

Bradford Metropolitan District Council Waste Management DPD

Habitats Regulations Assessment

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Executive Summary

HRA is required under the EU Habitats Directive (92/43/EEC) for any proposed plan or project which may have a significant effect on one or more European sites. The purpose of HRA is to determine whether or not significant effects are likely and to suggest ways in which they could be avoided.

The first stage of HRA is screening. Screening involves identifying whether a plan or project could have any Likely Significant Effects (LSEs) on any European Designated sites.

European designated sites are Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). National planning policy also recommends that Ramsar sites should be afforded the same level of consideration as SPAs and SACs. HRA relates specifically to the reasons why sites have been identified as European sites (qualifying interests). European sites are often formed of several component Sites of Special Scientific Interest (SSSI).

The Bradford Waste Management DPD (the Preferred Approach document (January 2011) together with the Bradford Waste Management DPD Revised Chapter 5 document (October 2011) was screened for LSEs earlier in 2012 and the findings of this exercise were reported within the Bradford Metropolitan District Council Core Strategy and Waste Management DPD Habitats Regulations Assessment Screening Report (ENVIRON, June 2012).

The screening exercise identified LSEs on the following European designated sites from an increase in emissions to air from the allocation of ‘Site 78 – Aire Valley Road, Worth Village Keighley’ for waste management use

- South Pennine Moors Phase 2 SPA;
- South Pennine Moors SAC;
- North Pennine Moors SPA; and
- North Pennine Moors SAC.

An in-combination effect was also identified in relation to increased air pollution from population and traffic increases in neighbouring authority areas combining with increased air pollution within the plan area (including from traffic and the proposed new waste management site near Keighley) potentially affecting the South Pennine Moors Phase 2 SPA, South Pennine Moors SAC, the North Pennine Moors SPA and the North Pennine Moors SAC.

As the findings of the HRA screening exercise could not conclude that the Waste Management DPD would not result in adverse effects on European designated sites, the HRA of the plan has progressed to the next stage of HRA: Appropriate Assessment (AA). In order to provide the evidence required for the AA, an air quality modelling exercise has been undertaken.

An air quality modelling exercise has been undertaken to ascertain whether a hypothetical waste management use, using combustion processes, at proposed Site 78 of the Bradford Waste Management DPD could have adverse effects on European designated sites.

The air quality modelling exercise has found that at the closest receptors to Site 78, which are located on a component site of the South Pennine Moors SPA/SAC (locally called Rombald’s Moor), the impact from acidification is at a maximum 2% of the critical load. This cannot be scoped out as insignificant as it is over the 1% significance threshold.

It is important to note that if the impact is greater than 1%, it should not automatically be concluded that there would be a Likely Significant Effect on the SPA/SAC. It means that further investigation and assessment is required to determine whether the predicted impact will have a 'Likely Significant Effect' on the interest features of the site (Conservation Objectives).

Where the process concentrations cannot be considered as insignificant, the next stage in the assessment process is to consider the process contribution together with the existing background concentration, to calculate the Predicted Environmental Concentration (PEC) to determine the overall impact on air quality.

At the receptor locations existing background acid deposition is already significantly above the critical load and whilst the addition from the waste facility is small (2% of the critical load), the resulting PEC is at least 200% of the critical load.

The study has considered that potential deposition will impact on the most sensitive vegetation classes which could be found within the SPA/SAC. The study is also based on maximum permitted releases from the potential waste management use on Site 78. The impacts are only just above the insignificant level and will have little impact on overall deposition. However, in the interests of the precautionary principle, the potential effect cannot be ruled out and should be considered further.

With regard to arsenic the predicted results are just above the 1% criteria at two receptors. However, the calculated PEC is under 5% of the critical load and thus not considered significant.

The air quality modelling exercise has therefore identified a potential significant adverse effect on a component site of the South Pennine Moors SPA/SAC (locally called Rombald's Moor), from acidification.

Natural England and the Environment Agency have been consulted on the findings of the air quality modelling exercise. Clarifications have been provided in response to queries raised by the consultees regarding the methodology employed and these can be found in Section 5 of this report. Natural England is broadly in agreement with the findings of the air quality modelling exercise and agree that a significant effect on the South Pennine Moors SPA/SAC cannot be ruled out. The Environment Agency did not comment on the significance of the potential impacts.

In conclusion, the findings of this air quality modelling exercise suggest that although the addition of the emissions from a waste facility would be relatively small, acid deposition is already in excess of the critical load for this part of the South Pennine Moors SPA/SAC (Rombald's Moor) and therefore a waste management use involving combustion processes on proposed Site 78 of the Bradford Waste Management DPD would potentially exacerbate an existing situation. With regards to impact avoidance measures, it is therefore suggested that proposed Site 78 of the Bradford Waste Management DPD may not be suitable for a waste management use which uses combustion processes and it is recommended that the Bradford Waste Management DPD is amended to reflect that this use should not be identified as being suitable for Site 78. Alternative sites within the Plan Area should instead be identified for waste management use using combustion process, if it is necessary to provide such a facility within the District. It should be noted that this assessment has not considered other proposed allocated sites which are located further away from the SAC/SPA than Site 78. Therefore, until the impact avoidance measures are put in place it is not possible to conclude that the Bradford Waste Management DPD will not result in adverse effects on European sites.

1 Background

The Bradford Waste Management DPD (the Preferred Approach document (January 2011) together with the Bradford Waste Management DPD Revised Chapter 5 document (October 2011)) was screened for Likely Significant Effects (LSEs) earlier in 2012 and the findings of this exercise were reported within the Bradford Metropolitan District Council Core Strategy[1] and Waste Management DPD Habitats Regulations Assessment Screening Report (ENVIRON, June 2012).

The screening exercise identified LSEs on the following European designated sites from an increase in emissions to air from the allocation of 'Site 78 – Aire Valley Road, Worth Village Keighley' for waste management use

- South Pennine Moors Phase 2 SPA;
- South Pennine Moors SAC;
- North Pennine Moors SPA; and
- North Pennine Moors SAC.

An in-combination effect was also identified in relation to increased air pollution from population and traffic increases in neighbouring authority areas combining with increased air pollution within the plan area (including from traffic and the proposed new waste management site near Keighley) potentially affecting the South Pennine Moors Phase 2 SPA, South Pennine Moors SAC, the North Pennine Moors SPA and the North Pennine Moors SAC. Relevant information about these sites is provided within Table 1.1. More detailed information about the designated sites can be found within the Bradford Metropolitan District Council Core Strategy and Waste Management DPD Habitats Regulations Screening Assessment (ENVIRON UK Ltd, June 2012).

The information in Table 1.1 shows that all of the European designated sites can be adversely affected by air pollution and atmospheric deposition.

[1] The Bradford Waste Management DPD was screened at the same time as the Bradford Core Strategy DPD.

