custard et al. 2005 describes how species respond differently to disturbance. For example when considering the predicted effect of changes in intertidal habitat area on percentage overwinter survival, dunlin are less affected by changes in habitat than curlew.

C4.1.1 Existing Sources and Barriers to Disturbance

The Natural England Regulation 33 guidance states that there is intermittent disturbance to internationally important migratory species and the waterfowl assemblage from both the landward and seaward side of the Severn Estuary which has increased in recent years, due to the estuary becoming more populated and with increased development of all weather recreational pursuits. In addition the Regulation 33 guidance states that all supporting habitats at the time of writing are highly vulnerable to noise and visual disturbance.

Current sources of disturbance and physical barriers to wader sightlines (where known) within the study area are given in *Table C4.1*.

Table C4.1 Typical Current Disturbance Effects / Barriers within the Study Area

Activity / Barrier	Location	Current Disturbance Effects/ Effect of Barrier
Site 12		

Activity / Barrier	Location	Current Disturbance Effects/ Effect of Barrier
Activity – traffic and watersport activities on the Severn Estuary	Passing in close proximity of the study area.	It is likely that waders feeding and roosting on the shoreline at Lydney are habituated to activities on the Severn Estuary.
Activity - existing rail	Extends adjacent to foreshore in between waste site 12	Existing daily, intermittent noise and visual.
Barrier - woodland	Two belts of woodland occur in-between waste site 12 and the shoreline.	Construction and operation impacts are likely to be significantly screened visually from the shoreline by the woodland belts.
Site 13		
Activity – traffic and watersport activities on the Severn Estuary.	As above.	As above.
Lydney Industrial Estate	Site of waste site 13	Daily noise and human presence. Sightlines to waders using the foreshore may be disrupted by existing buildings depending on positioning of the facility.
Existing Lydney Harbour/Lydney Harbour Road traffic	Adjacent to waste site 13 and the foreshore.	Daily regular traffic noise and visual effects from traffic to the industrial estate.
Lydney Harbour Canal and treelines	Extends between waste site 13 and the shoreline.	Construction and operation impacts may be partially screened by the tree belt and the canal provides physical separation from the high tide habitats.

Waste Site 12

One further source of current disturbance to note is the mainline railway which extends along the foreshore to the south of waste site 12. This is used frequently by trains and therefore it could be that birds feeding on the mudflats in BV605 are likely to be habituated to this type of disturbance.

The woodland belts in between waste site 12 and the foreshore, together with the railway are likely to act as a barrier to any disturbance activities and visually screen impacts from the foreshore located 300 m from the site.

Waste Site 13

Industrial development is widespread around the Severn, however near Lydney it is potentially limited to the Lydney Industrial Estate where waste site 13 is located. No planning applications within the 2009 to 2010 have been submitted for significant development in the industrial estate or within other areas along the foreshore at Lydney.

The industrial estate may add to the background disturbance levels in the area of foreshore at Lydney. The existing level of disturbance at the estuary and within proximity of the study area is therefore potentially higher in comparison with other areas of the wider SPA and Ramsar site. This indicates that any further contribution to direct and prolonged disturbance could still be to the detriment of local bird populations. However it may also be that local bird populations are already habitualised to some extent to the current levels of disturbance, for example from noise and visual impacts and therefore any small increase in such effects would be unlikely to have a significant impact.

The existing level of disturbance at the stretches of the estuary within close proximity of the study area is therefore at a reasonable level, particularly for waste site 13. The acknowledgement of disturbance is reflected in the highly vulnerable status placed on birds in all supporting SPA and Ramsar site habitats in the Regulation 33 Advice Note. This indicates that any further contribution to direct and prolonged disturbance could be to the detriment of SPA and Ramsar site bird populations.

That birds do occur along the stretches of the coast adjacent to Lydney close to the Lydney Industrial Estate such as the large numbers of dunlin and along the shore at15400, 300 m from waste site 12 suggests that some degree of habituation could be exhibited by birds, most likely those which overwinter. Intermittent noise sources are a key source of disturbance to birds, however, there are also a number of intermittent noise sources which occur in this area already and it is possible that the birds may be accustomed to such effects.

There are also a number of industrial buildings which are located in waste site 13 between the SPA and Ramsar site. Depending on the position of a facility within waste site 13, these may provide barriers to the effects of noise and visual disturbance from new development on the landward side of them. This is of particular importance when considering bird sightlines which are key to the early identification of predators for waders and set one of the targets within the Conservation Objectives for specific species (see *Box D1.2*).

Expected disturbance effects that may arise from the development of the specified waste facility within the waste sites 12 and 13 are considered in the following section.

C4.1.2 Expected Sources of Disturbance from Development of a Waste Facility within the Waste Sites

It should be noted that due to the lack of specific development details at this stage, the assessment has been made using typical construction and operation details for a 200 ktpa capacity thermal treatment facility which is considered to be the most disturbing option for these waste sites as a worst case scenario.

Table C4.2 gives typical disturbance sources from the assumed worst case scenario for the development of a 200 ktpa thermal treatment facility. Noise effects from facilities such as MBT/autoclave are also considered.

The baseline identified existing industrial buildings and chimneys in between waste sites 13 which would obstruct sightlines for bird species which would serve to lessen this impact (see *Table C4.1*). This is discussed further below with consideration of the findings of relevant studies.

