# G & A POWELL

# POULTRY UNITS AT GLANMEHELI FARM, GLANMEHELI FARM, NEWTOWN, POWYS.

# AMMONIA EMISSIONS: IMPACT ASSESSMENT

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# 1.0 INTRODUCTION

Isopleth Ltd has been commissioned by Berrys, on behalf of G & A Powell, to carry out a detailed assessment of ammonia impacts associated with a poultry operation at Glanmeheli Farm, Kerry, Newtown SY16 4LN. The farm lies within the administrative area of Powys Council.

Additional poultry rearing (broiler) sheds are proposed on land adjacent to an existing free range (laying) shed. When complete, it is planned that the site capacity will increase to a maximum of 200,000 birds in 4 buildings.

An assessment of ammonia impacts against critical levels and critical loads (for nutrient nitrogen and acid deposition) has therefore been completed:

- Critical levels are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.
- Critical loads are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

The type, source and significance of potential impacts have been identified and detailed modelling undertaken in line with NRW Guidance:

> *NRW (December 2018) Assessing the impact of ammonia and nitrogen on designated sites from new and expanding intensive livestock units. Technical guidance for determining environmental permit applications or responding to planning application consultations. Reference number:* ***GN020***

Also:

> *NRW (March 2017) Assessment of ammonia and nitrogen impacts from livestock units when applying for an Environmental Permit or Planning Permission. Reference number:* ***OGN 41***

Predicted ground level concentrations of ammonia, nutrient nitrogen and acid deposition are compared with relevant air quality standards and guidelines for the protection of sensitive habitats.

# 2.0 SITE SETTING AND OPERATIONS

## 2.1 Description

The application site is located south of the A489 approximately 5km ESE km Newtown at OS GR 316550, 289780. The site setting can be seen in Appendix A, which are drawings submitted with the planning application and have been reproduced courtesy of Berrys.

The land at Glanmeheli Farm and is farmed by Geraint and Anabel Powell and family trading as G & A Powell. The 550-acre farm is a mixed organic holding, with a herd of Limousin-cross suckler cows and a flock of Welsh Mule ewes and 200 pigs. The animals cattle are reared on home-produced spring barley and spring wheat, winter barley and grass silage with turnips for the sheep flock. The site also includes a 16000 bird free-range layer unit in a single house. There is a range of agricultural buildings on the farm including livestock buildings, crop storage buildings and silos.

The closest residences to the poultry facility are those associated with Glanmeheli Farm (i.e. the applicant, family and tenants). Glanmeheli Farm is shown, alongside assessed receptors which are not associated with the farm, in Drawing AQ1 (Appendix A).

The site currently consists of a single free-range laying building, housing 16,000 birds. The applicant is now seeking to adapt the existing building to accept broilers as well as constructing 3 additional houses for a total maximum capacity of 200,000 birds across the 4 sheds.

The broilers will be brought in as day old chicks at a 50-50 mix of males and females. The 37 day growth period will lead to birds being around 1.9kg in weight by clearout.

The new buildings will each measure approximately 101m by 24m with a height to the eaves of approximately 2 metres, 5.75 metres to the ridge and 6.4 metres at the top of the fans which is the highest point of each new shed.

For the comfort and productivity of the birds the temperature within the houses must be regulated. The ventilation is based on a Fancom 'Minimum Transitional Tunnel' (MTT) design, which uses ridge ventilation at the early stage of the cropping cycle transferring to a tunnel ventilation system (i.e. gable fan driven) at the end of the cycle. The fans will operate at a variable rate dependent upon the age of the birds and will only be switched off when the sheds are vacant.

There is sufficient fan capacity (including back-up systems) to ensure that the comfort of the birds is maintained even in the event that the outside ambient temperature rises above 30ºC.

The facility will be of modern design, utilising the current best practice control measures for minimisation of odour impact. This includes optimisation of diet for the growing birds and the use of nipple drinkers to reduce litter moisture content, for example. High litter moisture content, low oxygen levels, small particle size, high temperatures and low pH encourage anaerobic bacterial activity and the generation of odours and the facility will be operated in a manner which discourages such activity.

## 2.2 Ecological Receptors

Ecological site searches 2km (local sites and AW) and 5km (SSSI and European sites) are included as Appendix B to this report. These confirmed that the following sites are of interest:

- Mongtomery Canal SAC and SSSI; and
- Numerous ancient woodland sites.