Table 1.1: European designated sites potentially affected

Site Name	Location	Relevant reasons for designation	Conservation objectives	Relevant potential effects on favourable condition status
South Pennine Moors Phase 2 SPA	A component site lies within Bradford District south of Ilkley and north of Keighley and Baildon. Other component sites are located within the District to the west and south of Oakworth/Howarth. Remainder of site lies outside of the District boundary, within 25 km of the District boundary.	Qualifies under Article 4.1 of the Directive (79/409/EEC) for breeding; • *Asio flammeus* Short-eared owl; • *Falco columbarius* Merlin; and • *Pluvialis apricaria* Golden plover. Also under Article 4.2 of the Directive (79/409/EEC) for supporting internationally important assemblages of birds.	Maintenance of the ecosystems on which the birds depend.	Air pollution and atmospheric deposition is likely to be an important cause of eutrophication for wet and dry heaths.
South Pennine Moors SAC	The SAC covers the same footprint as the SPA within the Bradford District. A component site lies within Bradford District south of Ilkley and north of Keighley and Baildon. Other component sites are located within the District to the west and south of Oakworth/Howarth. Remainder of site lies outside of the District boundary, within 25 km of the District boundary.	Annex 1, Primary: • 4030 European dry heaths. • 7130 Blanket bogs * Priority feature • 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles. Non Primary: • 4010 Northern Atlantic wet heaths with *Erica tetralix*. • 7140 Transition mires and quaking bogs	Maintenance of the Annex I habitats that are a primary reason for selection of this site and maintenance of non-primary habitats.	Air pollution and atmospheric deposition is likely to be an important cause of eutrophication for wet and dry heaths.
North Pennine Moors SPA	This site lies approximately 1.5 km to the north/north-east of the Bradford District boundary. The closest component site lies approximately 1.5km to the north of Ilkley.	Primary, Annex 1 species: • A082 *Circus cyaneus* 2.2% of the GB breeding population (Count as at 1993 and 1994) • A098 *Falco columbarius* 10.5% of the GB breeding population (Estimated population) • A103 *Falco peregrinus* 1.3% of the GB breeding	Maintenance of the ecosystems on which the birds depend.	There is evidence that acidic and nitrogen deposition are having damaging effects on the vegetation and hence on the

		population (Count as at 1991) • A140 *Pluvialis apricaria* (North-western Europe - breeding) at least 6.2% of the GB breeding population (Estimated population) There are no non-primary reasons for designation.		bird populations.
North Pennine Moors SAC	The SAC covers the same footprint as the North Pennine Moors SPA. This site lies approximately 1.5 km to the north/north-east of the Bradford District boundary. The closest component site lies approximately 1.5km to the north of Ilkley.	Primary, Annex 1 habitats • European dry heaths • *Juniperus communis* formations on heaths or calcareous grasslands • Petrifying springs with tufa formation (*Cratoneurion*) * Priority feature • Siliceous rocky slopes with chasmophytic vegetation • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles • Blanket bogs Non Primary, Annex 1 habitats: • 4010 Northern Atlantic wet heaths with *Erica tetralix* • 6130 Calaminarian grasslands of the *Violetalia calaminariae* • 6150 Siliceous alpine and boreal grasslands • 6210 Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) • 7230 Alkaline fens • 8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) • 8210 Calcareous rocky slopes with chasmophytic vegetation Non Primary, Annex 2 species • Marsh saxifrage *Saxifraga hirculus*	Maintenance of the Annex I habitats that are a primary reason for selection of this site and maintenance of non-primary habitats.	There is evidence that acidic and nitrogen deposition are having damaging effects on the vegetation.

The following recommendations were made in the HRA Screening Report (ENVIRON, June 2012):

- The potential effects from a waste management use on ‘site 78 Aire Valley Road, Worth Village Keighley’ on European sites could be avoided by the plan stating that an incinerator, gasification and/or pyrolysis plant is not operated on that site;
- Alternatively, potential effects of an incinerator, gasification and/or pyrolysis plant on the South Pennine Moors Phase 2 SPA, should it be proposed, would need to be assessed and mitigated at the planning application level through a project level appropriate assessment (AA). It is not known whether a project level AA would be able to conclude that such a facility would not have an adverse effect on the South Pennine Moors Phase 2 SPA; and
- Waste Management DPD Preferred Policy WDM2: Assessing All Applications for New, Expanded and Residual Waste Management Facilities – the policy wording should read that “adverse effects on European designated sites are avoided.” Currently the policy requires adverse effects to be minimised which is not strong enough to conclude that the plan will not have an adverse effect on European sites.

As the findings of the HRA screening exercise could not conclude that the Waste Management Plan DPD would not result in adverse effects on European designated sites, the HRA of the plan has progressed to the next stage of HRA: Task 2 Appropriate Assessment (AA).
In order to provide the evidence required for the AA, an air quality modelling exercise has been undertaken to establish whether an incinerator, gasification and/or pyrolysis plant could result in adverse effects on the European designated sites identified and whether the Waste Management DPD policy wording should be changed.

This report presents the findings of the Appropriate Assessment (AA) of the Bradford Waste Management DPD and puts forward measures to be incorporated into the Bradford Waste Management DPD to ensure that it does not result in any adverse effects on European designated sites.

2 Bradford Waste Management DPD

2.1 Introduction

Bradford Metropolitan District Council is currently preparing a Local Development Framework (LDF) for Bradford which will contain a number of Development Plan Documents (DPD). The Waste Management DPD is being prepared as part of the Bradford LDF.

The Waste Management DPD needs to be in line with the Core Strategy, as it will be instrumental in shaping the future Waste Management needs of the District such as the locations of new housing, policies relating to sustainable construction, suitable areas for commercial development and associated infrastructure to be delivered within the District. As the two DPDs relate to each other in this way and both set spatial strategies for the District it was therefore considered appropriate to screen both documents for potential effects on European sites at the same time. The findings of the screening exercise can be found in Bradford Metropolitan District Council Core Strategy[2] and Waste Management DPD Habitats Regulations Assessment Screening Report (ENVIRON, June 2012).

2.2 The Waste Management DPD

The Waste Management DPD will set out the Council's spatial strategy for dealing with all types of waste within the Bradford District. It will identify waste management sites for dealing with the main streams of waste such as:

- Municipal Solid Waste (MSW); and
- Commercial and Industrial waste.

With criteria based policies for the management of the following waste streams:

- Agricultural;
- Construction, Demolition and Excavation;
- Hazardous; and
- Residual.

The Waste Management DPD will:

- Set out the broad vision for the future of waste management within the District and objectives for sustainable development of waste management over the next 10 – 20 years;
- Set out spatial policies for steering and shaping the development of waste management to deliver both the vision and objectives;
- In particular, set out the potential locations for new waste management facilities; and
- Take account of national and regional policy and the Council's policies in the 2020 Bradford Vision and Community Strategy and the emerging Core Strategy DPD.

The Waste Management DPD is also being developed over a number of stages. The stages completed and related consultation documents are as follows:

- Issues and Options (consultation November 2009 – January 2011);

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[2] The Bradford Waste Management DPD was screened at the same time as the Bradford Core Strategy DPD.

- Preferred Approach (consultation January – April 2011); and
- Preferred Approach - Revised Chapter 5 (consultation October - December 2011).

The Bradford Waste Management DPD Preferred Approach (January 2011) and the Revised Chapter 5 (October 2011) together form the most recent version of the Waste Management DPD. This is because focussed consultation on a revised version of Chapter 5 (relating to potential waste management sites) of the draft plan was undertaken at the end of 2011.

The "Waste Management DPD Preferred Approach (January 2011)" and the "Waste Management DPD Preferred Approach Revised Chapter 5 (October 2011)" have been subject to HRA screening.

The next stage of the Waste Management DPD preparation involves the production of a draft Submission version, which is expected to be published for consultation later in 2012. Following consultation, the Core Strategy will be submitted to the Government for examination.

3 Methodology

3.1 Introduction

This section sets out the approach adopted for the HRA.