Table C4.2 Likely Sources of Disturbance from Development of a 100 ktpa Thermal Treatment Facility

Phase	Type	Disturbance/Activity	Duration/Level
Construction and Operation	Noise&Visual	Increase in human presence within site and presence of high vis clothing	Temporary/permanent
Construction and Operation	Noise&Visual	Increase in traffic levels including construction traffic of the Lydney Harbour main access road	Temporary/permanent
Construction	Noise&Visual	Temporary site preparation works including excavation/drilling/piling as necessary	Temporary
Construction	Noise&Visual	Temporary facility construction works	Temporary
Construction	Noise&Visual	Temporary moderate increase in irregular loud noises	Temporary
Operation	Barrier to sightline	Building and stack serve as potential barrier to bird sightline on foreshore	Permanent
Operation	Predation	Increase in predatory perches	Permanent
Construction	Smothering – effects on supporting habitat	Temporary dust pollution from site preparation works	Temporary

C4.1.3 Bird Disturbance

Whilst disturbance effects to coastal bird species have been documented in a range of studies, there are a number of factors which can influence the response of the birds and the distance over which effects occur. ERM's own experience (1) (2) is that presence of humans (especially where walking dogs) and intermittent noise sources are important sources of disturbance to coastal

(1) South Humber Power Station, Pyewipe (1996) ABB Power Generation Ltd.
(2) Environmental Assessment of 1,320 MW CCGT Power Station at Killingholme (1998) Southern Energy

birds, although the responses can vary. Many of our observations have recorded birds being disturbed but then returning to the general area, or moving to another area nearby, rather than leaving the area altogether. We have also observed birds maintaining a standoff of approximately 250m from construction works including ongoing piling activity through coastal mudflats, but less effect from works behind the seawall.

A comprehensive review of construction and waterfowl conducted on the Humber Estuary by Cutts *et al* in 2008 [(1)] provided a detailed species specific review of disturbance distance. Species including curlew, redshank and shelduck in particular were found to be (if unhabituated) highly sensitive to disturbance with the highest alert distances for all regularly occurring species examined along the Humber (Curlew 275 m, Redshank 250 m and Shelduck 199 m). In addition, this study also provided details on the types of activities likely to cause a response including human presence, fishing activities, boat disturbance, shooting disturbance, aircraft noise, roads and traffic and construction. Cutts *et al* (2008) also stated from their own monitoring of construction of Humber flood defences for the EA that most construction activity had a moderate to high impact on birds.

Cruickshank *et al* 2010 [(2)] also suggested that from their own review of activities on the Humber that disturbance could have a moderate to high impact on birds within the estuary.

An additional review undertaken by Goss-Custard in 2007 [(3)] also agreed with this statement that in general the evidence suggests that disturbance can affect the behaviour and physiology of waterbirds. However, it was suggested that the above statement is not a sufficient reason for believing that the disturbance is deleteriously affecting bird species.

All species have different survival strategies so those which have commonly available feeding resource and a number of roost sites will be much less affected by disturbance than those for species where feeding resource is limited. Evidence from Stillman *et al* (2005) [(4)] for the Humber Estuary concurs with this statement.

Of particular relevance to this report was an 11 year study undertaken by Burton *et al* (2002) [(5)] of Cardiff Bay and the impacts of disturbance to birds from construction activities. This study suggested that construction work disturbance significantly reduced densities of five species, two of which being

(1) Cutts, N. Phelps, A. & Burdon, D. (2008) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance.

(2) Cruickshank, K. Liley, D. Fearnley, H. Stillman, R. Harvell, P. Hoskin, R and Underhill-Day, J. (2010) Desk Based Study on Recreational Distrubance ot Birds on the Humber Estuary.Footprint Ecology / Humber Management Scheme.

(3) Goss-Custard, J.D. (2007) Assessment of the Anticipated Effects on the Exe Estuary Special Protection Area. Devon County Council

(4) Stillman, R.A. West, A.D. Goss-Custard, J.D. McGorty, S. Frost, N.Jrisey, D.J. Kenny, A.J and Drewitt, A.L. (2005) Predicting site quality for shorebird communities: a case study on the Humber estuary, UK. *Marine Ecology Progress Series*. **Vol. 305**: 203-217

(5) Burton, N.H.K. Armitage, M.J.S. Musgrove, A.J. & Rehfisch, M.M. (2002) Impacts of manmade features on numbers of estuarine waterbirds at low tide. *Environmental Management*, 30 (6), pp. 857-864.

redshank and curlew and also reduced feeding activity of three species one of which being redshank. This study did state that while displacement of redshank was significant, there was no overall decline in this species.

Studies by Smith & Visser (1993) in their review of research in the Wadden Sea, also suggest that there are differential flight responses by waterfowl to a variety of disturbance sources, and that the distances at which different bird species take flight differ, even when the source is similar. For instance golden plover tend to be more tolerant of disturbance than some other waders, with flight distances from walking people recorded at 50m compared to almost 100m for redshank and curlew. The data from these studies were used to produce response radii for key species. These showed curlew to be affected in a 300m-500m range and redshank within 200m-300m.

Further tolerance distances have been observed at differing distances from flood defence walls (Glimmerveen & Vent, 1984). Waders feeding between 200 m and 300 m from a sea wall were found to be more tolerant of people walking on mudflats than birds foraging between 500m to 1000m from the wall.

Work undertaken by the Institute of Estuarine and Coastal Studies (IECS) on birds on the mudflats and surrounds (part of the Humber Estuary SPA and Ramsar site) near the Saltend Industrial Estate approximately 10-15 years ago were in line with these findings. Ingress of people onto the mudflats caused the greatest effect (causing some species to fly at approximately 300m), but with birds approaching operating flood defence construction plant on the banks without external personnel to approximately 50 m. In general regular noise sources caused little disturbance to waders with no apparent alterations in their feeding rates, but an irregular impact noise source did push some waders down shore, although a degree of habituation was observed. There has also been significant development at the industrial estate at Saltend over the last 10-15 years, including flood defence works, a CCGT power station on the edge of the site adjacent to the mudflats and yet the mudflats continue to be used by important numbers of waterfowl.