The JNCC describes the Mongtomery Canal SAC as consisting of:

- Inland water bodies (Standing water, Running water) (73.6%);
- Heath, Scrub, Maquis and Garrigue, Phygrana (2.4%);
- Dry grassland, Steppes (21.6%); and
- Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites) (2.4%).

There are no 'annex I' habitats within this SAC / SSSI, however there is one Annex II species that is a primary reason for selection of this site, which is Floating water-plantain *Luronium natans:*

> *'This is the largest and the most extensive population of floating water-plantain Luronium natans in Britain and is a highly significant lowland population. In favourable management conditions the species can be dominant over kilometre lengths of canal, carpeting the shallow bed and flowering and setting seed in abundance. This is a semi-natural population, having colonised from drift material or seed but needing periodic human disturbance for continued growth; in this respect the canal is a substitute for the species' former slow-moving, mesotrophic river niche, which has been largely destroyed in lowland Britain.'*

*Luronium natans* occurs as two forms: in shallow water with floating oval leaves, and in deep water with submerged rosettes of narrow leaves. As such, any species on the canal banks are not key to the Mongtomery Canal SAC and SSSI designation.

The location of the ecological sites assessed in this report are shown in drawing AQ1 (Appendix A).

# 3.0 APPROACH

## 3.1 General Approach

NRW guidance GN 020 and OGN 41 has been followed for this assessment in relation to sites of European and National interest (i.e. 'Natura 2000' sites). Predicted ground level concentrations of ammonia, nutrient nitrogen and acid deposition are compared with relevant air quality standards and guidelines for the protection of sensitive habitats. For local sites and ancient woodland, Guidance *Intensive farming risk assessment for your environmental permit* (May 2018) is used.

## 3.2 Critical Levels

Critical levels for the protection of vegetation and ecosystems are specified within relevant European air quality directives and corresponding UK air quality regulations.

**Table 3-1**
**Ammonia Critical Level**

| Concentration (µg/m$^3$) | Habitat and Averaging Period |
|---|---|
| 1 | Annual mean. Sensitive lichen communities & bryophytes and ecosystems where lichens & bryophytes are an important part of the ecosystem's integrity |
| 3 | For all higher plants (all other ecosystems) |

## 3.3 Critical Loads

Critical loads are set for the deposition of various substances to sensitive ecosystems. The AQTAG procedure defines the dispersion modelling approach in terms of receptor location and arrays, use of topographical and terrain data, the calculation of deposition fluxes, how these should be considered alongside the background conditions and relevant critical levels and loads.

Predicted contributions to acid deposition and nitrogen deposition have been calculated and compared with the relevant critical load range for the habitat types associated with each designated site as derived from the UK Air Pollution Information System (APIS) website[1]. The contribution to critical loads for Nitrogen deposition are recorded as KgN/ha/yr. Deposition rates are converted to units of acid equivalents ($k_{eq}$/ha/year), which is a measure of how acidifying the chemical species can be, by dividing the dry deposition flux (kg/ha/year) by standard conversion factors.

Deposition rates were calculated using dispersion modelling results processed by following empirical methods recommended by the Environment Agency in AQTAG and summarised below.

[1] www.apis.ac.uk

Firstly, calculate dry deposition flux using the following equation:

*Dry deposition flux (µg/m$^2$/s) = ground level concentration (µg/m$^3$) x deposition velocity (m/s)*

The applied deposition velocity for ammonia is 0.020 m/s for grassland and 0.030 m/s for woodland. This may be adapted based on the overall concentration of ammonia as a process contribution however this value is appropriate for concentrations below 10 µg/m$^3$. For sites such as water bodies, this deposition velocity may be reduced still further, with a value of 0.005 m/s having been applied (and accepted) for previous planning applications within Powys.

The units are then converted from µg/m$^2$/s to units of kg/ha/year by multiplying the dry deposition flux by a standard conversion factor for ammonia of 259.7.

Wet deposition occurs via the incorporation of the pollutant into water droplets which are then removed in rain or snow and is not considered significant over short distances compared with dry deposition and therefore for the purposes of this assessment, wet deposition has not been considered.

GN 020, OGN 41 and *Intensive farming risk assessment for your environmental permit* only requires that the nutrient nitrogen critical load calculations are undertaken. There is no requirement for the calculation of acidification.