3.2 Approach to the HRA

Figure 3.1 sets out the overall HRA process in accordance with the CLG draft guidance[3]. Current best practice demonstrates that a blurring of the tasks in an iterative manner is the most effective method of assessing a plan as it develops and therefore the process should be revisited as policies develop, in response to consultation and as more information becomes available.

This report relates to HRA tasks 2 and 3.

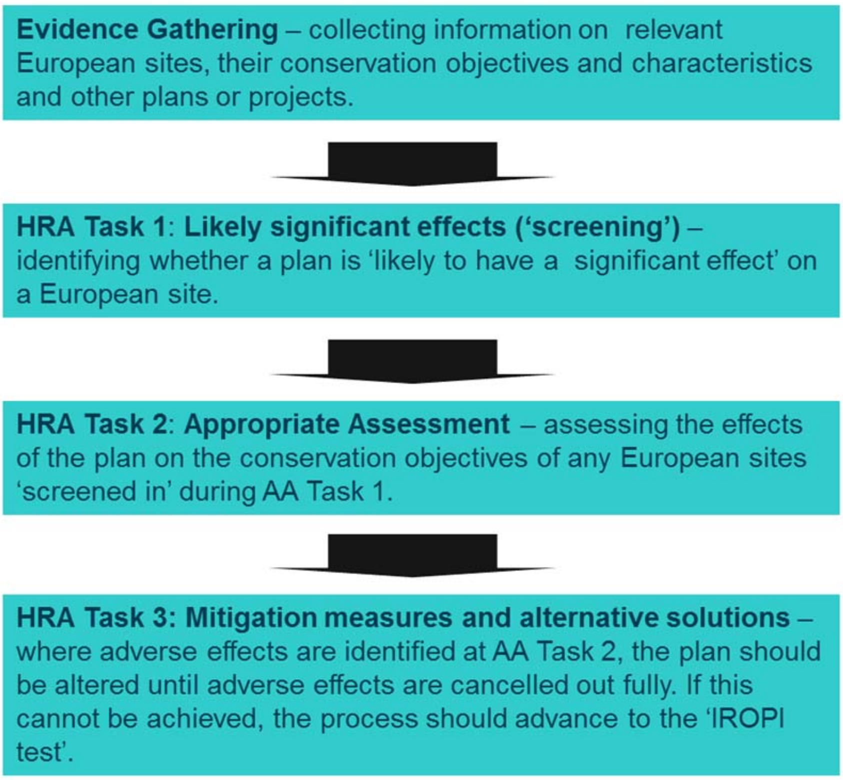

Figure 3.1 The HRA Process

The findings of HRA task 1 (screening) are discussed in Section 1. LSEs were identified in HRA task 1 and it has been decided by Council Officers to further investigate the potential effects on air quality should 'Site 78 – Aire Valley Road, Worth Village Keighley' be allocated within the Waste Management DPD for all waste management uses, including incineration, gasification or pyrolysis processes (please see Bradford Metropolitan District Council Core

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[3] Department for Communities and Local Government (August 2006) Planning for the Protection of European Sites: Appropriate Assessment, Guidance for Regional Spatial Strategies and Local Development Documents, Consultation Document. DCLG Publications

Strategy and Waste Management DPD Habitats Regulations Assessment Screening Report (ENVIRON, June 2012) and the Bradford Waste Management DPD Revised Chapter 5 (October 2011) for maps showing the locations of the SPA/SAC and the proposed waste sites).

The objectives of HRA task 2 are to ascertain potential effects on the integrity of the South Pennine Moors Phase 2 SPA, the South Pennine Moors SAC, the North Pennine Moors SPA and the North Pennine Moors SAC (including potential in-combination effects).

The objectives of HRA task 3 are to Identify any recommended measures by which any potential effects can be avoided e.g. through changes to policy wording in the Waste Management DPD.

An air quality modelling exercise has been undertaken to provide the evidence required to ascertain potential effects on site integrity. The methodology employed for the modelling exercise is set out below.

The results of the modelling exercise were consulted on with Natural England and the Environment Agency. The responses received from these organisations are discussed in Section 5.

3.3 Evidence Gathering

3.3.1 Air Dispersion Modelling

The ADMS 4.2 dispersion model has been used to predict ground level concentrations of pollutants arising from a hypothetical waste treatment plant to be located at site 78, Aire Valley Road, Worth Village Keighley. This is a new generation air dispersion modelling system used to support regulatory and non-regulatory modelling requirements worldwide. The model has been extensively validated against field data sets and has been subject to numerous validation studies.

3.3.2 Input Data

In order to model the impacts of a waste treatment plant, it was first necessary to establish a hypothetical plant, suitable for the proposed site in order to determine relevant input data for the modelling. This was carried out by reviewing a number of recent planning applications for pyrolisation and gasification plants throughout the UK, with an annual waste handling capacity of approximately 100 000 tonnes per annum. When selecting the parameters a conservative approach was taken. A summary of the data obtained and that included within the modelling is provided in Table 3.1 below.

Table 3.1: Model Input Data

Parameter	Range	Selected
Stack Height (m)	27 - 65	27
Stack Diameter (m)	1.3 – 2.0	1.5
Exhaust Temperature (˚C)	125 - 401	125
Exit Velocity (m/s)	12.0 - 21.3	15
Actual gas flow rate (m^3/s)	33 - 34	34
Normalised flow rate (Nm^3/s)	13.0 - 18.7	18.7

The waste treatment site will have to comply with the Waste Incineration Directive (WID). Thus for the purposes of the modelling the emission limits included in Annex V of the WID have been used to calculate the emission rate of pollutants arising from the proposed facility. The emission rates used in the modelling are presented in Table 3.2.

Table 3.2: Pollutant Emission Rates

Pollutant	WID Emission Limit mg/Nm^3	Emission Rate g/s
Oxides of Nitrogen (NOx)	200	3.74
Sulphur Dioxide (SO_2)	50	0.935
Hydrogen Chloride (HCl)	10	0.187
Hydrogen Fluoride (HF)	1	0.0187
Ammonia (NH3)	10	0.187
Group 1 metals	0.05	0.0009
Group 2 metals	0.05	0.0009
Group 3 metals	0.5	0.0094

All data inputs were discussed and agreed with Bradford City Council.

The model has been run to predict concentrations at a selected number of receptors located in the North Pennines SPA/SAC and South Pennines SPA/SAC as shown in Figure 3.2. The receptors have been chosen to represent both the likely maximum and the typical average ground level concentration of pollutants within each area of the SAC/SPA. The waste treatment site is marked with the red dot.

Given the complex nature of the terrain surrounding Keighley, terrain data was included within the model as it was considered terrain was likely to impact the dispersion of pollutants.

Hourly sequential meteorological data from the Bingley Meteorological Station for 2007 to 2011 were used in the modelling. The model was run for each year separately and then the maximum concentration from the five years calculated and used for comparison with the critical loads and critical levels More information on the methodology used to select the relevant critical loads and levels is given in Section 4.

