



Lostock Sustainable Energy Plant –
Proposal to Increase Waste Throughput

Ecological Interpretation of Air Quality
Assessment

Technical Appendix 5.5

Prepared for Axis PED

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1 Introduction

This document provides an ecological interpretation of the Air Quality Assessment (AQA) undertaken by Fichtner Consulting Engineers for the proposed increase in waste fuel throughput (the Proposal) of the consented Lostock Sustainable Energy Plant (LSEP) located at Lostock Gralam, Cheshire.

The aim of the assessment is to provide further ecological interpretation of the results of the AQA, focussing on any effects on sensitive ecological receptors which cannot be screened out as insignificant, in accordance with Environment Agency and Institute of Air Quality Management (IAQM) criteria.

This analysis is based on dispersion and deposition modelling undertaken by Fichtner Consulting Engineers, and reported in the Process Emissions Modelling (Appendix 5.2 to the EIA Report). It focusses on potential ecological effects at sensitive receptors where exceedances of the identified screening thresholds are predicted. In these cases, further ecological assessment has been undertaken to:

- Confirm sensitivity of qualifying and notified features;
- Assess potential effects by comparing dispersion and deposition model plots with the spatial distribution of sensitive habitats; and
- Provide an informed ecological opinion on the likelihood of significant effects or significant harm.

Potential ecological effects are also evaluated in the context of the existing Section 36 consent for the LSEP, in respect of any changes predicted by the AQA.

2 Scope and methodology

2.1 Scope of assessment

Geographic scope of assessment

The geographic scope of assessment is set out in Appendix 5.2, section 3.2 (Ecologically sensitive receptors), and is based on Environment Agency (EA) guidance. The following screening distances were applied in accordance with EA guidance:

- 10km from emission source for Habitat (Natura 2000) sites, including Special Areas of Conservation (SAC) and Special Protection Areas (SPA), and for Ramsar sites;
- 2km from emission source for National Nature Reserves (NNR) and Sites of Special Scientific Interest (SSSIs); and
- 2km from emission source for Local Nature Reserves (LNR), Local Wildlife Sites (LWS) and ancient woodlands.

Screening thresholds

Screening thresholds used in Appendix 8.3 for statutory designated sites are based on Environment Agency guidance, and can be summarised as follows:

- For Ramsar, Natura 2000 sites and SSSIs, predicted process contributions (PCs) below 1% of the relevant long-term (annual) Critical Level and Critical Load or 10% of the relevant short-term (24-hour) Critical Level are screened out;
- For Ramsar, European sites and SSSIs, PCs above 1%, where the predicted environmental concentration (PEC; PC plus background) is <70% of the Critical Level and Critical Load are screened out.

For Natura 2000 sites the 1% PC has been regarded as a *de minimis* threshold, below which effects can be considered inconsequential. The English and Welsh agencies which make up the Air Quality Technical Advisory Group (AQTAG) clarified that projects below the 1% PC do not have to be considered in an in-combination assessment¹, although this has been subject to further revision (with respect to cumulative vehicle emissions) through UK and European case law.

¹ Environment Agency (2015). *AQTAG position. In-combination guidance and assessment*. Response to PINS, March 2015.

For permitting purposes, EA advise that a 100% PC can be used for locally designated sites and ancient woodlands; however, for the purpose of this variation application purposes a 1% threshold has been applied, in accordance with the advice set out below.

IAQM guidance on scope

The Institute of Air Quality Management (IAQM) published guidance on the assessment of air quality impacts on designated sites in June 2019², updated in 2020³. This confirmed the use of the 1% long-term / 10% short-term thresholds for industrial point source emissions, with some important clarifications:

- *'The 1% screening criterion is not a threshold of harm and exceeding this threshold does not, of itself, imply damage to a habitat'* (IAQM 2019, para. 5.5.1.8);
- The 70% PEC threshold *'was intended to be a trigger for detailed dispersion modelling. It is not intended to be a damage threshold.'* (5.5.3.2);
- The 100% threshold for locally designated sites and ancient woodlands used in permit applications purposes may be inappropriate in a planning context, failing to provide adequate protection.

IAQM guidance does not suggest a threshold for consideration of effects on locally designated sites, and there is as yet no established practice for treatment of locally designated sites in the ecological interpretation of air quality assessments. In order to take the guidance into account, predicted impacts in excess of the 1% long-term threshold have been identified and highlighted in this report, and the sensitivity of component habitats to air quality effects considered in greater detail. However, the interpretation of impact significance reflects the lower degree of policy protection of locally designated sites.

² Holman et al (2019). *A guide to the assessment of air quality impacts on designated nature conservation sites* – version 1.0, Institute of Air Quality Management, London.

www.iaqm.co.uk/text/guidance/airquality-impacts-on-nature-sites-2019.pdf

³ Holman et al (2020). *A guide to the assessment of air quality impacts on designated nature conservation sites* – version 1.1, Institute of Air Quality Management, London.