The Regulation 33 advice for the Severn Estuary highlights the need to maintain unimpeded sightlines at feeding and roosting sites and notes that waterfowl require unrestricted views of at least 500m and that there should be no increases in obstructions to existing bird sightlines.

C4.1.4 Summary of Likely Disturbance Effects from Waste Sites 12 and 13

Based on the information in *Section C1.4.3*, development sites that are over 500m from the estuary are much less likely to result in disturbance effects to birds to the extent that they would result in effects on integrity of the SPA and Ramsar site however waste sites 12 and 13 are 300 m and 200 m respectively.

The woodland belts and the railway are however considered to provide significant screening of the shoreline from waste site 12 and it is unlikely that construction or operational impacts at this site will disturb birds in this area. **Waste site 12 is therefore screened out and it can be concluded that the construction of a facility at this site would have no likely significant effects on the Severn Estuary SPA and Ramsar site from bird disturbance.**

There may be potential to locate a facility within waste site 13 so that sightlines are not further obstructed from a development.

C4.2 ASSESSMENT OF LIKELY DISTURBANCE IMPACTS OF WASTE SITE 13

There is a possibility that development at waste site 13 could result in disturbance to the birds present within the survey sectors 15203, 15905, 15408, BV605 and BV607 given that the site is located 200 m from the SPA and Ramsar site.

In order to assess a worst case scenario, an estimate of the likely % loss of species has been calculated and compared against the Conservation Objectives targets. If all the birds from all the WeBS survey sectors covering part of the study area were lost, this would amount to a total of 1,630 wintering birds (including high and low tide peak counts for all assemblage species and qualifying interest species) which would result in a less than 2 % loss (1.7%) of the total assemblage (93,986). This is significant and could affect the favourable conservation status.

It is highly unlikely however, that development at waste site 13 would result in the entire loss of the peak numbers of birds from these sectors and any disturbance would generally be only temporary during construction. Although the site is close to the estuary it has the existing physical barriers of the industrial estate, potentially between the site and the estuary depending on where the facilities were placed. In addition birds present will be likely to have some habituation to noise emanating from this site.

It is considered that mitigation measures could be implemented for site 13 to avoid significant disturbance impacts to birds and such measures are set out in *Section C4.3*.

C4.3 POSSIBLE MITIGATION MEASURES FOR SITE 13

A range of mitigation measures could be adopted as listed below. However, the actual options will depend largely on the specifics of the development proposals which cannot be assessed at this stage. It is also likely that supplementary bird survey work will be required to ascertain more up to date details about bird numbers, distribution and their changing activities and behaviour through the tidal cycle and across the year.

- Ensure the construction personnel do not go onto the coastal habitats.

- Use screening around the site which is erected during periods when birds are absent from the adjacent habitats (*eg* summer months).

- Minimise the use of large cranes and the time at which the construction workforce is operating at heights, especially wearing fluorescent jackets.

- Direct lighting into the work sites and avoid spillage onto the estuarine habitats.

- Avoid intermittent noise sources during periods of high sensitivity (*eg* passage months).

- Programme construction works so that key parts of the work most likely to cause disturbance are undertaken at times of the year when the coastal habitats are not used (or are less well used) by waders such as the summer months.

- Avoid working practices which are likely to cause disturbance to birds around periods of high tide when birds are likely to be closer to the development sites.

- Cessation of construction work over the winter months during periods of hard weather (as agreed with Natural England and local Planning Authority).

Annex D

In-combination Assessment

D1 *IN-COMBINATION ASSESSMENT INFORMATION*

This Annex draws on and adds to the information provided in the GCC HRA baseline report (August 2009) and the GCC HRA screening report (December 2009) which was reviewed by Natural England.

Section D1.1.1 below and *Table D1.1* detail all known plans and proposals within the in-combination assessment study area (see *Figure 8.1* of the main report). *Table D1.2* then summarises the effects which require consideration of in-combination effects (see *Section 8.1* of the main report). These include those effects which were assessed and considered to have no likely significant effect, or where it could not be concluded that they would have no likely significant effect from impacts arising from the development of waste sites. *Table D1.2* draws on *Table D1.1* to identify potential significant effects from other plans and projects which may act in-combination with screened out effects from the plan. An indication as to whether a resulting significant effect is likely to occur in-combination is given.

D1.1.1 *Plans*

- South West Regional Spatial Strategy (RSS). (revoked 6 July 2010)
- The Adopted District Local Plans.
- Relevant Local Development Documents (LDDs) within the Local Development Framework (LDF) of the District Authority in which the site is located.
- Gloucestershire Local Transport Plan (LTP2). 2006-2011
- Relevant Local Development Documents (LDDs) within the Local Development Framework (LDF) of other District Authorities in Gloucestershire / or neighbouring Authorities (only if deemed necessary).
- Welsh Unitary Development Plans (UDPs) and other Development Plans (as necessary).

- Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. (Under the 2004 Act, some of the Local Plan policies have been formally 'saved' whilst others have been deleted, hence only the saved policies should be referred to.)
- Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003 (Under the 2004 Act, some of the Local Plan policies have been formally 'saved' whilst others have been deleted, hence only the saved policies should be referred to.)
- South Gloucestershire Minerals and Waste Local Plan (adopted May 2002) South Gloucestershire Local Development Framework (in preparation)
- Wales Waste Strategy and Wales Regional Waste Plan – South East
- Worcestershire County Structure Plan 1996 – 2011 and Worcestershire Waste Core Strategy (in preparation)
- Wiltshire and Swindon Waste Local Plan, Wilshire Council Mineral and Waste Development Plan Documents including Waste Core Strategy (adopted July 2009), Waste Development control (adopted September 2009) and the Waste Sites Allocations (in preparation)
- Oxfordshire Mineral and Waste Local Plan and Minerals and Waste Development Framework (in preparation)
- Warwickshire Waste Local Plan adopted 1995 and Minerals & Waste Development Framework – Core Strategy (in preparation)
- Other Minerals and Waste Local Plans / Local Development Frameworks (as necessary).

