An Updated Report on the Modelling of the Dispersion and Deposition of Ammonia from the Existing Free Range Egg Laying Chicken Houses and the Proposed Broiler Chicken Rearing Houses at Brynthomas, Penybont, near to Llandrindod Wells in Powys

Prepared by Steve Smith

AS Modelling & Data Ltd.

Email: stevesmith@asmodata.co.uk

Telephone: 01952 462500

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1. Introduction

AS Modelling & Data Ltd. has been instructed by Ian Pick of Ian Pick Associates Ltd., on behalf of Mr. Ben Owens to use computer modelling to assess the impact of ammonia emissions from the existing free range egg-laying chicken houses and the proposed broiler chicken rearing houses at Brynthomas, Penybont, near to Llandrindod Wells in Powys. LD1 5SP.

Ammonia emission rates from the existing and proposed poultry houses have been assessed and quantified based upon the Environment Agency's standard ammonia emission factors. The ammonia emission rates have then been used as inputs to an atmospheric dispersion and deposition model which calculates ammonia exposure levels and nitrogen and acid deposition rates in the surrounding area.

This report is arranged in the following manner:

- Section 2 provides relevant details of the farm and potentially sensitive receptors in the area.

- Section 3 provides some general information on ammonia; details of the method used to estimate ammonia emissions, relevant guidelines and legislation on exposure limits and where relevant, details of likely background levels of ammonia.

- Section 4 provides some information about ADMS, the dispersion model used for this study and details the modelling procedure.

- Section 5 contains the results of the modelling.

- Section 6 provides a discussion of the results and conclusions.

2. Background Details

Brynthomas is in a rural area approximately 2.3 km to the south of the village of Penybont, near to Llandrindod Wells in Powys. The surrounding land is used largely for grazing, but there is some arable farming nearby. The farm is located on level ground on the banks of the River Ithon, a tributary of the River Wye, at an elevation of around 230 m, with the land rising to the east and south.

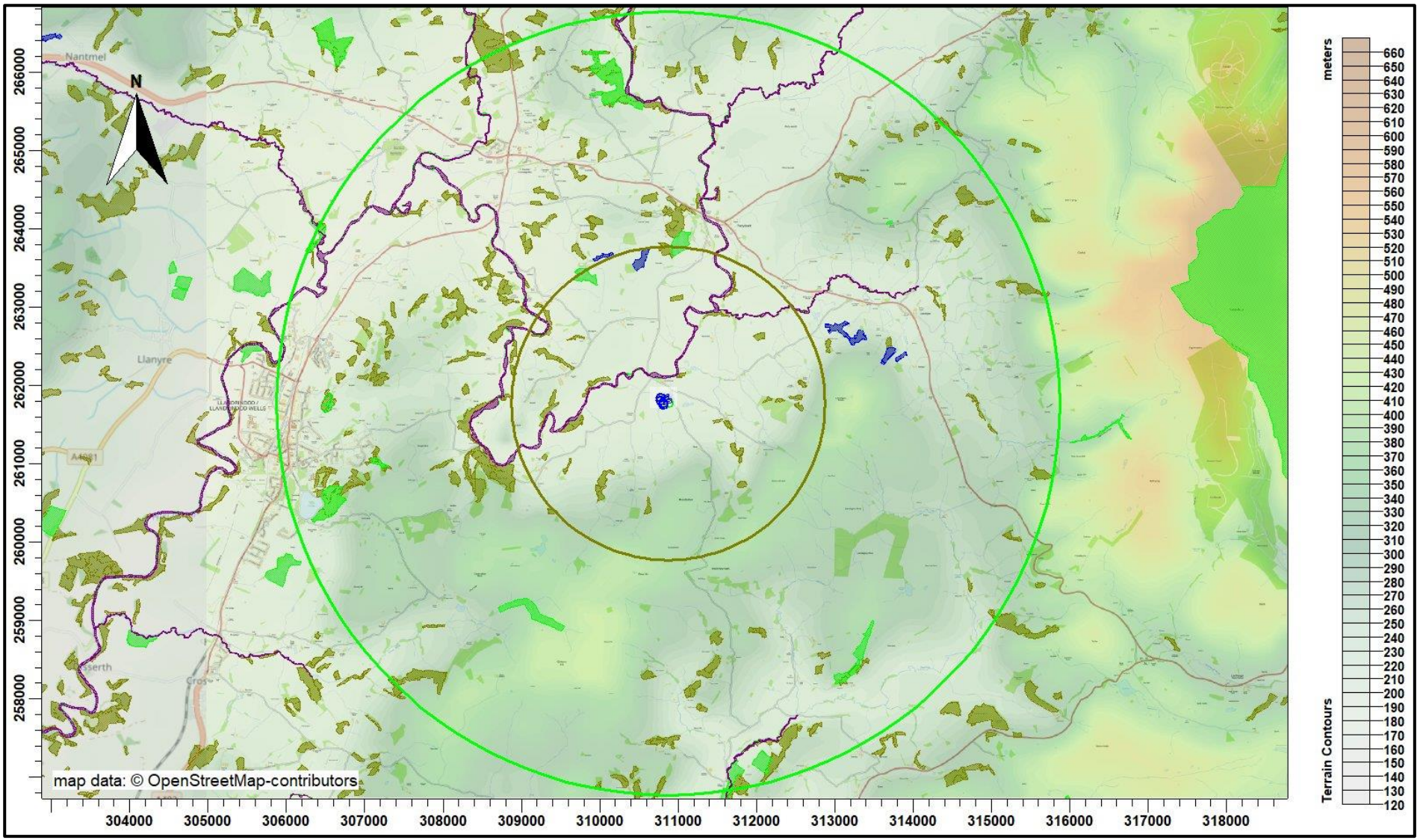
Currently, there are two poultry houses at Brynthomas which provide accommodation for up to 32,000 egg-laying chickens, which have access to outdoor ranging areas via pop holes on the side of the house. The poultry houses are ventilated using gable end fans. Manure collects within the houses, before being cleared out and taken off site at the end of each flock cycle, approximately once per year.

Under the proposal, the current poultry houses would be used to rear up to 77,000 broiler chickens, rather than housing 32,000 egg laying chickens. The ventilation systems of the existing houses would be upgraded, with primary ventilation provided by uncapped high speed ridge mounted fans and the gable end fans retained to provide supplementary ventilation in hot weather conditions. Two new poultry houses would also be constructed to the north of the existing houses, these houses would be used to rear an additional 104,000 broiler chickens. The new poultry houses would be ventilated via high speed ridge fans, each with a short chimney. The broiler chickens would be reared from day old chicks up to 38 days old and there would be approximately 7.5 flocks per annum.

There are a number of areas within 2 km of Brynthomas that are designated as Ancient Woodlands (AWs). Further afield, there are eleven areas designated as Sites of Special Scientific Interest (SSSIs) and parts of the River Wye Special Area of Conservation (SAC) within 5 km of the site. There are also some areas designated by Natural Resources Wales as ammonia sensitive AWs that are within 5 km of Brynthomas.

A map of the surrounding area showing the site of the poultry houses at Brynthomas and nearby wildlife sites is provided in Figure 1. In this figure, the SAC is shaded purple, the SSSIs are shaded green, the AWs are shaded olive, ammonia sensitive AWs are shaded blue and the site of the proposed poultry houses is outlined in blue.

Figure 1. The area surrounding Brynthomas - concentric circles radii 5 km (green) and 2 km (olive)



3. Ammonia, Background Levels, Critical Levels & Loads & Emission Rates

3.1 Ammonia concentration and nitrogen and acid deposition

When assessing potential impact on ecological receptors, ammonia concentration is usually expressed in terms of micrograms of ammonia per metre cubed of air (µg-NH_3/m^3) as an annual mean. Ammonia in the air may exert direct effects on the vegetation, or indirectly affect the ecosystem through deposition which causes both hyper-eutrophication (excess nitrogen enrichment) and acidification of soils. Nitrogen deposition, specifically in this case the nitrogen load due to ammonia deposition/absorption is usually expressed in kilograms of nitrogen per hectare per year (kg-N/ha/y). Acid deposition is expressed in terms of kilograms equivalent (of H^+ ions) per hectare per year (keq/ha/y).

3.2 Background ammonia levels and nitrogen and acid deposition

The background ammonia concentration (annual mean) in the area around Brynthomas and the local wildlife sites is 1.66 µg-NH_3/m^3. The background nitrogen deposition rate to woodland is 29.54 kg-N/ha/y and to short vegetation is 18.34 kg-N/ha/y. The background acid deposition rate to woodland is 2.22 keq/ha/y and to short vegetation is 1.38 keq/ha/y. The source of these background figures is the Air Pollution Information System (APIS, July 2021). The background levels are calculated from a 2016 -2018 inventory of ammonia sources (and sources of nitrogen and sulphur oxides, for the Critical Loads) and therefore, it is assumed that ammonia emissions from the existing houses are included in the inventory. However, it should be noted that due to the nature and resolution of the model used to calculate the background levels, the process contribution from the existing houses would be averaged over a 5 km x 5 km grid square; therefore, in close proximity to the farm the contribution will be underestimated and further afield may be overestimated.

3.3 Critical Levels & Critical Loads

Critical Levels and Critical Loads are a benchmark for assessing the risk of air pollution impacts to ecosystems. It is important to distinguish between a Critical Level and a Critical Load. The Critical Level is the gaseous concentration of a pollutant in the air, whereas the Critical Load relates to the quantity of pollutant deposited from air to the ground.

- Critical Levels are defined as, "concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge" (UNECE).
- Critical Loads are defined as, "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (UNECE).

For ammonia concentration in air, the Critical Level for higher plants is 3.0 µg-NH_3/m^3 as an annual mean. For sites where there are sensitive lichens and bryophytes present, or where lichens and bryophytes are an integral part of the ecosystem, the Critical Level is 1.0 µg-NH_3/m^3 as an annual mean.

Critical Loads for nutrient nitrogen are set under the Convention on Long-Range Transboundary Air Pollution. They are based on empirical evidence, mainly observations from experiments and gradient studies. Critical Loads are given as ranges (e.g. 10-20 kg-N/ha/y); these ranges reflect variation in ecosystem response across Europe. The Critical Levels and Critical Loads at the wildlife sites assumed in this study are provided in Table 1. Where the Critical Level of 1.0 µg-NH_3/m^3 is assumed, it is usually unnecessary to consider the Critical Load as the Critical Level provides the stricter test. Normally, the Critical Load for nitrogen deposition provides a stricter test than the Critical Load for acid deposition.

Table 1. Critical Levels and Critical Loads at the wildlife sites

Site	Critical Level (µg-NH_3/m^3)	Critical Load - Nitrogen Deposition (kg-N/ha/y)	Critical Load - Acid Deposition (keq/ha/y)
AWs and NRW ammonia sensitive AWs	1.0 [1]	-	-
Cae Llwyn SSSI, Cae-Cwm-Rhocas SSSI and Ithon Valley Woodlands SSSI	3.0 [1]	10.0 [2 & 3]	-
Howey Brook Stream Section SSSI, Meeting House Quarry SSSI and Bach-y-Graig Stream Section, Llanfawr Quarries, Llandrindod Wells SSSI	n/a [4]	n/a [4]	n/a [4]
Lake wood SSSI, Llandrindod Wells SSSI	1.0 [1 & 2]	10.0 [2 & 3]	-
River Ithon SSSI/River Wye SAC	n/a [4]	n/a [4]	-

1. A precautionary figure, used where details of the site are unavailable, or citations indicate that sensitive lichens and bryophytes may be present.
2. Based on the citation for the site and information from APIS.
3. The lower bound of the range of Critical Loads for the site/species, obtained from APIS.
4. Based on information from NRW (geographical database website).

3.4 Guidance on the significance of ammonia emissions

In May 2021, Natural Resources Wales published guidance for ammonia assessments. Which contains the following:

- We are using Critical Level as a standard to ensure the sensitive site is protected and to enable sustainable development. The following statements should help you decide on the next course of action.
- If the process contribution and background levels do not exceed the Critical Level and there are no other sources to consider then normally the application can proceed.
- There will be occasions where the Critical Level is close to being reached. It is important to note that the Critical Level is not a target but a level that we want to avoid. Where the background is close to the critical level we may advise against the development even if the Critical Level is not exceeded.
- If the process contribution plus the background level reaches or exceeds the Critical Level then abatement must be used to reduce the process contribution to below 1% of the critical level in order for the application to proceed.
- If your process contribution is below 1% of the Critical Level and there are no other sources of ammonia to consider, the application can proceed regardless of the background level.

For new developments at existing farms, it is assumed that the process contribution means the change in process contribution, rather than the entire process contribution and that the existing process contribution is included in background figures. However, AS Modelling & Data Ltd. would note that

although the process contribution from most farming installations is already included in the background ammonia concentrations and nitrogen and acid deposition rates, for established farms that are in close proximity to a wildlife site then, because the background concentrations and deposition rates are derived as an average for a 5 km by 5 km grid, there may be large underestimation of the existing process contributions to the local background level.

The Natural Resources Wales guidance appears to apply to statutory sites and some Ancient Woodlands deemed ammonia sensitive by Natural Resources Wales. For Local Nature Reserves (LNRs), Local Wildlife Sites (LWSs) and other Ancient Woodlands (AWs), it is assumed that the Environment Agency's horizontal guidance, H1 Environmental Risks Assessment, H1 Annex B - Intensive Farming is still applicable as there is no other official guidance that AS Modelling & Data Ltd. are aware of. The following are taken from this document.

"An emission is insignificant where Process Contribution (PC) is <50% for local and national nature reserves (LNRs & NNRs), ancient woodland and local wildlife sites." And "Where modelling predicts a process contribution >100% at a NNR, LNR, ancient woodland or local wildlife site, your proposal may not be considered acceptable. In such cases, your assessment should include proposals to reduce ammonia emissions."

This document was withdrawn February 1st 2016 and replaced with a web-page titled "Intensive farming risk assessment for your environmental permit", which contains essentially the same criteria. It is assumed that the upper threshold and lower threshold on the web-page refers to the levels that were previously referred to as levels of insignificance and acceptability in Annex B - Intensive Farming.

Within the range between the lower and upper thresholds, whether or not the impact is deemed acceptable is at the discretion of the Environment Agency. N.B. In the case of LWSs and AWs, the Environment Agency do not usually consider other farms that may act in-combination and therefore a PC of up to 100% of Critical Level or Critical Load is usually deemed acceptable for permitting purposes and therefore the upper and lower thresholds are the same (100%).

3.5 Quantification of Ammonia Emissions

Ammonia emission rates from poultry houses depend on many factors and are likely to be highly variable. However, the benchmarks for assessing impacts of ammonia and nitrogen deposition are framed in terms of an annual mean ammonia concentration and annual nitrogen deposition rates. To obtain relatively robust figures for these statistics, it is not necessary to model short term temporal variations and a steady continuous emission rate can be assumed. In fact, modelling short term temporal variations might introduce rather more uncertainty than modelling continuous emissions.