# 4.0 ASSESSMENT

## 4.1 Step 1: Distance Screen

GN 020, OGN 41 and *Intensive farming risk assessment for your environmental permit* requires that conservation sites need only be considered where they fall within set distances of the activity:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites or Sites of Special Scientific Interest (SSSIs) within 5 km of the installation; and
- National Nature Reserves (NNRs), Local Nature Reserves (LNRs), local wildlife sites and ancient woodland within 2km of the location of the installation.

As noted in section 2.2, there are ecological receptors within these Tier 1 screening distances.

## 4.2 Step 2: Simple Screening Threshold

In this case, detailed modelling ('step 3') has been undertaken rather than simple screening. As such, there is no 'Step 2' assessment in this case.

## 4.3 Step 3

Powys Council has not yet been approached to identify other agricultural installations which, in their view, could potentially act in combination with the proposed development, such as:

1. Applications for planning or permitting that are submitted but not yet determined;
2. Developments that have planning permission and/or permits but are not yet (fully) operating;
3. Developments that started operating after the most recent update of background levels.

Indications from Powys Council are that pre-application discussions would be required where such information would be provided.

Modelling has been completed in line with the requirements of *Guidance on modelling the concentration and deposition of ammonia emitted from intensive farming. Air Quality Modelling and Assessment Unit, 22 November 2010, v3*. The BREEZE AERMOD model has been used.

Modelling was carried out with discrete receptors representing the ecological sites of biological interest. For larger sites (or linear sites perpendicular to the proposed development), multiple discrete receptor locations have been used.

**Table 4-2**
**Ecological Receptor Locations**

| Receptor | Site | OS Coordinate Xm | OS Coordinate Ym | Height (m AoD) |
|---|---|---|---|---|
| **Montgomery Canal SAC / SSSI** | | | | |
| D1 | Mont Canal SSSI 1 | 313896.0 | 293009.0 | 98.3 |
| D2 | Mont Canal SSSI 2 | 314203.0 | 293231.0 | 93.2 |
| D3 | Mont Canal SSSI 3 | 314530.0 | 293707.0 | 93.8 |
| D4 | Mont Canal SSSI 4 | 314833.0 | 293988.0 | 95.7 |
| D5 | Mont Canal SSSI 5 | 315579.0 | 294575.0 | 87.9 |
| **Ancient Woodlands (refer to Drawing AQ1)** | | | | |
| D6 | AW1 a | 316558.6 | 289989.8 | 188.3 |
| D7 | AW1 b | 316608.1 | 289949.9 | 190.3 |
| D8 | AW1 c | 316655.6 | 290041.4 | 189.5 |
| D9 | AW1 d | 316694.6 | 289992.3 | 194.2 |
| D10 | AW1 e | 316736.2 | 290080.4 | 196.5 |
| D11 | AW1 f | 316776.5 | 290035.1 | 200.6 |
| D12 | AW1 g | 316794.1 | 290125.8 | 197.4 |
| D13 | AW2 | 317083.1 | 289768.6 | 201.0 |
| D14 | AW3 | 317528.8 | 289659.7 | 189.5 |
| D15 | AW4 | 317467.0 | 289503.5 | 200.4 |
| D16 | AW5 | 317751.7 | 290114.4 | 177.2 |
| D17 | AW6 | 317163.7 | 289219.3 | 215.4 |
| D18 | AW7a | 316179.9 | 289715.9 | 188.3 |
| D19 | AW7b | 316141.0 | 289817.6 | 185.7 |
| D20 | AW7c | 316070.4 | 289787.7 | 186.3 |
| D21 | AW8 | 316955.9 | 289007.7 | 217.7 |
| D22 | AW9a | 316561.7 | 289098.4 | 228.9 |
| D23 | AW9b | 316363.9 | 289029.1 | 230.0 |
| D24 | AW9c | 316185.1 | 288962.3 | 237.1 |
| D25 | AW10 | 315292.4 | 289641.8 | 202.6 |
| D26 | AW11 | 315472.2 | 288846.4 | 209.4 |
| D27 | AW12 | 315562.0 | 290489.0 | 199.1 |
| D28 | AW13 | 315868.0 | 291309.4 | 219.3 |
| D29 | AW14 | 317868.2 | 289545.7 | 216.4 |
| D30 | AW15 | 318240.3 | 289793.6 | 206.2 |
| D31 | AW16 | 317204.7 | 288717.4 | 247.1 |
| D32 | AW17 | 317033.4 | 288702.2 | 247.5 |
| D33 | AW18 | 316716.0 | 288873.5 | 221.1 |

There are no APIS critical load values or Natural England citations for local sites (e.g. LWS) or ancient woodland. Therefore robust nutrient nitrogen and acid critical load results are presented for the SSSI only. This must be confirmed by Powys Council and Natural Resources Wales, if required.