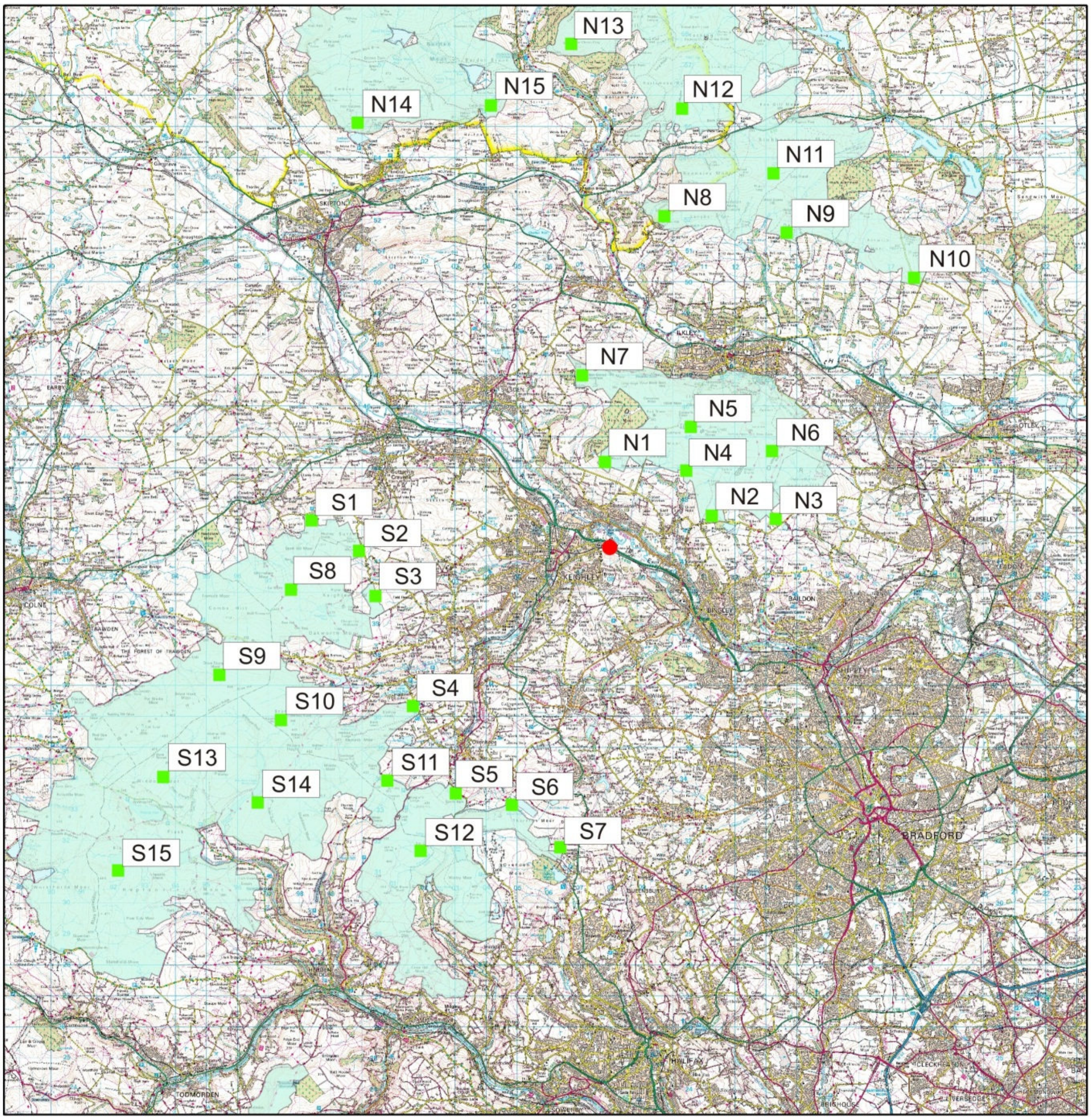

Figure 3.2: Receptor Locations

3.3.3 Model Outputs

The results of the modelling have been compared with the relevant critical levels and critical loads to determine the significance of impacts arising from the proposed waste treatment facility. The relevant critical levels have been sourced from the Environment Agency's H1 guidance[4] and are provided in Table 3.3.

Table 3.3: Critical Levels for the Protection of Vegetation and Ecosystems			
Pollutant	**Concentration (µg/m^3)**	**Reference Period**	**Notes**
Ammonia	1	Annual mean	For sensitive lichen and

[4] Environment Agency H1, December 201, Environmental Risk Assessment Framework Annex F – Air Emissions

			bryophyte communities
	3	Annual mean	For all other plants
Sulphur Dioxide	10	Annual mean	For sensitive lichen and bryophyte communities
	20	Annual mean	For all other plants
Nitrogen Oxides (as NO_2)	30	Annual mean	All plants
	75	Daily mean	All plants
Hydrogen Fluoride	<5	Daily mean	All plants
	<0.5	Weekly mean	All plants

To allow comparison with relevant critical loads, the ground level concentrations of pollutants must first be converted to deposition rates. The detailed methodology for this conversion is provided in Annex A. The relevant critical loads for nutrient nitrogen and acidification have been sourced from the APIS website[5] and are provided in Table 3.4. For each SAC/SPA area the website provides data for a range of habitat types. In all cases the critical load for the most sensitive habitat type has been chosen. The complete APIS data for all habitats included in the North and South Pennine Moors SAC/SPAs is given in Annex B.

Table 3.4: Minimum Critical Loads for Nutrient Nitrogen and Acidity

Criteria	Site	Critical Load	
		Grassland	**Forest**
Nutrient Nitrogen[1] (N/ha/yr)	North Pennine Moors	5-10	10-15
	South Pennine Moors	5-10	10.-15
Acidification[2] (keq/ha/yr)	North Pennine Moors	0.491	0.606
	South Pennine Moors	0.569	0.713

[1] Critical Load presented as a range

[2] Minimum CLMaxN for each site and vegetation class

The critical loads for heavy metals has been obtained from the Environment Agency's H1 guidance and are provided in Table 3.5.

Table 3.5: Critical Loads for Heavy Metals

Group	Metal	Deposition Rate (mg/m^2/day)
Group 1 metals	Cadmium	0.009

[5] http://www.apis.ac.uk/

Group 2 metals	Mercury	0.004
Group 3 metals	Arsenic	0.02
	Lead	1.1
	Chromium	1.5
	Copper	0.25
	Nickel	0.11

3.3.4 Significance Criteria

To determine the significance of the releases on the SAC/SPAs, the results have been assessed using the criteria given in H1. Releases can be considered to be insignificant if:

- Process Contribution long term <= 1 % of the long term environmental benchmark (critical level or critical load); and
- Process Contribution short term <= 10 % of the short term environmental benchmark.

Where the process concentrations cannot be considered as insignificant, the next stage in the assessment process is to consider the process contribution together with the existing background concentration, to calculate the Predicted Environmental Concentration (PEC) to determine the overall impact on air quality.

It is important to note that if the impact is greater than 1%, it should not automatically be concluded that there would be a Likely Significant Effect on the SPA/SAC. It means that further investigation and assessment is required to determine whether the predicted impact will have a 'Likely Significant Effect' on the interest features of the site (Conservation Objectives).

4 Findings

4.1 Ambient Air Concentrations

The predicted ground level concentrations of NOx, SO_2, NH_3 and HF in ambient air together with a comparison with the relevant critical levels are provided in Table 4.1. As it is not possible to calculate a weekly average using the ADMS model, the daily mean has been compared with both the daily mean reference level and the weekly mean reference level to assess the significance of impacts.

The comparison indicates that at all receptor locations the predicted contribution from the waste facility will be less than 1% of the critical level and thus can be considered to be insignificant.