<https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf>

Receptors and impacts considered in assessment

Location of sensitive receptors

The location of sensitive ecological receptors within the 10km screening radius for habitats sites is shown in EIA Report Figure 5.3; Figure 5.3a provides a more detailed view of the wider range of sites considered within 2km of the LSEP.

European designated sites (habitat sites)

The nearest component site of **West Midlands Mosses Special Area of Conservation (SAC)** is located approximately 9.6km south-west of the stack location at its closest point.

Internationally designated sites

The nearest component site of **Midland Meres and Mosses - Phase 1 Ramsar Site** (Tatton Mere SSSI) is located approximately 8.4km north-east of the stack location at its closest point, with The Mere, Mere SSSI nearby and also within the 10km screening radius.

The nearest component site of **Midland Meres and Mosses - Phase 2 Ramsar Site** (Abbots Mill SSSI) is located approximately 9.6km SW, and is contiguous with West Midlands Mosses SAC.

UK statutory designated sites

The nearest statutory designated sites are **Plumley Lime Beds Site of Special Scientific Interest (SSSI)** (2.28km north-east of the stack location at its closest point) and **Witton Lime Beds SSSI** (2.01km west). Both are located outside the 2km screening distance for consideration of air quality impacts, but within the SSSI Impact Risk Zone (IRZ) for combustion processes.

Locally designated sites

The following locally designated sites (Local Wildlife Sites (LWS) and proposed Local Wildlife Sites (pLWS) occur within the 2km screening radius of the Site.

Table 2.1: Locally designated sites included in assessment

AQA ref.	Site name	Distance (km)	Site features
E9	Ashton's and Neumann's Flashes	1.46	Neutral grassland; fen, marsh and swamp; open water; open mosaic habitat.
E10	Gradbrook Valley	1.85	No citation information available

AQA ref.	Site name	Distance (km)	Site features
E11	Griffiths Park	0.29	No citation information available
E12	Long Wood	1.77	Broadleaved woodland
E13	Marston Flashes	1.82	Fen, marsh and swamp; marshy grassland
E14	Wade Brook	0.46	No citation information available
E15	Wincham Brook Valley and Mill Wood	0.76	Broadleaved woodland; neutral grassland; rivers
E16	Winnington Wood	2.11	Broadleaved woodland
E17	River Dane	1.49	Rivers
E18	Marshall's Gorse	1.72	No citation information available
E19	Rudheath Lime Beds	0.15	No citation information available
E20	Lostock House Orchard	1.98	No citation information available

Ancient woodlands

Winnington Wood LWS is also listed as an ancient semi-natural woodland (ASNW) on Natural England's Ancient Woodland Inventory data. No other ancient woodland sites occur within the 2km search radius.

2.2 Assessment methodology

Data search

Information including the Citations, notified natural features and condition of statutory designated sites were sourced from the Natural England website.

The Air Pollution Information System (APIS) website's Site Relevant Critical Loads function was used to provide an initial assessment of the sensitivity of statutory designated sites to pollutant impacts. This provides habitat-specific critical loads for nitrogen and acid deposition, as well as setting out recommended Critical Levels for long-term (annual mean) ammonia (NH₃) and sulphur dioxide (SO₂).⁴

Identification of appropriate habitats and environmental quality standards

In order to assess whether potentially significant ecological effects are likely to occur, the vulnerability of component habitats is assessed for each of the qualifying features of the designated sites. For many habitats these can be expressed in terms of Critical

⁴ <http://www.apis.ac.uk/srcf>

Loads for nitrogen and acid deposition, and Critical Levels for short and long-term ground-level atmospheric concentrations of other pollutants.

Critical Levels are normally set at a single level for the protection of the most sensitive features of all habitats, although lower levels are used when particularly sensitive features (e.g. important lichen or bryophyte communities) are present. The appropriate level to use was based on published information (e.g. Natural England citations) about the SSSI (e.g. whether lichens or bryophytes were identified as important components of notified features) and other site-specific information such as surveys and management plans; APIS also identifies whether lichens and bryophytes are present, but this is based on the habitat present and is not necessarily site-specific.

Critical Loads for nitrogen and acid deposition are set as a range with lower and upper limits. The APIS website recommends the appropriate Critical Load for different habitats to be used for environmental assessment purposes; this has been followed in the assessment, unless a different limit is justified in terms of published evidence or advice, or on the basis of the field survey. APIS sets Critical Loads for habitats based on the EUNIS (European Nature Information System) classification (Strachan, 2015⁵); however, Site-relevant Critical Loads for qualifying features of particular designated sites also give Broad Habitats and in some cases relevant NVC (National Vegetation Classification) plant communities. Notified habitat features in SSSIs are normally expressed in terms of NVC communities, while qualifying features of SACs are expressed in terms of Habitats Directive Annex I habitats. This can lead to anomalies in the way APIS treats what is essentially the same habitat in different sites (e.g. alder woodland (W7) NVC community is given a minimum Critical Load of 10kg N/ha/yr for SSSIs, but the equivalent EUNIS / Annex I habitat is considered not to be vulnerable to atmospheric nitrogen deposition). Where necessary, translation between NVC and EUNIS to ensure the correct quality standard is applied has been undertaken with reference to Strachan (2015).