3.5.1 Existing laying chicken and proposed broiler chicken housing ammonia emissions

The Environment Agency provides an Intensive Farming guidance note which lists standard ammonia emission factors for a variety of livestock, including poultry. For free-range egg laying chickens caged with deep litter in modern housing, the Environment Agency figure is 0.29 kg-NH_3/bird place/year and for broiler chickens it is 0.034 kg-NH_3/bird place/year; these figures, which appear to have been

adopted by Natural Resources Wales, are used as the basis of the calculation of the emissions from the existing and proposed poultry units.

3.5.2 Existing ranging area ammonia emissions

As the birds would have access to outdoor ranging areas, some of the birds' droppings, which is the source of the ammonia, would be deposited on these ranging areas. To estimate the ammonia emissions from the ranges for each scenario, it is assumed that laying hens produce 0.75 kg-N/y in their droppings (NAEI) of which 70% is ammoniacal nitrogen, that is nitrogen in a form that may readily be converted to ammonia (NAEI), and that 35% of ammoniacal nitrogen is emitted as ammonia (NAEI).

Three scenarios are considered for ranging area emissions:

- Scenario 1 - The Realistic Scenario - in which ranging emissions are based upon a figure of 7.34% range usage obtained from recent peer reviewed scientific investigations of very similar housing/ranging systems (Pettersson *et al*). This equates to an emission factor of 0.016 kg-NH3/bird-place/y.
- Scenario 2 - The Pessimistic Scenario - in which ranging emissions based upon a figure of 12% range usage which is at the higher end of the range of percentages obtained from available peer reviewed scientific investigations (Campbell *et al*; Larsen *et al*; Chielo *et al*; Dawkins *et al*; Hegelund *et al*; Pettersson *et al*; Sossidou *et al* and Whay *et al*). This equates to an emission factor of 0.027 kg-NH3/bird-place/y.
- Scenario 3 - The Unsound Scenario - in which ranging emissions based upon a figure of 20% range usage which is a figure that has been mandated by Natural Resources Wales, but is not based upon any peer reviewed literature and has not been included in the UK Ammonia Emission Inventory since 2015 (prior to which the figure was mentioned, but only as personal correspondence, with no reference to any peer reviewed work). It should be noted that the maintainers of the NAEI state the following, "We have no specific measurement/observational data for this number" and have described the number as "unsound". This equates to an emission factor of 0.045 kg-NH3/bird-place/y.

Details of the bird numbers and baseline ammonia emission rates used in the modelling are provided in Table 2.

Table 2. Details of poultry numbers and baseline ammonia emission rates

Source	Animal numbers/ Tonnes	Type or weight	Emission factor (kg-NH_3/place/y)	Emission rate (g-NH_3/s)
Existing Housing	32,000	Egg Laying chickens with deep litter (EA standard emission factor)	0.29	0.294065
Existing Ranges	32,000	Ranging egg laying chickens (NRW figure)	0.045	0.045631
Proposed Housing	181,000	Broiler Chickens (EA standard emission factor)	0.034	0.195008

4. The Atmospheric Dispersion Modelling System (ADMS) and model parameters

The Atmospheric Dispersion Modelling System (ADMS) ADMS 5 is a new generation Gaussian plume air dispersion model, which means that the atmospheric boundary layer properties are characterised by two parameters; the boundary layer depth and the Monin-Obukhov length rather than in terms of the single parameter Pasquill-Gifford class.

Dispersion under convective meteorological conditions uses a skewed Gaussian concentration distribution (shown by validation studies to be a better representation than a symmetrical Gaussian expression).

ADMS has a number of model options, these include: dry and wet deposition; NO_x chemistry; impacts of hills; variable roughness; buildings and coastlines; puffs; fluctuations; odours; radioactivity decay (and γ-ray dose); condensed plume visibility; time varying sources and inclusion of background concentrations.

ADMS has an in-built meteorological pre-processor that allows flexible input of meteorological data both standard and more specialist. Hourly sequential and statistical data can be processed and all input and output meteorological variables are written to a file after processing.

The user defines the pollutant, the averaging time (which may be an annual average or a shorter period), which percentiles and exceedance values to calculate, whether a rolling average is required or not and the output units. The output options are designed to be flexible to cater for the variety of air quality limits which can vary from country to country and are subject to revision.

4.1 Meteorological data

Computer modelling of dispersion requires hourly sequential meteorological data and to provide robust statistics the record should be of a suitable length; preferably four years or longer.

The meteorological data used in this study is obtained from assimilation and short term forecast fields of the Numerical Weather Prediction (NWP) system known as the Global Forecast System (GFS)[1].

The GFS is a spectral model: the physics/dynamics model has an equivalent resolution of approximately 9 km (latterly 6 km) over the UK; terrain is understood to be resolved at a resolution of approximately 2 km (with sub-9/6 km terrain effects parameterised). Site specific data may be extrapolated from nearby grid points, or a most representative grid point chosen. The GFS resolution adequately captures major topographical features and the broad-scale characteristics of the weather over the UK. Smaller scale topological features may be included in the dispersion modelling by using the flow field module of ADMS (FLOWSTAR[2]). The use of NWP data has advantages over traditional meteorological records because:

- Calm periods in traditional records may be over represented because the instrumentation used may not record wind speed below approximately 0.5 m/s and start up wind speeds may be greater than 1.0 m/s. In NWP data, the wind speed is continuous down to 0.0 m/s, allowing the calms module of ADMS to function correctly.

- Traditional records may include very local deviations from the broad-scale wind flow that would not necessarily be representative of the site being modelled; these deviations are difficult to identify and remove from a meteorological record. Conversely, local effects at the site being modelled are relatively easy to impose on the broad-scale flow and provided horizontal resolution is not too great, the meteorological records from NWP data may be expected to represent well the broad-scale flow.

- Information on the state of the atmosphere above ground level which would otherwise be estimated by the meteorological pre-processor may be included explicitly.

A wind rose showing the distribution of wind speeds and directions in the GFS derived data is shown in Figure 2a.

Wind speeds are modified by the treatment of roughness lengths (see Section 4.7) and where terrain data is included in the modelling, the raw GFS wind speeds and directions will be modified. The terrain and roughness length modified wind rose for the location of the poultry houses is shown in Figure 2b; it should be noted that elsewhere in the modelling domain the modified wind roses may differ markedly, reflecting the local flow in that part of the domain. The effective resolution of the wind field is approximately 180 m. Please also note that FLOWSTAR[2] is used to obtain a local flow field, not to explicitly model dispersion in complex terrain as defined in the ADMS User Guide; therefore, the ADMS default value for minimum turbulence length has been amended[3].

1. The GFS data used is derived from the high resolution operational GFS datasets, the data is not obtained from the lower resolution (0.5 degree) long-term archive.
2. Note that FLOWSAR requirements are for meteorological data representative of the upwind flow over the modelling domain and that single site meteorological data (observational or from high resolution modelled data) that is representative of the application site is not generally suitable (personal correspondence: CERC 2019 and UK Met O 2015). If data are deemed representative of a particular application site, either wholly or partially, then these data cannot also be representative of the upstream flow over the modelling domain. Furthermore, it would be extremely poor practice to use such data as the boundary conditions for a flow-solver, such as FLOWSTAR.
3. When modelling complex terrain with ADMS, by default, the minimum turbulence length has 0.1 m added to the flat terrain value (calculated from the Monin-Obukhov length). Whilst this might be appropriate over hill/mountain tops in terrain with slopes > 1:10 (and quite possibly only in certain wind directions) in lesser terrain it introduces model behaviour that is not desirable where FLOWSTAR is simply being used to modify the upwind flow. Specifically, the parameter sigma z of the Gaussian plume model is overly constrained, which for elevated point sources emissions, may on occasion cause over prediction of ground level concentrations in stable weather conditions and light winds (Steven R. Hanna & Biswanath Chowdhury, 2013), conversely for low level emission sources, this will cause gross under prediction. Note that this becomes particularly important overnight and if calm and light wind conditions are not being ignored, as they often are when using traditional observational meteorological datasets. To reduce this behaviour, where terrain is modelled, AS Modelling & Data Ltd. have set a minimum turbulence length of 0.025 m in ADMS. This approximates the normal behaviour of ADMS with flat terrain.

Figure 2a. The wind rose. Raw GFS derived data, for 52.246 N, 3.306 W, 2017-2020

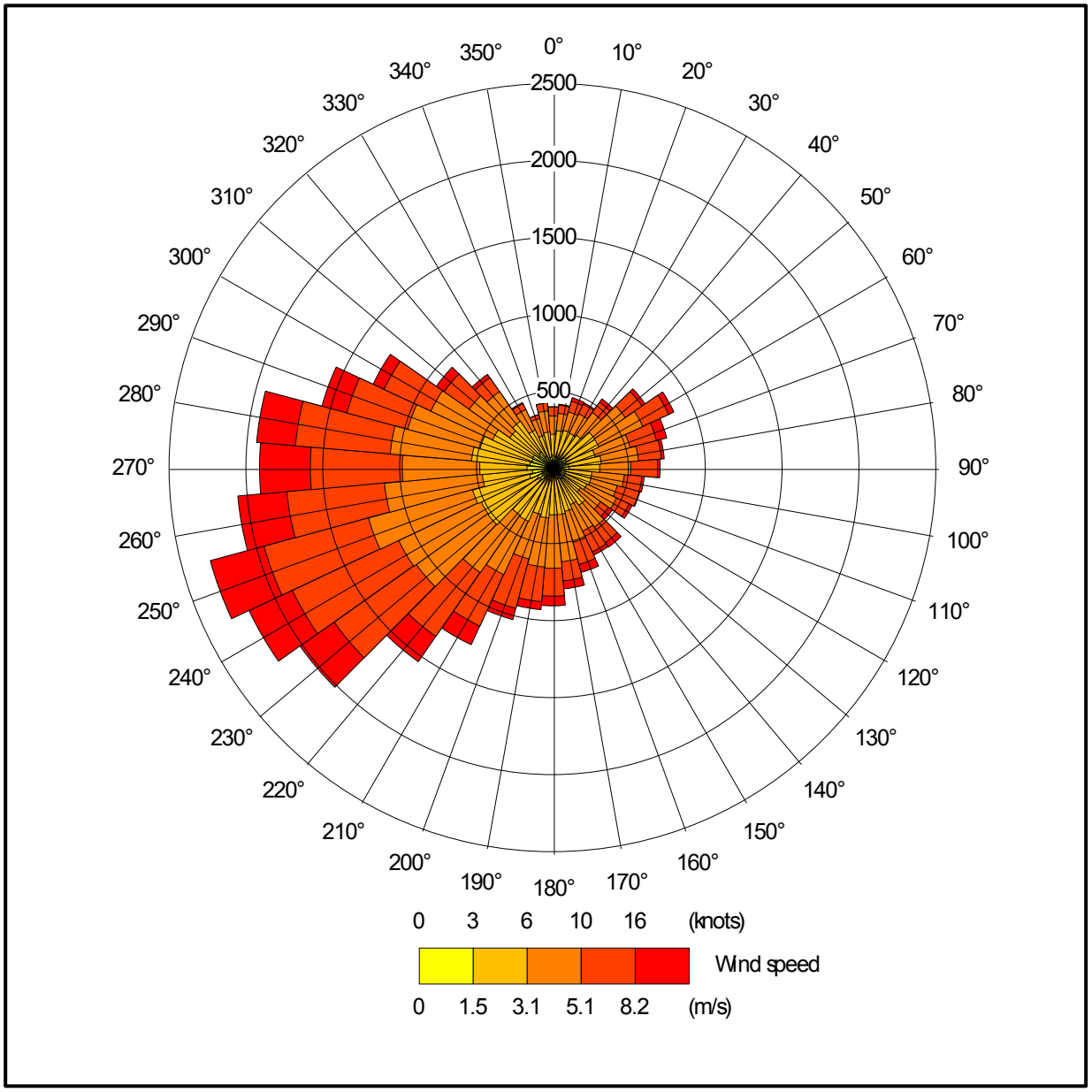
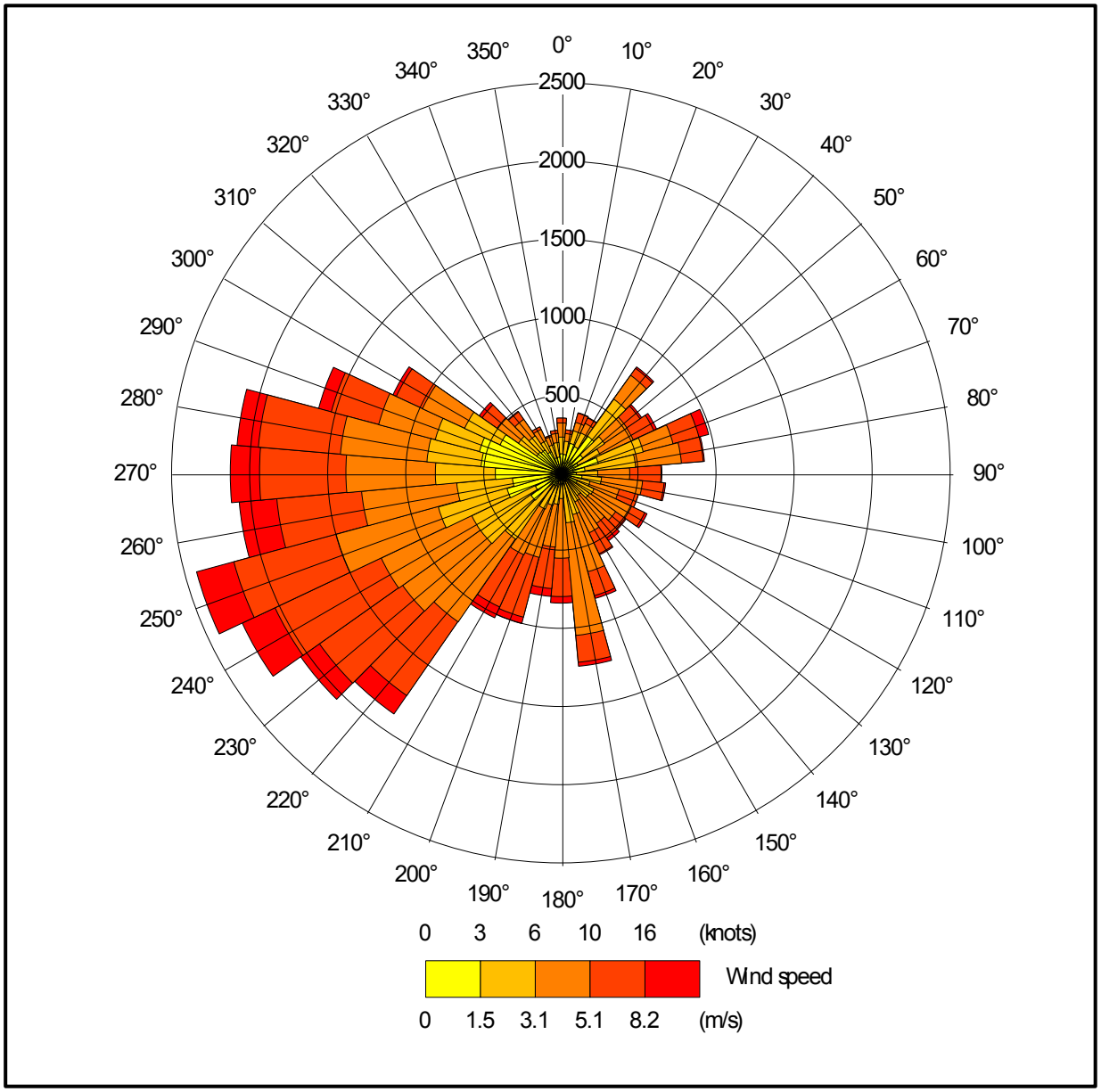


Figure 2b. The wind rose. FLOWSTAR modified GFS derived data for NGR 310850, 261800, 2017-2020



4.2 Emission sources

Emissions from the gable end fans on the existing houses are represented by volume sources within ADMS (EX1_GAB and EX2_GAB).