Table D1.1 In-combination Assessment Information

European Site	Relevant Plans	Relevant Projects	Comments
Rodborough Common SAC	• Plans within Stroud District Council's Local Development Framework Stroud District Council's Local Development Plan Core Strategy and Proposals map are under preparation hence no specific detail of development allocation is available. • Potentially other District LDFs within Gloucestershire.	• Cotswolds Canal Restoration Project. • Land east of the A38 at Colethrop Farm, Hardwicke (Housing at Hunts Grove) (1,750 with planning consent + 250 extra proposed in the Draft RSS. A further 1500 proposed in RSS proposed modifications in an area of	The only likely project to be of relevance in proximity of Rodborough Common SAC is the Cotswolds Canal Restoration Project.

European Site	Relevant Plans	Relevant Projects	Comments
	• Adopted Stroud Local Plan. • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. • Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • South West RSS. (revoked 6 July 2010).	search at Whaddon, south of Gloucester). • Proposal for the Aston Down site. • Housing at Cheapside Wharf, Stroud (c. 140). • Housing at Lister Petter site (c.600). • Housing at Bymacks, Long Street and Yellow. • Hundred Close, Dursley (c. 90) • Housing at Ebley Wharf, Westward Road, Ebley (c.120). • Housing at Brockworth (in Stroud District) (c.500). • In addition a number of smaller residential developments. • Nearby minerals working could have an adverse effect through dust deposition. • Any other major development identified in Development plans (or elsewhere) with the potential to have a significant effect on Rodborough Common SAC, including increases in traffic flows near or over the common.	
Dixton Wood SAC	• Plans within Tewkesbury Borough Council's Local Development Framework (Tewksbury Borough Council Local Development Scheme adopted 2009) & other District LDFs within Gloucestershire. • Adopted Tewkesbury Local Plan. • Joint Core Strategy (Tewkesbury Borough Council, Gloucester City Council and Cheltenham Borough Council) (in preparation). • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. • Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • South West RSS. (revoked 6 July 2010).	• National Grid gas pipeline project. • Proposed Gloucester Parkway Station. • Housing at Brockworth / Hucclecote (Gloucester) (c.1,400). • Housing north of Gloucester with associated infrastructure and employment (c. 2,500) (as proposed in Draft RSS. (revoked 6 July 2010)). • Housing north west of Cheltenham and associated infrastructure and employment (c. 5,000) (as proposed in Draft RSS. (revoked 6 July 2010)). • Housing at Leckhampton Lane, Shurdington (c.360). • Housing at M and G Sports (c.350).	The list of projects relates to the whole of Tewkesbury Borough (in which sites for 3578 new dwellings need to be found between Jan 2003 and 2011) , the majority of developments will be not near enough to Dixton Wood to have significant effects on the site.

European Site	Relevant Plans	Relevant Projects	Comments
		• Housing at Brockworth District (c.185). • Housing at Mill Lane, Brockworth (c.120). • Housing proposed in Brockworth Area of Search in RSS (revoked 6 July 2010) Proposed Modifications (1,500). • Housing at Southam parish (c.120). • Various waste disposal operations at Wingmoor Farm. • Housing and associated infrastructure and employment on Leckhampton White Land (c.1300) (as in Draft RSS. (revoked 6 July 2010)). • Any other major development identified in Development plans (or elsewhere) with the potential to have a significant effect on Dixton Wood.	
Wye Valley & Forest of Dean Bat Sites SAC	• Plans within the Forest of Dean District Council's Local Development Framework & potentially other District LDFs within Gloucestershire. (Detailed allocations for the development of individual sites will be included in the future Development Plan Documents to be prepared later in the Local Development Framework programme) • Adopted Forest of Dean Local Plan. • Monmouthshire County Council's (Unitary Authority) Development Plan. • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. • Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • Wye Valley AONB Management Plan. (This is currently being reviewed). • South West RSS. (revoked 6 July 2010).	• Cinderford Regeneration Project – including the Northern Quarter Area Action Plan (c. 575 town total). • Lydney Docks Regeneration Project. • Housing at East Lydney (c.1,250). • Coleford group of settlements 348 total. • Any other major development identified in Development plans (or elsewhere) with the potential to have a significant effect on the Wye Valley & Forest of Dean Bat Sites (SAC).	The list of projects relates to the whole of the District, but it is likely that the majority of developments will not be near enough to bat sites to have significant effects.
River Wye SAC	• Plans within the Forest of Dean District Council's Local	• Lydney Docks Regeneration Project. • National Grid gas pipeline project.	The list of projects relates to the whole of the District,