APIS do not provide site-relevant critical loads for Ramsar sites, so the appropriate EQS must be determined from the relevant European (SPA, SAC) or UK (SSSI) designation attached to the site. Care needs to be taken to include the correct listed features; for example, with respect to one component SSSI (Rostherne Mere) APIS list supporting habitat of waterfowl species which are notified features of the SSSI. These are listed as

⁵ Strachan, I.M. (2015). *Manual of terrestrial EUNIS habitats in Scotland*. Scottish Natural Heritage Commissioned Report No. 766.

'noteworthy fauna' on the Ramsar site Information Sheet, but are not part of the selection criteria, and are not one of the features used to assess impacts at Ramsar Site level. Conversely, on the same site another sensitive feature (bog habitat) which does not appear on the SSSI notified features in APIS, forms part of the Ramsar Site selection criteria, and is therefore relevant for the impact assessment.

Assessment of effect magnitude and significance

There are no currently accepted thresholds for assessing the magnitude of air quality effects on ecological receptors. Neither the IAQM (2020) guidance or CIEEM (2021)⁶ guidance on ecological impact interpretation provides any guidance on effect magnitude or ecological significance thresholds. In the absence of guidance for ecological receptors, Environmental Protection UK (EPUK, 2010)⁷ advice can be applied with caution; although this was developed for assessment of nitrogen dioxide and particulate emissions on human health in a development control context, it provides a useful descriptor to express impact magnitude as a percentage of the relevant assessment level (see Table 2.2 below). This has now been superseded by revised advice, which is now explicitly reserved for application in a human health assessment context.

Table 2.2: EPUK (2010) guidance on impact magnitude

Magnitude of change	Annual mean value increase / decrease (as percentage of assessment level)
Large	>10%
Medium	5 – 10%
Small	1 – 5%
Imperceptible	<1%

With respect to assessing **significance** of ecological effects, it is important to note that the 1% screening threshold is not an effect threshold. The magnitude of impact which might result in a significant ecological effect is likely to depend on baseline conditions and sensitivity of the receiving environment.

⁶ CIEEM (2021) *Advice on Ecological Assessment of Air Quality Impacts*. Chartered Institute of Ecology and Environmental Management. Winchester, UK

⁷ Environmental Protection UK (2010). *Development Control: Planning For Air Quality (2010 Update)*. EPUK, April 2010.

CIEEM (2018⁸) define a significant ecological effect as “an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area”. The guidelines do not favour a matrix approach to the assessment of significance, because these can downplay impacts on features of local importance, and the ecological meaning of the resulting terms is often poorly defined. Instead, significance is defined at the geographic scale at which it occurs.

With respect to assessing whether it is possible to conclude no adverse effect on site integrity (European site) and to conclude no damage (SSSIs) in a permitting context in England and Wales, Environment Agency (EA) guidance⁹ distinguished between circumstances when:

- the background concentration is less than the appropriate environmental criterion but a small process contribution leads to an exceedance; or
- the background concentration is currently exceeding the appropriate environmental criterion and the new process contribution will cause an additional **small** increase; and
- the background concentration is less than the appropriate environmental criterion, but the process contribution is significant (*i.e. of higher magnitude*) and leads to an exceedance; or
- the background concentration is more than the appropriate environmental criterion, and the process contribution is **large**.

In the first two circumstances, the EA recommend that a decision is based on local circumstances, based on factors set out in guidance (such as spatial disposition of sensitive habitats relative to predicted effects); in the latter two circumstances, the EA state that it is not possible to conclude no adverse effect. The EA go on to distinguish between the varying level of legal and policy protection applied to European sites relative to SSSIs. For European sites (SACs, SPAs and Ramsar sites) the key policy test is ‘no likely significant effect’, which is best understood as ‘no possible significant effect

⁸ CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition*. Chartered Institute of Ecology and Environmental Management, Winchester

⁹ Environment Agency (2012). *Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation*. Operational Instruction 67_12, Issued 08/05/12

according to best available scientific knowledge'. For SSSIs, the EA refer to 'operations likely to damage' a SSSI.

3 Sensitivity to air quality impacts

3.1 SAC and Ramsar Sites

West Midlands Mosses SAC

APIS Site-relevant Critical Loads lists the following qualifying features and sensitivities for West Midlands Mosses SAC:

Table 3.1: West Midlands Mosses SAC sensitivity

Qualifying feature	NH3 ($\mu\text{g}/\text{m}^3$)	N deposition (kg N/ha/yr)	Acid deposition (Keq/ha/yr)-minCLmaxN
Natural dystrophic lakes and ponds (EUNIS C1.4 permanent dystrophic lakes and ponds)	seek site-specific advice	3 - 10	No CL given
Transition mires and quaking bogs (D2 Valley mires, poor fens and transition mires)	1.0	10 - 15	0.511

Background levels for ammonia, and rates of nitrogen and acid deposition all exceed the minimum environmental quality standard (EQS) for sensitive habitats. Background NOx and sulphur dioxide levels are well below the EQS.