The movement of air over and around buildings and other structures generates areas of flow re-circulation that can lead to increased ground level concentrations of pollutants close to the source. Where the stack height is less than 2.5 times the height of any nearby building (within 5 stack heights), downwash effects and entrainment can be significant. The Glanmeheli Farm site details have been provided by the applicant and a detailed dispersion model constructed on this basis.

In accordance with current guidance, 5 years of meteorological data has been used. The site at Shobdon is the closest representative site with a >90% complete data set.

### *4.3.1 Model inputs*

Two scenarios have been modelled. These represent:

- Scenario 1: The existing scenario, with 16,000 free range layers birds housed in 1 building and able to move within the range; and
- Scenario 2: The proposed broiler facility with 200,000 birds housed in 4 buildings.

Modelling inputs for the Glanmaheli Farm site are shown appendix C.

The presence of elevated terrain can significantly affect ground level concentrations of pollutants emitted from sources in a number of ways. Elevated terrain reduces the distance between the plume centre line and the ground level, thereby increasing ground level concentrations. Elevated terrain can also increase turbulence and, hence, plume mixing with the effect of increasing concentrations near to a source and reducing concentrations further away.

The site is located between approximately 195m – 197.5m AOD. Information relating to the topography of the area surrounding the site has been used to assess the impact of terrain features on the dispersion of emissions from the site. Topographical data has been obtained in digital (.ntf) format and incorporated into the assessment. All buildings have been incorporated into the dispersion model as detailed in the modelling files at a height of 4.5m This compares with the 5.5m stack heights modelled and gable fans for the transitional arrangement which have been modelled as area sources (with no vertical velocity).

The emissions of ammonia from the poultry buildings have been calculated using the Environment Agency / NRW ammonia emission factors. These are indicative only and may not reflect actual emissions where housing methods exceed minimum requirements and ammonia emissions are therefore lower than those which may be found at a ‘standard’ facility. Indirect heating is used for the existing broiler houses (biomass) and is also proposed for the expanded facility. Application of a >35% reduction on ammonia emissions from poultry facilities under these circumstances.

The ammonia emitted from the farm under the existing situation has been based on assumption that a the birds will spend a proportion of their time in the house and the remainder on the range. The proportion of droppings that are deposited in the house and on the range is skewed by the time spent roosting. A ratio of 88% indoors and 12% outdoors has been previously accepted for similar schemes in Powys and this has therefore been adopted in this assessment:

- 16000 birds total;
- 88% of droppings in the house (equivalent to 14080 birds); and
- 12% of droppings on the range (equivalent to 1920 birds).

The existing house layout has been modelled with side ventilation (outlet) the length of the house and this has been input as an area source of 164.6m$^2$ giving a specific emission rate of 0.787 mg/m2/s when assuming an ammonia emission rate of 0.29 $NH_3$ kg/pl/year from NRW guidance. Added to this is the ammonia from the droppings deposited within the range (approximately 8.08 Ha). At 530 kgN/year per 1000 birds, a total of 1017.6 kg/yr N would be deposited, with approximately 35% of this (356.16 kg/yr N) emitted to the air as ammonia. The specific emission rate for the range is therefore 0.00013984 mg/m$^2$/s. The area of Ancient Woodland within the range is approximately 1.64 Ha, meaning that 134.08 kg N is directly deposited as droppings in that area (81.90 kgN/Ha).

The ammonia emitted from the farm under the proposed situation, with the standard EA factor of 0.034 kg $NH_3$/animal place/year (reduced to 0.0221 kg $NH_3$/animal place/year due to the ground source heat pumps) are as shown in Table 4-3. Each of the buildings has been assumed to house 50000 birds (i.e. even distribution at the maximum capacity) which is a worst case assumption as mortality throughout the crop will mean that fewer birds are in the final crop.

**Table 4-3**
**Emission Rates (g/s)**

| Receptor | Emission Sc1 | Emission Sc2 |
|---|---|---|
| House 1 (existing) | 0.787 mg/m2/s | 0.0022461 g/s per fan<br>0.0007093 g/m2/s (gable) |
| Range (existing) | 0.00013984 mg/m2/s | --- |
| House 2 (proposed) | --- | 0.0044922 g/s per fan<br>0.0005615 g/m2/s (gable) |
| House 3 (proposed) | --- | 0.0044922 g/s per fan<br>0.0005615 g/m2/s (gable) |
| House 4 (proposed) | --- | 0.0044922 g/s per fan<br>0.0005615 g/m2/s (gable) |

All proposed houses are designed with roof vents and transitional venting to gable fans towards the end of the crop. The total emission above has therefore been divided by this number of sources. The temperature of release has been assumed at 25°C and the efflux velocity at 3m/s for the ridge fans.