European Site	Relevant Plans	Relevant Projects	Comments
	Development Framework & potentially other District LDFs within Gloucestershire. • Adopted Forest of Dean Local Plan. • Monmouthshire County Council's Unitary Development Plan. • Relevant plans within Herefordshire Council's (Unitary Authority) Local Development Framework. • Powys County Council's Unitary development Plan. • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. • Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • Ross and Hereford Flood Defence Schemes. • The Asset Management Programme (4). • The Catchment Flood Management Plan. • Hereford Growth Point. • Any other Environment Agency plans – e.g. covering river navigation issues (as advised). • Wye Valley AONB Management Plan. • South West RSS. (revoked 6 July 2010).	• Any other major development identified in Development plans (or elsewhere such as the Lydney Area Action Plan (in preparation)) with the potential to have a significant effect on the River Wye.	but it is likely that the majority of developments will not be near enough to the River Wye to have significant effects.
Wye Valley Woodlands SAC	• Plans within the Forest of Dean District Council's Local Development Framework & potentially other District LDFs within Gloucestershire. • Adopted Forest of Dean Local Plan. • Monmouthshire County Council's Unitary Development Plan. • Relevant plans within Herefordshire Council's (Unitary Authority) Local Development Framework. • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. • Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • Wye Valley AONB Management Plan. • South West RSS (revoked 6 July 2010).	• National Grid gas pipeline project. • Any other major development identified in Development plans (or elsewhere) with the potential to have a significant effect on the Wye Valley Woodlands.	The list of projects relates to the whole of the District, but it is likely that the majority of developments will not be near enough to the Wye Valley Woodlands to have significant effects.

European Site	Relevant Plans	Relevant Projects	Comments
North Meadow & Clattinger Farm SAC	• Local Plans produced by the former district councils in Wiltshire (North Wiltshire Local plan) which are still relevant after 1 April, 2009. The policies contained within these documents currently form part of the development plan for Wiltshire and will remain in place until replaced by policies in new Development Plan Documents (DPD), particularly the Wiltshire Core Strategy. • Borough of Swindon Local Plan • Wiltshire Council Local Development Framework. • Wiltshire Council Minerals & Waste Development Plan Documents. • Wiltshire & Swindon Waste Local Plan. • Wiltshire & Swindon Minerals Local Plan. • Plans within Cotswold District Council's Local Development Framework • Adopted Cotswold District Local Plan. • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. • Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • Oxfordshire Minerals & Waste Local Plan (saved policies). • Oxfordshire Minerals Local Plan (Adopted). • Plans within Oxfordshire"s Minerals and Waste Development Framework. • Plans within Swindon Borough Council's Local Development Framework. • South West RSS. (revoked 6 July 2010)	• Housing at Kingshill North and South (c.490). • Mineral working / restoration / landfill operations at Sandpool Farm, Somerford Keynes. • Mineral extraction in the Cotswold Water Park at Cerney Wick Farm Quarry and Latton Farm Quarry. • Restoration sites in the Cotswold Water Park e.g. Carney Wick Farm & Cleveland Lakes. • Proposals for sand and gravel extraction at and in the vicinity of Down Ampney Airfiied. • Any other major development identified in Development plans (or elsewhere) with the potential to have a significant effect on North Meadow & Clattinger Farm.	The list of projects relates to the whole of the District, but it is likely that the majority of developments will not be near enough to North Meadow & Clattinger Farm to have significant effects.
Cotswold Beechwoods SAC	• Any relevant plans within Stroud District Council's emerging Local Development Framework. • Adopted Stroud Local Plan. • Any relevant plans within Tewkesbury Borough Council's emerging Local Development Framework. • Adopted Tewkesbury Local Plan.	• Cotswolds Canal Restoration Project. • Land east of the A38 at Colethrop Farm, Hardwicke (Housing at Hunts Grove) 1,750 with planning consent + 250 extra proposed in the Draft RSS. A further 1500 proposed in RSS proposed modifications in an area of search at Whaddon, south of Gloucester).	The list of projects relates to the whole of the districts of Stroud, Tewkesbury and Cotswolds, but it is likely that the majority of developments will not be near enough to the

European Site	Relevant Plans	Relevant Projects	Comments
	• Any relevant plans within Cotswold District Council's emerging Local Development Framework. • Adopted Cotswold Local Plan. • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. • Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • South West RSS. (revoked 6 July 2010).	• Housing at Brockworth (in Stroud District) (c.500). • Proposal for the Aston Down site. • Housing at Lister Petter site (c.650). • Housing at Bymacks, Long Street and Yellow Hundred Close, Dursley (c. 90) • Proposed Gloucester Parkway Station. • Housing at Brockworth (c.1,400). • Housing north of Gloucester with associated infrastructure and employment • (c. 2,500) (as proposed in Draft RSS). • Housing north west of Cheltenham and associated infrastructure and employment • (c. 5,000) (as proposed in Draft RSS). • Housing at Leckhampton (c.1300 – Area of Search). • Housing at M and G Sports (c.350). • Housing at Brockworth District (c.185). • Housing at Mill Lane, Brockworth (c.120). • Housing proposed in Brockworth Area of Search in RSS Proposed Modifications (1,500) • Housing at Southam parish (c.120). • Various waste disposal and management operations at Wingmoor Farm. • Kingshill North and South (c.490). • Bourton on the Water (124). • Land to north-east of Cotswold Mead, Painswick (nursing home and c. 20 associated ancillary dwellings) • Nearby minerals workings. • GCC Transport plan, proposal to increase road infrastructure in area of Cotswold Beechwoods (sites 4, 5, 6, 7, 8 and 9). • Various waste disposal and management operations at Wingmoor Farm (waste sites 1, 2 and 10, Land north of Railway Triangle (7), Netheridge Sewage Treatment Works (9),	Cotswold Beechwoods SAC to have direct significant effects. Potential effects from increased visitor numbers should be considered however the qualifying features of the SAC are not particularly sensitive to disturbance and appropriate management would need to be considered to address such effects.