Table 4.1: Predicted Ground Level Concentrations and Comparison with Critical Levels

Site	Ground Level Concentrations µg/m^3					Percentage of Critical Level					
	Annual Mean			Daily Mean		Annual Mean			Daily Mean		Weekly mean[2]
	NOx	SO_2	NH_3	NOx	HF	NOx	SO_2	NH_3	NOx	HF	HF
N1	0.07	0.02	0.003	0.07	0.0003	0.2	0.2	0.3	0.1	0.0	0.1
N2	0.12	0.03	0.006	0.12	0.0006	0.4	0.3	0.6	0.2	0.0	0.1
N3	0.08	0.02	0.004	0.08	0.0004	0.3	0.2	0.4	0.1	0.0	0.1
N4	0.12	0.03	0.006	0.13	0.0006	0.4	0.3	0.6	0.2	0.0	0.1
N5	0.09	0.02	0.004	0.09	0.0005	0.3	0.2	0.4	0.1	0.0	0.1
N6	0.05	0.01	0.002	0.05	0.0003	0.2	0.1	0.2	0.1	0.0	0.1
N7	0.03	0.01	0.002	0.03	0.0001	0.1	0.1	0.2	0.0	0.0	0.0
N8	0.02	0.00	0.001	0.02	0.0001	0.1	0.0	0.1	0.0	0.0	0.0
N9	0.03	0.01	0.001	0.03	0.0001	0.1	0.1	0.1	0.0	0.0	0.0
N10	0.02	0.01	0.001	0.03	0.0001	0.1	0.1	0.1	0.0	0.0	0.0
N11	0.02	0.01	0.001	0.02	0.0001	0.1	0.1	0.1	0.0	0.0	0.0
N12	0.01	0.00	0.001	0.01	0.0001	0.0	0.0	0.1	0.0	0.0	0.0
N13	0.01	0.00	0.001	0.01	0.0001	0.0	0.0	0.1	0.0	0.0	0.0
N14	0.01	0.00	0.001	0.02	0.0001	0.0	0.0	0.1	0.0	0.0	0.0
N15	0.01	0.00	0.001	0.01	0.0001	0.0	0.0	0.1	0.0	0.0	0.0
S1	0.02	0.01	0.001	0.02	0.0001	0.1	0.1	0.1	0.0	0.0	0.0
S2	0.03	0.01	0.002	0.03	0.0002	0.1	0.1	0.2	0.0	0.0	0.0
S3	0.03	0.01	0.002	0.04	0.0002	0.1	0.1	0.2	0.0	0.0	0.0
S4	0.04	0.01	0.002	0.04	0.0002	0.1	0.1	0.2	0.0	0.0	0.0
S5	0.02	0.01	0.001	0.02	0.0001	0.1	0.1	0.1	0.0	0.0	0.0

S6	0.02	0.00	0.001	0.02	0.0001	0.1	0.0	0.1	0.0	0.0	0.0
S7	0.01	0.00	0.001	0.01	0.0001	0.0	0.0	0.1	0.0	0.0	0.0
S8	0.03	0.01	0.001	0.03	0.0001	0.1	0.1	0.1	0.0	0.0	0.0
S9	0.02	0.01	0.001	0.02	0.0001	0.1	0.1	0.1	0.0	0.0	0.0
S10	0.02	0.01	0.001	0.02	0.0001	0.1	0.1	0.1	0.0	0.0	0.0
S11	0.03	0.01	0.001	0.03	0.0001	0.1	0.1	0.1	0.0	0.0	0.0
S12	0.02	0.00	0.001	0.02	0.0001	0.1	0.0	0.1	0.0	0.0	0.0
S13	0.02	0.00	0.001	0.02	0.0001	0.1	0.0	0.1	0.0	0.0	0.0
S14	0.02	0.01	0.001	0.02	0.0001	0.1	0.1	0.1	0.0	0.0	0.0
S15	0.02	0.00	0.001	0.02	0.0001	0.1	0.0	0.1	0.0	0.0	0.0
Critical Level						30	10[1]	1[1]	75	5	0.5

[1] Level for most sensitive plants

[2] Comparison of daily mean with weekly limit

4.2 Nutrient Nitrogen

The predicted contribution from the waste processing facility on nutrient nitrogen is provided in Table 4.2. Comparison with the minimum critical load provided for all relevant ecosystem/vegetation types within either the North Pennine Moors SAC/SPA or South Pennine Moors SAC/SPA, indicates that the contribution will be less than 1% at all locations and thus can be considered to be insignificant.

Table 4.2: Predicted Nutrient Nitrogen Deposition and Comparison with Critical Loads

Receptor	Nutrient Nitrogen Deposition kg/ha/yr		Percentage of Critical Level	
	Grassland	Forest	Grassland	Forest
N1	0.03	0.04	0.5	0.4
N2	0.05	0.08	1.0[1]	0.8
N3	0.03	0.06	0.7	0.6
N4	0.05	0.08	1.0[1]	0.8
N5	0.04	0.06	0.7	0.6
N6	0.02	0.03	0.4	0.3
N7	0.01	0.02	0.2	0.2
N8	0.01	0.01	0.2	0.1
N9	0.01	0.02	0.2	0.2
N10	0.01	0.02	0.2	0.2
N11	0.01	0.01	0.2	0.1
N12	0.01	0.01	0.1	0.1
N13	0.00	0.01	0.1	0.1

N14	0.01	0.01	0.1	0.1
N15	0.00	0.01	0.1	0.1
S1	0.01	0.02	0.2	0.2
S2	0.01	0.02	0.3	0.2
S3	0.01	0.02	0.3	0.2
S4	0.01	0.02	0.3	0.2
S5	0.01	0.01	0.2	0.1
S6	0.01	0.01	0.1	0.1
S7	0.00	0.01	0.1	0.1
S8	0.01	0.02	0.2	0.2
S9	0.01	0.01	0.2	0.1
S10	0.01	0.01	0.2	0.1
S11	0.01	0.02	0.2	0.2
S12	0.01	0.01	0.1	0.1
S13	0.01	0.01	0.1	0.1
S14	0.01	0.01	0.2	0.1
S15	0.01	0.01	0.1	0.1
Minimum Critical Load			5	10
[1] Actual value less than 1.0				

4.3 Acid Deposition

The combined impact of dry acid deposition from emissions of NOx, SO_2, NH_3 and wet and dry deposition of HCl on grassland and forest habitats is provided in Table 4.3 for each of the receptor locations. Comparison with the critical load for acid deposition has been carried out using the methodology on the APIS website and using the data for the most sensitive ecosystem/vegetation types within either the North Pennine Moors SAC/SPA or South Pennine Moors SAC/SPA. This indicates that for most receptors the contribution will be less than 1% of the critical load and therefore can be considered to be insignificant.

However, at the 5 closest receptors to Site 78 (located within the South Pennine Moors SAC/SPA) the predicted deposition exceeds the 1% criteria and thus consideration of the total Predicted Environmental Concentration (PEC) has been carried out using the APIS Critical Load Function tool. This was carried out for the two most sensitive habitat types for grasslands; bogs and montane habitats and one for forests; broadleaved woodland. Rather than use the broad critical load data provided for the whole of the South Pennine Moors SAC/SPA, the critical loads and background deposition data was obtained for each of the 5km squares within which a receptor was located from the APIS database. The results for each habitat are provided in Tables 4.4 to 4.6.

Using the APIS Critical Load Function Tool to compare the predicted environmental acid deposition with the relevant critical loads for all relevant habitats, it can be seen that the PEC is dominated by the background concentrations.

