Report on the Modelling of the Dispersion and Deposition of Ammonia from the Existing and Proposed Piggeries at Ellingham Home Farm, Ellingham, near Chathill in Northumberland

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1. Introduction

AS Modelling & Data Ltd. has been instructed by Ms. Elaine Marshall of Yorkshire Farmers Livestock Marketing Ltd., on behalf of Ellingham Home Farm, to use computer modelling to assess the impact of ammonia emissions from the existing and proposed piggeries at Ellingham Home Farm, Ellingham, Chathill, Northumberland. NE67 5LL.

Ammonia emission rates have been assessed and quantified based upon a bespoke ammonia emission factor provided by the Environment Agency. The emission rates have then been used as inputs to an atmospheric dispersion and deposition model which calculates ammonia exposure levels and nitrogen 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

Ellingham Home Farm is located approximately 700 m to the north-west of the village of Ellingham in Northumberland. The surrounding land is predominantly used for arable farming with isolated areas of woodland. The site at an elevation of around 82 m with the land falling towards the coast to the east and rising towards the Northumberland Sandstone Hills to the west.

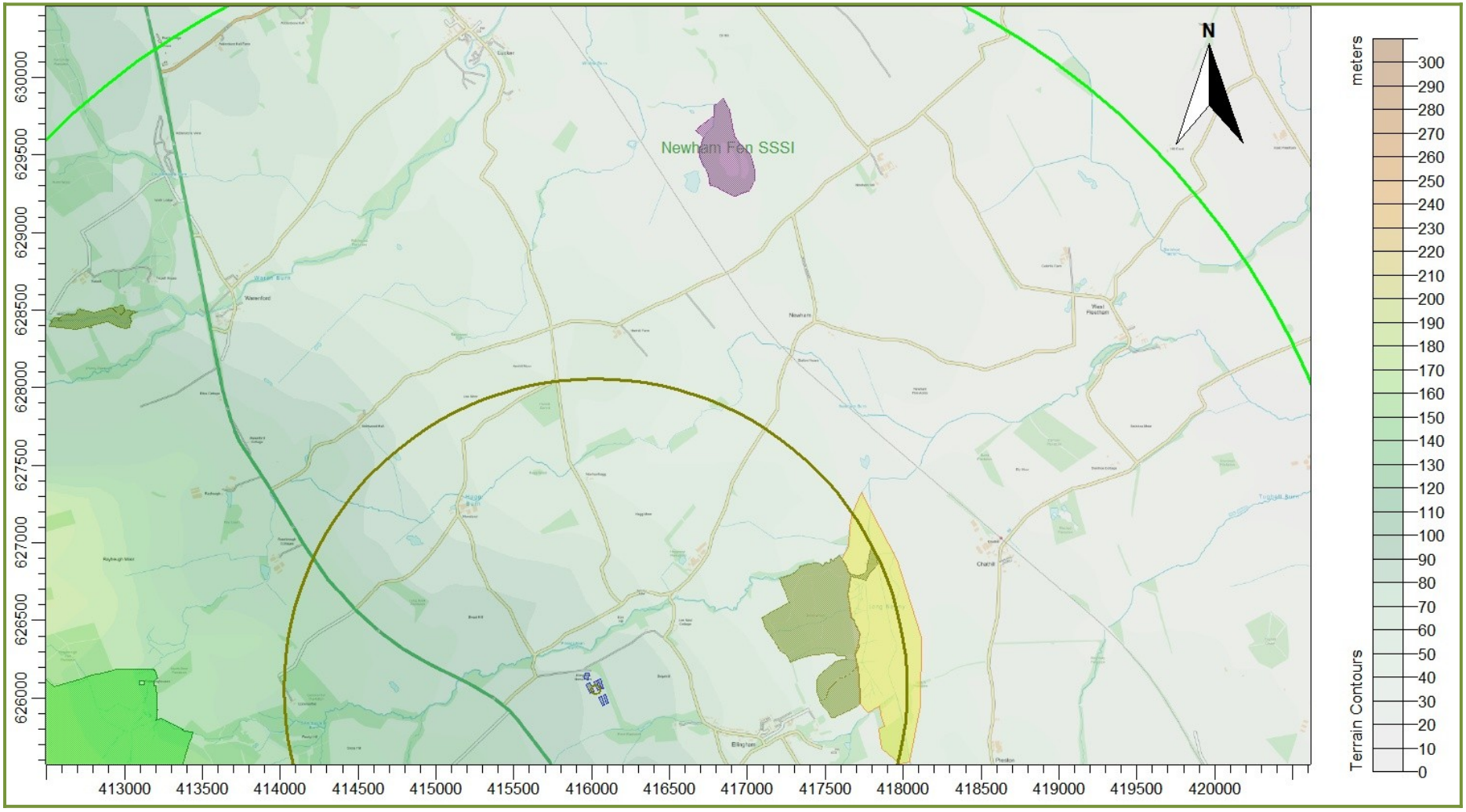
Two scenarios are considered in this report:

- **Scenario 1** - The baseline scenario - The two existing pig houses, which provide accommodation for up to 2,000 pigs reared from 30 kg to around 107 kg. The houses have solid flooring and straw bedding and are naturally ventilated.
- **Scenario 2** – The proposed scenario - The existing and proposed houses together, 4,000 pigs in total which would be reared from 7 kg to around 107 kg.

At the Environment Agency's request, only wildlife sites identified in the pre-application report (EPR/BP3323UV/P001) have been considered in this report.

A map of the surrounding area showing the positions of the pig unit (outlined in blue) and Newham Fen SAC (shaded in purple) is provided in Figure 1.

Figure 1. The area surrounding Ellingham Home Farm – concentric circles radii 2.0 km (olive) and 5.0 km (green)



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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 source of the background figures is the Air Pollution Information System (APIS, September 2026). It should be noted that the 1 km APIS database background levels are extrapolated from 5 km modelled data. Ammonia levels may vary markedly over relatively short distances and the APIS website itself notes that, the background values should be used only to assist the user in obtaining a broad indication of the likely pollutant impact at a specific location and cannot be considered representative of any particular location within the 5 km grid square; extrapolation to a 1 km grid does not alter this.

The APIS figure for background ammonia concentration (2023) in the area around Ellingham Home Farm is 0.86 µg-NH_3/m^3. The background nitrogen deposition rate to woodland is 14.14 kg-N/ha/y and to short vegetation is 8.59 kg-N/ha/y. The background acid deposition rate to woodland is 1.05 keq/ha/y and to short vegetation is 0.64 keq/ha/y.

The APIS background figures are subject to correction and revision and appear to change fairly frequently, the latest figures can be obtained at https://www.apis.ac.uk/app.

In most cases, the APIS background figures, which are modelled, extrapolated and statistically manipulated figures, nevertheless, are the only figures available and although it is noted that the background values should be used only to assist in obtaining a broad indication of the likely pollutant impact, it is also noted that across the majority of the UK the lower bounds of the Critical Level and Critical Load are already exceeded.

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). However, AS Modelling & Data Ltd. would note that effects have been shown to occur at loads that are well below existing Critical Loads (as currently defined) and that these effects are likely to adversely impact the most sensitive species first. Furthermore, recent research suggests that responses are far from linear and where background levels are high and sensitive species that may be associated with the habitat have already been negatively impacted, or indeed are now absent, responses to changes in nitrogen load (in terms of biodiversity) are relatively limited compared to where background levels are low. Therefore, what is deemed significant (in terms of a percentage of Critical Load), where background levels are low, is not necessarily significant where background levels are high.