The (standard) emission parameters per stack are therefore as shown in Table 4-4 below for all stacks modelled in scenario 2.

**Table 4-4**
**Emission Parameters**

| Stack height (m) | Temp (°C) | Velocity (m/s) | Stack Diameter (m) |
|---|---|---|---|
| 5.5 | 25 | 3.0 | 0.8 |

The gable end fans have been modelled as area sources the width of the house (and 2m deep) at a release height of 2m above ground level.

### *4.3.2 Results: Critical Levels*

The Scenario 1 (i.e. existing development) dispersion modelling results against critical levels are shown in the tables below. The applicable $NH_3$ critical level at all ancient woodland sites is subject to site specific consultation advice, hence both results are presented. The ecological sites are represented with multiple discrete points in some cases (refer to Table 4-2) and the maximum result for each site has been presented.

**Table 4-5**
**Scenario 1 Results: Critical Levels**

| Site | $NH_3$ Concentration ($\mu g/m^3$) | % of Critical Level 3 $\mu g/m^3$ | % of Critical Level 1 $\mu g/m^3$ |
|---|---|---|---|
| Mont Canal SSSI | 0.05 | 1.8% | --- |
| AW1 a | 16.13 | 537.5% | 1612.5% |
| AW2 | 4.53 | 151.1% | 453.4% |
| AW3 | 2.06 | 68.7% | 206.1% |
| AW4 | 2.18 | 72.5% | 217.6% |
| AW5 | 1.08 | 35.9% | 107.7% |
| AW6 | 0.28 | 9.5% | 28.5% |
| AW7a | 7.45 | 248.3% | 744.9% |
| AW8 | 0.10 | 3.4% | 10.1% |
| AW9a | 0.07 | 2.4% | 7.3% |
| AW10 | 1.06 | 35.2% | 105.5% |
| AW11 | 0.23 | 7.8% | 23.4% |
| AW12 | 0.63 | 20.9% | 62.6% |
| AW13 | 0.04 | 1.2% | 3.7% |
| AW14 | 0.21 | 7.0% | 20.9% |
| AW15 | 0.62 | 20.7% | 62.2% |
| AW16 | 0.02 | 0.6% | 1.8% |
| AW17 | 0.02 | 0.5% | 1.6% |
| AW18 | 0.06 | 1.9% | 5.8% |

Impacts are above 1% of the critical level at the Montgomery Canal SSSI / SAC. This is a national and European site so falls within the scope of GN 020. The PC is between 1% ('the threshold of insignificance') and 8% (upper threshold % of critical level).

The AW sites do not fall within the scope of GN020 and the 'intensive farming risk' criteria apply for these sites. The PC for the existing layout is above 100% of the critical level for the sites shaded in Table 4-5.

The Scenario 2 (i.e. proposed development) dispersion modelling results are shown in the tables below. The applicable level at all ancient woodland sites is subject to site specific consultation advice, hence both results are presented.

**Table 4-6**
**Scenario 2 Results: Critical Levels**

| Site | $NH_3$ Concentration ($\mu g/m^3$) | % of Critical Level 3 $\mu g/m^3$ | % of Critical Level 1 $\mu g/m^3$ | $NH_3$ Concentration ($\mu g/m^3$) Sc1 – Sc2 |
|---|---|---|---|---|
| Mont Canal SSSI | 0.04 | 1.2% | --- | 0.016 |
| AW1 a | 4.17 | 139.0% | 417.1% | 11.954 |
| AW2 | 3.48 | 116.0% | 348.1% | 1.053 |
| AW3 | 1.19 | 39.5% | 118.5% | 0.875 |
| AW4 | 1.37 | 45.7% | 137.1% | 0.805 |
| AW5 | 0.63 | 21.1% | 63.4% | 0.443 |
| AW6 | 0.40 | 13.4% | 40.3% | -0.118 |
| AW7a | 3.12 | 104.0% | 312.1% | 4.328 |
| AW8 | 0.20 | 6.8% | 20.5% | -0.103 |
| AW9a | 0.10 | 3.2% | 9.7% | -0.024 |
| AW10 | 0.59 | 19.8% | 59.3% | 0.462 |
| AW11 | 0.22 | 7.5% | 22.4% | 0.010 |
| AW12 | 0.33 | 11.0% | 33.0% | 0.295 |
| AW13 | 0.06 | 2.0% | 6.0% | -0.023 |
| AW14 | 0.32 | 10.6% | 31.8% | -0.109 |
| AW15 | 0.46 | 15.3% | 45.9% | 0.162 |
| AW16 | 0.02 | 0.6% | 1.7% | 0.000 |
| AW17 | 0.02 | 0.5% | 1.6% | 0.000 |
| AW18 | 0.12 | 4.1% | 12.3% | -0.065 |