With respect to natural dystrophic lakes and ponds, APIS advice¹⁰ states: '*Critical load should only be applied to waters with low alkalinity with no significant agricultural or other direct human inputs. Use lower end of range for boreal and alpine dystrophic lakes.*' In this case the SAC citation description makes it clear it is a low alkalinity lake, therefore a critical load is appropriate; however it does not have a boreal or alpine character. A critical load of **10kg N/ha/yr** for environmental assessment purposes is therefore appropriate; this is also appropriate for transition mire and quaking bog habitat.

Midland Meres and Mosses Phase 2 Ramsar Site

The Ramsar wetlands information sheet for the site¹¹ indicates that it is listed under two selection criteria, as described in the extract below:

¹⁰ http://www.apis.ac.uk/sites/default/files/downloads/APIS%20critical_load_range_document.pdf

¹¹ <https://jncc.gov.uk/jncc-assets/RIS/UK11080.pdf>

Ramsar criterion 1

The site comprises a diverse range of habitats from open water to raised bog.

Ramsar criterion 2

Supports a number of rare species of plants associated with wetlands, including the nationally scarce cowbane *Cicuta virosa* and, elongated sedge *Carex elongata*. Also present are the nationally scarce bryophytes *Dicranum affine* and *Sphagnum pulchrum*.

Also supports an assemblage of invertebrates including several rare species. There are 16 species of British Red Data Book insect listed for this site including the following endangered species: the moth *Glyphipteryx lathamella*, the caddisfly *Hagenella clathrata* and the sawfly *Trichiosoma vitellinae*

APIS do not provide figures for listed features of Ramsar sites; in the case of this site, the qualifying features of the contiguous West Midlands Mosses SAC provides a suitably precautionary analogue for assessment of sensitivity.

The nearest component SSSI within the SAC / Ramsar site is Abbots Moss¹².

Midland Meres and Mosses Phase 1 Ramsar Site

Ramsar site selection criteria are shown below, taken from the information sheet:

Ramsar criterion 1

The site comprises a diverse range of habitats from open water to raised bog

Ramsar criterion 2

Supports a number of rare species of plants associated with wetlands including five nationally scarce species together with an assemblage of rare wetland invertebrates (three endangered insects and five other British Red Data Book species of invertebrates)

In the case of this site, the sensitivities of the two component SSSIs within the 10km screening radius are of the greatest relevance, along with Rostherne Mere SSSI which lies just outside the 10km radius.

Natural England's Citation for Tatton Meres SSSI¹³ and associated site details¹⁴ indicates that it includes two notified features: open water habitat, and fen, marsh and swamp

¹² <https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001643.pdf>

¹³ <https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1003604.pdf>

¹⁴

<https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1003604&SiteName=Tatton+Mere&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=>

habitat. It is described in the citation as moderately nutrient-rich water bodies with fringing reedswamp and fen communities.

The citation for The Mere, Mere SSSI¹⁵ describes the site as a moderately nutrient-rich lake with diverse aquatic plant communities, and aquatic invertebrates including a rare damselfly species.

The citation for Rostherne Mere SSSI¹⁶ states that it is a deep, naturally nutrient-rich lake which has been further enriched by agricultural inputs and droppings from roosting waterfowl and gulls; although not a Ramsar listed feature, numbers of wintering pintail and pochard ducks are nationally significant and are notified features of the SSSI. The citation also mentions a small area of bog habitat overgrown with birch trees, but this is not listed in the site detail website¹⁷ as a notified feature or monitored feature.

Sensitivities of their notified features as listed by APIS are tabulated below:

Table 3.2: Midland Meres and Mosses Phase 1 Ramsar Site sensitivity

Notified feature of component SSSIs	NH3 ($\mu\text{g}/\text{m}^3$)	N deposition (kg N/ha/yr)	Acid deposition (Keq/ha/yr)-minCLmaxN
Standing water	No CL given	No CL given	No CL given

This focusses on the open water habitat, where factors such as nitrogen and phosphorus limitation need to be taken into account; however, atmospheric inputs tend to be less important than inputs from groundwater and surface waters, or (as in the case of Rostherne Mere) nutrient inputs from roosting birds.

To take into account the presence of the reedswamp and fen habitat present at Tatton Meres SSSI, a critical load for nitrogen deposition of rich fens (EUNIS habitat D4.1) listed by APIS of **15 - 30kg N/ha/yr**¹⁸ should be used for assessment purposes. This habitat is not regarded as sensitive to acid deposition. For Rostherne Mere SSSI the value for valley mires, poor fens and transition mires (EUNIS D2) of **10 - 15kg N/ha/yr** would be precautionary for the small area of peatland habitat. Acid deposition critical loads for

¹⁵ <https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001818.pdf>

¹⁶ <https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1003353.pdf>

¹⁷

<https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1003353&SiteName=Rostherne+Mere&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=>

¹⁸ <http://www.apis.ac.uk/indicative-critical-load-values>

this habitat have been obtained from the APIS query by location tool for bog broad habitat of **0.561keq/ha/yr** (CLmaxN), which is currently exceeded by background deposition rates.