For bog habitats, the habitat which is considered most sensitive to acid deposition, at NP4 where acid deposition is predicted to be greatest the background deposition of 2.44 keq/ha/yr accounts for some 380% of the critical load. The process contribution is some 0.01 keq/ha/yr, resulting in a PEC of 382% of the critical load.

The deposition rates for montane habitats indicate that the process contribution is 1 % or less of the critical load at all receptors. Background deposition varies from 203 to 232% of the critical load, with the resulting PEC varying from 204% of the critical load at receptor NP5 to 233% at NP1.

Acid deposition is predicted to be slightly higher in forests than on grassland habitats, however exceedance of the 1% criteria is only predicted at two receptors, NP2 and NP4. At these receptors the background deposition rate is 3.57 keq/ha/yr, some 232% of the critical load, resulting in a PEC of 3.59 keq/ha/yr 233% of the critical load.

It should be noted that the assessment has not obtained detailed information on the individual habitats present at any particular location within the SAC/SPAs. Rather it has obtained data for all habitats and then used the critical loads for the most sensitive habitat type to ensure a conservative assessment. These habitats may not be present at the locations where the exceedance is predicted and thus the next step would be to obtain more detailed information on the specific habitats present within the relevant area of the South Pennine Moors SAC/SPA.

Table 4.3: Predicted Acid Deposition and Comparison with Critical Levels

Receptor	Acid Deposition keq/ha/yr		Percentage of Critical Level	
	Grassland	Forest	Grassland	Forest
N1	0.005	0.010	0.9	**1.5**
N2	0.010	0.016	**1.7**	**2.2**
N3	0.007	0.011	**1.2**	**1.5**
N4	0.010	0.016	**1.7**	**2.3**
N5	0.007	0.012	**1.3**	**1.7**
N6	0.004	0.007	0.7	0.9
N7	0.002	0.004	0.4	0.6
N8	0.002	0.003	0.3	0.4
N9	0.002	0.004	0.5	0.6
N10	0.002	0.003	0.4	0.5
N11	0.002	0.003	0.3	0.4
N12	0.001	0.002	0.2	0.3
N13	0.001	0.002	0.2	0.3
N14	0.001	0.002	0.2	0.3

N15	0.001	0.002	0.2	0.3
S1	0.002	0.003	0.3	0.5
S2	0.003	0.004	0.4	0.6
S3	0.003	0.005	0.5	0.6
S4	0.003	0.005	0.5	0.7
S5	0.002	0.003	0.3	0.4
S6	0.001	0.002	0.2	0.3
S7	0.001	0.001	0.2	0.2
S8	0.002	0.004	0.4	0.5
S9	0.002	0.003	0.3	0.4
S10	0.002	0.003	0.3	0.4
S11	0.002	0.003	0.4	0.5
S12	0.001	0.002	0.2	0.3
S13	0.001	0.002	0.2	0.3
S14	0.002	0.003	0.3	0.4
S15	0.001	0.002	0.2	0.3

Table 4.4: Predicted Acid Deposition Environmental Concentrations and Comparison with Critical Loads for Bog Habitats

Receptor	PC keq/ha/yr	PC as % CL	Background Deposition keq/ha/yr	Background as % of Critical Load	PEC keq/ha/yr	PEC as % CL
N2	0.010	1.7	2.28	380	2.29	381.7
N3	0.007	1.7	2.28	380	2.29	381.7
N4	0.010	1.7	2.28	380	2.29	381.7
N5	0.007	1.7	2.07	356.9	2.08	358.6

PC = Process Contribution

PEC = Predicted Environmental Concentration (PC+Background)

CL = Critical Load

Table 4.5: Predicted Acid Deposition Environmental Concentrations and Comparison with Critical Loads for Montane Habitats

Receptor	PC keq/ha/yr	PC as % CL	Background Deposition keq/ha/yr	Background as % of Critical Load	PEC keq/ha/yr	PEC as % CL
N2	0.010	1.0	2.28	221.4	2.29	222.3

N3	0.007	1.0	2.28	221.4	2.29	222.3
N4	0.010	1.0	2.28	221.4	2.29	222.3
N5	0.007	1.0	2.07	202.9	2.08	203.9
PC = Process Contribution PEC = Predicted Environmental Concentration (PC+Background) CL = Critical Load						

Table 4.6: Predicted Acid Deposition Environmental Concentrations and Comparison with Critical Loads for Broadleaved Woodland

Receptor	PC keq/ha/yr	PC as % CL	Background Deposition keq/ha/yr	Background as % of Critical Load	PEC keq/ha/yr	PEC as % CL
N1	0.010	<1	No further assessment needed			
N2	0.016	1.3	3.57	231.8	3.59	233.1
N3	0.011	<1	No further assessment needed			
N4	0.016	1.3	3.57	231.8	3.59	233.1
N5	0.012	<1	No further assessment needed			
PC = Process Contribution PEC = Predicted Environmental Concentration (PC+Background) CL = Critical Load						

4.4 Heavy Metal Deposition

The predicted heavy metal deposition arising from the proposed waste facility is provided in Table 4.7. Comparison with the most stringent critical loads for each metal has been carried out and demonstrates that for group 1 and group 2 metals, deposition is predicted to be less than 1% of the critical load at all receptors.

For group 3 metals, comparison with the critical load for Arsenic indicates potential exceedence of the 1% criteria at two receptor locations and thus consideration of the PEC for Arsenic has been undertaken for these two locations in Table 4.8. Comparison of the deposition rates with the critical load for nickel, the next most stringent critical load after arsenic, indicates that deposition is predicted to be below 1% at all receptor locations.

Background concentrations of arsenic have been obtained from ambient air quality monitoring carried out by Defra as part of the Rural Heavy Metals Network. Annual average ambient concentrations were obtained for all years between 2007 and 2011 for the two sites closest to the South Pennines Moor SAC/SPA; Cockley Beck and Beacon Hill. The maximum concentration was used in the assessment. Comparison of the resulting PEC with the critical load indicates that the PEC will be less than 5% of the critical load and thus the impact of the waste facility is considered insignificant.

Table 4.7: Predicted Heavy Metal Deposition and Comparison with Critical Loads							
Receptor	**Heavy Metal Deposition mg/m²/day**			**Percentage of Critical Level**			
	Group 1	**Group 2**	**Group 3**	**Gp 1 Cadmium**	**Gp 2 Mercury**	**Gp 3 Arsenic**	**Gp 3 Nickel**
N1	0.00001	0.00001	0.00014	0.2	0.4	0.7	0.1
N2	0.00003	0.00003	0.00026	0.3	0.6	**1.3**	0.2
N3	0.00002	0.00002	0.00018	0.2	0.4	0.9	0.2
N4	0.00003	0.00003	0.00026	0.3	0.7	**1.3**	0.2
N5	0.00002	0.00002	0.00019	0.2	0.5	**1.0**	0.2
N6	0.00001	0.00001	0.00011	0.1	0.3	0.5	0.1
N7	0.00001	0.00001	0.00007	0.1	0.2	0.3	0.1
N8	0.00000	0.00000	0.00004	0.0	0.1	0.2	0.0
N9	0.00001	0.00001	0.00006	0.1	0.2	0.3	0.1
N10	0.00001	0.00001	0.00005	0.1	0.1	0.3	0.0
N11	0.00000	0.00000	0.00004	0.0	0.1	0.2	0.0
N12	0.00000	0.00000	0.00003	0.0	0.1	0.2	0.0
N13	0.00000	0.00000	0.00003	0.0	0.1	0.1	0.0
N14	0.00000	0.00000	0.00003	0.0	0.1	0.2	0.0
N15	0.00000	0.00000	0.00003	0.0	0.1	0.1	0.0
S1	0.00001	0.00001	0.00005	0.1	0.1	0.3	0.0
S2	0.00001	0.00001	0.00007	0.1	0.2	0.3	0.1
S3	0.00001	0.00001	0.00007	0.1	0.2	0.4	0.1
S4	0.00001	0.00001	0.00008	0.1	0.2	0.4	0.1
S5	0.00000	0.00000	0.00004	0.0	0.1	0.2	0.0
S6	0.00000	0.00000	0.00004	0.0	0.1	0.2	0.0
S7	0.00000	0.00000	0.00002	0.0	0.1	0.1	0.0
S8	0.00001	0.00001	0.00006	0.1	0.1	0.3	0.1
S9	0.00000	0.00000	0.00004	0.0	0.1	0.2	0.0
S10	0.00000	0.00000	0.00005	0.1	0.1	0.2	0.0
S11	0.00001	0.00001	0.00006	0.1	0.1	0.3	0.1
S12	0.00000	0.00000	0.00004	0.0	0.1	0.2	0.0
S13	0.00000	0.00000	0.00003	0.0	0.1	0.2	0.0
S14	0.00000	0.00000	0.00004	0.0	0.1	0.2	0.0
S15	0.00000	0.00000	0.00003	0.0	0.1	0.2	0.0