Emissions from the time-cycled, high speed ridge/roof fans that would be used to ventilate the existing and proposed poultry houses are represented by three point sources per house within ADMS (EX1 & EX2 1, 2 & 3 and PR1 & PR2 1, 2 & 3).

Details of the point and volume source parameters are shown in Tables 3a and 3b and the positions of the sources may be seen in Figure 3 (marked by red shaded rectangles and green circles, respectively).

Table 3a. Point source parameters

Source ID	Height (m)	Diameter (m)	Efflux velocity (m/s)	Emission temperature (˚C)	Emission rate per source (g-NH_3/s)
EX1 & EX2 1, 2 & 3 (proposed)	6.5	0.8	12.0	21.0	0.013827 [1]
PR1 & PR2 1, 2 & 3	7.3	0.8	12.0	21.0	0.018675

Table 3b. Volume source parameters

Source ID	Length (m)	Width (m)	Depth (m)	Base height (m)	Emission temperature (°C)	Existing Baseline emission rate per house (g-NH_3/s)	Proposed emission rate per house (g-NH_3/s)
EX1_GAB and EX2_GAB (existing)	19.8	10.0	3.0	0.0	Ambient	0.147033 [3]	-
EX1_GAB and EX2_GAB (proposed)	19.8	10.0	3.0	0.0	Ambient	-	0.020740 [2]

1. Reduced by 50% when ambient temperature equals, or exceeds, 21Celsius.
2. 50% of total, only emitted when ambient temperature equals, or exceeds, 21Celsius.
3. For the Unsound Scenarios, 80% of this figure is used; for the Realistic Scenario, 88% of this figure is used and for the Realistic Scenario, 92.66% of this figure is used.

The egg-laying chickens in the existing poultry houses have access to external ranging areas. Emissions from these ranging areas are represented by two area sources within ADMS (EX1_RAN and EX2_RAN). Details of the area source parameters are shown in Table 3c and the positions of the area sources may be seen in Figure 3, where they are indicated by blue shaded polygons.

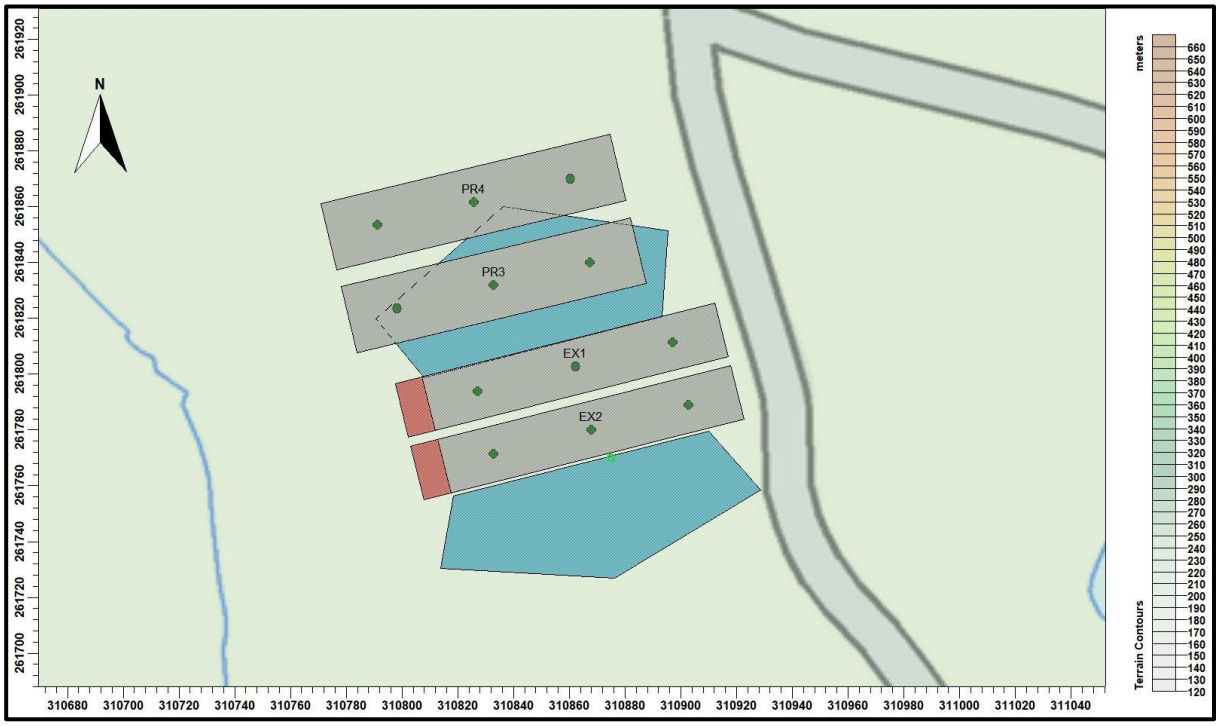
Table 3c. Area source parameters

Source ID	Area (m^2)	Base height (m)	Emission temperature (°C)	Emission rate - Unsound Scenario (g-NH_3/s)	Emission rate- Pessimistic Scenario (g-NH_3/s)	Emission rate - Realistic scenario (g-NH_3/s)
EX1_RAN	4,050.2	0.0	Ambient	0.022815	0.013689	0.008112
EX2_RAN	3,678.9	0.0	Ambient	0.022815	0.013689	0.008112

4.3 Modelled buildings

The structure of the existing and proposed poultry houses may affect the plumes from the point sources.Therefore, these buildings are modelled within ADMS. The positions of the modelled buildings may be seen in Figure 3, where they are marked by grey rectangles.

Figure 3. The positions of modelled buildings and sources



4.4 Discrete receptors

Seventy-six discrete receptors have been defined: twenty-eight at the AWs (1 to 27), sixteen at the SSSIs (28 to 43) twenty-eight at the River Wye SAC (44 to 71) and six at the ammonia sensitive AWs (72 to 76). These receptors are defined at ground level within ADMS. The positions of the discrete receptors may be seen in Figure 4a, a broad scale view and Figure 4b, a closer view, where they are marked by enumerated pink rectangles.

4.5 Regular Cartesian grid receptors

To produce the contour plots presented in Section 5 of this report and to define the spatially varying deposition fields used in the detailed modelling, a regular Cartesian grid has been defined within ADMS. The individual grid receptors are defined at ground level within ADMS. The position of the Cartesian grid may be seen in Figures 4a and 4b, where it is marked by grey lines.

4.6 Terrain data

Terrain has been considered in the modelling. The terrain data are based upon the Ordnance Survey 50 m Digital Elevation Model. A 12.0 km x 12.0 km domain has been resampled at 100 m horizontal resolution for use within ADMS. N.B. The resolution of FLOWSTAR is 64 x 64 grid points; therefore, the effective resolution of the wind field is approximately 180 m.

4.7 Roughness Length

A fixed surface roughness length of 0.25 m has been applied over the entire modelling domain. As a precautionary measure, the GFS meteorological data is assumed to have a roughness length of 0.225 m. The effect of the difference in roughness length is precautionary as it increases the frequency of low wind speeds and the stability and therefore increases predicted ground level concentrations.

Figure 4a. The discrete receptors and Cartesian grid receptors - a broadscale view

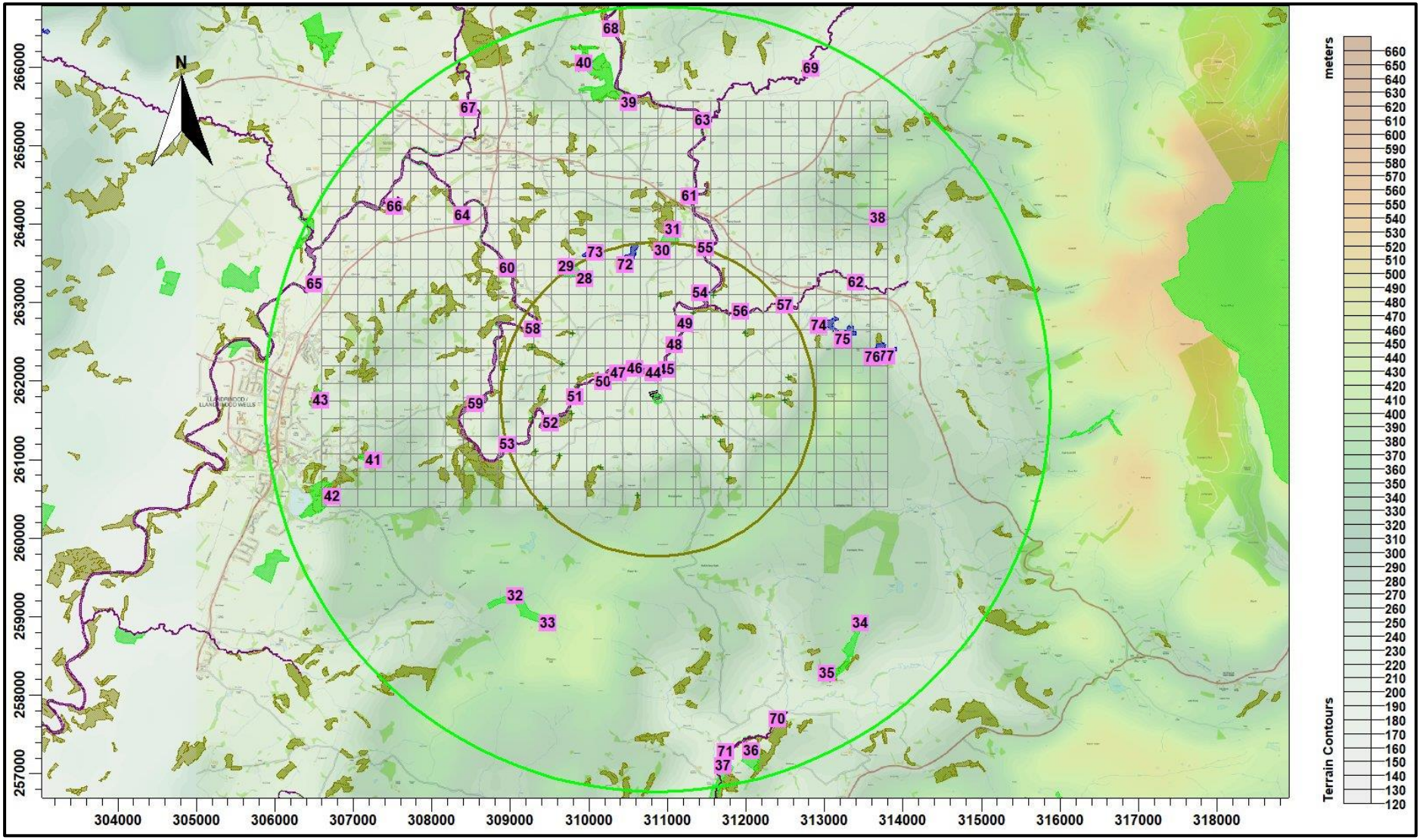
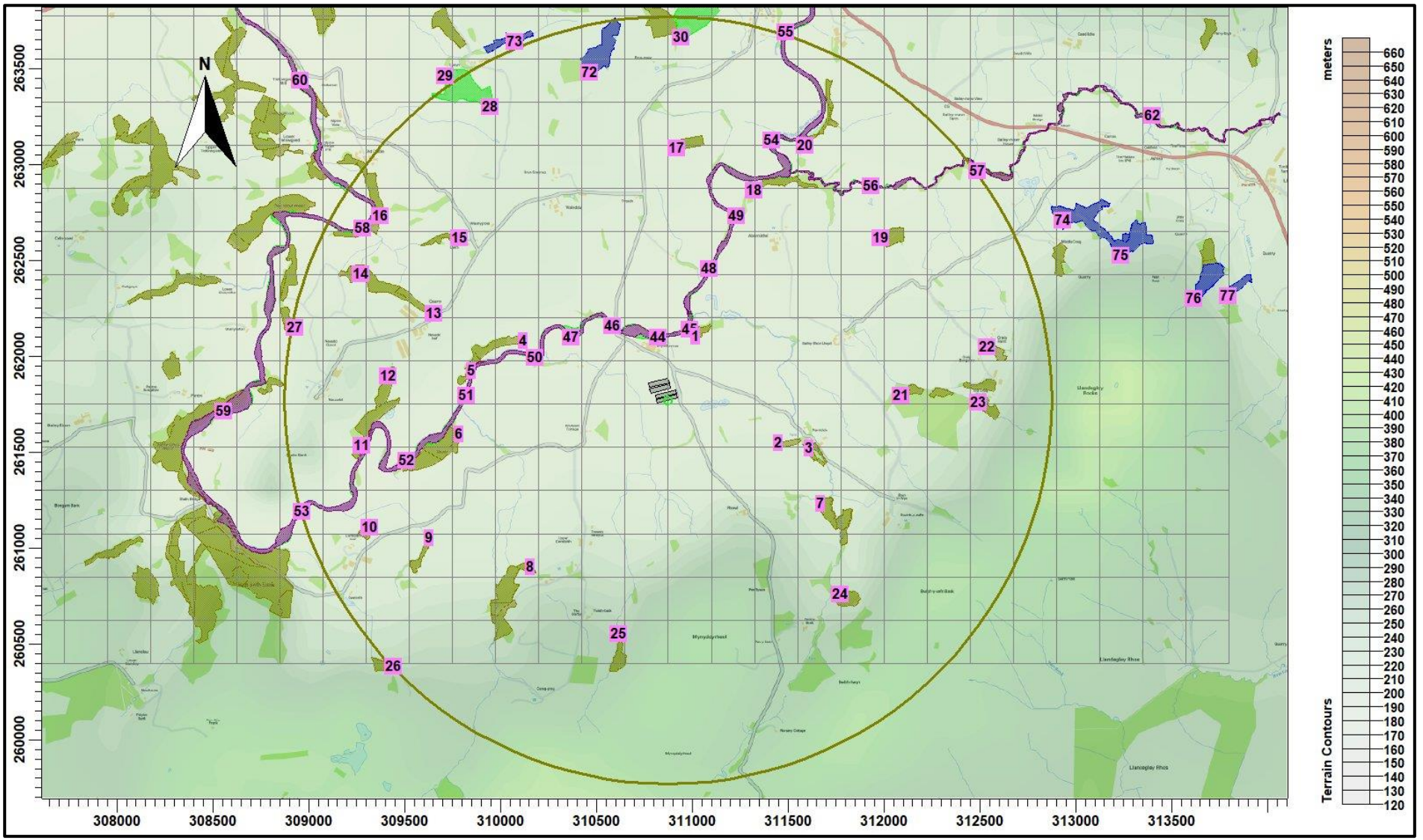


Figure 4b. The discrete receptors and Cartesian grid receptors - a closer view



4.8 Deposition

The method used to model deposition of ammonia and consequent plume depletion is based primarily upon Frederik Schrader and Christian Brümmer. Land Use Specific Ammonia Deposition Velocities: a Review of Recent Studies (2004-2013). AS Modelling & Data Ltd. has restricted deposition over arable farmland and heavily grazed and fertilised pasture; this is to compensate for possible saturation effects due to fertilizer application and to allow for periods when fields are clear of crops (Sutton), the deposition is also restricted over areas with little or no vegetation and the deposition velocity is set to 0.002 m/s where grid points are over the poultry housing and 0.010 m/s to 0.015 m/s over heavily grazed grassland. Where deposition over water surfaces is calculated, a deposition velocity of 0.005 m/s is used.