Open water habitat values remain appropriate for The Mere, Mere SSSI, with no critical load given, and effects from atmospheric inputs relatively unlikely given its moderately nutrient-rich status and likely greater contribution of nutrients from surface or groundwater inputs.

With respect to ammonia levels, the **1.0 µg/m³** critical level is more precautionary and appropriate for the Tatton Meres and Rostherne Mere component sites of the Ramsar site, since both rich fen and poor fen / transition mire habitats can contain important bryophyte communities. 3.0 µg/m³ is precautionary for open water habitats at The Mere, Mere SSSI.

3.2 SSSIs

Plumley Lime Beds SSSI

APIS Site Relevant Critical Loads information for the SSSI¹⁹ lists the following sensitivities of the notified features.

Table 3.3: Plumley Lime Beds SSSI sensitivity

Notified feature (including EUNIS & NVC classification)	NH3 (µg/m ³)	N deposition (kg N/ha/yr)	Acid deposition (Keq/ha/yr)-minCLmaxN
G1 Broadleaved deciduous woodland NVC W6 Alder - stinging nettle woodland	Site-specific advice	10 - 20	1.886
G1.A Meso- and eutrophic Quercus woodland NVC W8 ash woodland	Site-specific advice	15 - 20	1.886
E1.26 Sub-Atlantic semi-dry calcareous grassland CG1 sheep's fescue - carline thistle grassland	1	15 - 25	5.071

¹⁹ <http://www.apis.ac.uk/select-feature?site=1001690&SiteType=SSSI&submit=Next>

The main anomaly in the EQS recommended by APIS is in the W6 alder - stinging nettle community, which is given a minimum critical load for nitrogen deposition in accordance with the broadleaved woodland broad habitat class (EUNIS level 2 class G1). As discussed in section 2.2 above, alder woodlands should not be regarded as sensitive for nitrogen deposition; the most precautionary critical load should therefore be **15kg N/ha/yr**, applied to the ash woodland and calcareous grassland notified features. Alder woodlands are also not regarded as sensitive to acid deposition, while the value given for ash woodland must be regarded as very precautionary, given the calcareous nature of the substrate and consequently high degree of buffering.

Background levels of nitrogen deposition to ash woodland habitats are modelled at an average of 46.7kg N/ha/yr, significantly exceeding the upper critical load. The upper critical load for calcareous grassland is exceeded by deposition rates (at grassland velocities) modelled at 27.4kg N/ha/yr. Ammonia levels at 3.54µg/m³ exceed the upper critical level for protection of ecosystems, and significantly exceed the lower critical level for lichen or bryophyte-rich habitats. Acid deposition rates exceed the lower critical load for woodland habitats, but are below the critical load for calcareous grassland. As on other local sites, NO_x levels and SO₂ levels are safely below the relevant EQS.

Witton Lime Beds SSSI

APIS Site Relevant Critical Loads information for the SSSI²⁰ lists the following sensitivities of the notified features.

Table 3.4: Witton Lime Beds SSSI sensitivity

Notified feature (including EUNIS & NVC classification)	NH ₃ (µg/m ³)	N deposition (kg N/ha/yr)	Acid deposition (Keq/ha/yr)-minCLmaxN
E1.26 Sub-Atlantic semi-dry calcareous grassland CG1 sheep's fescue - carline thistle grassland	1	15 - 25	5.071

Average modelled background ammonia levels at 3.54µg/m³ are well above the relevant critical level for habitats with important bryophyte or lichen communities.

²⁰ <http://www.apis.ac.uk/select-feature?site=1003715&SiteType=SSSI&submit=Next>

Nitrogen deposition rates are just above the critical load at 26.2kg N/ha/yr. Acid deposition rates, NOx and sulphur dioxide levels are all well below the relevant EQS.

3.3 Local Wildlife Sites and ancient woodlands

Derivation of appropriate EQS

APIS do not provide site-relevant critical loads for nitrogen or acid deposition for locally designated sites, although acid deposition critical loads can be obtained using the 'search by grid reference' function.

Based on site citations, it is possible to determine an appropriate habitat-based nitrogen deposition critical load; it is also possible to determine a suitable ammonia critical level based on the likelihood that the qualifying habitat supports important bryophyte or lichen communities.

The following principles have been applied:

- Where detailed information on woodland plant communities is absent, the precautionary 10kg N lower critical load has been applied for broadleaved woodland broad habitat (EUNIS G1);
- Lowland woodland habitats in the local area are deemed unlikely to support important bryophyte or lichen communities, and a 3µg/m³ critical level for ammonia has been applied to these habitats, together with neutral grassland and rivers;
- Fen, marsh and swamp habitats have been assigned the lower 1µg/m³ critical level for ammonia, on the basis that they may support ammonia-sensitive 'brown moss' communities.