Although impacts remain above 1% of the critical level at the Montgomery Canal SSSI / SAC these are a reduction on the existing use of 0.5% of the critical level. This is a national and European site so falls within the scope of GN 020. The PC is below 1% therefore the background does not need to be considered.

Similarly, at AW sites above 100% of the critical level for the existing scenario, the proposed layout results in a reduction on the existing use.

The proposed application will result in a reduction of impacts at all relevant sites. Further assessment of critical loads is therefore not required in this case.

### *4.3.3 Results: N Nitrogen Critical Load*

The Scenario 1 (i.e. existing development) dispersion modelling results against nutrient nitrogen critical load are shown in the tables below. The applicable nutrient nitrogen critical load at all ancient woodland sites is subject to site specific consultation advice. The ecological sites are represented with multiple discrete points in some cases (refer to Table 4-2) and the maximum result for each site has been presented.

**Table 4-7**
**Scenario 1 Results: N Deposition**

| Site | Conc (µg/m³) | dep velocity (m/s) | N Dep kg/ha/yr | Lower Critical Load | % of C.L. |
|---|---|---|---|---|---|
| Mont Canal SSSI | 0.054 | 0.005 | 0.07 | 3.0 | 2.3% |
| AW1 a | 16.125 | 0.030 | 125.78 | 10.0* | 1257.8% |
| AW2 | 4.534 | 0.030 | 35.36 | 10.0 | 353.6% |
| AW3 | 2.061 | 0.030 | 16.07 | 10.0 | 160.7% |
| AW4 | 2.176 | 0.030 | 16.97 | 10.0 | 169.7% |
| AW5 | 1.077 | 0.030 | 8.40 | 10.0 | 84.0% |
| AW6 | 0.285 | 0.030 | 2.22 | 10.0 | 22.2% |
| AW7a | 7.449 | 0.030 | 58.10 | 10.0 | 581.0% |
| AW8 | 0.101 | 0.030 | 0.79 | 10.0 | 7.9% |
| AW9a | 0.073 | 0.030 | 0.57 | 10.0 | 5.7% |
| AW10 | 1.055 | 0.030 | 8.23 | 10.0 | 82.3% |
| AW11 | 0.234 | 0.030 | 1.82 | 10.0 | 18.2% |
| AW12 | 0.626 | 0.030 | 4.88 | 10.0 | 48.8% |
| AW13 | 0.037 | 0.030 | 0.29 | 10.0 | 2.9% |
| AW14 | 0.209 | 0.030 | 1.63 | 10.0 | 16.3% |
| AW15 | 0.622 | 0.030 | 4.85 | 10.0 | 48.5% |
| AW16 | 0.018 | 0.030 | 0.14 | 10.0 | 1.4% |
| AW17 | 0.016 | 0.030 | 0.12 | 10.0 | 1.2% |
| AW18 | 0.058 | 0.030 | 0.45 | 10.0 | 4.5% |

[*Broadleaved deciduous woodland]

As with the critical levels, impacts are above 1% of the critical load at the Montgomery Canal SSSI / SAC. This is a national and European site so falls within the scope of GN 020. The PC is between 1% ('the threshold of insignificance') and 8% (upper threshold % of critical load).

The AW sites do not fall within the scope of GN020 and the 'intensive farming risk' criteria apply for these sites. The PC for the existing layout, attributable to airborne deposition only (excluding direct deposition), is above 100% of the critical load for the sites shaded in Table 4-7.

The Scenario 2 (i.e. proposed development) dispersion modelling results against nutrient nitrogen critical load are shown in the tables below. The applicable nutrient nitrogen critical load at all ancient woodland sites is subject to site specific consultation advice. The ecological sites are represented with multiple discrete points in some cases (refer to Table 4-2) and the maximum result for each site has been presented.