European Site	Relevant Plans	Relevant Projects	Comments
		Land Adjacent to Quadrant Business Centre, Quedgley (5), Javelin Park, Stroud (4), Land at Moreton Valance, Stroud (6) and Nastend Farm (8). • Any other major development identified in Development plans (or elsewhere) with the potential to have a significant effect on the Cotswold Beechwoods (SAC). Housing figures come from Gloucestershire County Council Strategic Planning and are up-to-date as of 05/2009. Figures were checked in the adopted Local Plan 07 2010.	
Bredon Hill SAC	• Worcestershire County Council's Minerals & Waste Development Framework. • Worcestershire Waste Local Plan and emerging Waste Core Strategy • Worcestershire Minerals Local Plan. • Any relevant plans within Wychavon District Council's emerging Local Development Framework and the South Worcestershire Joint Core Strategy (SWJCS).. • Adopted Wychavon Local Plan. • Plans within Tewkesbury Borough Council's Local Development Framework. • Adopted Tewkesbury Borough Local Plan. • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. • Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • West Midlands RSS. (revoked 6 July 2010).	• Housing north of Gloucester with associated infrastructure and employment (c.2,500) (as proposed in Draft RSS). • Housing north west of Cheltenham and associated infrastructure and employment (c.5,000) (as proposed in Draft RSS). • Housing at Brockworth District (c.185). • Housing at Mill Lane, Brockworth (c.120). • Housing proposed in Brockworth Area of Search in RSS Proposed Modifications (1,500). • Housing at Southam parish (c.120). • Various waste disposal and management operations at Wingmoor Farm. • Any other major development identified in Development plans (or elsewhere) with the potential to have a significant effect on Bredon Hill.	The list of projects relates to the whole of Tewkesbury District, but it is likely that the majority of developments will not be near enough to Bredon Hill to have significant effects.
Walmore Common SPA and Ramsar	• Any relevant plans within the Forest of Dean District Council's emerging Local Development Framework. • Adopted Forest of Dean Local Plan. • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004.	• Development of wind turbines or wind farms along the Severn Estuary and the area around Walmore Common. • Development of a telecommunications mast system in the area around the common.	The list of projects relates to the whole of the Forest of Dean District, but it is likely that the majority of developments will not be

European Site	Relevant Plans	Relevant Projects	Comments
	• Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • South West RSS.	• Open access on common land. • Operation of sluice and water levels; implementation of a Water Level Management Plan and ditch management rotation. • Any other major development identified in Development plans (or elsewhere) with the potential to have a significant effect on Walmore Common SPA.	near enough to Walmore Common to have significant effects.
Severn Estuary SAC, SPA and Ramsar	• Any relevant plans within the Forest of Dean District Council's emerging Local Development Framework. • Adopted Forest of Dean Local Plan. • Any relevant plans within Stroud District Council's emerging Local Development Framework. • Adopted Stroud District Council Local Plan. • Any relevant plans within South Gloucestershire Council's emerging Local Development Framework. • Adopted South Gloucestershire Local Plan. • Adopted South Gloucestershire Minerals & Waste Local Plan. • Any relevant plans within Bristol City Council's emerging Local Development Framework. • Adopted Bristol City Council Local Plan. • Any relevant plans within North Somerset Council's emerging Local Development Framework. • Adopted North Somerset Local Plan. • Any relevant plans (including the Joint Waste Core Strategy) produced by the West of England Partnership. • Monmouthshire County Council's Development Plan. • Newport City Council's Unitary Development Plan. • Cardiff City Council's Unitary Development Plan. • The Vale of Glamorgan Council's Unitary Development Plan.	Stroud • Cotswolds Canal Restoration Project. • Land east of the A38 at Colethrop Farm, Hardwicke (Housing at Hunts Grove) (c.1,500 – 1,750). • Activity / development at Sharpness Docks. Forest of Dean • Lydney Docks Regeneration Project. • Housing at Lydney (c.1380 town total). • Other – outside of Gloucestershire – English / East side of Estuary • Development associated with the decommissioning of Berkeley power station. • Proposals at Oldbury power station. • Avonmouth Docks. • EA flood defence proposals for Avonmouth. • Wind turbine proposals in South Gloucestershire and around Avonmouth. • Proposals at Hinkley Point B power station. Other – outside of Gloucestershire – Welsh / West side of Estuary • Development projects / activity at Chepstow Docks. • Development projects / activity at Newport	Impacts on the Severn Estuary could potentially arise from a number of different sources or different kinds of development in a number of Authorities (both in England and in Wales) adjoining the Estuary. Effects of disturbance on qualifying bird populations is of particular importance together with any effects from water pollution.

European Site	Relevant Plans	Relevant Projects	Comments
	• The Shoreline Management Plan. • Relevant Catchment Flood Management Plans & Catchment Abstraction Management Strategies (EA). • Severn Estuary Flood Risk Management Strategy (EA) • Severn Estuary River Basin Management Plan • Rights of Way Improvement Plans. • Severn Estuary Partnership plans and strategies. • Regional Technical Statement for Aggregates (South Wales RAWP) • Wales Regional Waste Plans • Include Regulation 33 advice doc • Severn Estuary also has marine management by ASERA to ensure all activities are compatible with site's COs. • http://www.severnestuary.net/frms/index.html • http://www.environment-agency.gov.uk/research/planning/33172.aspx	Docks. • Development projects / activity at Cardiff Bay (Docks). • Development projects / activity at Newport Docks. • Development projects / activity at Barry Docks. • EA flood defence proposals for Caldicot. Other • The Crown Estate licences for sand and gravel dredging in English & Welsh water. A good source of information is the Severn Estuary Partnership website: http://www.severnestuary.net/sep/ This site has a variety of useful information on the Severn Estuary including mapped information on: - Major developments proposed in development plans - Major sewage discharges &planned improvements - Major industrial discharges. But the assessment of in-combination effects cannot be totally exhaustive; the list of other plans and projects has to be workable.	
Avon Gorge Woodlands SAC	• Any relevant plans within Bristol City Council's emerging Local Development Framework. • Adopted Bristol City Council Local Plan. • Any relevant plans within the Forest of Dean District Council's emerging Local Development Framework (LDF). • Adopted Forest of Dean Local Plan. • Any relevant plans within Stroud District Council's emerging Local Development Framework. • Adopted Stroud District Council Local Plan. • Any relevant plans within Cotswold District Council's emerging Local Development Framework. .	• Major housing or industrial development in and around the city of Bristol. • Strategic waste management proposals as part of the West of England Partnership Joint Core Strategy. • Any other major development identified in Development plans (or elsewhere) with the potential to have a significant effect on the Avon Gorge Woodlands.	It is likely that any significant impacts on this site are more likely to arise from development in Bristol rather than in Gloucestershire.