EQS for locally designated sites

The table below summarises appropriate critical levels and critical loads for the Local Wildlife Sites considered in the assessment:

Table 3.5: Sensitivity of Local Wildlife Sites

AQA ref.	Site name	Ammonia critical level (µg/m ³)	Nitrogen deposition critical load (kg N/ha/yr)	Acid deposition critical load (keq/ha/yr)
Ashton's and Neumann's Flashes	Fen, marsh and swamp (D4.1 Rich fens)	1	15 - 30	5.07

AQA ref.	Site name	Ammonia critical level ($\mu\text{g}/\text{m}^3$)	Nitrogen deposition critical load (kg N/ha/yr)	Acid deposition critical load (keq/ha/yr)
Gadbrook Valley	No citation information (G1 Broadleaved woodland)	3	10 - 20	3.02
Griffiths Park	No citation information (G1 Broadleaved woodland)	3	10 - 20	1.90
Long Wood	G1 Broadleaved woodland	3	10 - 20	1.90
Marston Flashes	Fen, marsh and swamp (D4.1 Rich fens)	1	15 - 30	5.07
Wade Brook	No citation information (Neutral grassland; E2.2 low and medium altitude hay meadows)	3	20 - 30	5.07
Wincham Brook Valley and Mill Wood	G1 Broadleaved woodland	3	10 - 20	1.87
Winnington Wood	G1 Broadleaved woodland	3	10 - 20	1.87
River Dane	Rivers	No CL	No CL	No CL
Marshall's Gorse	No citation information (G1 Broadleaved woodland)	3	10 - 20	3.02
Rudheath Lime Beds	No citation information (Neutral grassland; E2.2 low and medium altitude hay meadows)	3	20 - 30	5.07
Lostock House Orchard	No citation information (Neutral grassland; E2.2 low and medium altitude hay meadows)	3	20 - 30	5.07

Where no citation information was available, the most appropriate habitat has been assessed through aerial photograph interpretation.

4 Assessment of predicted air quality impacts

4.1 Impacts on SAC and Ramsar sites

Summary of predicted impacts in AQA

The following table summarises the predicted impacts of ammonia, nitrogen and acid deposition on the SAC and Ramsar sites. The table disaggregates individual component SSSIs where these have been modelled separately, in recognition of the fact that sensitivities vary according to the habitats present at each component site. Where model assessment points are aggregated, the largest process contribution (PC) is presented below.

Table 4.1: Summary of predicted impacts at SAC and Ramsar Sites

AQA ref.	Site name	Ammonia PC ($\mu\text{g}/\text{m}^3$) % of CL	Nitrogen deposition PC (kg N/ha/yr) % of CL	Acid deposition PC (keq/ha/yr) as % of CL
E3 - E5	West Midlands Mosses SAC / Midland Meres and Mosses Phase 2 Ramsar	0.4% (CL $1\mu\text{g}/\text{m}^3$)	0.3% (CL 10kg N/ha/yr)	1.16% (CL 0.511keq)
E1	Midland Meres and Mosses Phase 1 Ramsar (Tatton Meres SSSI)	0.6% (CL $1\mu\text{g}/\text{m}^3$)	0.5% (CL 15kg)	Not sensitive
E2	Midland Meres and Mosses Phase 1 Ramsar (The Mere, Mere SSSI)	0.33% (CL $3\mu\text{g}/\text{m}^3$)	No CL	Not sensitive
E6	Midland Meres and Mosses Phase 1 Ramsar (Rostherne Mere SSSI)	0.4% (CL $1\mu\text{g}/\text{m}^3$)	0.4% (CL 10kg)	4.0% (CL 0.561keq)

Likely significant effect screening

There are therefore two modelled impacts which cannot be screened out as insignificant:

- Acid deposition rates on transition mire / quaking bog habitat at West Midlands Mosses SAC / Midland Meres and Mosses Phase 2 Ramsar Site;
- Acid deposition rates on bog habitat at the Rostherne Mere SSSI component site of Midland Meres and Mosses Phase 1 Ramsar Site.

In terms of Environment Agency guidance, in both cases the background concentration is currently exceeding the appropriate environmental criterion and the process contribution will cause an additional **small** increase. In these circumstances it is not necessary to conclude a significant effect will occur, but to consider local and site-

specific circumstances. These are considered in section 4.4 below in terms of effect significance, taking into account factors such as the changes in emissions of the LSEP with the Proposal relative to current baseline; wider trends in emissions rates; and factors which may make the habitat on site more or less sensitive to the effects of changes in acid deposition rates.

4.2 Impacts on SSSIs

Summary of predicted impacts in AQA

The following table summarises the predicted impacts of ammonia, nitrogen and acid deposition on the two SSSI sites considered in the assessment.