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 used as the assessment criteria at the relevant receptor locations are provided in Table 1. N.B. 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. However, it may be necessary to consider nitrogen deposition should a Critical Load of 5.0 kg-N/ha/y be appropriate.

Normally, the Critical Load for nitrogen deposition provides a stricter test than the Critical Load for acid deposition, therefore acid deposition has not been considered further.

Please note that the assessment requirement is to use the lower bound of the range of Critical Loads for habitats that are present; however, the APIS database (https://www.apis.ac.uk/app) may contain Critical Levels and Critical Loads for species/habitats that are not present at the site or not present at the parts of the site under consideration.

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

Site	Critical Level ($\mu g\text{-}NH_3/m^3$)	Critical Load Nitrogen Deposition (kg-N/ha/y)	Critical Load Acid Deposition (keq/ha/y)
Newham Fen SSSI/SAC	1.0 [1 & 2]	15.0 [2 & 3]	-

1. A precautionary figure used where no details of the ecology of the site are available, or the citation for the sites indicates that sensitive lichens and/or bryophytes are present.
2. Based upon APIS (https://www.apis.ac.uk/search-habitat-impacts) and the citation for the site. Note that the APIS database may contain entries habitats/species that are not present at the site or part of the site under consideration.
3. The lower bound of the range of Critical Load for habitats/species present at the site (https://www.apis.ac.uk/search-habitat-impacts) and Review and revision of empirical critical loads of nitrogen for Europe, 2022. Note that the APIS database may contain entries habitats/species that are not present at the site or part of the site under consideration.

3.4 Guidance on the Significance of Ammonia Emissions

3.4.1 Environment Agency Criteria

The Environment Agency and Department for Environment, Food & Rural Affairs published guidance "Intensive farming risk assessment for your environmental permit" (last updated August 2025) applies to ammonia emitting developments requiring a permit. The Environment Agency ammonia screening thresholds for designated nature conservation sites are given in Table 2.

Table 2. Environment Agency Screening Thresholds

Nature conservation site designation	Distance from site (km)	Lower threshold %	Upper threshold %
Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites	5	1	No upper threshold
Sites of Special Scientific Interest (SSSIs)	5	20	50
Local nature sites (National Nature Reserves, Local Nature Reserves, Local Wildlife Sites, Ancient Woodlands)	2	100	100

If the predicted process contributions to Critical Level or Critical Load are below the lower threshold percentage, the impact is usually deemed acceptable.

If the predicted process contributions to Critical Level or Critical Load are in the range between the lower and upper thresholds, whether or not the impact is deemed acceptable is at the discretion of the Environment Agency. In making their decision, the Environment Agency will consider whether other farming installations might act in-combination with the farm and the sensitivities of the wildlife sites. In the case of LWSs and AWs, the Environment Agency do not usually consider other farms that may act in-combination and therefore a Process Contribution of up to 100% of Critical Level and/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 pig reraring 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.

The bespoke emission factor used for the pig rearing houses and the manure storage at Ellingham Home Farm have been obtained from the Environment Agency Pre-application Report (27th August 2026).

Details of the pig numbers and types, manure storage, emission factors used and calculated ammonia emission rates are provided in Tables 3a, 3b and 3c.

Table 3a. Details of pig numbers, emission factors and ammonia emission rates – existing scenario

Source ID	Pig numbers	Emission Factor ($kg\text{-}NH_3/place/y$)	Emission rate ($g\text{-}NH_3/s$)
EX1	1,000	1.888	0.059827
EX2	1,000	1.888	0.059827

Table 3b. Details of pig numbers, emission factors and ammonia emission rates – proposed scenario

Source ID	Pig numbers	Emission Factor ($kg\text{-}NH_3/place/y$)	Emission rate ($g\text{-}NH_3/s$)
EX1	1,000	1.10	0.034857
EX2	1,000	1.10	0.034857
PR1	1,000	1.10	0.034857
PR2	1,000	1.10	0.034857

Table 3c. Details of manure storage, emission factors and ammonia emission rates

Source ID	Tonnage	Emission Factor ($kg\text{-}NH_3/t/y$)	Emission rate ($g\text{-}NH_3/s$)
MAN	150	0.850	0.004040

4. The Atmospheric Dispersion Modelling System (ADMS) and Model Parameters

The Atmospheric Dispersion Modelling System (ADMS) ADMS 6 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 that 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 discrete model. The physics/dynamics model has a resolution or had a resolution of approximately 7 km over the central UK; terrain is understood to be resolved at a resolution of approximately 2 km, with sub-7 km terrain effects parameterised. Site specific data may be extrapolated from nearby archive 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 observational records may be over-represented, this is because the instrumentation used may not record wind speeds 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 site is shown in Figure 2b. It should be noted that, elsewhere in the modelling domain, wind-roses may differ depending on the local terrain. Please 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].

4.1.1 Land/Sea breezes and katabatic winds

Land and sea breezes are generally well represented in the GFS data. Katabatic winds are unlikely to be represented in the GFS data and are likely to occur at the site; should they do so, because there are relatively low-level sources in this case, these effects may be important. However, under meteorological conditions where katabatic winds may occur, FLOWSTAR sets surface winds downslope and therefore, if: calms parameters are set correctly; Monin-Obukhov and minimum

turbulence length parameters are set properly and FLOWSTAR is used, this does result in an approximation of katabatic winds for near surface sources. Please note that the wind roses in Figures 2a and 2b are for virtual anemometers at 10 m above ground level and therefore do not necessarily demonstrate these effects and the wind rose for the FLOWSTAR output at the surface is shown in Figure 2c.

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 FLOWSTAR 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. GFS derived data for 55.528 N, 1.746 W, 2022 - 2025