In summary, the method is as follows:

- A preliminary run of the model without deposition is used to provide an ammonia concentration field.
- The preliminary ammonia concentration field, along with land usage, is used to define a deposition velocity field. The deposition velocities used are provided in Table 4.

Table 4. Deposition velocities

NH_3 concentration (PC + background) ($\mu g/m^3$)	< 10	10 - 20	20 - 30	30 - 80	> 80
Deposition velocity - woodland (m/s)	0.03	0.015	0.01	0.005	0.003
Deposition velocity - short vegetation (m/s)	0.02 (0.015 over heavily grazed grassland)	0.015	0.01	0.005	0.003
Deposition velocity - arable farmland/rye grass (m/s)	0.005	0.005	0.005	0.005	0.003

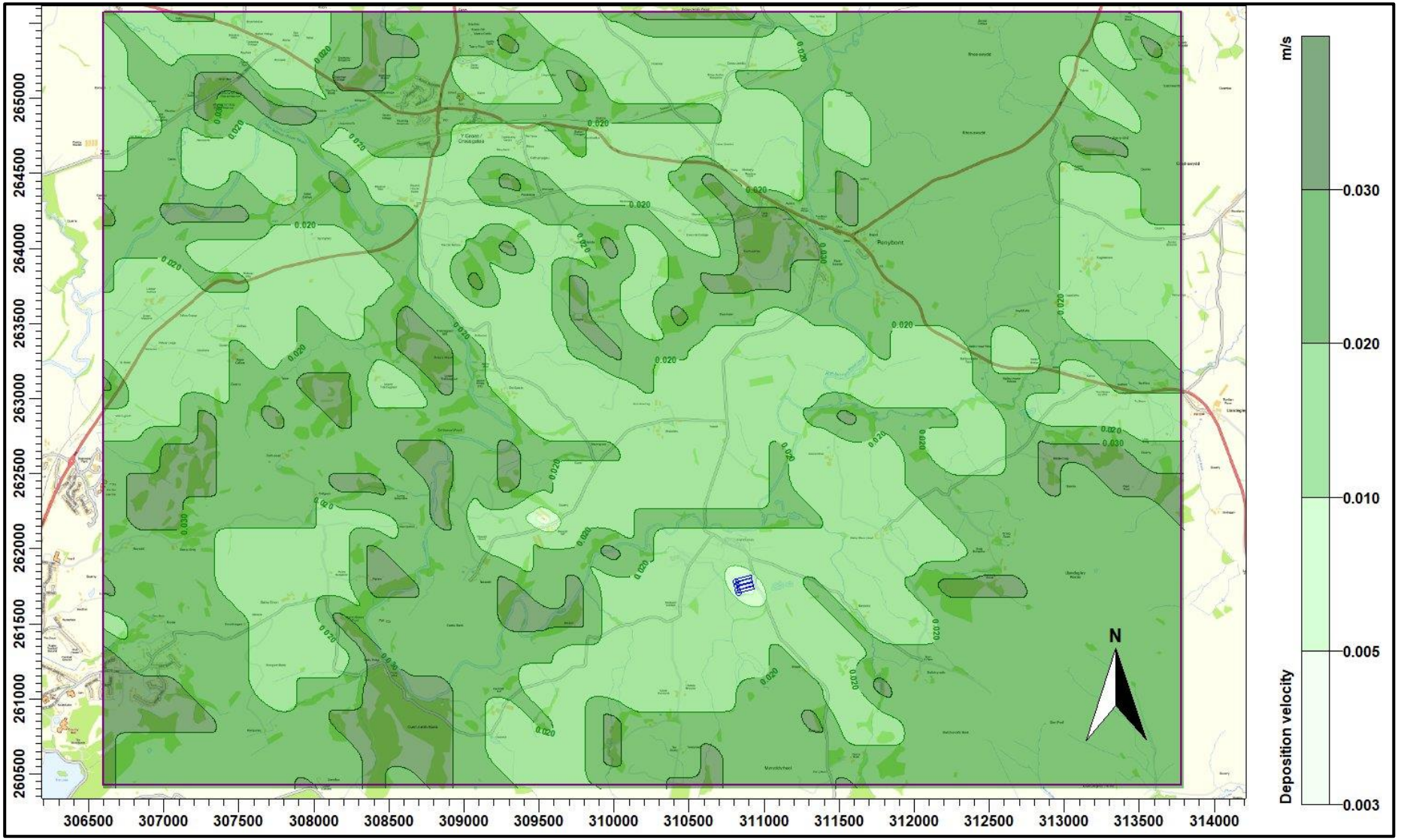
- The model is then rerun with the spatially varying deposition module.

A contour plot of the spatially varying deposition field is provided in Figure 5.

In this case, the model has also been run with a fixed deposition at 0.003 m/s and similarly to not modelling deposition at all, the predicted ammonia concentrations (and nitrogen and acid deposition rates) are always higher than if spatially varying deposition were modelled explicitly, particularly where there is some distance between the source and a receptor.

The May 2021, Natural Resources Wales guidance for ammonia assessments defines a set of deposition velocities to be used, which differ somewhat to those described above. AS Modelling & Data considers these to be, at best, incomplete.; however, to demonstrate that, in general, Natural Resources Wales guidance is less precautionary than the AS Modelling & Data Ltd methodology, the modelling has also been run using the deposition velocities defined in the Natural Resources Wales guidance for ammonia assessments.

Figure 5. The spatially varying deposition field



5. Details of the Model Runs and Results

5.1 Preliminary modelling and sensitivity testing

ADMS was run a total of forty times, once for each year of the meteorological record for the Existing Unsound Scenario and Proposed Scenario in the following five modes:

- In basic mode without calms, or terrain - GFS data.
- With calms and without terrain - GFS data.
- Without calms and with terrain (0.025 m minimum turbulence length) - GFS data.
- Without calms and with terrain (ADMS default minimum turbulence length) - - GFS data.
- Without calms (but with calms correction applied to the Exiting Scenario results), with terrain (0.025 m minimum turbulence length) and with a fixed deposition velocity of 0.003 m/s - GFS data.

For each mode, statistics for the maximum annual mean ammonia concentration at each receptor were compiled for the following scenarios:

- Existing Unsound Scenario - 32,000 free range chickens in the existing two houses.
- Proposed Scenario - 181,000 broiler chickens in the existing proposed houses.

Details of the predicted annual mean ammonia concentrations at each receptor are provided in Table 5. In the Table, predicted ammonia concentrations (or ammonia concentrations equivalent to nitrogen deposition rates) that are in excess of 100% of Critical Level or Load for a non-statutory wildlife site and that are in excess of 1% of Critical Level or Load for a statutory wildlife site are highlighted with bold red text.

Table 5. Predicted maximum annual mean ammonia concentration rate at the discrete receptors - Existing Unsound Scenario and Proposed Scenario

Receptor number	X(m)	Y(m)	Designation	Maximum annual mean ammonia concentration - (µg/m³)									
				Existing Layers (20% ranging)					Proposed Broilers				
				GFS No Calms No Terrain	GFS Calms No Terrain	GFS No Calms Terrain Min turb 0.025m	GFS No Calms Terrain Default min turb	GFS Calms Correction Terrain Fixed depo 0.003 m/s	GFS No Calms No Terrain	GFS Calms No Terrain	GFS No Calms Terrain Min turb 0.025m	GFS No Calms Terrain Default min turb	GFS No Calms Terrain Fixed depo 0.003 m/s
1	311016	262103	AW	**4.298**	**5.184**	**4.771**	**2.710**	**3.405**	0.687	0.681	0.710	0.733	0.685
2	311451	261547	AW	**2.548**	**2.790**	**2.776**	**1.376**	**1.585**	0.301	0.299	0.355	0.435	0.317
3	311611	261520	AW	**1.821**	**1.985**	**2.068**	**1.024**	**1.149**	0.223	0.221	0.283	0.345	0.249
4	310117	262079	AW	**1.273**	**1.503**	**1.465**	0.614	0.813	0.106	0.105	0.121	0.121	0.083
5	309847	261922	AW	0.894	**1.092**	**1.193**	0.448	0.557	0.072	0.071	0.098	0.098	0.059
6	309784	261591	AW	0.916	**1.074**	**1.201**	0.482	0.572	0.073	0.072	0.112	0.151	0.089
7	311671	261231	AW	**1.158**	**1.272**	**1.341**	0.613	0.632	0.135	0.134	0.166	0.177	0.115
8	310154	260901	AW	0.660	0.791	0.694	0.302	0.338	0.065	0.065	0.077	0.102	0.060
9	309627	261053	AW	0.479	0.568	0.645	0.268	0.301	0.060	0.059	0.073	0.082	0.057
10	309319	261106	AW	0.366	0.437	0.536	0.217	0.240	0.047	0.046	0.072	0.079	0.053
11	309275	261535	AW	0.469	0.549	0.567	0.217	0.241	0.044	0.044	0.054	0.077	0.040
12	309413	261896	AW	0.510	0.614	0.564	0.211	0.241	0.045	0.044	0.056	0.059	0.029
13	309654	262222	AW	0.549	0.647	0.597	0.239	0.290	0.054	0.054	0.064	0.064	0.036
14	309270	262428	AW	0.327	0.386	0.347	0.150	0.168	0.038	0.037	0.047	0.047	0.026
15	309788	262615	AW	0.465	0.566	0.383	0.200	0.231	0.047	0.047	0.065	0.065	0.036
16	309373	262731	AW	0.298	0.359	0.291	0.141	0.154	0.035	0.034	0.051	0.051	0.028
17	310917	263084	AW	0.459	0.546	0.412	0.247	0.278	0.061	0.061	0.071	0.071	0.050
18	311323	262865	AW	0.522	0.637	0.630	0.314	0.343	0.087	0.086	0.092	0.092	0.067
19	311984	262615	AW	0.685	0.758	0.789	0.373	0.408	0.099	0.098	0.136	0.154	0.103
20	311587	263097	AW	0.346	0.433	0.442	0.220	0.231	0.065	0.064	0.070	0.070	0.051
21	312087	261794	AW	0.960	**1.037**	**1.258**	0.527	0.606	0.120	0.119	0.170	0.170	0.125
22	312537	262048	AW	0.585	0.633	0.825	0.283	0.328	0.077	0.076	0.095	0.095	0.065
23	312493	261758	AW	0.603	0.644	0.962	0.341	0.408	0.078	0.077	0.092	0.092	0.061
24	311774	260758	AW	0.614	0.687	**1.043**	0.288	0.378	0.054	0.054	0.058	0.058	0.035
25	310618	260553	AW	0.418	0.537	0.487	0.159	0.222	0.044	0.044	0.045	0.045	0.023
26	309440	260383	AW	0.274	0.320	0.397	0.140	0.155	0.036	0.036	0.033	0.041	0.025
27	308926	262146	AW	0.270	0.333	0.324	0.130	0.138	0.032	0.032	0.042	0.042	0.022

Table 5. (continued)