**Table 4-7**
**Scenario 1 Results: N Deposition**

| Site | Conc ($\mu g/m^3$) | dep velocity (m/s) | N Dep kg/ha/yr | Lower Critical Load | % of C.L. |
|---|---|---|---|---|---|
| Mont Canal SSSI | 0.037 | 0.005 | 0.05 | 3.0 | 1.62% |
| AW1 a | 4.171 | 0.030 | 32.53 | 10.0* | 325.3% |
| AW2 | 3.481 | 0.030 | 27.15 | 10.0 | 271.5% |
| AW3 | 1.185 | 0.030 | 9.25 | 10.0 | 92.5% |
| AW4 | 1.371 | 0.030 | 10.69 | 10.0 | 106.9% |
| AW5 | 0.634 | 0.030 | 4.94 | 10.0 | 49.4% |
| AW6 | 0.403 | 0.030 | 3.14 | 10.0 | 31.4% |
| AW7a | 3.121 | 0.030 | 24.34 | 10.0 | 243.4% |
| AW8 | 0.205 | 0.030 | 1.60 | 10.0 | 16.0% |
| AW9a | 0.097 | 0.030 | 0.76 | 10.0 | 7.6% |
| AW10 | 0.593 | 0.030 | 4.63 | 10.0 | 46.3% |
| AW11 | 0.224 | 0.030 | 1.75 | 10.0 | 17.5% |
| AW12 | 0.330 | 0.030 | 2.58 | 10.0 | 25.8% |
| AW13 | 0.060 | 0.030 | 0.46 | 10.0 | 4.6% |
| AW14 | 0.318 | 0.030 | 2.48 | 10.0 | 24.8% |
| AW15 | 0.459 | 0.030 | 3.58 | 10.0 | 35.8% |
| AW16 | 0.017 | 0.030 | 0.14 | 10.0 | 1.4% |
| AW17 | 0.016 | 0.030 | 0.12 | 10.0 | 1.2% |
| AW18 | 0.123 | 0.030 | 0.96 | 10.0 | 9.6% |

[*Broadleaved deciduous woodland]

Although impacts remain above 1% of the critical level at the Montgomery Canal SSSI / SAC these are a reduction on the existing use of 0.7% of the critical level. This is a national and European site so falls within the scope of GN 020. The PC is below 1% therefore the background does not need to be considered.

Similarly, at AW sites above 100% of the critical load for the existing scenario, the proposed layout results in a reduction on the existing use. In the case of AW3, this reduced the PC to below 100%.

These results are attributable to airborne deposition only (excluding direct deposition). QAs described above, the area of Ancient Woodland within the range (AW1) is approximately 1.64 Ha, meaning that 134.08 kg N is directly deposited as droppings in that area (81.90 kgN/Ha).

The proposed application will result in a reduction of impacts at all relevant sites, including a very large reduction from 207.68 kg/ha/yr to 32.53 kg/ha/yr at AW1 (the range).

Further assessment of critical loads is therefore not required in this case.

### 4.4 Summary

There is not predicted to be any significant increase in nitrogen impacts (deposition or gaseous) at the assessed ecological receptors. However, there is predicted to be a significant reduction of nitrogen (deposition or gaseous) at the majority of sites, in particular AW1, the existing range within the ancient woodland.

# 5.0 CONCLUSIONS

The potential ammonia impacts of an expansion to Glanmaheli Farm on local ecological sites has been assessed. The site currently consists of a single free-range laying building, housing 16,000 birds. The applicant is now seeking to adapt the existing building to accept broilers as well as constructing 3 additional houses for a total maximum capacity of 200,000 birds across the 4 sheds. The farm will use indirect heating which has been demonstrated to reduce ammonia emissions.

An assessment of ammonia impacts against critical levels and critical loads (for nutrient nitrogen and acid deposition) has been completed in accordance with Powys and NRW Guidance. Predicted ground level concentrations of ammonia and nutrient nitrogen are compared with relevant air quality standards and guidelines for the protection of sensitive habitats.

The assessment indicates that:

- Ammonia levels associated with the existing farm significantly above the NH3 critical level / nutrient N critical load for some of the closest ancient woodland;
- The existing nutrient nitrogen deposition is above the limit (for broadleaved woodland) for some of the closest ancient woodland; and
- The proposed farm will reduce these impacts for all sites where the critical level / load is currently being exceeded. The proposed development is therefore regarded as a significant improvement in air quality terms at ecological receptor locations.