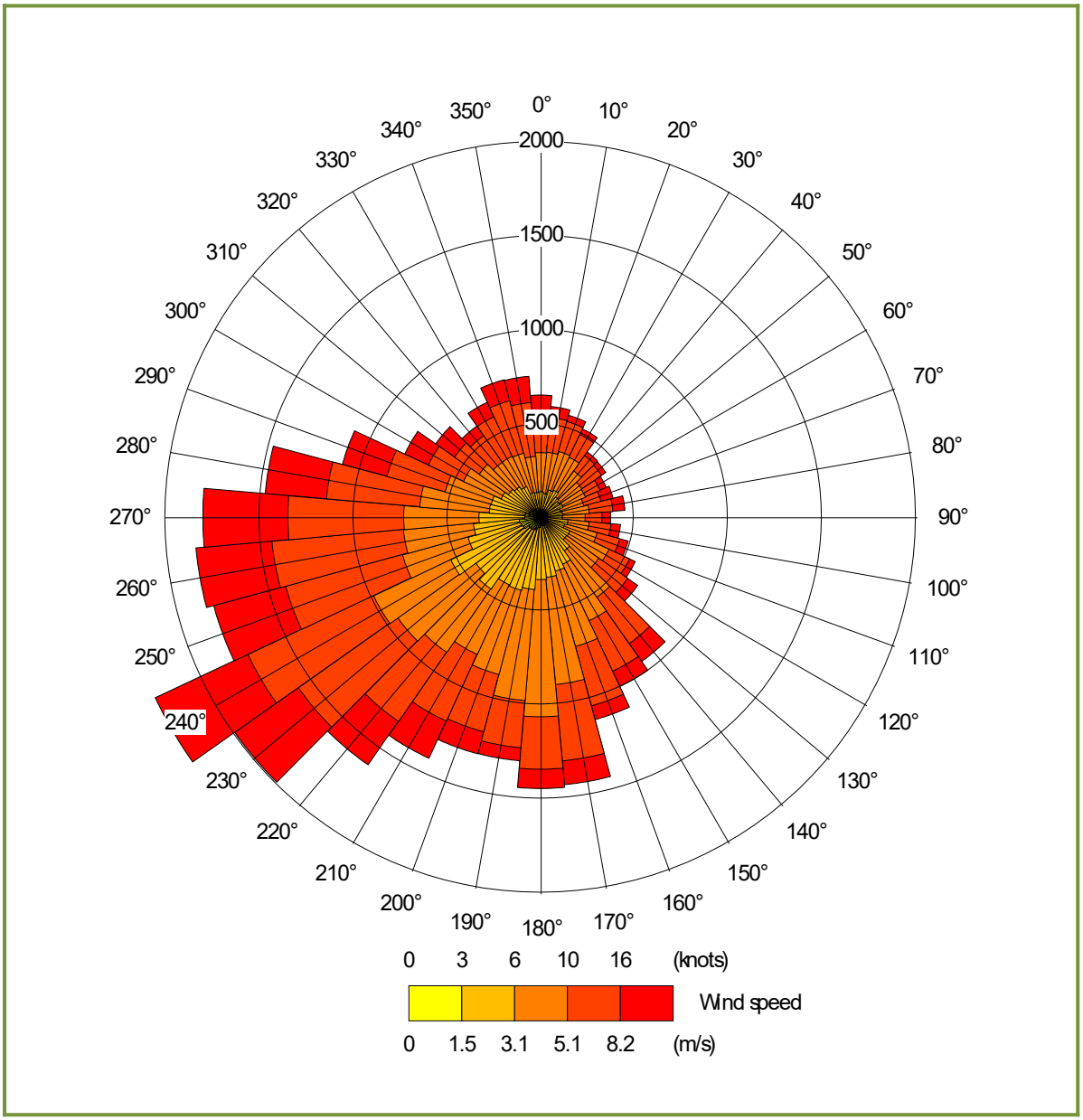


Figure 2b. The wind rose for NGR 416050, 626100, derived from FLOWSTAR output

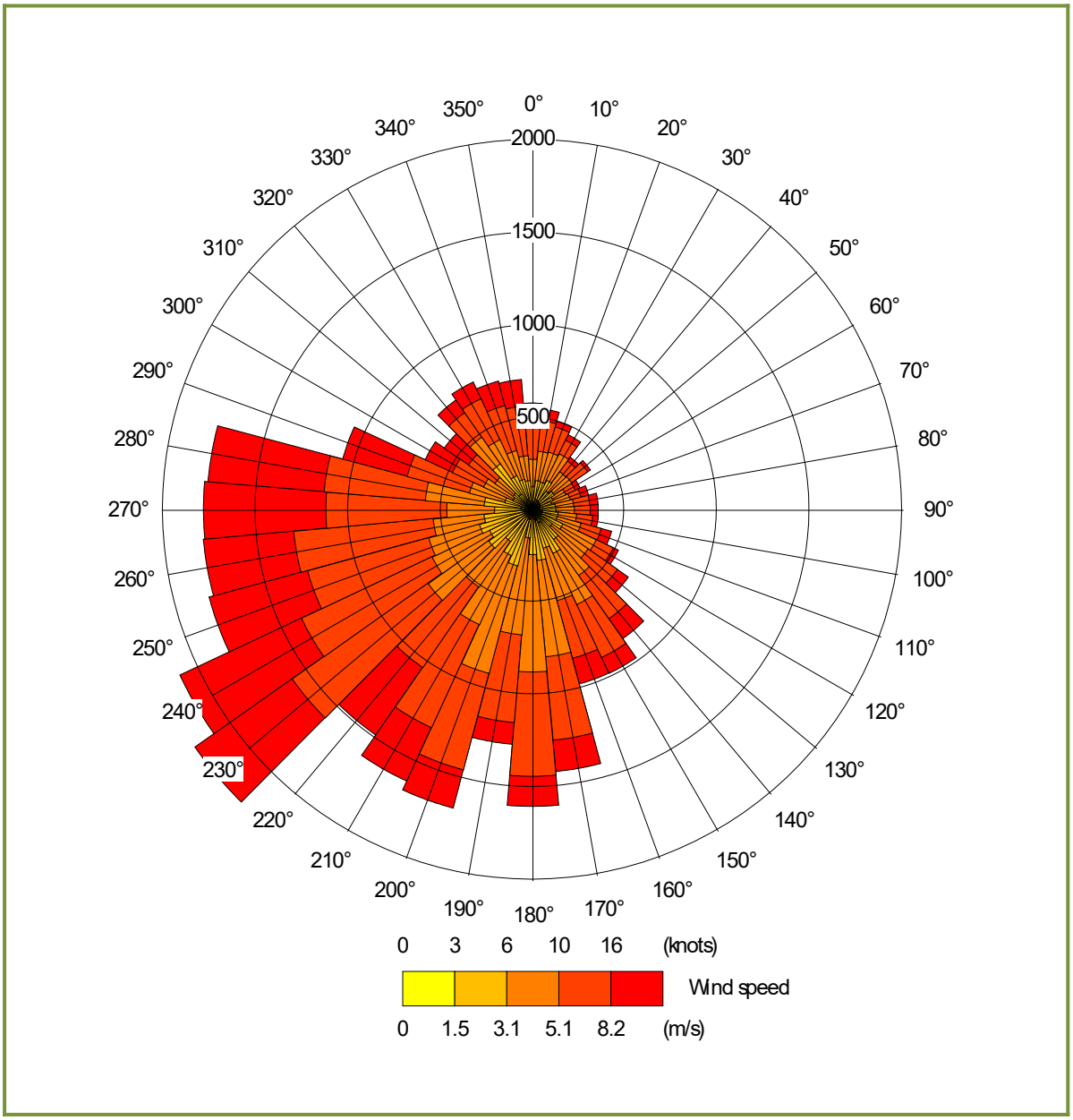
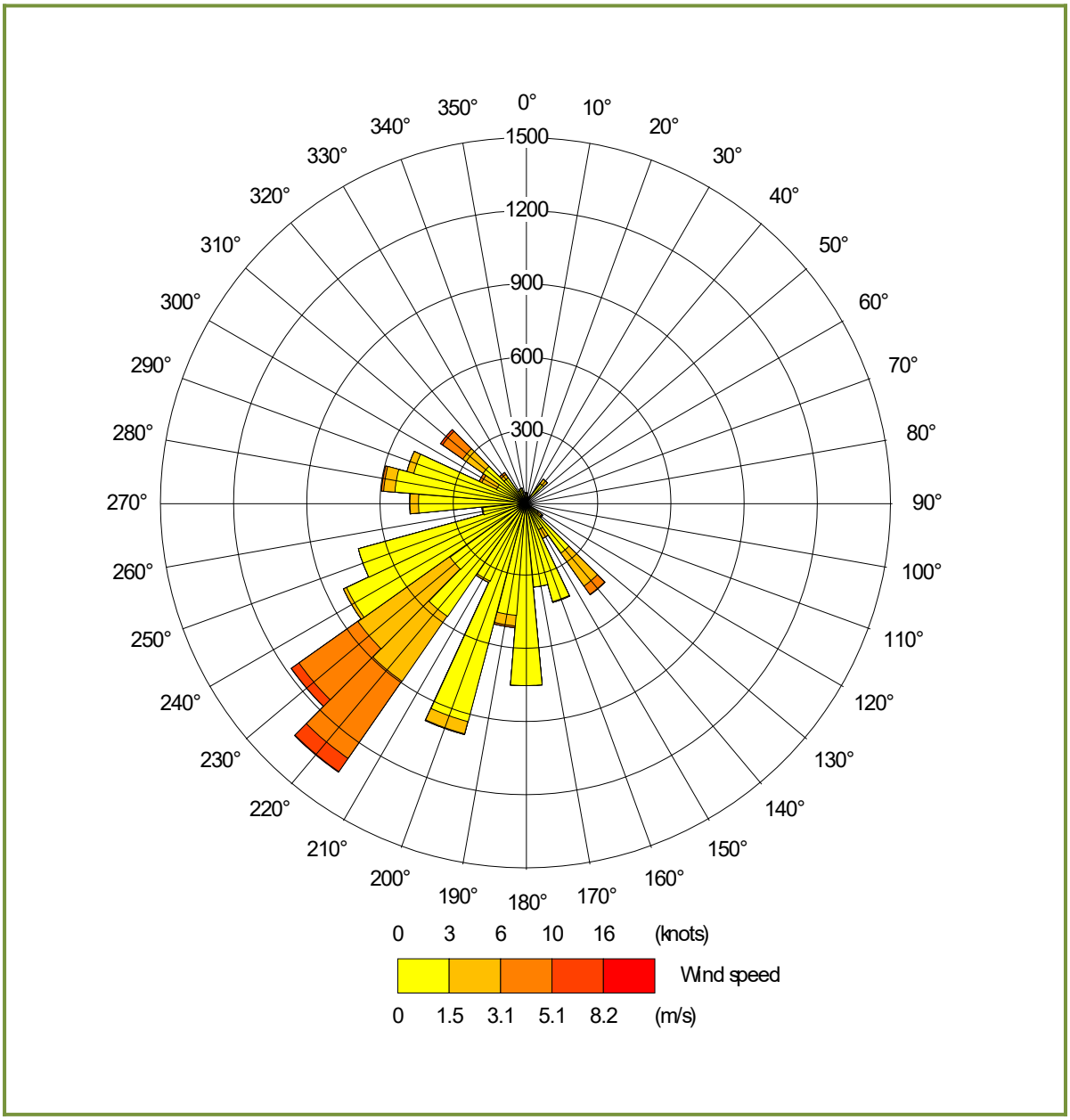