Critical Load (mg/m^2/day)	0.09	0.04	0.02	0.11

Table 4.8: Predicted Acid Deposition Environmental Concentrations and Comparison with Critical Loads for Broadleaved Woodland

Receptor	PC dry deposition flux mg/m^2/day	PC % of CL	Background annual mean	Background dry deposition flux mg/m^2/day	PEC dry deposition flux mg/m^2/day	% of CL
N2	0.0003	1.3	0.000763	0.0007	0.0009	4.6
N4	0.0003	1.3	0.000763	0.0007	0.0009	4.6
N5	0.0002	1.0	0.000763	0.0007	0.0009	4.3

PC = Process Contribution

PEC = Predicted Environmental Concentration (PC+Background)

CL = Critical Load

5 Consultation

The findings of the air quality modelling exercise have been consulted on with Natural England and the Environment Agency in October 2012.

Natural England[6] agreed that a significant effect on the South Pennine Moors SPA/SAC could not be ruled out and agreed with the assumptions made regarding the vegetation /habitats present on the South Pennine Moors SSSI (Rombald's Moor). Natural England Land Management officers for this area have advised that there is no direct evidence to prove the effect of acid deposition on the habitats of the South Pennine Moors SSSI. However, there is a strongly suspected correlation between the high acid deposition in the substrates and the species poor variants of the habitats found within the designated area.

The responses received from these organisations did, however, raise queries relating to the methodology employment. These queries are summarised below and clarifications are provided in response to the queries:

- Natural England agreed with the suggestion from the Environment Agency[7] that terrain should be factored into the modelling - This has already been factored into the modelling and clarification has been added to Section 3.3.1 of this report.
- The Environment Agency suggested that building downwash should be considered within the modelling – Buildings were not included within the model because it is considered that the impacts of building downwash can be avoided by appropriate stack design and thus would be considered at a detailed design stage.
- Natural England agreed with the suggestion from the Environment Agency which was that site relevant critical loads should be used to evaluate the findings rather than the critical loads from the 5km resolution maps - There is no clear guidance regarding which is correct. Site relevant critical loads were used for the initial screening stage but where impacts could not immediately be screened out, the individual 5km grid squares were used as this data is considered to be more accurate that that presented for the whole SAC/SPA which covers as area significantly larger than $5km^2$. However, the model was re-run using the site specific critical loads data for the South Pennine Moors SAC/SPA and it was found that the impacts from the hypothetical plant are still above 1% (but less than 2%) of the critical load at some locations within the SAC/SPA and thus cannot be ruled out as insignificant.

Natural England commented that the addition of the emissions from a waste facility would be relatively small but would not be welcome given that acid deposition is already so far in excess of the critical load for this part of the European designated site. The aim should be for an incremental reduction in acid deposition to below the critical load rather than potentially exacerbating an unsatisfactory situation.

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[6] Letter dated 30th October 2012

[7] Email correspondence between 11th October 2012 and 17th October 2012.

6 Summary and Conclusions

6.1 Summary

An air quality modelling exercise has been undertaken to ascertain whether a hypothetical waste management use, using combustion processes, at proposed Site 78 of the Bradford Waste Management DPD could have adverse effects on European designated sites.

The air quality modelling exercise has found that at the closest receptors to Site 78, which are located on a component site of the South Pennine Moors SPA/SAC (locally called Rombald's Moor), the impact from acidification is at a maximum 2% of the critical load. This cannot be scoped out as insignificant as it is over the 1% significance threshold.

It is important to note that if the impact is greater than 1%, it should not automatically be concluded that there would be a Likely Significant Effect on the SPA/SAC. It means that further investigation and assessment is required to determine whether the predicted impact will have a 'Likely Significant Effect' on the interest features of the site (Conservation Objectives).

Where the process concentrations cannot be considered as insignificant, the next stage in the assessment process is to consider the process contribution together with the existing background concentration, to calculate the Predicted Environmental Concentration (PEC) to determine the overall impact on air quality.

At the receptor locations existing background acid deposition is already significantly above the critical load and whilst the addition from the waste facility is small (2% of the critical load), the resulting PEC is at least 200% of the critical load.

The study has considered that potential deposition will impact on the most sensitive vegetation classes which could be found within the SPA/SAC. The study is also based on maximum permitted releases from the potential waste management use on Site 78. The impacts are only just above the insignificant level and will have little impact on overall deposition. However, in the interests of the precautionary principle, the potential effect cannot be ruled out and should be considered further.

With regard to arsenic the predicted results are just above the 1% criteria at two receptors. However, the calculated PEC is under 5% of the critical load and thus not considered significant.

The air quality modelling exercise has therefore identified a potential significant adverse effect on a component site of the South Pennine Moors SPA/SAC (locally called Rombald's Moor), from acidification.

The findings of the air quality modelling exercise have been consulted on with Natural England and the Environment Agency. Clarifications have been provided in response to queries raised by the consultees regarding the methodology employed and these can be found in Section 5 of this report. Natural England is broadly in agreement with the findings of the air quality modelling exercise and agree that a significant effect on the South Pennine Moors SPA/SAC cannot be ruled out. The Environment Agency did not comment on the significance of the potential impacts.

6.2 Conclusions

In conclusion, the findings of this air quality modelling exercise suggest that although the addition of the emissions from a combustion based waste facility would be relatively small, acid deposition is already in excess of the critical load for this part of the South Pennine Moors SPA/SAC (Rombald's Moor) and therefore a combustion based waste management use on proposed Site 78 of the Bradford Waste Management DPD would potentially exacerbate an existing situation. With regards to impact avoidance measures, it is therefore suggested that proposed Site 78 of the Bradford Waste Management DPD may not be suitable for a waste management use which uses combustion processes and it is recommended that the Bradford Waste Management DPD is amended to reflect that this use should not be identified as being suitable for Site 78. Alternative sites within the Plan Area should instead be identified for waste management use using combustion process, if it is necessary to provide such a facility within the District. It should be noted that this assessment has not considered other proposed allocated sites which are located further away from the SAC/SPA than Site 78. Therefore, until the impact avoidance measures are put in place it is not possible to conclude that the Bradford Waste Management DPD will not result in adverse effects on European sites.