Table 4.2: Summary of predicted impacts on SSSIs

AQA ref.	Site name	Ammonia PC ($\mu\text{g}/\text{m}^3$) % of CL	Nitrogen deposition PC (kg N/ha/yr) % of CL	Acid deposition PC (keq/ha/yr) as % of CL
E7	Witton Lime Beds SSSI	0.7% (CL $1\mu\text{g}/\text{m}^3$)	0.3% (CL 15kg N/ha/yr)	0.2% (CL 5.071keq)
E8	Plumley Lime Beds SSSI	2.1% (CL $1\mu\text{g}/\text{m}^3$)	1.6% (CL 15kg)	2.9% (CL 1.886keq)

Exceedance of screening thresholds

Modelled increases in nitrogen deposition rates only exceed screening thresholds on the ash woodland notified feature at Plumley Lime Beds SSSI, due to the higher deposition velocity to woodland habitats. Acid deposition thresholds are also only exceeded on the ash woodland. With respect to acid deposition, calcareous grassland habitats have both a lower deposition velocity than woodland, and are less sensitive; the PC is therefore well below the screening threshold.

Ammonia levels exceed screening thresholds for the bryophyte component of the calcareous grassland habitat at Plumley Lime Beds SSSI.

These can all be regarded as low magnitude changes, in accordance with the characterisation of effect magnitude set out in Table 2.2 above; their significance is discussed in section 4.4 below, taking into account the likelihood of significant harm to notified features of the SSSIs, and the predicted changes in emissions relative to currently permitted baseline values.

4.3 Impacts on locally designated sites

Summary of predicted impacts in AQA

The following table summarises the predicted impacts of ammonia, nitrogen and acid deposition on the two SSSI sites considered in the assessment.

Table 4.3: Summary of predicted impacts on locally designated sites

AQA ref.	Site name	Ammonia PC ($\mu\text{g}/\text{m}^3$) % of CL	Nitrogen deposition PC (kg N/ha/yr) % of CL	Acid deposition PC (keq/ha/yr) as % of CL
E9	Ashton's and Neumann's Flashes	0.9% (CL $1\mu\text{g}/\text{m}^3$)	0.4% (CL 15kg N/ha/yr)	0.2% (CL 5.07keq)
E10	Gadbrook Valley	0.2% (CL $3\mu\text{g}/\text{m}^3$)	0.8% (CL 10kg)	0.6% (CL 3.02keq)
E11	Griffiths Park	0.4% (CL $3\mu\text{g}/\text{m}^3$)	1.4% (CL 10kg)	1.6% (CL 1.90keq)
E12	Long Wood	0.9% (CL $3\mu\text{g}/\text{m}^3$)	3.0% (CL 10kg)	3.6% (CL 1.90keq)
E13	Marston Flashes	0.7% (CL $1\mu\text{g}/\text{m}^3$)	0.3% (CL 15kg)	0.2% (CL 5.07keq)
E14	Wade Brook	0.8% (CL $3\mu\text{g}/\text{m}^3$)	0.9% (CL 20kg)	0.6% (CL 5.07keq)
E15	Wincham Brook Valley and Mill Wood	1.3% (CL $3\mu\text{g}/\text{m}^3$)	4.6% (CL 10kg)	5.35% (CL 1.87keq)
E16	Winnington Wood	0.8% (CL $3\mu\text{g}/\text{m}^3$)	2.8% (CL 10kg)	3.4% (CL 1.87keq)
E17	River Dane	n/a (No CL)	n/a (No CL)	Not sensitive
E18	Marshall's Gorse	0.2% (CL $3\mu\text{g}/\text{m}^3$)	0.8% (CL 10kg)	0.6% (CL 3.02keq)
E19	Rudheath Lime Beds	0.7% (CL $3\mu\text{g}/\text{m}^3$)	0.8% (CL 20kg)	0.6% (CL 5.07keq)
E20	Lostock House Orchard	0.9% (CL $3\mu\text{g}/\text{m}^3$)	0.9% (CL 20kg)	0.7% (CL 5.07keq)

Exceedance of screening thresholds

All of the modelled exceedances of screening thresholds are with respect to woodland habitats, where a precautionary critical load for nitrogen and acid deposition to broadleaved woodland broad habitat has been applied. All exceedances can be

described as low magnitude, with the exception of acid deposition rates at Mill Wood, which just exceed 5% of critical load and can therefore be regarded as medium magnitude. The significance of these results is discussed in section 4.4 below, taking into account the predicted changes in emissions relative to currently permitted values, and the recommended approach to locally designated sites in IAQM (2020) guidance.

4.4 Effect Significance

Consideration of changes relative to baseline

Table 32 of the AQA included a comparison of predicted impacts relative to the existing Section 36 consent, using ammonia emissions to illustrate differences. This showed that the LSEP with the Proposal would actually result in a reduction in impacts. This is explained due to the lower volumetric flow rate compared to the currently permitted emissions, meaning less pollutant is emitted per second from the stack; stack emissions would also have a higher exit velocity, with better buoyancy and consequently better dispersion. Differences are small (<0.5% of critical level) and therefore not a significant benefit in ecological terms, but do provide sufficient evidence to conclude that no ecological effects would be likely to occur as a consequence of the Proposal.