Receptor number	X(m)	Y(m)	Designation	Maximum annual mean ammonia concentration - (µg/m³)									
				Existing Layers (20% ranging)					Proposed Broilers				
				GFS No Calms No Terrain	GFS Calms No Terrain	GFS No Calms Terrain Min turb 0.025m	GFS No Calms Terrain Default min turb	GFS Calms Correction Terrain Fixed depo 0.003 m/s	GFS No Calms No Terrain	GFS Calms No Terrain	GFS No Calms Terrain Min turb 0.025m	GFS No Calms Terrain Default min turb	GFS No Calms Terrain Fixed depo 0.003 m/s
28	309949	263298	Cae Llwyn SSSI	**0.347**	**0.406**	**0.201**	**0.156**	**0.167**	**0.039**	**0.038**	**0.057**	**0.057**	**0.028**
29	309712	263459	Cae Llwyn SSSI	**0.263**	**0.311**	**0.164**	**0.120**	**0.125**	**0.032**	**0.031**	**0.045**	**0.045**	**0.022**
30	310939	263664	Cae-Cwm-Rhocas SSSI	**0.246**	**0.292**	**0.225**	**0.132**	**0.137**	**0.036**	**0.036**	**0.044**	**0.044**	**0.029**
31	311064	263932	Cae-Cwm-Rhocas SSSI	**0.187**	**0.225**	**0.200**	**0.105**	**0.108**	**0.030**	**0.030**	**0.033**	**0.033**	**0.022**
32	309057	259264	Howey Brook Stream Section SSSI	0.111	0.135	0.087	0.034	0.031	0.020	0.019	0.012	0.015	0.008
33	309478	258917	Howey Brook Stream Section SSSI	0.092	0.118	0.068	0.027	0.025	0.018	0.018	0.008	0.009	0.005
34	313456	258914	Graig Fawr SSSI	**0.109**	**0.122**	**0.083**	**0.028**	**0.024**	**0.016**	**0.016**	**0.013**	**0.013**	0.007
35	313035	258282	Graig Fawr SSSI	**0.080**	**0.092**	**0.057**	**0.022**	**0.020**	**0.012**	**0.011**	0.009	0.009	0.005
36	312062	257293	Coedmawr Fields SSSI	**0.049**	**0.061**	**0.037**	**0.017**	**0.016**	0.009	0.009	0.006	0.006	0.003
37	311705	257098	Coedmawr Fields SSSI	**0.046**	**0.058**	**0.034**	**0.016**	**0.014**	0.009	0.009	0.006	0.006	0.003
38	313683	264071	Meeting House Quarry SSSI	0.132	0.147	0.143	0.058	0.051	0.028	0.027	0.039	0.027	0.021
39	310505	265546	Ithon Valley Woodlands SSSI	**0.089**	**0.103**	**0.070**	**0.044**	**0.039**	**0.018**	**0.018**	**0.020**	**0.020**	**0.013**
40	309938	266049	Ithon Valley Woodlands SSSI	**0.080**	**0.091**	**0.055**	**0.039**	**0.033**	**0.017**	**0.017**	**0.018**	**0.018**	**0.011**
41	307262	260990	Bach-y-Graig Styream Section	0.110	0.129	0.106	0.044	0.038	0.019	0.018	0.021	0.024	0.013
42	306727	260536	Lake Wood Llandrindod Wells	**0.080**	**0.094**	**0.070**	**0.031**	**0.026**	**0.016**	**0.015**	**0.018**	**0.017**	**0.010**
43	306581	261752	Llanfawr Quarries Llandrindod Wells	**0.086**	**0.102**	**0.082**	**0.033**	**0.027**	**0.015**	**0.015**	**0.013**	**0.016**	0.007
44	310824	262097	River Ithon SSSI/River Wye SAC	5.990	6.916	4.518	3.072	4.214	0.565	0.562	0.587	0.595	0.569
45	310988	262141	River Ithon SSSI/River Wye SAC	3.673	4.412	3.514	2.267	2.753	0.548	0.544	0.531	0.546	0.514
46	310583	262160	River Ithon SSSI/River Wye SAC	3.584	4.199	1.743	1.570	2.040	0.226	0.223	0.216	0.216	0.179
47	310370	262097	River Ithon SSSI/River Wye SAC	2.164	2.611	1.944	1.040	1.468	0.168	0.166	0.183	0.183	0.139
48	311089	262454	River Ithon SSSI/River Wye SAC	1.244	1.507	1.106	0.733	0.815	0.178	0.175	0.180	0.180	0.154
49	311229	262729	River Ithon SSSI/River Wye SAC	0.672	0.818	0.797	0.402	0.447	0.106	0.104	0.110	0.110	0.084
50	310182	261991	River Ithon SSSI/River Wye SAC	1.618	1.904	2.093	0.833	1.143	0.126	0.125	0.148	0.148	0.105
51	309821	261793	River Ithon SSSI/River Wye SAC	0.973	1.157	1.248	0.485	0.590	0.069	0.070	0.103	0.115	0.062
52	309512	261456	River Ithon SSSI/River Wye SAC	0.579	0.682	0.761	0.304	0.344	0.055	0.055	0.088	0.114	0.066

Table 5. (continued)

Receptor number	X(m)	Y(m)	Designation	Maximum annual mean ammonia concentration - (µg/m³)									
				Existing Layers (20% ranging)					Proposed Broilers				
				GFS No Calms No Terrain	GFS Calms No Terrain	GFS No Calms Terrain Min turb 0.025m	GFS No Calms Terrain Default min turb	GFS Calms Correction Terrain Fixed depo 0.003 m/s	GFS No Calms No Terrain	GFS Calms No Terrain	GFS No Calms Terrain Min turb 0.025m	GFS No Calms Terrain Default min turb	GFS No Calms Terrain Fixed depo 0.003 m/s
53	308963	261191	River Ithon SSSI/River Wye SAC	0.294	0.348	0.395	0.159	0.167	0.036	0.036	0.056	0.068	0.039
54	311412	263124	River Ithon SSSI/River Wye SAC	0.364	0.446	0.464	0.231	0.241	0.064	0.063	0.066	0.066	0.047
55	311489	263688	River Ithon SSSI/River Wye SAC	0.207	0.253	0.307	0.141	0.144	0.039	0.038	0.039	0.039	0.026
56	311933	262888	River Ithon SSSI/River Wye SAC	0.497	0.564	0.571	0.287	0.302	0.077	0.077	0.104	0.115	0.077
57	312487	262965	River Ithon SSSI/River Wye SAC	0.372	0.412	0.474	0.213	0.230	0.058	0.057	0.090	0.100	0.067
58	309281	262666	River Ithon SSSI/River Wye SAC	0.289	0.346	0.296	0.138	0.151	0.034	0.034	0.049	0.049	0.027
59	308558	261713	River Ithon SSSI/River Wye SAC	0.248	0.293	0.396	0.135	0.149	0.028	0.028	0.035	0.042	0.019
60	308956	263439	River Ithon SSSI/River Wye SAC	0.159	0.195	0.131	0.075	0.073	0.023	0.022	0.031	0.031	0.016
61	311286	264359	River Ithon SSSI/River Wye SAC	0.131	0.159	0.209	0.084	0.090	0.024	0.024	0.025	0.025	0.017
62	313401	263255	River Ithon SSSI/River Wye SAC	0.215	0.236	0.256	0.112	0.110	0.038	0.037	0.057	0.063	0.042
63	311450	265320	River Ithon SSSI/River Wye SAC	0.077	0.094	0.116	0.050	0.047	0.016	0.016	0.016	0.016	0.011
64	308384	264104	River Ithon SSSI/River Wye SAC	0.097	0.119	0.088	0.049	0.045	0.017	0.017	0.022	0.022	0.010
65	306504	263235	River Ithon SSSI/River Wye SAC	0.062	0.073	0.067	0.030	0.026	0.013	0.013	0.012	0.012	0.006
66	307526	264216	River Ithon SSSI/River Wye SAC	0.069	0.085	0.073	0.036	0.032	0.014	0.013	0.017	0.017	0.008
67	308466	265473	River Ithon SSSI/River Wye SAC	0.072	0.086	0.055	0.037	0.033	0.015	0.015	0.017	0.017	0.008
68	310285	266484	River Ithon SSSI/River Wye SAC	0.064	0.073	0.046	0.030	0.025	0.014	0.014	0.015	0.015	0.010
69	312829	265984	River Ithon SSSI/River Wye SAC	0.052	0.064	0.061	0.034	0.029	0.015	0.014	0.013	0.013	0.008
70	312400	257697	River Ithon SSSI/River Wye SAC	0.057	0.070	0.042	0.019	0.018	0.010	0.009	0.007	0.007	0.003
71	311746	257278	River Ithon SSSI/River Wye SAC	0.049	0.062	0.037	0.017	0.016	0.010	0.010	0.006	0.006	0.003
72	310466	263480	NH3 sensitive AW	**0.373**	**0.423**	**0.235**	**0.179**	**0.184**	**0.046**	**0.046**	**0.072**	**0.072**	**0.040**
73	310077	263638	NH3 sensitive AW	**0.301**	**0.343**	**0.176**	**0.142**	**0.146**	**0.038**	**0.037**	**0.056**	**0.056**	**0.028**
74	312931	262707	NH3 sensitive AW	**0.360**	**0.391**	**0.335**	**0.156**	**0.160**	**0.054**	**0.054**	**0.073**	**0.080**	**0.054**
75	313237	262526	NH3 sensitive AW	**0.321**	**0.347**	**0.250**	**0.109**	**0.108**	**0.049**	**0.048**	**0.048**	**0.053**	**0.036**
76	313617	262299	NH3 sensitive AW	**0.256**	**0.277**	**0.207**	**0.082**	**0.080**	**0.040**	**0.040**	**0.034**	**0.034**	**0.024**
77	313793	262313	NH3 sensitive AW	**0.231**	**0.250**	**0.203**	**0.082**	**0.081**	**0.037**	**0.037**	**0.033**	**0.034**	**0.024**

5.2 Detailed deposition modelling

The detailed modelling was carried out over a domain that covers the existing and proposed poultry houses at Brynthomas, closer sensitive SSSIs, ammonia sensitive AWs and the nearby stretches of the River Ithon SSSi/River Wye SAC, the area where the preliminary modelling indicated that annual mean ammonia concentrations and nitrogen deposition rates could potentially exceed 1% of the Critical Level or Critical Load for the site (Proposed scenario, with fixed deposition velocity of 0.03 m/s).

The detailed deposition modelling run was conducted with terrain included. Calms cannot be used with terrain or spatially varying deposition in this case, the results of the preliminary runs demonstrate that, in this case, the effect of calms upon the modelling is significant in the Existing Scenarios and therefore a calms correction based upon the preliminary runs is applied to the Existing Scenarios results; for the proposed scenario, the effect of calms upon the modelling is insignificant.

The predicted maximum annual mean ground level ammonia concentrations and nitrogen deposition rates are shown in Tables 6a (Existing Unsound Scenario), 6b (Existing Pessimistic Scenario), 6c (Existing Realistic Scenario) and 6d (Proposed Scenario). In these Tables, predicted ammonia concentrations (or ammonia concentrations equivalent to nitrogen deposition rates) that are in excess of 100% of Critical Level or Load for a non-statutory wildlife site and that are that are in excess of 1% of Critical Level or Load for a statutory wildlife site are highlighted with bold red text.

Contour plots of the predicted ground level maximum annual mean and nitrogen deposition rate are shown in Figures 6a and 6b (Proposed Scenario). Contour plots of other scenarios can be provided upon request.

Table 6a. Predicted maximum annual mean ammonia concentration and nitrogen deposition rate at the discrete receptors - Existing Unsound Scenario

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level ($\mu g/m^3$)	Critical Load (kg/ha)	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
1	311016	262103	AW	0.03	1.0	10.0	2.108	**210.8**	16.42	**164.2**	1.767	**176.7**	13.77	**137.7**
2	311451	261547	AW	0.03	1.0	10.0	0.864	86.4	6.73	67.3	0.794	79.4	6.18	61.8
3	311611	261520	AW	0.03	1.0	10.0	0.586	58.6	4.56	45.6	0.539	53.9	4.20	42.0
4	310117	262079	AW	0.03	1.0	10.0	0.313	31.3	2.44	24.4	0.228	22.8	1.78	17.8
5	309847	261922	AW	0.03	1.0	10.0	0.193	19.3	1.50	15.0	0.141	14.1	1.10	11.0
6	309784	261591	AW	0.03	1.0	10.0	0.203	20.3	1.58	15.8	0.143	14.3	1.11	11.1
7	311671	261231	AW	0.03	1.0	10.0	0.333	33.3	2.60	26.0	0.289	28.9	2.25	22.5
8	310154	260901	AW	0.03	1.0	10.0	0.136	13.6	1.06	10.6	0.102	10.2	0.79	7.9
9	309627	261053	AW	0.03	1.0	10.0	0.112	11.2	0.87	8.7	0.084	8.4	0.65	6.5
10	309319	261106	AW	0.03	1.0	10.0	0.083	8.3	0.65	6.5	0.065	6.5	0.51	5.1
11	309275	261535	AW	0.03	1.0	10.0	0.069	6.9	0.54	5.4	0.051	5.1	0.40	4.0
12	309413	261896	AW	0.03	1.0	10.0	0.069	6.9	0.54	5.4	0.052	5.2	0.41	4.1
13	309654	262222	AW	0.03	1.0	10.0	0.096	9.6	0.75	7.5	0.073	7.3	0.57	5.7
14	309270	262428	AW	0.03	1.0	10.0	0.053	5.3	0.41	4.1	0.042	4.2	0.33	3.3
15	309788	262615	AW	0.03	1.0	10.0	0.085	8.5	0.67	6.7	0.066	6.6	0.51	5.1
16	309373	262731	AW	0.03	1.0	10.0	0.053	5.3	0.41	4.1	0.042	4.2	0.33	3.3
17	310917	263084	AW	0.03	1.0	10.0	0.113	11.3	0.88	8.8	0.088	8.8	0.68	6.8
18	311323	262865	AW	0.03	1.0	10.0	0.153	15.3	1.19	11.9	0.128	12.8	1.00	10.0
19	311984	262615	AW	0.03	1.0	10.0	0.189	18.9	1.47	14.7	0.161	16.1	1.26	12.6
20	311587	263097	AW	0.03	1.0	10.0	0.101	10.1	0.79	7.9	0.086	8.6	0.67	6.7
21	312087	261794	AW	0.03	1.0	10.0	0.263	26.3	2.05	20.5	0.238	23.8	1.86	18.6
22	312537	262048	AW	0.03	1.0	10.0	0.124	12.4	0.97	9.7	0.116	11.6	0.90	9.0
23	312493	261758	AW	0.03	1.0	10.0	0.133	13.3	1.04	10.4	0.122	12.2	0.95	9.5
24	311774	260758	AW	0.03	1.0	10.0	0.113	11.3	0.88	8.8	0.095	9.5	0.74	7.4
25	310618	260553	AW	0.03	1.0	10.0	0.066	6.6	0.51	5.1	0.051	5.1	0.39	3.9
26	309440	260383	AW	0.03	1.0	10.0	0.047	4.7	0.36	3.6	0.034	3.4	0.26	2.6
27	308926	262146	AW	0.03	1.0	10.0	0.041	4.1	0.32	3.2	0.032	3.2	0.25	2.5

Table 6a. (continued)