Annex A: Detailed Calculation Methodologies

A1 Nutrient Nitrogen

Step 1 Calculate dry deposition flux (µg/m^2/s) = Ground Level Concentration (µg/m^3) x Dry Deposition Velocity (m/s) given in Table A1 for NO_2 and NH_3.

Table A1: Dry Deposition Velocities m/s		
Pollutant	**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 from µg/m^2/s to an annual deposition rate (kg/ha/yr) by multiplying by factors in Table A2.

Table A2: Conversion of Dry Deposition Rates to an Annual Rate	
Pollutant	**From µg/m^2/s to kg/ha/yr**
SO_2	157.7
NO_2	96
NH_3	259.7
HCl	306.7

Step 3 Compare total dry deposition with minimum critical load data provided by APIS data base.

A2 Acidification

Step 1 Follow steps 1 and 2 above for all relevant pollutants; SO_2, NO_2, NH_3 and HCl.

Step 2 Convert from an annual deposition rate (kg/ha/yr) to Kilo-equivalent Hydrogen Ion Depositions (keq/ha/yr) by multiplying by factors given below.

Table A3: Conversion of Dry Deposition Rates to Kilo-equivalent Hydrogen Ion Depositions	
Pollutant	**From kg/ha/yr to keq/ha/yr**
SO_2	0.0625
NO_2	0.071428
NH_3	0.071428
HCl	0.0282

Step 3 Wet deposition has only been included for HCl as for the other pollutants the impact from wet deposition within 15km of a point source is considered to be minor compared to that from dry deposition.

Within a few km of a stack wet deposition of HCl is considered to be comparable to the dry deposition, and with increasing distance becomes a smaller fraction. As a worst case assumption it is assumed that the wet HCl deposition will equal the dry deposition and therefore the HCl dry deposition rate has been doubled to account for HCl wet deposition.

Step 4 The kilo-equivalent hydrogen ion deposition rates for all pollutants have been added to obtain a total deposition rate.

Step 5 Comparison of the process contribution with the critical load has been carried out following the methodology provided within the APIS website i.e.

Where PEC N Deposition < CLmin N

PC as % CL = (PC S/CLmaxS)*100

Where PEC N Deposition > CLmin N

PC as % CL = (PC total deposition/CLmaxN)*100

A3 Heavy Metal Deposition

Step 1 Calculate the dry deposition flux by multiplying the ground level concentrations by the deposition velocity for particles of less than 10 micron diameter provided in H1 = 0.01 m/s.

Step 2 Convert to $mg/m^2/day$ = Total deposition flux ($\mu g/m^2/s$) x 86400 / 1000

Step 3 Compare with relevant critical loads

Annex B: APIS Data

North Pennines															
Code		s1528	H7130	H6150	H8210	H8110	H8220	H91A0	H4030	H5130	H4010	H6210	H7220	H6130	H7230
Name		Marsh Saxifrage	Blanket Bogs	Siliceous alpine and boreal grasslands	Calcareous rocky slopes with chasmophytic vegetation	Siliceous scree of the montane to snow levels	Siliceous rocky slopes with chasmophytic vegetation	Old sessile oak woods with Ilex and Blechnum in the British Isles	European dry heaths	Juniperus communis formations on heaths or calcareous grasslands	Northern Atlantic wet heaths with Erica Tetralix	Semi-natural dry grasslands and scrbland facies: on calcarious substrates	Petrifying springs with tufa formation	Calaminarian grasslands of the Violetalia calaminariae	Alkaline Fens
Nutrient Nitrogen															
Class		alpine and subalpine grassland	raised and blanket bogs	alpine and subalpine grassland	alpine and subalpine grassland	Arctic, alpine and subalpine scrub habitats	Arctic, alpine and subalpine scrub habitats	Acidophilous Quercus-dominated woodland	Dry Heaths	Dry Heaths	Northern wet heat: Erica tetralix dominated wet heath	Sub-atlantic semi-dry calcarious grassland	Mountain rich fens	Sub-atlantic semi-dry calcarious grassland	Rich Fens
Critical Loa	Minimum	5	5	5	5	5	5	10	10	10	10	15	15	15	15
	Maximum	10	10	10	10	15	15	15	20	20	20	25	25	25	30
Acidity															
Class		Montane	Bogs	Montane	Montane	Montane	Montane	Unmanaged broadleafed/coniferous woodland	Dwarf shrub heath	Dwarf shrub heath	Dwarf shrub heath	Calcareous grassland	not sensitive	Calcareous grassland	not sensitive
MaxCLminN		0.536	0.321	0.536	0.536	0.536	0.536	0.5	1.107	1.107	1.107	1.214		1.214	
MaxCLMaxN		4.398	1.12	4.398	4.398	4.398	4.398	11.614	5.072	5.072	5.072	5.214		5.214	
MaxCLMaxS		4.22	0.799	4.22	4.22	4.22	4.22	11.472	4.22	4.22	4.22	4		4	
MinCLminN		0.178	0.321	0.178	0.178	0.178	0.178	0.142	0.499	0.499	0.499	0.856		0.856	
MinCLMaxN		0.491	0.566	0.491	0.491	0.491	0.491	0.606	0.812	0.812	0.812	4.856		4.856	
MinCLMaxS		0.17	0.245	0.17	0.17	0.17	0.17	0.321	0.17	0.17	0.17	4		4	
Background															
2005	N	1.61	1.61	1.61	1.61	1.61	1.61	2.76	1.61	1.61	1.61	1.61		1.61	
2005	S	0.46	0.46	0.46	0.46	0.46	0.46	0.63	0.46	0.46	0.46	0.46		0.46	
2020	N	1.19	1.19	1.19	1.19	1.19	1.19	2.02	1.19	1.19	1.19	1.19		1.19	
	S	0.21	0.21	0.21	0.21	0.21	0.21	0.29	0.21	0.21	0.21	0.21		0.21	

South Pennines						
Code		H7130	H7140	H91A0	H4010	H4030
Name		Blanket Bogs	Transition mires and quaking bogs	Old sessile oak woods with Ilex and Blechnum in the British Isles	Northern Atlantic wet heaths with Erica Tetralix	European dry heaths
Nutrient Nitrogen						
Class		raised and blanket bogs	Valley mires, poor fens and transition mires	Acidophilous Quercus-dominated woodland	Northern wet heat: Erica tetralix dominated wet heath	Dry Heaths
Critical Loa	Minimum	5	10	10	10	10
	Maximum	10	15	15	20	20
Acidity						
Class		Bogs	Bogs	Unmanaged broadleafed/ coniferous woodland	Dwarf shrub heath	Dwarf shrub heath
MaxCLminN		0.321	0.321	0.5	1.107	1.107
MaxCLMaxN		1.181	1.181	4.712	3.027	3.027
MaxCLMaxS		0.86	0.86	4.355	2	2
MinCLminN		0.321	0.321	0.142	0.499	0.499
MinCLMaxN		0.569	0.569	0.713	0.749	0.749
MinCLMaxS		0.248	0.248	0.428	0.19	0.19
Background						
2005	N	1.92	1.92	3.52	1.92	1.92
2005	S	0.58	0.58	0.81	0.58	0.58
2020	N	1.41	1.41	2.49	1.41	1.41
2020	S	0.3	0.3	0.43	0.3	0.3