European Site	Relevant Plans	Relevant Projects	Comments
	• Adopted Cotswold District Council Local Plan. • Gloucestershire Waste Local Plan 2002 – 2012 Adopted October 2004. • Gloucestershire Minerals Local Plan 1997 – 2006 Adopted April 2003. • Any relevant plans within South Gloucestershire's emerging Local Development Framework. • Adopted South Gloucestershire Local Plan. • Adopted South Gloucestershire Minerals & Waste Local Plan. • Any relevant plans (including the Joint Waste Core Strategy) produced by the West of England Partnership. • Bristol Avon Catchment Flood Management Plan & Catchment Abstraction Management Strategy.		

NB - Housing figures come from Gloucestershire County Council Strategic Planning and are up-to-date as of 05/2009. Figures were checked in the adopted Local Plan 07 2010.

Table D1.2 Consideration of In-combination Effects

European Site	Relevant Waste Site	Impact type identified as having no likely significant effect or could not conclude no likely significant effect (Table 6.8)	Consideration of Other specific proposals that may contribute to an in combination likely significant effect (see final column of Table D1.1)	Identified potential likely significant effect (on European site Conservation Objectives) from other proposals	In combination likely significant effect
Cotswold Beechwoods SAC	4 Javelin Park, Stroud 5 Land adjacent to Quadrant Business Centre, Quedgeley	Air pollution pathway identified (*Section 4.2.3*). Air dispersion modelling findings are that for waste sites 7 (at 200 ktpa, 100 m stack) and 11 (at 100 ktpa, 80 m stack) it can be concluded that there would be no likely significant effect and for waste sites 4, 5, 6, 8 and 9, it could	The list of projects in *Table D1.1* relates to the whole of the districts of Stroud, Tewkesbury and Cotswolds, but it is likely that the majority of developments will not be near enough to the Cotswold Beechwoods SAC to have direct significant effects.	Air Pollution for waste sites 4, 5, 6, 7, 8, 9 and 11. It is considered that effects from waste sites 7 and 11 are unlikely to contribute given their contribution to air emissions at 200 ktpa and 100 ktpa are considered insignificant. It is considered that contribution to	No specific in-sources of in-combination effects identified, however further consideration will be required at the planning application stage.

European Site	Relevant Waste Site	Impact type identified as having no likely significant effect or could not conclude no likely significant effect (Table 6.8)	Consideration of Other specific proposals that may contribute to an in combination likely significant effect (see final column of Table D1.1)	Identified potential likely significant effect (on European site Conservation Objectives) from other proposals	In combination likely significant effect
	6 Land at Moreton Valence, Stroud 8 Nastend Farm, Stroudwater Business Park, Stonehouse, Stroud 9 Netheridge Sewage Treatment Works, Gloucester	not be concluded that there would be no likely significant effect for emissions from a generic thermal treatment facility on the Cotswold Beechwoods SAC (*Section 6.2*). Therefore a consideration of in-combination effects is required.	Potential effects from further contribution to air pollution from other emitting projects would need to be considered, however these projects would need to demonstrate no likely significant effect from air pollution alone and in-combination. No such projects have been identified at present. Potential effects from an increase in traffic pollution arising from transport plans and development would need to be considered, however these will need to demonstrate no likely significant effect at the plan and project level. Potential effects from increased visitor numbers should be considered however the qualifying features of the SAC are not particularly sensitive to disturbance and appropriate management would need to be considered to address such effects.	air pollution from waste sites 4, 5, 6, 8 and 9 would be unlikely to result in a likely significant effect in-combination with effects such as other emitting facilities or increased traffic pollution as they will need to demonstrate no likely significant effect alone or in-combination at the project level.	

European Site	Relevant Waste Site	Impact type identified as having no likely significant effect or could not conclude no likely significant effect (Table 6.8)	Consideration of Other specific proposals that may contribute to an in combination likely significant effect (see final column of Table D1.1)	Identified potential likely significant effect (on European site Conservation Objectives) from other proposals	In combination likely significant effect
Dixton Wood SAC	1 Areas A, B & C at Wingmoor Farm East, Tewkesbury 2 Areas A, B & C at Wingmoor Farm West, Tewkesbury 3 Easter Park, Ashchurch/ Tewkesbury Industrial Estate, Tewkesbury 10 The Park, Wingmoor Farm West, Tewkesbury	Air pollution pathway identified (*Section 4.2.3*). Air dispersion modelling findings are that for waste sites 1, 2, 3 and 10, it could not be concluded that there would be no likely significant effect for emissions from a generic thermal treatment facility on the Dixton Wood SAC (*Section 6.2*). Therefore a consideration of in-combination effects is required.	The list of projects relates to the whole of Tewkesbury Borough (in which sites for 3578 new dwellings need to be found between Jan 2003 and 2011) , the majority of developments will be not near enough to Dixton Wood to have significant effects on the site. Potential effects from further contribution to air pollution from other emitting projects would need to be considered, however these projects would need to demonstrate no likely significant effect from air pollution alone and in-combination. No such projects have been identified at present. Potential effects from an increase in traffic pollution arising from transport plans and development would need to be considered, however these will need to demonstrate no likely significant effect at the plan and project level. Potential effects from	Air Pollution for waste sites 1, 2, 3 and 10. It is considered that contribution to air pollution from waste sites 1, 2, 3 and 10 would be unlikely to result in a likely significant effect in-combination with effects such as other emitting facilities or increased traffic pollution as they will need to demonstrate no likely significant effect alone or in-combination at the project level.	No specific in-sources of in-combination effects identified, however further consideration will be required at the planning application stage.