Figure 2c. The wind rose for NGR 416050, 626100 at surface level, derived from FLOWSTAR output



4.2 Emission sources

Emissions from the existing and proposed pig houses and the manure storage area are represented by volume sources within ADMS.

Details of the volume source parameters are shown in Table 4. The positions of the sources may be seen in Figure 3 (marked by red shaded rectangles).

Table 4. Volume source parameters

Source ID	Length (m)	Width (m)	Depth (m)	Base height (m)	Emission temperature (°C)	Emission rate (g-NH_3/s)
EX1	60.96	15.57	3.0	1.5	Ambient	0.034857 [1]
EX2	60.96	15.57	3.0	1.5	Ambient	0.034857 [1]
PR1	60.96	15.57	3.0	1.5	Ambient	0.034857
PR2	60.96	15.57	3.0	1.5	Ambient	0.034857
MAN	25.13	41.82	3.0	0.5	Ambient	0.004040

1. The emission rate for the existing houses in the proposed scenario is shown for 1,000 pigs per house using the bespoke emission factor of 1.1, the results in the tables for the existing scenario have been scaled by a factor of 1.716 to give figures for 1,000 pigs per house using the standard emission factor of 1.888.

4.3 Modelled buildings

Not modelled.

4.4 Discrete receptors

Thirty-four discrete receptors have been defined at the wildlife sites, however the results at only two are reported as requested. These receptors are defined at ground level within ADMS. The positions of the discrete receptors may be seen in Figures 4a and 4b (marked by enumerated pink rectangles).

4.5 Cartesian grid

To produce the contour plots presented in Section 5 of this report and to define the spatially varying deposition velocity field, two regular Cartesian grids have been defined within ADMS. The individual grid receptors are defined at ground level within ADMS and their positions may be seen in Figures 4a and 4b (marked grey grid 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 22.0 km by 22.0 km domain has been resampled at 100 m horizontal resolution for use within ADMS. The resolution of FLOWSTAR is 64 x 64 grid points; therefore, the effective resolution of the wind field for the terrain runs is approximately 340 m.

4.7 Roughness Length

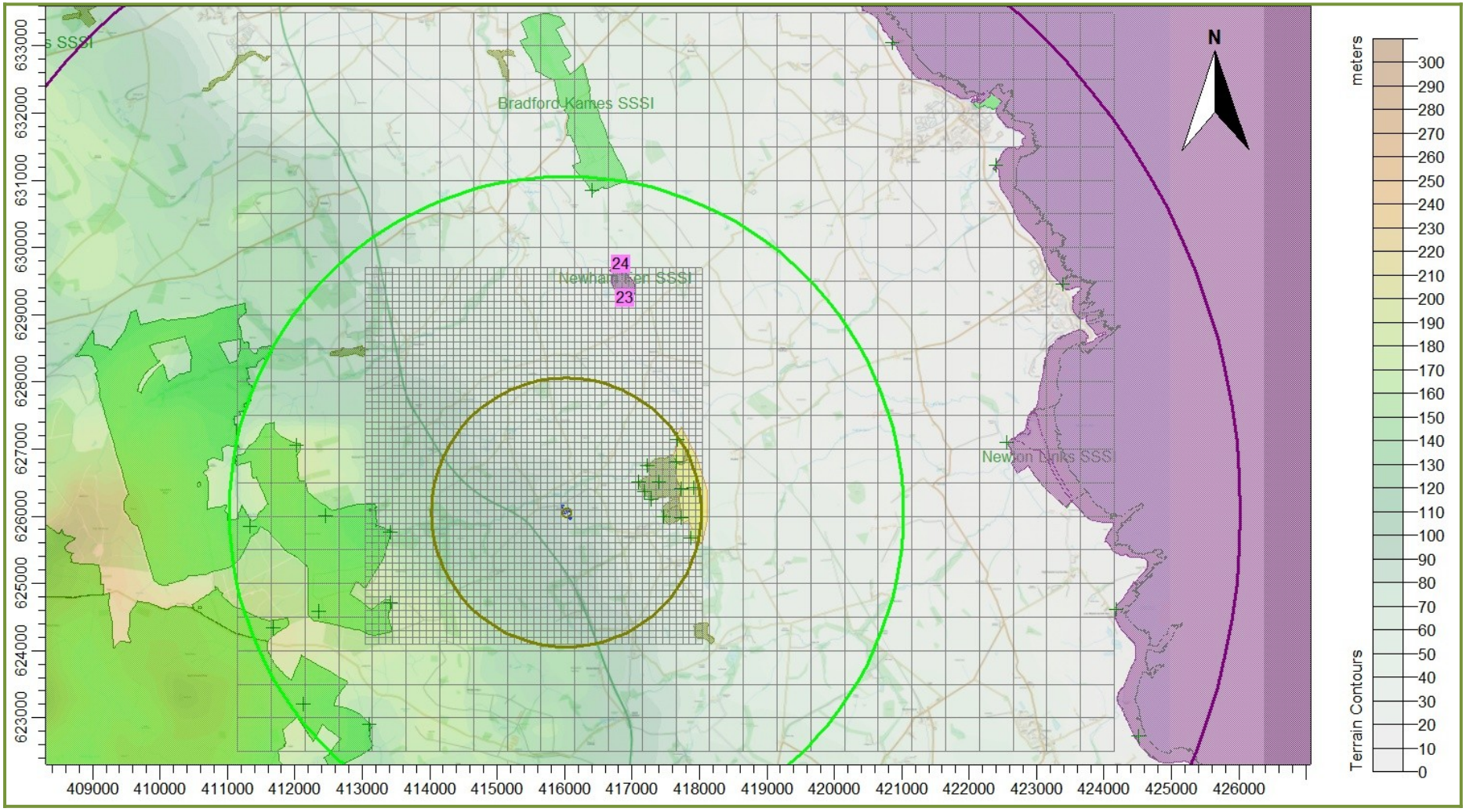
In this case, a spatially varying roughness length file has been defined, this is based upon the Defra Living Landscapes database. The GFS meteorological data is assumed to have a roughness length of 0.134 m (arithmetic average of the spatially varying roughness over the modelling domain). The sample of the central area of the spatially varying roughness length field is shown in Figure 5.