Likely Significant Effect on SAC / Ramsar Sites

Before considering the predicted reduction in baseline emissions, it should be noted that the only parameter predicted to remain above screening thresholds is acid deposition to transition mire / quaking bog and bog habitats. It should be recognised that the effects of acid deposition *per se* are likely to be less harmful than exceedance of nitrogen deposition critical loads. Acid deposition was a major cause of bog degradation in the 19th and 20th centuries, but this was in a context of much higher contributions from sulphur pollutants from coal burning. It should also be noted that the predicted magnitude of impact is very small at these distances from the emission source, at <0.01keq/ha/yr, and very unlikely indeed to have any effect on bog chemistry.

Most importantly, the predicted small reduction in emissions relative to baseline means it can be safely concluded that there would be no likely significant effect on qualifying features of West Midlands Mosses SAC or Midlands Mosses and Meres Phase 1 and 2 Ramsar Sites.

Significance of effects on Plumley Lime Beds SSSI

Baseline ammonia levels given by APIS are relatively high at $3.54\mu\text{g}/\text{m}^3$, albeit based on a 5x5km grid model, with no discernible downward trend. In this context the continued contribution of $0.021\mu\text{g}/\text{m}^3$ from the LSEP with the Proposal is likely to be inconsequential in terms of either adding to the effects of baseline, or preventing recovery following implementation of wider-scale abatement measures.

With respect to nitrogen deposition, the additional process contribution only just exceeds the screening threshold (1.6% / 0.24kg N/ha/yr) for ash woodland, and remains below 1% for the calcareous grassland notified feature, while the alder - stinging nettle woodland cannot be regarded as sensitive. Baseline deposition rates are high with a site average of 46.7kg N/ha/yr given by APIS, which means the process contribution will be inconsequential to the effects of the baseline and would not significantly impede recovery following wider-scale abatement measures.

The SSSI Citation for Plumley Lime Beds²¹ states: '*Plumley Lime Beds has been selected to represent calcareous habitat in a county where there are few remaining natural outcrops of limestone or areas of calcareous soil or sand dune. The site differs from the nearby lime beds at Witton in that lime has washed out from the beds into the surrounding land creating variable soil condition. A wider range of habitats also occurs including woodland, a pool and marshland and an area of soil deposited on part of the lime beds.*' As such, the site-specific critical load for acid deposition of 1.886keq/ha/yr (minCLmaxN) is certainly over-precautionary, although likely to be appropriate for other sites located on non-calcareous substrates. No significant harm is therefore likely as a consequence of acid deposition.

Significance of effects on local sites

The magnitude of impact on local sites is small, with the exception of acid deposition rates at the Mill Wood section of Wincham Brook Valley and Mill Wood LWS, which is just over the threshold of a medium-scale impact. With respect to nitrogen deposition, it should also be noted that the precautionary 10kg value has been applied in all cases, when it is likely that some of the woodlands will belong to the W1.A Meso and eutrophic *Quercus* woodland critical load class, with a 15kg N/ha/yr minimum value.

In assessing significance, it is important to recognise the lower level of policy protection afforded to locally designated sites, commensurate with their status relative to

²¹ <https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001690.pdf>

internationally important and UK statutory designated sites. IAQM (2020) guidance states (para. 5.5.2.2): *'it is...normal practice to treat [LWS] sites in the same manner as SSSIs and European Sites, although the determination of the significance of an effect may be different.'* In this case the predicted impacts can be regarded at their most precautionary as a minor negative impact, unlikely to be reflected in a discernible effect on site condition, or to significantly prevent recovery if wider-scale reductions are achieved in background levels.

Once again and most importantly, the predicted reduction in baseline emissions will ensure no effects are likely as a consequence of the Proposal.

5 Conclusions

Dispersion and deposition modelling (Appendix 5.2 of the EIA Report) identified a number of small magnitude exceedances of screening thresholds at statutory and locally designated sites as a consequence of emissions from the LSEP with the Proposal.

Further consideration of the sensitivity of ecological receptors has resulted in some modifications of site-relevant critical loads and levels, compared to those given in APIS. Additional consideration of sensitivity was also required to account for Ramsar Sites and Local Wildlife Sites, neither of which are covered in the APIS site-relevant advice. A reasoned explanation is provided for these changes, which include both increases and decreases in sensitivity relative to APIS recommendations

The significance of effects has been assessed in the context of predicted changes to existing baseline emissions. The AQA predicts that these will reduce slightly as a consequence of changes to flue gas emission rates and exit velocity; this provides reassurance of **no significant changes to existing baseline conditions as a consequence of the Proposal.**

No likely significant effects are predicted for European or Ramsar Sites, and no significant harm is predicted for SSSIs or locally designated sites.