On the basis of the significant reductions afforded by the proposed scheme over the existing layout, the ammonia / N nitrogen emissions should not be regarded as a development constraint in this case.

# APPENDIX A

# APPENDIX B

# APPENDIX C

**Table C-1**
**House 1 (existing): Stack Locations**

| Stack ID | OS GR Xm | OS GR Ym |
|---|---|---|
| B1S1 | 327706.0 | 321124.6 |
| B1S2 | 327714.5 | 321121.6 |
| B1S3 | 327711.8 | 321113.3 |
| B1S4 | 327720.3 | 321110.2 |
| B1S5 | 327719.1 | 321099.1 |
| B1S6 | 327727.1 | 321097.0 |
| B1S7 | 327725.0 | 321087.1 |
| B1S8 | 327733.3 | 321084.8 |
| B1S9 | 327730.5 | 321076.2 |
| B1S10 | 327738.8 | 321073.6 |
| B1S11 | 327736.4 | 321064.5 |
| B1S12 | 327744.5 | 321062.4 |
| B1S13 | 327743.8 | 321050.5 |
| B1S14 | 327751.9 | 321048.1 |
| B1S15 | 327749.2 | 321039.7 |
| B1S16 | 327758.0 | 321036.2 |

**Table C-2**
**House 2 (existing): Stack Locations**

| Stack ID | OS GR Xm | OS GR Ym |
|---|---|---|
| B2S1 | 327738.3 | 321141.2 |
| B2S2 | 327747.0 | 321138.1 |
| B2S3 | 327744.2 | 321129.8 |
| B2S4 | 327752.8 | 321126.6 |
| B2S5 | 327751.4 | 321115.6 |
| B2S6 | 327759.5 | 321113.1 |
| B2S7 | 327757.4 | 321103.6 |
| B2S8 | 327765.7 | 321101.3 |
| B2S9 | 327763.0 | 321092.8 |
| B2S10 | 327771.4 | 321090.2 |
| B2S11 | 327768.7 | 321081.6 |
| B2S12 | 327776.9 | 321078.6 |
| B2S13 | 327776.1 | 321066.8 |
| B2S14 | 327784.2 | 321064.5 |
| B2S15 | 327781.4 | 321056.1 |
| B2S16 | 327790.3 | 321052.6 |

**Table C-3**
**House 3 (proposed): Stack Locations**

| Stack ID | OS GR Xm | OS GR Ym |
|---|---|---|
| B3S1 | 327776.6 | 321159.8 |
| B3S2 | 327785.1 | 321156.8 |
| B3S3 | 327782.4 | 321148.5 |
| B3S4 | 327790.9 | 321145.4 |
| B3S5 | 327789.7 | 321134.3 |
| B3S6 | 327797.7 | 321132.2 |
| B3S7 | 327795.6 | 321122.3 |
| B3S8 | 327803.9 | 321120.0 |
| B3S9 | 327801.1 | 321111.4 |
| B3S10 | 327809.4 | 321108.8 |
| B3S11 | 327807.0 | 321099.7 |
| B3S12 | 327815.1 | 321097.6 |
| B3S13 | 327814.4 | 321085.7 |
| B3S14 | 327822.5 | 321083.3 |
| B3S15 | 327819.8 | 321074.9 |
| B3S16 | 327828.6 | 321071.4 |

**Table C-4**
**House 4 (proposed): Stack Locations**

| Stack ID | OS GR Xm | OS GR Ym |
|---|---|---|
| B4S1 | 327808.9 | 321176.4 |
| B4S2 | 327817.6 | 321173.3 |
| B4S3 | 327814.8 | 321165.0 |
| B4S4 | 327823.4 | 321161.8 |
| B4S5 | 327822.0 | 321150.8 |
| B4S6 | 327830.1 | 321148.3 |
| B4S7 | 327828.0 | 321138.8 |
| B4S8 | 327836.3 | 321136.5 |
| B4S9 | 327833.6 | 321128.0 |
| B4S10 | 327842.0 | 321125.4 |
| B4S11 | 327839.3 | 321116.8 |
| B4S12 | 327847.5 | 321113.8 |
| B4S13 | 327846.7 | 321102.0 |
| B4S14 | 327854.8 | 321099.7 |
| B4S15 | 327852.0 | 321091.3 |
| B4S16 | 327860.9 | 321087.8 |