Figure 3. The positions of the modelled sources



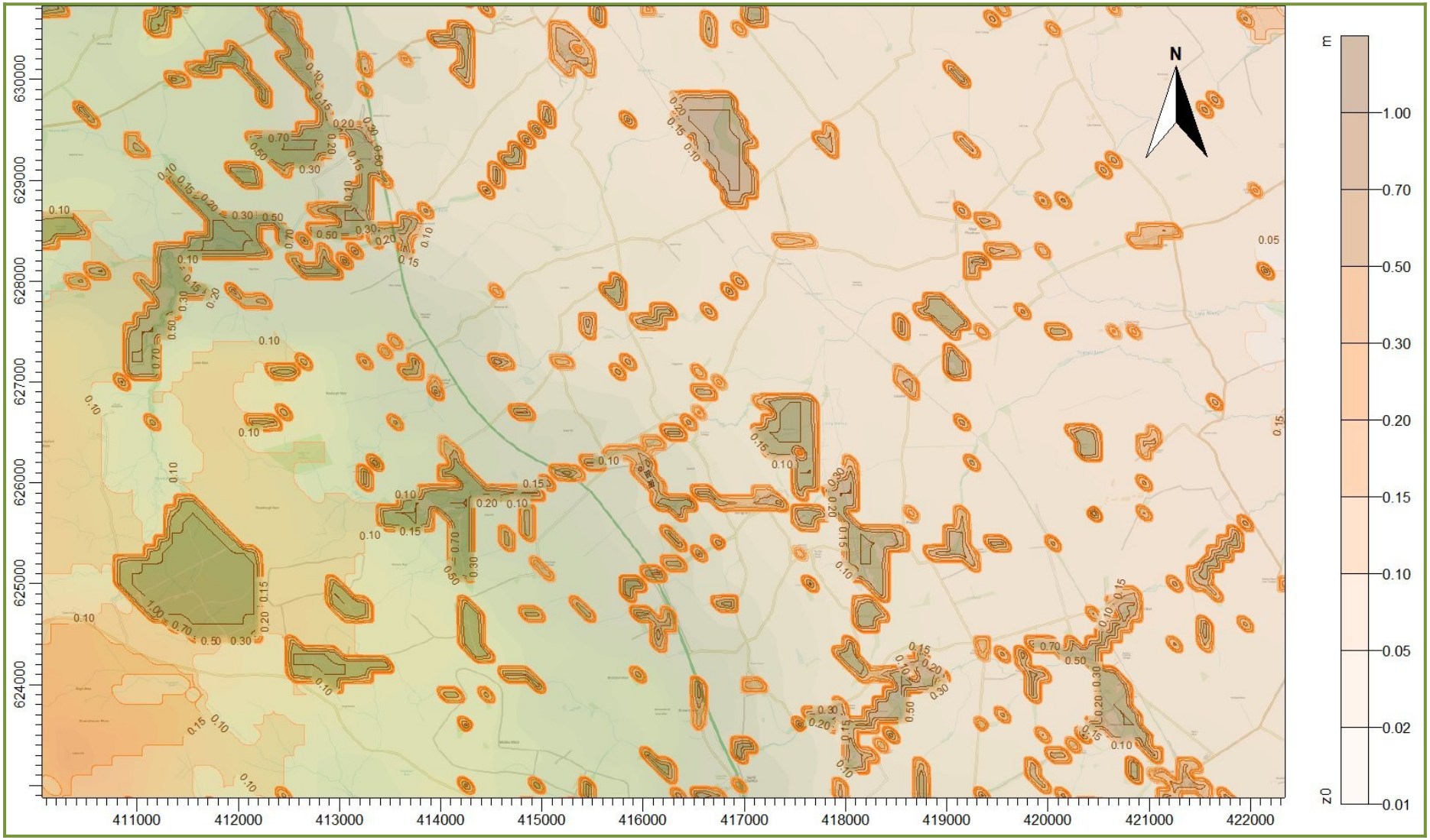
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Figure 4. The discrete receptors and regular cartesian grids – broadscale view



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Figure 5. The spatially varying surface roughness field (central area)



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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 livestock 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, has been used to define a deposition velocity field. The deposition velocities used are provided in Table 5.