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level ($\mu g/m^3$)	Critical Load (kg/ha)	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
28	309949	263298	Cae Llwyn SSSI	0.02	3.0	10.0	0.056	**1.9**	0.29	**2.9**	0.042	**1.4**	0.22	**2.2**
29	309712	263459	Cae Llwyn SSSI	0.02	3.0	10.0	0.041	**1.4**	0.21	**2.1**	0.031	**1.0**	0.16	**1.6**
30	310939	263664	Cae-Cwm-Rhocas SSSI	0.02	3.0	10.0	0.049	**1.6**	0.26	**2.6**	0.040	**1.3**	0.21	**2.1**
31	311064	263932	Cae-Cwm-Rhocas SSSI	0.02	3.0	10.0	0.037	**1.2**	0.19	**1.9**	0.031	**1.0**	0.16	**1.6**
32	309057	259264	Howey Brook Stream Section SSSI	0.03	n/a	n/a	0.009	-	0.07	-	0.008	-	0.06	-
33	309478	258917	Howey Brook Stream Section SSSI	0.03	n/a	n/a	0.007	-	0.06	-	0.006	-	0.05	-
34	313456	258914	Graig Fawr SSSI	0.03	1.0	10.0	0.007	0.7	0.06	0.6	0.007	0.7	0.05	0.5
35	313035	258282	Graig Fawr SSSI	0.03	1.0	10.0	0.005	0.5	0.04	0.4	0.005	0.5	0.04	0.4
36	312062	257293	Coedmawr Fields SSSI	0.02	3.0	10.0	0.003	0.1	0.02	0.2	0.003	0.1	0.02	0.2
37	311705	257098	Coedmawr Fields SSSI	0.02	3.0	10.0	0.003	0.1	0.02	0.2	0.003	0.1	0.02	0.2
38	313683	264071	Meeting House Quarry SSSI	0.03	n/a	n/a	0.016	-	0.13	-	0.013	-	0.10	-
39	310505	265546	Ithon Valley Woodlands SSSI	0.03	3.0	10.0	0.011	0.4	0.08	0.8	0.009	0.3	0.07	0.7
40	309938	266049	Ithon Valley Woodlands SSSI	0.03	3.0	10.0	0.008	0.3	0.06	0.6	0.007	0.2	0.05	0.5
41	307262	260990	Bach-y-Graig Styream Section	0.03	n/a	n/a	0.011	-	0.08	-	0.010	-	0.07	-
42	306727	260536	Lake Wood Llandrindod Wells	0.03	1.0	10.0	0.009	0.9	0.07	0.7	0.008	0.8	0.06	0.6
43	306581	261752	Llanfawr Quarries Llandrindod Wells	0.03	n/a	n/a	0.006	-	0.05	-	0.005	-	0.04	-
44	310824	262097	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	2.409	-	18.76	-	1.922	-	14.98	-
45	310988	262141	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	1.645	-	12.82	-	1.403	-	10.93	-
46	310583	262160	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	1.057	-	8.24	-	0.833	-	6.49	-
47	310370	262097	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.683	-	5.32	-	0.492	-	3.84	-
48	311089	262454	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.415	-	3.23	-	0.358	-	2.79	-
49	311229	262729	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.209	-	1.63	-	0.174	-	1.35	-
50	310182	261991	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.463	-	3.61	-	0.328	-	2.55	-
51	309821	261793	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.200	-	1.56	-	0.142	-	1.10	-
52	309512	261456	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.113	-	0.88	-	0.084	-	0.65	-

Table 6a. (continued)

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level (µg/m^3)	Critical Load (kg/ha)	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
53	308963	261191	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.052	-	0.40	-	0.042	-	0.33	-
54	311412	263124	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.103	-	0.80	-	0.084	-	0.66	-
55	311489	263688	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.052	-	0.41	-	0.043	-	0.34	-
56	311933	262888	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.138	-	1.07	-	0.117	-	0.91	-
57	312487	262965	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.102	-	0.79	-	0.088	-	0.68	-
58	309281	262666	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.050	-	0.39	-	0.040	-	0.31	-
59	308558	261713	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.034	-	0.26	-	0.026	-	0.21	-
60	308956	263439	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.024	-	0.19	-	0.020	-	0.15	-
61	311286	264359	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.027	-	0.21	-	0.023	-	0.18	-
62	313401	263255	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.044	-	0.34	-	0.039	-	0.30	-
63	311450	265320	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.014	-	0.11	-	0.012	-	0.09	-
64	308384	264104	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.014	-	0.11	-	0.011	-	0.09	-
65	306504	263235	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.007	-	0.05	-	0.006	-	0.04	-
66	307526	264216	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.009	-	0.07	-	0.007	-	0.06	-
67	308466	265473	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.009	-	0.07	-	0.007	-	0.05	-
68	310285	266484	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.006	-	0.05	-	0.005	-	0.04	-
69	312829	265984	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.010	-	0.08	-	0.009	-	0.07	-
70	312400	257697	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.004	-	0.03	-	0.004	-	0.03	-
71	311746	257278	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.004	-	0.03	-	0.003	-	0.02	-
72	310466	263480	NH3 sensitive AW	0.03	1.0	10.0	0.064	**6.4**	0.50	**5.0**	0.049	**4.9**	0.38	**3.8**
73	310077	263638	NH3 sensitive AW	0.03	1.0	10.0	0.046	**4.6**	0.36	**3.6**	0.035	**3.5**	0.28	**2.8**
74	312931	262707	NH3 sensitive AW	0.03	1.0	10.0	0.074	**7.4**	0.58	**5.8**	0.069	**6.9**	0.54	**5.4**
75	313237	262526	NH3 sensitive AW	0.03	1.0	10.0	0.048	**4.8**	0.37	**3.7**	0.044	**4.4**	0.35	**3.5**
76	313617	262299	NH3 sensitive AW	0.03	1.0	10.0	0.034	**3.4**	0.27	**2.7**	0.032	**3.2**	0.25	**2.5**
77	313793	262313	NH3 sensitive AW	0.03	1.0	10.0	0.038	**3.8**	0.30	**3.0**	0.036	**3.6**	0.28	**2.8**

Table 6b. Predicted maximum annual mean ammonia concentration and nitrogen deposition rate at the discrete receptors - Existing Pessimistic Scenario

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level ($\mu g/m^3$)	Critical Load (kg/ha)	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
1	311016	262103	AW	0.03	1.0	10.0	2.018	**201.8**	15.73	**157.3**	1.696	**169.6**	13.21	**132.1**
2	311451	261547	AW	0.03	1.0	10.0	0.844	84.4	6.57	65.7	0.776	77.6	6.05	60.5
3	311611	261520	AW	0.03	1.0	10.0	0.571	57.1	4.45	44.5	0.527	52.7	4.10	41.0
4	310117	262079	AW	0.03	1.0	10.0	0.307	30.7	2.40	24.0	0.224	22.4	1.75	17.5
5	309847	261922	AW	0.03	1.0	10.0	0.189	18.9	1.47	14.7	0.137	13.7	1.07	10.7
6	309784	261591	AW	0.03	1.0	10.0	0.197	19.7	1.54	15.4	0.138	13.8	1.08	10.8
7	311671	261231	AW	0.03	1.0	10.0	0.328	32.8	2.55	25.5	0.284	28.4	2.22	22.2
8	310154	260901	AW	0.03	1.0	10.0	0.134	13.4	1.04	10.4	0.100	10.0	0.78	7.8
9	309627	261053	AW	0.03	1.0	10.0	0.110	11.0	0.85	8.5	0.082	8.2	0.64	6.4
10	309319	261106	AW	0.03	1.0	10.0	0.080	8.0	0.63	6.3	0.063	6.3	0.49	4.9
11	309275	261535	AW	0.03	1.0	10.0	0.067	6.7	0.52	5.2	0.049	4.9	0.38	3.8
12	309413	261896	AW	0.03	1.0	10.0	0.068	6.8	0.53	5.3	0.051	5.1	0.40	4.0
13	309654	262222	AW	0.03	1.0	10.0	0.094	9.4	0.74	7.4	0.071	7.1	0.55	5.5
14	309270	262428	AW	0.03	1.0	10.0	0.052	5.2	0.40	4.0	0.041	4.1	0.32	3.2
15	309788	262615	AW	0.03	1.0	10.0	0.084	8.4	0.65	6.5	0.064	6.4	0.50	5.0
16	309373	262731	AW	0.03	1.0	10.0	0.051	5.1	0.40	4.0	0.041	4.1	0.32	3.2
17	310917	263084	AW	0.03	1.0	10.0	0.109	10.9	0.85	8.5	0.085	8.5	0.66	6.6
18	311323	262865	AW	0.03	1.0	10.0	0.149	14.9	1.16	11.6	0.125	12.5	0.97	9.7
19	311984	262615	AW	0.03	1.0	10.0	0.183	18.3	1.43	14.3	0.155	15.5	1.21	12.1
20	311587	263097	AW	0.03	1.0	10.0	0.099	9.9	0.77	7.7	0.083	8.3	0.65	6.5
21	312087	261794	AW	0.03	1.0	10.0	0.253	25.3	1.97	19.7	0.230	23.0	1.79	17.9
22	312537	262048	AW	0.03	1.0	10.0	0.120	12.0	0.94	9.4	0.112	11.2	0.87	8.7
23	312493	261758	AW	0.03	1.0	10.0	0.129	12.9	1.01	10.1	0.119	11.9	0.92	9.2
24	311774	260758	AW	0.03	1.0	10.0	0.112	11.2	0.87	8.7	0.093	9.3	0.73	7.3
25	310618	260553	AW	0.03	1.0	10.0	0.065	6.5	0.51	5.1	0.050	5.0	0.39	3.9
26	309440	260383	AW	0.03	1.0	10.0	0.046	4.6	0.36	3.6	0.033	3.3	0.26	2.6
27	308926	262146	AW	0.03	1.0	10.0	0.040	4.0	0.31	3.1	0.032	3.2	0.25	2.5

Table 6b. (continued)

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level ($\mu g/m^3$)	Critical Load (kg/ha)	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
28	309949	263298	Cae Llwyn SSSI	0.02	3.0	10.0	0.055	**1.8**	0.29	**2.9**	0.042	**1.4**	0.22	**2.2**
29	309712	263459	Cae Llwyn SSSI	0.02	3.0	10.0	0.040	**1.3**	0.21	**2.1**	0.031	**1.0**	0.16	**1.6**
30	310939	263664	Cae-Cwm-Rhocas SSSI	0.02	3.0	10.0	0.048	**1.6**	0.25	**2.5**	0.039	**1.3**	0.20	**2.0**
31	311064	263932	Cae-Cwm-Rhocas SSSI	0.02	3.0	10.0	0.036	**1.2**	0.18	**1.8**	0.030	**1.0**	0.16	**1.6**
32	309057	259264	Howey Brook Stream Section SSSI	0.03	n/a	n/a	0.009	-	0.07	-	0.008	-	0.06	-
33	309478	258917	Howey Brook Stream Section SSSI	0.03	n/a	n/a	0.007	-	0.05	-	0.006	-	0.05	-
34	313456	258914	Graig Fawr SSSI	0.03	1.0	10.0	0.007	0.7	0.06	0.6	0.006	0.6	0.05	0.5
35	313035	258282	Graig Fawr SSSI	0.03	1.0	10.0	0.005	0.5	0.04	0.4	0.004	0.4	0.03	0.3
36	312062	257293	Coedmawr Fields SSSI	0.02	3.0	10.0	0.003	0.1	0.02	0.2	0.003	0.1	0.02	0.2
37	311705	257098	Coedmawr Fields SSSI	0.02	3.0	10.0	0.003	0.1	0.02	0.2	0.003	0.1	0.01	0.1
38	313683	264071	Meeting House Quarry SSSI	0.03	n/a	n/a	0.016	-	0.13	-	0.013	-	0.10	-
39	310505	265546	Ithon Valley Woodlands SSSI	0.03	3.0	10.0	0.010	0.3	0.08	0.8	0.008	0.3	0.06	0.6
40	309938	266049	Ithon Valley Woodlands SSSI	0.03	3.0	10.0	0.008	0.3	0.06	0.6	0.006	0.2	0.05	0.5
41	307262	260990	Bach-y-Graig Styream Section	0.03	n/a	n/a	0.010	-	0.08	-	0.009	-	0.07	-
42	306727	260536	Lake Wood Llandrindod Wells	0.03	1.0	10.0	0.008	0.8	0.06	0.6	0.007	0.7	0.06	0.6
43	306581	261752	Llanfawr Quarries Llandrindod Wells	0.03	n/a	n/a	0.006	-	0.04	-	0.005	-	0.04	-
44	310824	262097	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	2.317	-	18.05	-	1.862	-	14.51	-
45	310988	262141	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	1.580	-	12.31	-	1.353	-	10.54	-
46	310583	262160	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	1.050	-	8.18	-	0.833	-	6.49	-
47	310370	262097	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.676	-	5.27	-	0.488	-	3.80	-
48	311089	262454	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.403	-	3.14	-	0.349	-	2.72	-
49	311229	262729	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.203	-	1.59	-	0.170	-	1.32	-
50	310182	261991	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.455	-	3.55	-	0.321	-	2.50	-
51	309821	261793	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.195	-	1.52	-	0.138	-	1.07	-
52	309512	261456	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.109	-	0.85	-	0.080	-	0.63	-

Table 6b. (continued)

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level (µg/m^3)	Critical Load (kg/ha)	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
53	308963	261191	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.050	-	0.39	-	0.040	-	0.31	-
54	311412	263124	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.101	-	0.78	-	0.082	-	0.64	-
55	311489	263688	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.051	-	0.40	-	0.042	-	0.33	-
56	311933	262888	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.133	-	1.04	-	0.113	-	0.88	-
57	312487	262965	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.097	-	0.76	-	0.083	-	0.65	-
58	309281	262666	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.049	-	0.38	-	0.039	-	0.30	-
59	308558	261713	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.033	-	0.26	-	0.025	-	0.20	-
60	308956	263439	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.024	-	0.18	-	0.019	-	0.15	-
61	311286	264359	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.027	-	0.21	-	0.022	-	0.17	-
62	313401	263255	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.043	-	0.33	-	0.037	-	0.29	-
63	311450	265320	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.013	-	0.11	-	0.012	-	0.09	-
64	308384	264104	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.013	-	0.10	-	0.011	-	0.08	-
65	306504	263235	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.006	-	0.05	-	0.005	-	0.04	-
66	307526	264216	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.009	-	0.07	-	0.007	-	0.06	-
67	308466	265473	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.008	-	0.06	-	0.007	-	0.05	-
68	310285	266484	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.006	-	0.05	-	0.005	-	0.04	-
69	312829	265984	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.010	-	0.08	-	0.009	-	0.07	-
70	312400	257697	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.004	-	0.03	-	0.003	-	0.03	-
71	311746	257278	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.003	-	0.03	-	0.003	-	0.02	-
72	310466	263480	NH3 sensitive AW	0.03	1.0	10.0	0.063	**6.3**	0.49	**4.9**	0.048	**4.8**	0.38	**3.8**
73	310077	263638	NH3 sensitive AW	0.03	1.0	10.0	0.046	**4.6**	0.36	**3.6**	0.035	**3.5**	0.27	**2.7**
74	312931	262707	NH3 sensitive AW	0.03	1.0	10.0	0.070	**7.0**	0.55	**5.5**	0.065	**6.5**	0.51	**5.1**
75	313237	262526	NH3 sensitive AW	0.03	1.0	10.0	0.046	**4.6**	0.36	**3.6**	0.043	**4.3**	0.33	**3.3**
76	313617	262299	NH3 sensitive AW	0.03	1.0	10.0	0.033	**3.3**	0.26	**2.6**	0.031	**3.1**	0.24	**2.4**
77	313793	262313	NH3 sensitive AW	0.03	1.0	10.0	0.036	**3.6**	0.28	**2.8**	0.034	**3.4**	0.27	**2.7**