European Site	Relevant Waste Site	Impact type identified as having no likely significant effect or could not conclude no likely significant effect (Table 6.8)	Consideration of Other specific proposals that may contribute to an in combination likely significant effect (see final column of Table D1.1)	Identified potential likely significant effect (on European site Conservation Objectives) from other proposals	In combination likely significant effect
			increased visitor numbers should be considered however the qualifying features of the SAC are not particularly sensitive to disturbance and appropriate management would need to be considered to address such effects.		
Severn Estuary SAC, SPA and Ramsar	12 Hurst Farm, Lydney 13 Land at Lydney Industrial Estate, Lydney	Air pollution pathway identified (*Section 4.2.3*). Air dispersion modelling findings are that for waste sites 12 and 13, it could not be concluded that there would be no likely significant effect for emissions from a generic thermal treatment facility on the Severn Estuary SAC (*Section 6.2*). Therefore a consideration of in-combination effects is required.	Impacts on the Severn Estuary could potentially arise from a number of different sources or different kinds of development in a number of Authorities (both in England and in Wales) adjoining the Estuary. Potential effects from further contribution to air pollution from other emitting projects would need to be considered, however these projects would need to demonstrate no likely significant effect from air pollution alone and in-combination. No such projects have been identified at present. Potential effects from an increase in traffic pollution arising from transport plans	Air Pollution for waste sites 12 and 13. It is considered that contribution to air pollution from waste sites 12 and 13 would be unlikely to result in a likely significant effect in-combination with effects such as other emitting facilities or increased traffic pollution as they will need to demonstrate no likely significant effect alone or in-combination at the project level.	No specific in-sources of in-combination effects identified, however further consideration will be required at the planning application stage.

European Site	Relevant Waste Site	Impact type identified as having no likely significant effect or could not conclude no likely significant effect (Table 6.8)	Consideration of Other specific proposals that may contribute to an in combination likely significant effect (see final column of Table D1.1)	Identified potential likely significant effect (on European site Conservation Objectives) from other proposals	In combination likely significant effect
			and development would need to be considered, however these will need to demonstrate no likely significant effect at the plan and project level. Potential effects from air pollution on supporting habitats should be considered. Potential effects from increased visitor numbers should be considered however development in the local area would need to demonstrate no significant effects from an increase in disturbance from visitor pressure.		
Severn Estuary SAC, SPA and Ramsar	4 Javelin Park, Stroud 5 Land adjacent to Quadrant Business Centre, Quedgeley 6 Land at Moreton Valence,	• Water pollution pathway identified for waste sites 4, 5, 6, 8, 9, 12, and 13 (*Section 4.2.3*). Mitigation measures were discussed which the assessment concludes will render potential adverse effects insignificant for all of these waste sites (*Section 6.3*). • Bird disturbance effects identified for waste sites 12	Impacts on the Severn Estuary could potentially arise from a number of different sources or different kinds of development in a number of Authorities (both in England and in Wales) adjoining the Estuary. Effects of disturbance on qualifying bird populations is of particular importance together with any effects from	Water Pollution: • Abstraction and other water works will be undertaken under EA consents, such that there is unlikely to be any significant effect. It is also assumed that standard development control will ensure proposals comply with regulator standards, such that there is unlikely to be any significant effect.	No specific in-sources of in-combination effects identified, however further consideration will be required at the planning application stage.

European Site	Relevant Waste Site	Impact type identified as having no likely significant effect or could not conclude no likely significant effect (Table 6.8)	Consideration of Other specific proposals that may contribute to an in combination likely significant effect (see final column of Table D1.1)	Identified potential likely significant effect (on European site Conservation Objectives) from other proposals	In combination likely significant effect
	Stroud 8 Nastend Farm, Stroudwater Business Park, Stonehouse, Stroud 9 Netheridge Sewage Treatment Works, Gloucester 12 Hurst Farm, Lydney 13 Land at Lydney Industrial Estate, Lydney	and 13 (*Section 4.2.4*). The bird disturbance assessment (*Section 6.3* and *Annex C*) concluded no likely significant effects on the Severn Estuary SPA and Ramsar from the development of a waste facility on waste site 12. Mitigation measures were discussed for waste site 13 which would render potential adverse effects insignificant (*Section 6.4* and *Annex C*).	water pollution.	• It is likely that a number of developments will not be near enough to the Severn Estuary SAC to have significant effects from run off via surface water links. It is assumed that standard development control will ensure all new housing proposals meet the required regulator standards such that it would be unlikely for significant effect to occur due to water pollution. Bird disturbance: • Any proposals in the vicinity of the Severn Estuary SPA and Ramsar and shoreline habitat used by qualifying bird populations will need to demonstrate that they will have no significant adverse effects on the integrity of the European site either through mitigation or appropriate positioning of the development.	

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