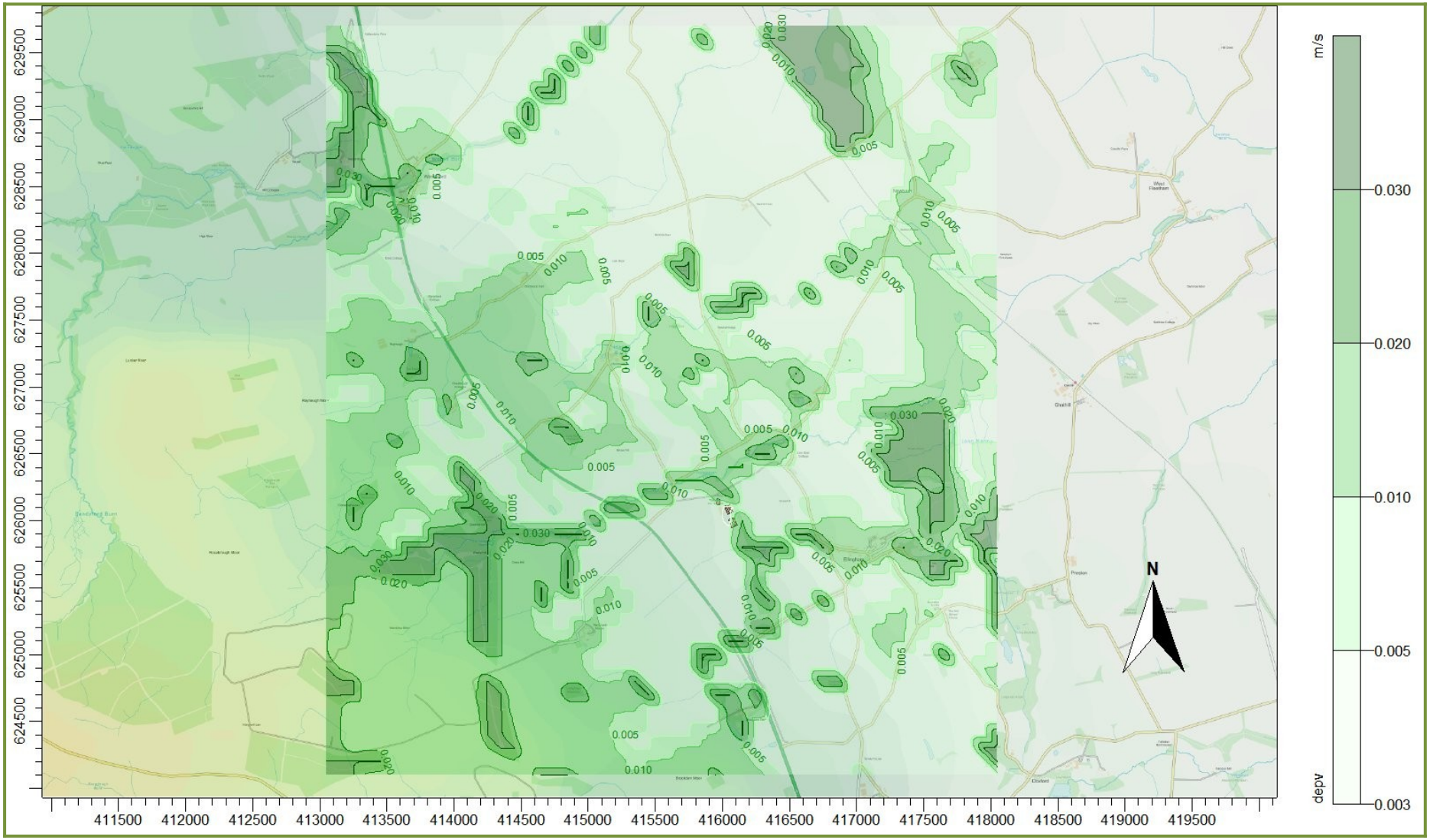
Table 5. Deposition velocities

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 (0.010 to 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 6.

Figure 6. The spatially varying deposition velocity field



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5. Details of the Model Runs and Results

5.1 Preliminary modelling and model sensitivity tests

ADMS was effectively run a total of eight times, once for each year of the meteorological record in the following modes:

- In basic mode without calms, or terrain – GFS data.
- With calms and without terrain – GFS data.

For each mode, statistics for the maximum annual mean ammonia concentration at each receptor were compiled. Details of the predicted annual mean ammonia concentrations at each receptor are provided in Table 6. The primary purpose of the preliminary modelling is to assess the effect of calms on the results however in this case the receptors are further than 2 km from the site and are therefore not considered..

Table 6. Predicted maximum annual mean ammonia concentration – preliminary modelling

Receptor number	X(m)	Y(m)	Name/Designation	Maximum annual mean ammonia concentration ($\mu g/m^3$)			
				Existing		Existing & Proposed	
				GFS No Calms No Terrain	GFS Calms No Terrain	GFS No Calms No Terrain	GFS Calms No Terrain
23	416897	629254	Newham Fen SSSI/SAC	0.047	0.053	0.053	0.060
24	416836	629766	Newham Fen SSSI/SAC	0.037	0.041	0.042	0.047

5.2 Detailed deposition modelling

In this case, detailed modelling has been carried out over a high resolution 5.0 km x 5.6 km domain surrounding Ellingham Home Farm. The primary purpose is to determine the magnitude of deposition of ammonia and consequent plume depletion close to the sources where it is of the greatest importance. Outside of this domain a fixed deposition velocity of 0.005 m/s is assumed (with appropriate deposition velocities applied post-modelling at the discrete receptors).

The predicted maximum annual mean ground level ammonia concentrations and nitrogen deposition rates at the discrete receptors are shown in Tables 7a (Scenario 1 – Existing Baseline) and 7b (Scenario 2 – Existing and Proposed). In the Tables, predicted ammonia concentrations and nitrogen deposition rates that exceed the Environment Agency's lower percentage threshold of 1% of the relevant Critical Level or Load for the site are coloured blue.

Predicted changes to annual mean ammonia concentrations and annual nitrogen deposition rates are shown in Table 8 (Scenario 2 minus Scenario 1).

Contour plots of the predicted ground level maximum annual mean ammonia concentrations and maximum annual nitrogen deposition rates are shown in Figures 7a and 7b (Scenario 1 – Existing Baseline) and Figures 8a and 8b (Scenario 2 – Existing and Proposed).

Table 7a. Predicted process contribution to annual mean ammonia concentrations and nitrogen deposition rates - Scenario 1

Receptor number	X(m)	Y(m)	Name	Site Parameters			Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity	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
23	416897	629254	Newham Fen SSSI/SAC	0.02	1.0	-	0.0127	**1.27**	0.07	-
24	416836	629766	Newham Fen SSSI/SAC	0.02	1.0	-	0.0107	**1.07**	0.06	-

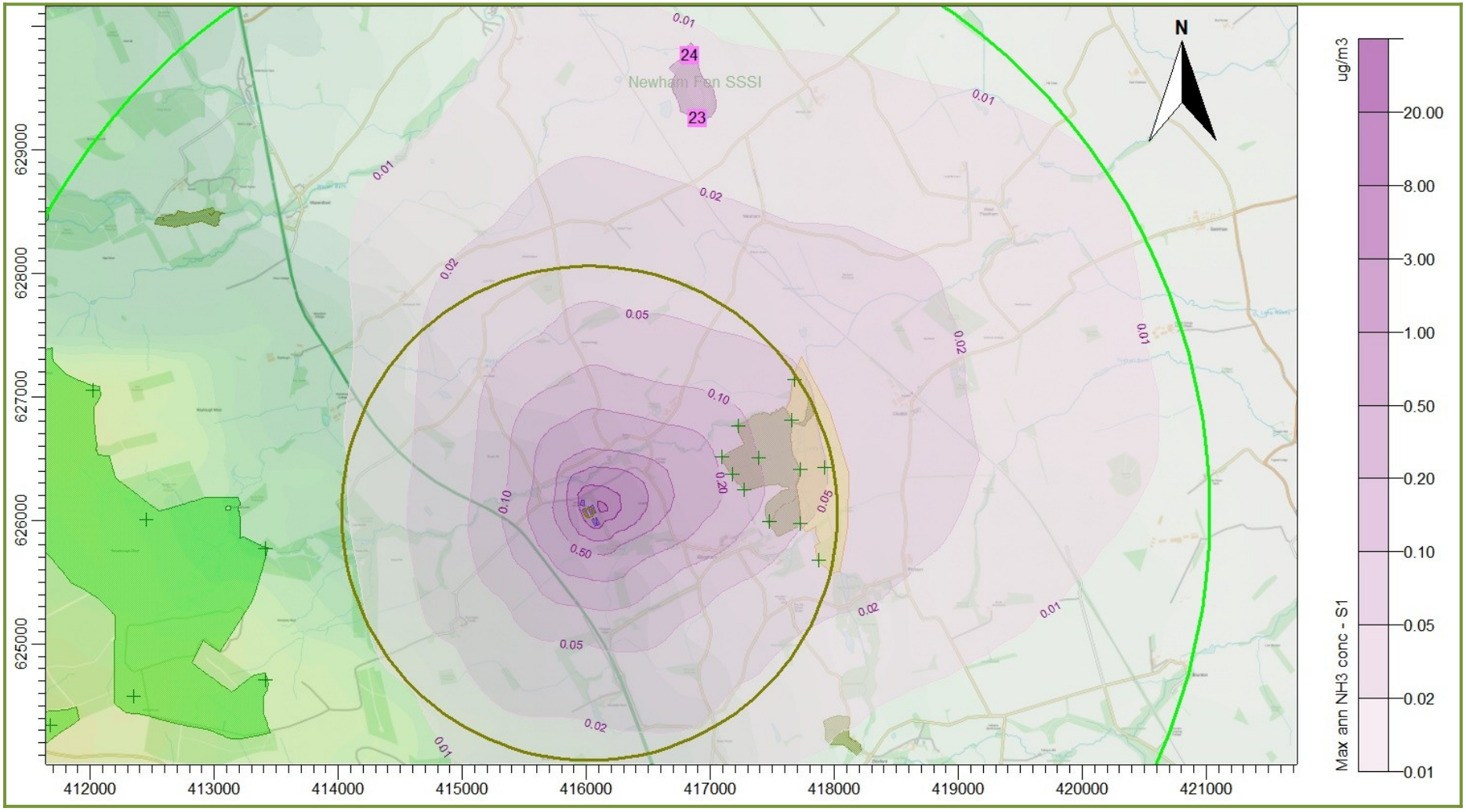
Table 7b. Predicted process contribution to annual mean ammonia concentrations and nitrogen deposition rates - Scenario 2