Table 6c. Predicted maximum annual mean ammonia concentration and nitrogen deposition rate at the discrete receptors - Existing Realistic Scenario

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level ($\mu g/m^3$)	Critical Load (kg/ha)	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
1	311016	262103	AW	0.03	1.0	10.0	1.960	**196.0**	15.27	**152.7**	1.648	**164.8**	12.84	**128.4**
2	311451	261547	AW	0.03	1.0	10.0	0.829	82.9	6.46	64.6	0.764	76.4	5.95	59.5
3	311611	261520	AW	0.03	1.0	10.0	0.561	56.1	4.37	43.7	0.518	51.8	4.04	40.4
4	310117	262079	AW	0.03	1.0	10.0	0.304	30.4	2.36	23.6	0.221	22.1	1.72	17.2
5	309847	261922	AW	0.03	1.0	10.0	0.186	18.6	1.45	14.5	0.135	13.5	1.05	10.5
6	309784	261591	AW	0.03	1.0	10.0	0.193	19.3	1.51	15.1	0.135	13.5	1.05	10.5
7	311671	261231	AW	0.03	1.0	10.0	0.323	32.3	2.52	25.2	0.281	28.1	2.19	21.9
8	310154	260901	AW	0.03	1.0	10.0	0.132	13.2	1.03	10.3	0.099	9.9	0.77	7.7
9	309627	261053	AW	0.03	1.0	10.0	0.108	10.8	0.84	8.4	0.080	8.0	0.62	6.2
10	309319	261106	AW	0.03	1.0	10.0	0.078	7.8	0.61	6.1	0.061	6.1	0.47	4.7
11	309275	261535	AW	0.03	1.0	10.0	0.065	6.5	0.51	5.1	0.047	4.7	0.37	3.7
12	309413	261896	AW	0.03	1.0	10.0	0.066	6.6	0.52	5.2	0.050	5.0	0.39	3.9
13	309654	262222	AW	0.03	1.0	10.0	0.093	9.3	0.73	7.3	0.070	7.0	0.55	5.5
14	309270	262428	AW	0.03	1.0	10.0	0.051	5.1	0.40	4.0	0.040	4.0	0.31	3.1
15	309788	262615	AW	0.03	1.0	10.0	0.082	8.2	0.64	6.4	0.063	6.3	0.49	4.9
16	309373	262731	AW	0.03	1.0	10.0	0.050	5.0	0.39	3.9	0.040	4.0	0.31	3.1
17	310917	263084	AW	0.03	1.0	10.0	0.107	10.7	0.84	8.4	0.083	8.3	0.65	6.5
18	311323	262865	AW	0.03	1.0	10.0	0.147	14.7	1.14	11.4	0.123	12.3	0.96	9.6
19	311984	262615	AW	0.03	1.0	10.0	0.179	17.9	1.40	14.0	0.151	15.1	1.18	11.8
20	311587	263097	AW	0.03	1.0	10.0	0.097	9.7	0.75	7.5	0.082	8.2	0.64	6.4
21	312087	261794	AW	0.03	1.0	10.0	0.247	24.7	1.93	19.3	0.224	22.4	1.74	17.4
22	312537	262048	AW	0.03	1.0	10.0	0.118	11.8	0.92	9.2	0.110	11.0	0.85	8.5
23	312493	261758	AW	0.03	1.0	10.0	0.127	12.7	0.99	9.9	0.116	11.6	0.91	9.1
24	311774	260758	AW	0.03	1.0	10.0	0.110	11.0	0.86	8.6	0.092	9.2	0.72	7.2
25	310618	260553	AW	0.03	1.0	10.0	0.064	6.4	0.50	5.0	0.049	4.9	0.38	3.8
26	309440	260383	AW	0.03	1.0	10.0	0.046	4.6	0.35	3.5	0.033	3.3	0.26	2.6
27	308926	262146	AW	0.03	1.0	10.0	0.039	3.9	0.30	3.0	0.031	3.1	0.24	2.4

Table 6c. (continued)

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level ($\mu g/m^3$)	Critical Load (kg/ha)	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
28	309949	263298	Cae Llwyn SSSI	0.02	3.0	10.0	0.055	**1.8**	0.28	**2.8**	0.041	**1.4**	0.21	**2.1**
29	309712	263459	Cae Llwyn SSSI	0.02	3.0	10.0	0.040	**1.3**	0.21	**2.1**	0.030	**1.0**	0.16	**1.6**
30	310939	263664	Cae-Cwm-Rhocas SSSI	0.02	3.0	10.0	0.047	**1.6**	0.24	**2.4**	0.038	**1.3**	0.20	**2.0**
31	311064	263932	Cae-Cwm-Rhocas SSSI	0.02	3.0	10.0	0.035	**1.2**	0.18	**1.8**	0.029	**1.0**	0.15	**1.5**
32	309057	259264	Howey Brook Stream Section SSSI	0.03	n/a	n/a	0.009	-	0.07	-	0.008	-	0.06	-
33	309478	258917	Howey Brook Stream Section SSSI	0.03	n/a	n/a	0.007	-	0.05	-	0.006	-	0.05	-
34	313456	258914	Graig Fawr SSSI	0.03	1.0	10.0	0.007	0.7	0.05	0.5	0.006	0.6	0.05	0.5
35	313035	258282	Graig Fawr SSSI	0.03	1.0	10.0	0.005	0.5	0.04	0.4	0.004	0.4	0.03	0.3
36	312062	257293	Coedmawr Fields SSSI	0.02	3.0	10.0	0.003	0.1	0.02	0.2	0.003	0.1	0.01	0.1
37	311705	257098	Coedmawr Fields SSSI	0.02	3.0	10.0	0.003	0.1	0.02	0.2	0.003	0.1	0.01	0.1
38	313683	264071	Meeting House Quarry SSSI	0.03	n/a	n/a	0.016	-	0.12	-	0.013	-	0.10	-
39	310505	265546	Ithon Valley Woodlands SSSI	0.03	3.0	10.0	0.010	0.3	0.08	0.8	0.008	0.3	0.06	0.6
40	309938	266049	Ithon Valley Woodlands SSSI	0.03	3.0	10.0	0.008	0.3	0.06	0.6	0.006	0.2	0.05	0.5
41	307262	260990	Bach-y-Graig Styream Section	0.03	n/a	n/a	0.010	-	0.08	-	0.009	-	0.07	-
42	306727	260536	Lake Wood Llandrindod Wells	0.03	1.0	10.0	0.008	0.8	0.06	0.6	0.007	0.7	0.05	0.5
43	306581	261752	Llanfawr Quarries Llandrindod Wells	0.03	n/a	n/a	0.006	-	0.04	-	0.005	-	0.04	-
44	310824	262097	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	2.256	-	17.58	-	1.821	-	14.19	-
45	310988	262141	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	1.537	-	11.98	-	1.320	-	10.29	-
46	310583	262160	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	1.043	-	8.13	-	0.830	-	6.47	-
47	310370	262097	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.670	-	5.22	-	0.484	-	3.77	-
48	311089	262454	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.395	-	3.08	-	0.342	-	2.67	-
49	311229	262729	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.200	-	1.56	-	0.167	-	1.30	-
50	310182	261991	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.450	-	3.50	-	0.317	-	2.47	-
51	309821	261793	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.192	-	1.49	-	0.135	-	1.05	-
52	309512	261456	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.107	-	0.83	-	0.078	-	0.61	-

Table 6. (continued)

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level (µg/m^3)	Critical Load (kg/ha)	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
53	308963	261191	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.048	-	0.38	-	0.039	-	0.30	-
54	311412	263124	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.099	-	0.77	-	0.081	-	0.63	-
55	311489	263688	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.050	-	0.39	-	0.042	-	0.33	-
56	311933	262888	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.130	-	1.02	-	0.110	-	0.86	-
57	312487	262965	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.094	-	0.74	-	0.080	-	0.63	-
58	309281	262666	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.048	-	0.37	-	0.038	-	0.30	-
59	308558	261713	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.032	-	0.25	-	0.025	-	0.19	-
60	308956	263439	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.023	-	0.18	-	0.018	-	0.14	-
61	311286	264359	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.026	-	0.20	-	0.022	-	0.17	-
62	313401	263255	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.042	-	0.32	-	0.036	-	0.28	-
63	311450	265320	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.013	-	0.10	-	0.011	-	0.09	-
64	308384	264104	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.013	-	0.10	-	0.011	-	0.08	-
65	306504	263235	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.006	-	0.05	-	0.005	-	0.04	-
66	307526	264216	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.008	-	0.07	-	0.007	-	0.05	-
67	308466	265473	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.008	-	0.06	-	0.007	-	0.05	-
68	310285	266484	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.006	-	0.05	-	0.005	-	0.04	-
69	312829	265984	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.009	-	0.07	-	0.009	-	0.07	-
70	312400	257697	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.004	-	0.03	-	0.003	-	0.03	-
71	311746	257278	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.003	-	0.03	-	0.003	-	0.02	-
72	310466	263480	NH3 sensitive AW	0.03	1.0	10.0	0.062	**6.2**	0.48	**4.8**	0.048	**4.8**	0.37	**3.7**
73	310077	263638	NH3 sensitive AW	0.03	1.0	10.0	0.045	**4.5**	0.35	**3.5**	0.034	**3.4**	0.27	**2.7**
74	312931	262707	NH3 sensitive AW	0.03	1.0	10.0	0.068	**6.8**	0.53	**5.3**	0.063	**6.3**	0.49	**4.9**
75	313237	262526	NH3 sensitive AW	0.03	1.0	10.0	0.044	**4.4**	0.35	**3.5**	0.041	**4.1**	0.32	**3.2**
76	313617	262299	NH3 sensitive AW	0.03	1.0	10.0	0.032	**3.2**	0.25	**2.5**	0.030	**3.0**	0.24	**2.4**
77	313793	262313	NH3 sensitive AW	0.03	1.0	10.0	0.035	**3.5**	0.27	**2.7**	0.033	**3.3**	0.26	**2.6**

Table 6d. Predicted maximum annual mean ammonia concentration and nitrogen deposition rate at the discrete receptors - Proposed Scenario

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level (µg/m^3)	Critical Load (kg/ha)	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
1	311016	262103	AW	0.03	1.0	10.0	0.603	60.3	4.70	47.0	0.595	59.5	4.64	46.4
2	311451	261547	AW	0.03	1.0	10.0	0.259	25.9	2.01	20.1	0.256	25.6	1.99	19.9
3	311611	261520	AW	0.03	1.0	10.0	0.199	19.9	1.55	15.5	0.197	19.7	1.54	15.4
4	310117	262079	AW	0.03	1.0	10.0	0.069	6.9	0.54	5.4	0.068	6.8	0.53	5.3
5	309847	261922	AW	0.03	1.0	10.0	0.047	4.7	0.37	3.7	0.046	4.6	0.36	3.6
6	309784	261591	AW	0.03	1.0	10.0	0.068	6.8	0.53	5.3	0.067	6.7	0.52	5.2
7	311671	261231	AW	0.03	1.0	10.0	0.091	9.1	0.71	7.1	0.090	9.0	0.70	7.0
8	310154	260901	AW	0.03	1.0	10.0	0.045	4.5	0.35	3.5	0.044	4.4	0.34	3.4
9	309627	261053	AW	0.03	1.0	10.0	0.047	4.7	0.36	3.6	0.043	4.3	0.34	3.4
10	309319	261106	AW	0.03	1.0	10.0	0.040	4.0	0.31	3.1	0.039	3.9	0.30	3.0
11	309275	261535	AW	0.03	1.0	10.0	0.029	2.9	0.23	2.3	0.028	2.8	0.22	2.2
12	309413	261896	AW	0.03	1.0	10.0	0.023	2.3	0.18	1.8	0.023	2.3	0.18	1.8
13	309654	262222	AW	0.03	1.0	10.0	0.030	3.0	0.24	2.4	0.030	3.0	0.23	2.3
14	309270	262428	AW	0.03	1.0	10.0	0.020	2.0	0.15	1.5	0.019	1.9	0.15	1.5
15	309788	262615	AW	0.03	1.0	10.0	0.028	2.8	0.22	2.2	0.028	2.8	0.22	2.2
16	309373	262731	AW	0.03	1.0	10.0	0.021	2.1	0.16	1.6	0.020	2.0	0.16	1.6
17	310917	263084	AW	0.03	1.0	10.0	0.042	4.2	0.33	3.3	0.039	3.9	0.30	3.0
18	311323	262865	AW	0.03	1.0	10.0	0.055	5.5	0.43	4.3	0.054	5.4	0.42	4.2
19	311984	262615	AW	0.03	1.0	10.0	0.080	8.0	0.62	6.2	0.078	7.8	0.61	6.1
20	311587	263097	AW	0.03	1.0	10.0	0.043	4.3	0.34	3.4	0.040	4.0	0.31	3.1
21	312087	261794	AW	0.03	1.0	10.0	0.100	10.0	0.78	7.8	0.098	9.8	0.76	7.6
22	312537	262048	AW	0.03	1.0	10.0	0.051	5.1	0.40	4.0	0.050	5.0	0.39	3.9
23	312493	261758	AW	0.03	1.0	10.0	0.047	4.7	0.36	3.6	0.046	4.6	0.36	3.6
24	311774	260758	AW	0.03	1.0	10.0	0.028	2.8	0.22	2.2	0.026	2.6	0.21	2.1
25	310618	260553	AW	0.03	1.0	10.0	0.017	1.7	0.14	1.4	0.017	1.7	0.13	1.3
26	309440	260383	AW	0.03	1.0	10.0	0.019	1.9	0.15	1.5	0.017	1.7	0.13	1.3
27	308926	262146	AW	0.03	1.0	10.0	0.016	1.6	0.13	1.3	0.016	1.6	0.12	1.2

Table 6d. (continued)