Receptor number	X(m)	Y(m)	Name	Site Parameters			Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity	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
23	416897	629254	Newham Fen SSSI/SAC	0.02	1.0	-	0.015	**1.47**	0.08	-
24	416836	629766	Newham Fen SSSI/SAC	0.02	1.0	-	0.012	**1.22**	0.06	-

Table 8. Predicted changes in process contribution to annual mean ammonia concentrations and nitrogen deposition rates - Scenario 2 minus Scenario 1

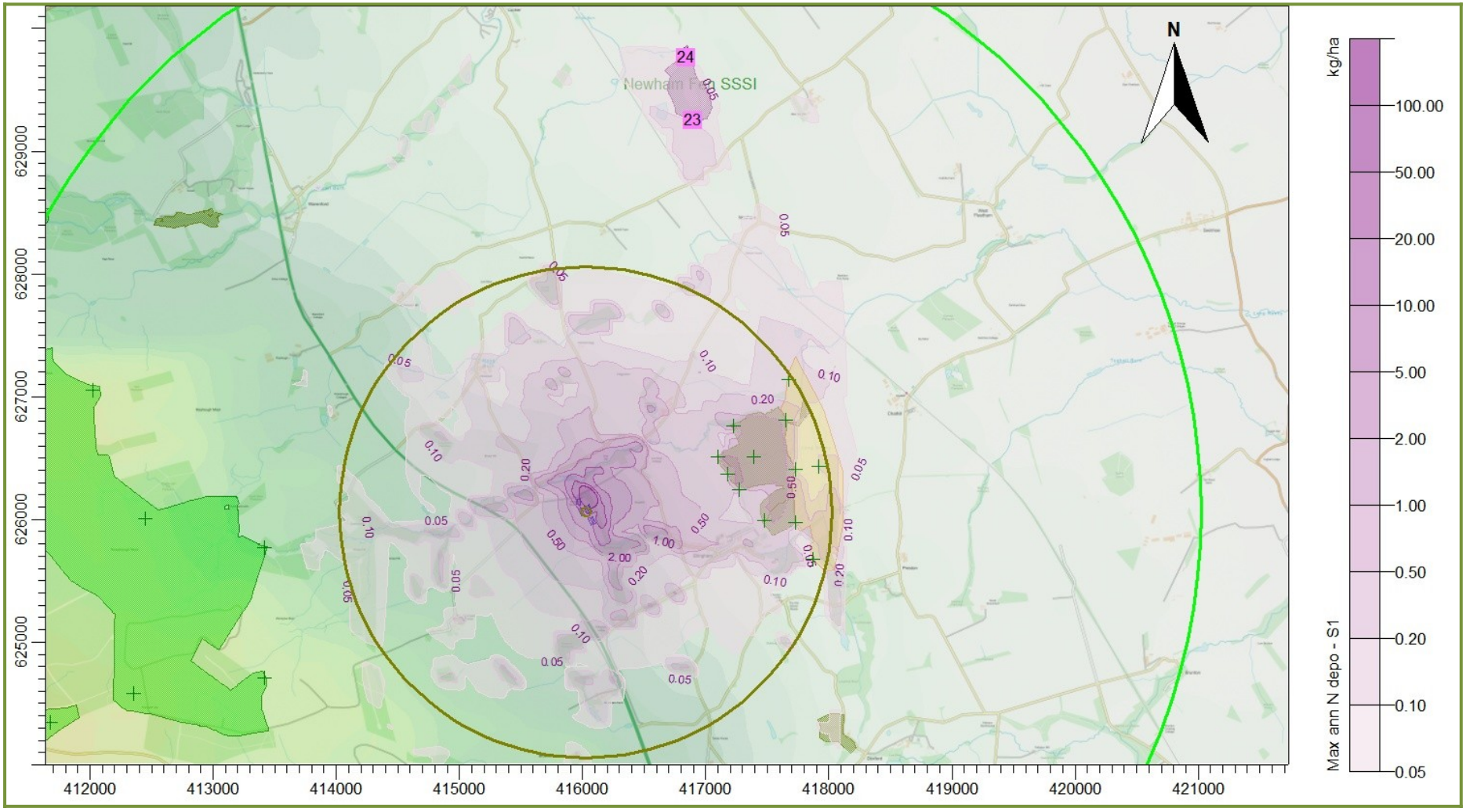
Receptor number	X(m)	Y(m)	Name	Site Parameters			Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity	Critical Level ($\mu g/m^3$)	Critical Load (kg/ha)	Process Contribution ($\mu g/m^3$)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
23	416897	629254	Newham Fen SSSI/SAC	0.02	1.0	15.0	0.002	0.20	0.01	-
24	416836	629766	Newham Fen SSSI/SAC	0.02	1.0	15.0	0.002	0.15	0.01	-

Figure 7a. Process contribution to maximum annual mean ammonia concentrations – Scenario 1