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level ($\mu g/m^3$)	Critical Load (kg/ha)	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
28	309949	263298	Cae Llwyn SSSI	0.02	3.0	10.0	0.020	0.7	0.10	**1.0**	0.020	0.7	0.10	**1.0**
29	309712	263459	Cae Llwyn SSSI	0.02	3.0	10.0	0.016	0.5	0.08	0.8	0.015	0.5	0.08	0.8
30	310939	263664	Cae-Cwm-Rhocas SSSI	0.02	3.0	10.0	0.021	0.7	0.11	**1.1**	0.021	0.7	0.11	**1.1**
31	311064	263932	Cae-Cwm-Rhocas SSSI	0.02	3.0	10.0	0.017	0.6	0.09	0.9	0.016	0.5	0.08	0.8
32	309057	259264	Howey Brook Stream Section SSSI	0.03	n/a	n/a	0.005	-	0.04	-	0.005	-	0.04	-
33	309478	258917	Howey Brook Stream Section SSSI	0.03	n/a	n/a	0.004	-	0.03	-	0.003	-	0.03	-
34	313456	258914	Graig Fawr SSSI	0.03	1.0	10.0	0.005	0.5	0.04	0.4	0.005	0.5	0.04	0.4
35	313035	258282	Graig Fawr SSSI	0.03	1.0	10.0	0.004	0.4	0.03	0.3	0.004	0.4	0.03	0.3
36	312062	257293	Coedmawr Fields SSSI	0.02	3.0	10.0	0.002	0.1	0.01	0.1	0.002	0.1	0.01	0.1
37	311705	257098	Coedmawr Fields SSSI	0.02	3.0	10.0	0.002	0.1	0.01	0.1	0.002	0.1	0.01	0.1
38	313683	264071	Meeting House Quarry SSSI	0.03	n/a	n/a	0.016	-	0.13	-	0.015	-	0.12	-
39	310505	265546	Ithon Valley Woodlands SSSI	0.03	3.0	10.0	0.009	0.3	0.07	0.7	0.009	0.3	0.07	0.7
40	309938	266049	Ithon Valley Woodlands SSSI	0.03	3.0	10.0	0.007	0.2	0.06	0.6	0.007	0.2	0.06	0.6
41	307262	260990	Bach-y-Graig Styream Section	0.03	n/a	n/a	0.008	-	0.06	-	0.008	-	0.06	-
42	306727	260536	Lake Wood Llandrindod Wells	0.03	1.0	10.0	0.007	0.7	0.05	0.5	0.007	0.7	0.05	0.5
43	306581	261752	Llanfawr Quarries Llandrindod Wells	0.03	n/a	n/a	0.005	-	0.04	-	0.005	-	0.04	-
44	310824	262097	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.505	-	3.93	-	0.501	-	3.90	-
45	310988	262141	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.454	-	3.54	-	0.449	-	3.50	-
46	310583	262160	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.153	-	1.19	-	0.152	-	1.18	-
47	310370	262097	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.118	-	0.92	-	0.116	-	0.90	-
48	311089	262454	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.131	-	1.02	-	0.130	-	1.01	-
49	311229	262729	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.074	-	0.57	-	0.069	-	0.54	-
50	310182	261991	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.088	-	0.69	-	0.087	-	0.68	-
51	309821	261793	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.049	-	0.38	-	0.048	-	0.37	-
52	309512	261456	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.051	-	0.40	-	0.049	-	0.39	-

Table 6d. (continued)

Receptor number	X(m)	Y(m)	Designation	Site Parameters			AS modelling & Data Ltd. deposition velocities				Natural Resources Wales deposition velocities			
							Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate		Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity (m/s)	Critical Level (µg/m^3)	Critical Load (kg/ha)	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
53	308963	261191	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.029	-	0.23	-	0.028	-	0.22	-
54	311412	263124	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.039	-	0.31	-	0.036	-	0.28	-
55	311489	263688	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.019	-	0.15	-	0.019	-	0.15	-
56	311933	262888	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.060	-	0.47	-	0.059	-	0.46	-
57	312487	262965	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.053	-	0.41	-	0.048	-	0.38	-
58	309281	262666	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.020	-	0.16	-	0.020	-	0.15	-
59	308558	261713	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.013	-	0.10	-	0.013	-	0.10	-
60	308956	263439	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.012	-	0.09	-	0.011	-	0.09	-
61	311286	264359	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.012	-	0.10	-	0.012	-	0.09	-
62	313401	263255	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.030	-	0.23	-	0.029	-	0.22	-
63	311450	265320	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.008	-	0.06	-	0.008	-	0.06	-
64	308384	264104	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.007	-	0.06	-	0.007	-	0.05	-
65	306504	263235	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.004	-	0.03	-	0.004	-	0.03	-
66	307526	264216	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.005	-	0.04	-	0.005	-	0.04	-
67	308466	265473	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.005	-	0.04	-	0.005	-	0.04	-
68	310285	266484	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.006	-	0.05	-	0.006	-	0.05	-
69	312829	265984	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.005	-	0.04	-	0.005	-	0.04	-
70	312400	257697	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.002	-	0.02	-	0.002	-	0.02	-
71	311746	257278	River Ithon SSSI/River Wye SAC	0.03	n/a	n/a	0.002	-	0.01	-	0.002	-	0.01	-
72	310466	263480	NH3 sensitive AW	0.03	1.0	10.0	0.028	**2.8**	0.22	**2.2**	0.027	**2.7**	0.21	**2.1**
73	310077	263638	NH3 sensitive AW	0.03	1.0	10.0	0.020	**2.0**	0.15	**1.5**	0.019	**1.9**	0.15	**1.5**
74	312931	262707	NH3 sensitive AW	0.03	1.0	10.0	0.040	**4.0**	0.31	**3.1**	0.039	**3.9**	0.30	**3.0**
75	313237	262526	NH3 sensitive AW	0.03	1.0	10.0	0.027	**2.7**	0.21	**2.1**	0.027	**2.7**	0.21	**2.1**
76	313617	262299	NH3 sensitive AW	0.03	1.0	10.0	0.018	**1.8**	0.14	**1.4**	0.018	**1.8**	0.14	**1.4**
77	313793	262313	NH3 sensitive AW	0.03	1.0	10.0	0.018	**1.8**	0.14	**1.4**	0.018	**1.8**	0.14	**1.4**

Figure 6a. Predicted maximum annual mean ammonia concentrations - Proposed Scenario

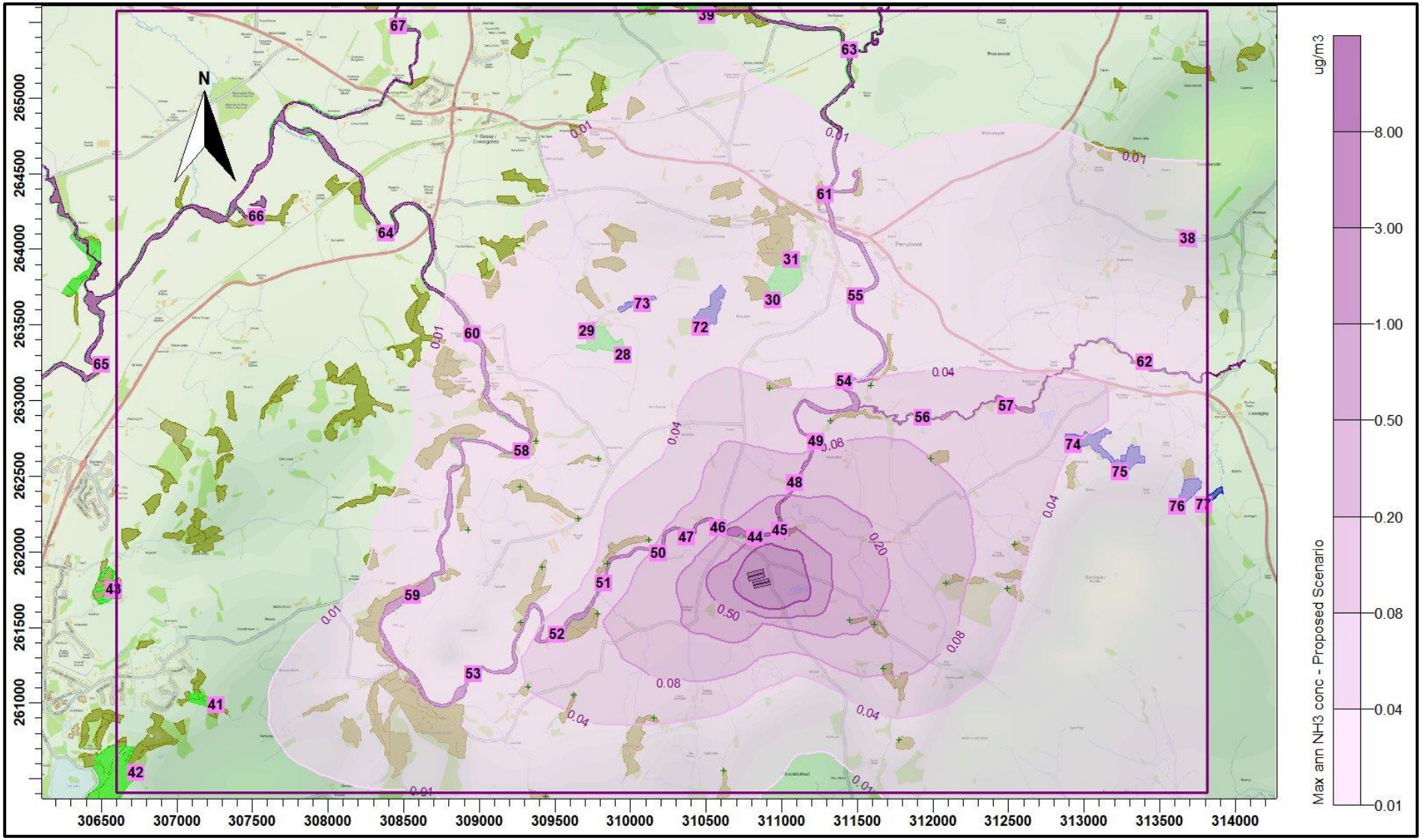
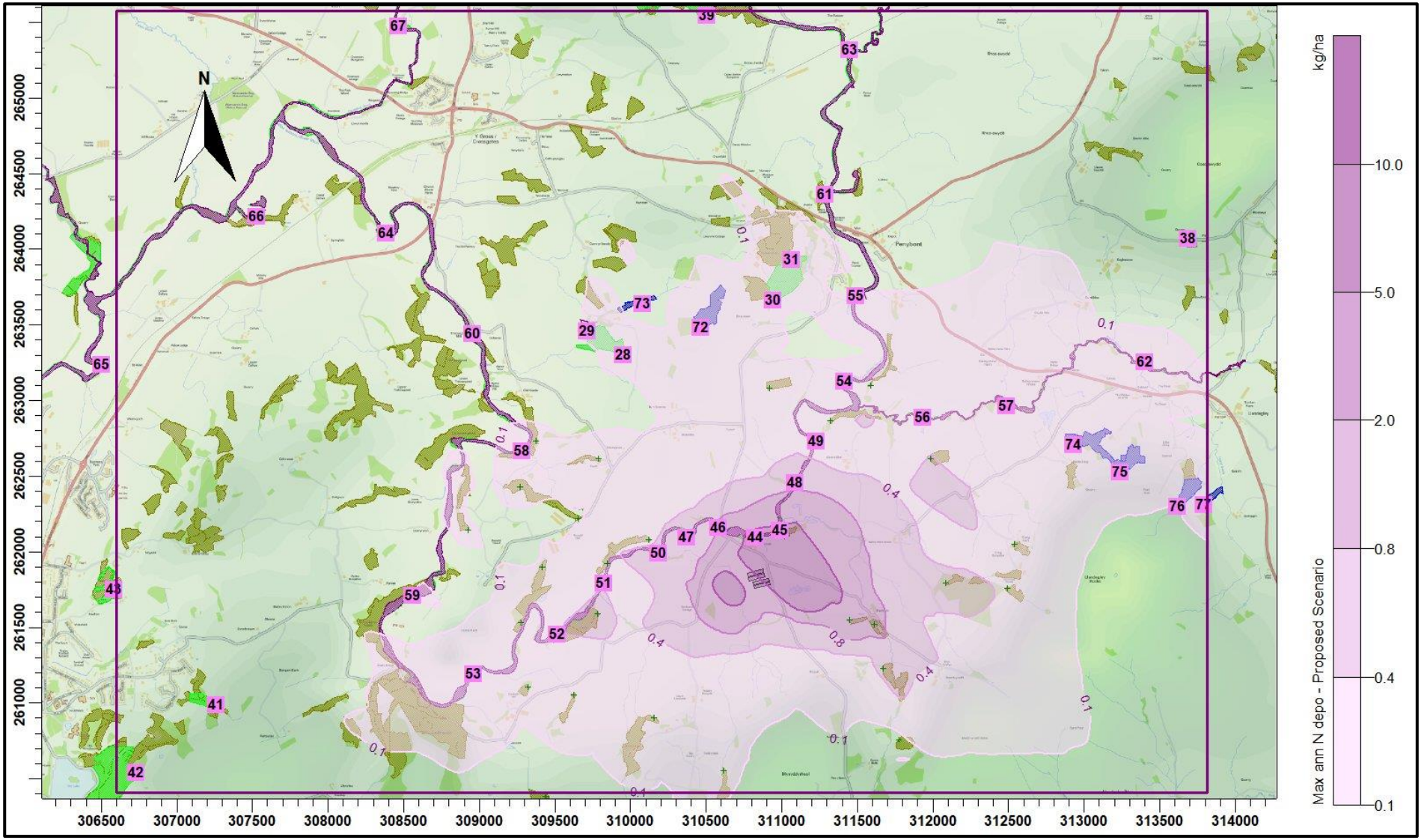


Figure 6b. Predicted maximum annual nitrogen deposition rates - Proposed Scenario



6. Summary and Conclusions

AS Modelling & Data Ltd. has been instructed by Ian Pick of Ian Pick Associates Ltd., on behalf of Mr. Ben Owens to use computer modelling to assess the impact of ammonia emissions from the existing free range egg-laying chicken houses and the proposed broiler chicken rearing houses at Brynthomas, Penybont, near to Llandrindod Wells in Powys. LD1 5SP.

Ammonia emission rates from the existing and proposed poultry houses have been assessed and quantified based upon the Environment Agency's standard ammonia emission factors. The ammonia emission rates have then been used as inputs to an atmospheric dispersion and deposition model which calculates ammonia exposure levels and nitrogen and acid deposition rates in the surrounding area.

6.1. Existing Scenario

The modelling predicts that, currently:

- There are exceedances of 1% of the Critical Level and/or Critical Load at Cae Llwyn SSSI, Cae-Cwm-Rhocas SSSI and the areas of ammonia sensitive AW to the north-north-west and east-north-east of the farm.

- There are exceedances of 100% of the Critical Level and/or Critical Load at an area of remnant AW to the north-east of the farm.

6.2. Proposed Scenario

The modelling predicts that:

- There would be small exceedances of 1% of the Critical Level and/or Critical Load at parts of Cae Llwyn SSSI and Cae-Cwm-Rhocas SSSI and at the areas of ammonia sensitive AW to the north-north-west and east-north-east of the farm. In all cases the magnitude and extent of the exceedances would be reduced from current levels under the Proposed Scenario.

- There would be no exceedances of 100% of the Critical Level and/or Critical Load at any of the AWs in the surrounding area. In all cases, the process contribution to ammonia levels and nitrogen deposition rates would be reduced from current levels under the Proposed Scenario.

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