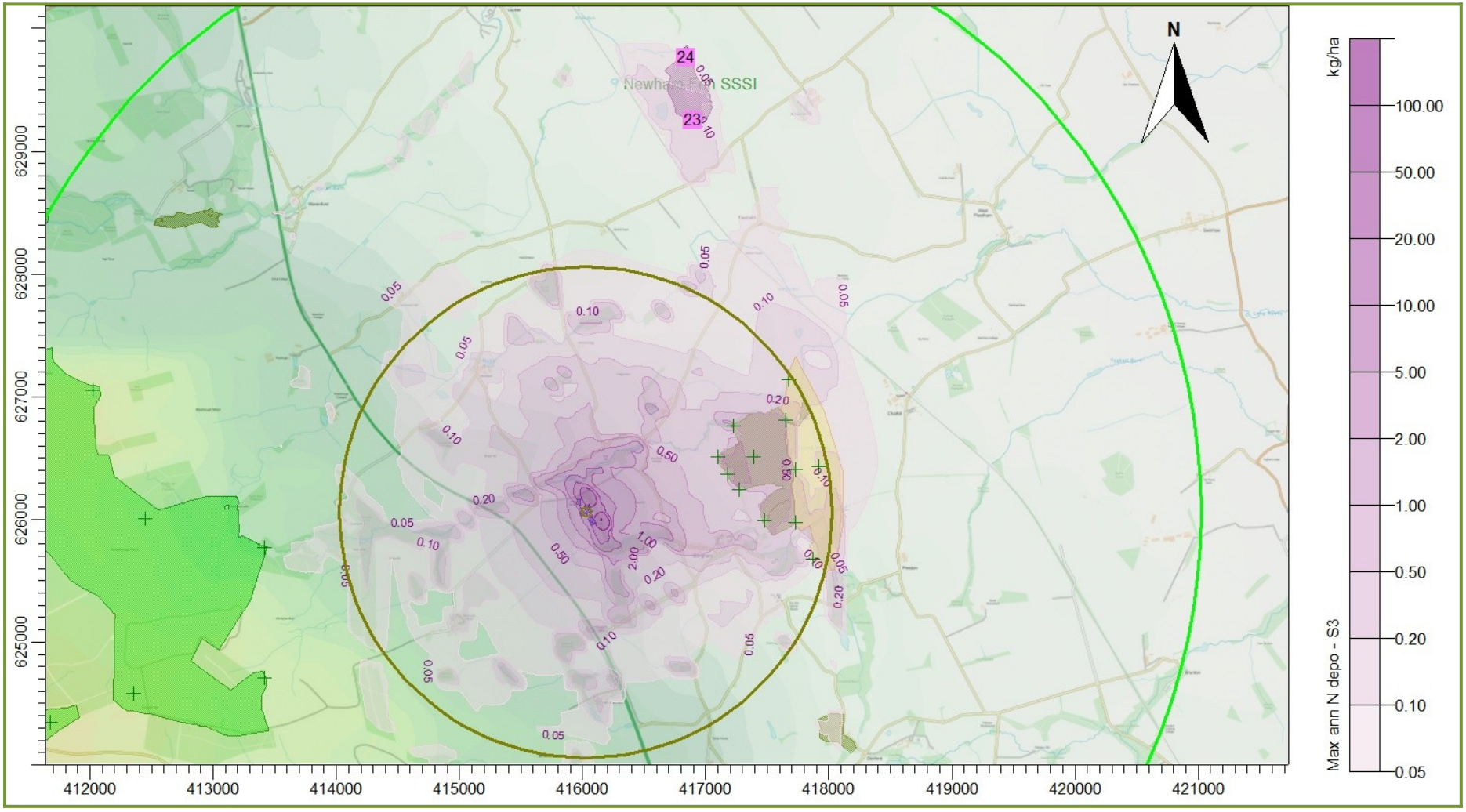
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Figure 7b. Process contribution to maximum annual nitrogen deposition – Scenario 1



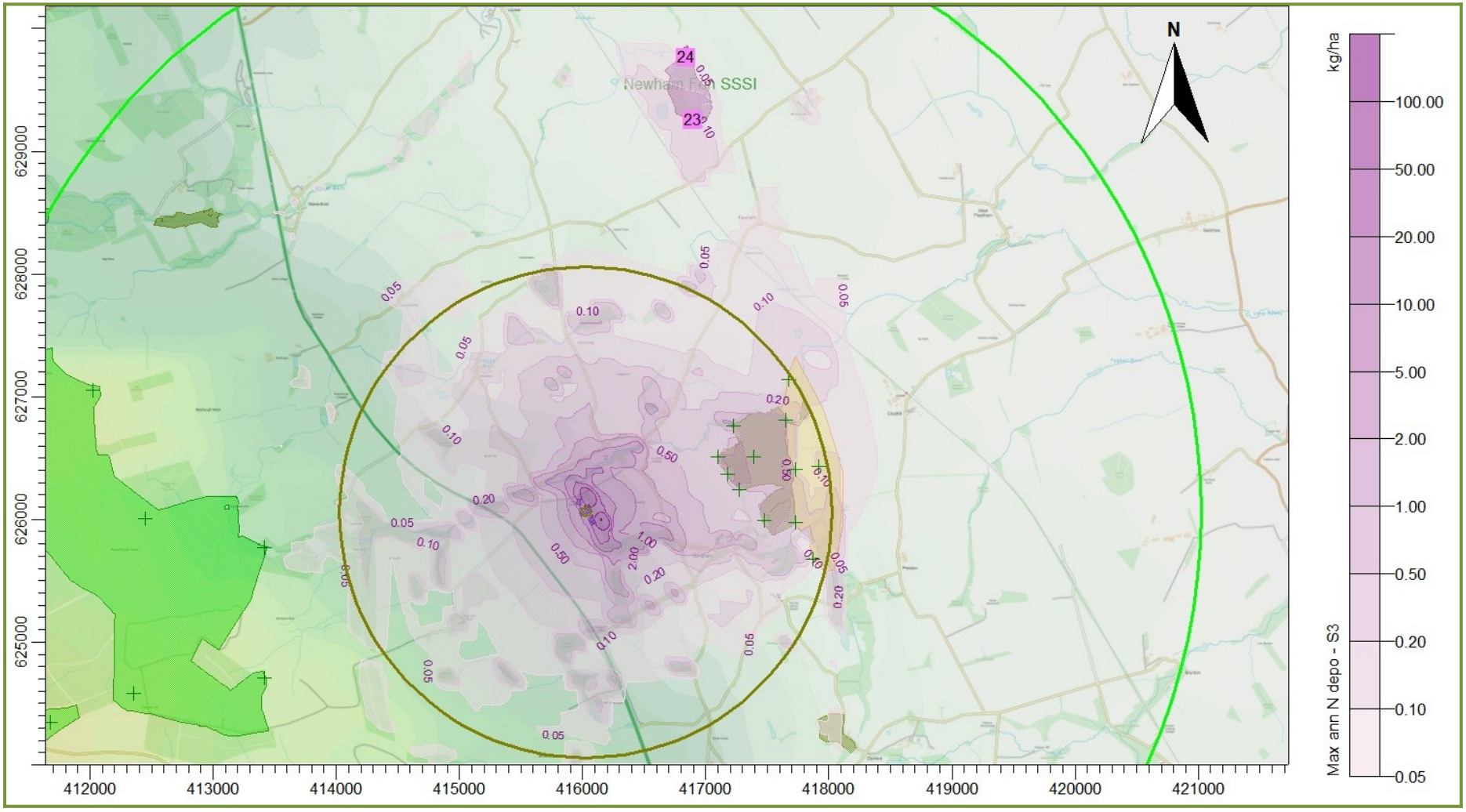
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Figure 8a. Process contribution to maximum annual mean ammonia concentrations – Scenario 2



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Figure 8b. Process contribution to maximum annual nitrogen deposition – Scenario 2



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6. Summary and Conclusions

Ammonia emission rates have been assessed and quantified based upon a bespoke ammonia emission factor provided by the Environment Agency. The emission rates have then been used as inputs to an atmospheric dispersion and deposition model which calculates ammonia exposure levels and nitrogen deposition rates in the surrounding area.

Scenario 1 - Baseline

The modelling predicts that:

- The process contributions to annual mean ammonia concentrations and annual nitrogen deposition rates currently exceed the Environment Agency lower threshold of 1% of the relevant Critical Level and Load at Newham Fen SAC.

Existing & Proposed Houses - Scenario 2

The modelling predicts that:

- The process contributions to annual mean ammonia concentrations and annual nitrogen deposition rates would continue to exceed the Environment Agency lower threshold of the relevant Critical Level and/or Load at Newham Fen SAC, however the increase at the receptors would be less than 1%.

7. References

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