



AVIAGEN TURKEYS  
PEN Y FFRIDD, SARON  
AMMONIA EMISSIONS: IMPACT ASSESSMENT

February 2023

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## 1.0 INTRODUCTION

### 1.1 Background

Isopleth Ltd has been commissioned by Ian Pick Associates, on behalf of Aviagen Turkeys, to carry out a detailed assessment of ammonia impacts associated with the proposed redevelopment of an existing poultry farm at Pen Y Ffridd, Saron, LL16 4SW. When complete, it is planned that the existing broiler farm will be replaced with a turkey breeder selection unit.

The site lies within the administrative area of Denbighshire County Council (planning) and Natural Resources Wales is responsible for regulating the site under an Environmental Permit.

### 1.2 Previous Applications / Assessments

The site benefits from planning permission for a broiler farm which has been in place since the 1980s. There have been no recent planning applications relating to the broiler farm.

### 1.3 Approach

An assessment of ammonia impacts against critical levels has 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.

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

### 1.4 Scope

This report is aimed at comparing the predictions of the ammonia modelling with limit values described by Natural Resources Wales and Denbighshire County Council. Interpretation of the results and the screening thresholds to be used by the Natural Resources Wales, for example in relation to screening distances and impact thresholds are relevant for both planning and Permitting. This assessment is therefore aimed at meeting the requirements of NRW and therefore also the requirements of Denbighshire County Council.

## 2.0 APPROACH

### 2.1 General Approach

On 13<sup>th</sup> May 2021 NRW released a web-based guidance suite focussed on the assessment of ammonia emissions from farming. This draws together previous NRW guidance<sup>1 2 3</sup> into a series of technical notes specific to the size and location of development and the sensitivity of the environment:

- Ammonia assessments for developments that require a permit or planning permission;
- Ammonia assessments: initial screening and evidence gathering (GN 020);
- How to carry out detailed modelling of ammonia emissions (GN 036);
- Detailed modelling of ammonia emissions stage 1 (GN 036);
- Detailed modelling of ammonia emissions stage 2 (GN 036);
- How to interpret the results from your screening or modelling exercise for Ammonia Emissions (GN 020);
- Ammonia scrubber design and use;
- Applications that reduce the impact or risk of pollution (GN 020);
- Emission factors for poultry, pigs and cattle for modelling and reporting; and
- Reducing ammonia emissions from agriculture.

The 2021 NRW Guidance suite has been subsequently updated, most recently in September 2022. The Guidance only requires that the ammonia critical level calculations are undertaken. There is no requirement for the calculation of and nutrient nitrogen critical load or acidification as the calculation of the ammonia forms the more stringent test.

NRW guidance 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 pollutants are compared with relevant air quality standards and guidelines for the protection of sensitive habitats. In line with the requirements of NRW and consistent with the data presented in the OpenData maps, ancient woodland has also been considered.

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<sup>1</sup> 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

<sup>2</sup> 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

<sup>3</sup> NRW Modelling the concentration and deposition of ammonia emitted from intensive farming Reference number: GN036 (version 1.0, December 2019)

The 'development' (i.e. the replacement turkey farm proposed) will house a maximum of 12500 turkeys. As such, the NRW Guidance suggests that an ecological screening distance of 5 kilometres is used and this is the approach taken in this assessment.

## 2.2 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 2-1**  
**Ammonia Critical Level**

Concentration ( $\mu\text{g}/\text{m}^3$ )	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)

The critical levels used in this assessment are based on data from APIS and NRW open data on access, flood, habitats, hydrology, landscapes, marine, designated land, water quality, and woodlands<sup>4</sup> (i.e. NRW opendata sensitivity maps). The opendata sensitivity maps provide additional information to confirm which of the ecological sites are particularly ammonia sensitive (and therefore the critical level of  $1.0 \mu\text{g}/\text{m}^3$  is appropriate) and which are not, where a critical level of  $3.0 \mu\text{g}/\text{m}^3$  has been applied.

## 2.3 Critical Loads

Critical loads are set for the deposition of various substances to sensitive ecosystems. As noted above, NRW does not require the calculation of nitrogen or acid deposition.

## 2.4 Other Sources of Ammonia

NRW Guidance states that:

*The background level of ammonia you get from the APIS website includes sources of ammonia up to the date of publication. You need to check the local authority planning portal for any other sources that have been built or are applying for permission to be built that could affect the sensitive sites within your screening distance. In order to do this assessment each sensitive site needs to be placed at the centre of search area.*

*You can find out background values from the Air Pollution Information Service (APIS) website*

*APIS background is given as a three year data set, you should only include sources of ammonia that have been operational after the 31<sup>st</sup> Dec of the mid year within the*

<sup>4</sup> [NRW Open Access Map](https://nrw.maps.arcgis.com/) available at <https://nrw.maps.arcgis.com/>

*three-year average dataset. Sources operational before that date will be considered as part of the background.*

## **2.5 Significance: Interpretation of Results**

The September 2022 NRW Guidance states the following:

*'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. Assuming there are no other sources of ammonia to consider.*

*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.'*

Therefore, where process contributions are up to 1% of the designated site Critical Level, then it should be determined that there is no significant environmental effect/no likely significant effect/damage to a designated site.

Previous guidance issued by NRW (OGN 41) proposed the use of an additional range for potential impacts of between 1% and 8% of the designated site Critical Level or Load. Where this was the case an in-combination assessment was required. For units that were assessed as exceeding the 8% threshold either alone, or in combination, the applicant was required to submit a plan as part of their permit application detailing how the ammonia emissions and nitrogen deposition would be reduced. These thresholds were removed for the May 2021 guidance.

## 3.0 SITE SETTING AND OPERATIONS

### 3.1 Location

The proposed replacement buildings are to be located on the site of the existing poultry farm buildings at Pen Y Ffridd, Saron, LL16 4SW. The location of the site can be seen in Appendix A.

### 3.2 Description of Development

The 8 existing broiler buildings are no longer in good condition and therefore must be replaced with units consistent with modern standards of welfare and husbandry. As such there is an opportunity for the farm operators to review the market and react to future consumer needs. The applicant is therefore seeking planning permission to:

- demolish the existing 8 broiler sheds which house approximately 102000 broilers over a 38 day growth cycle; and
- replace the broiler sheds with 6 new houses for turkeys to be used for breeder selection

The proposed unit is therefore not a standard turkey meat rearing unit and the bird sizes, housing and numbers across the growth cycle reflect this. For this reason, standard SCAIL ammonia factors for turkey meat rearing units are not appropriate in this case. The complete turkey breeder cycle length will be approximately 29 weeks:

- Turkey chicks are housed at 1 day old. There will be a maximum of 7500 females and 5000 males placed;
- The bird numbers are then reduced over the flock cycle through breeder selection, meaning that:
  - by week 20 fewer than 50% of the original birds remain on site.
  - By week 23 fewer than 25% of the original birds remain on site.
  - By the end of the 29 week cycles fewer than 10% of the original birds remain on site.
- Birds are cleared to another site for remainder of growing cycle;
- sheds are cleaned followed by 6 weeks empty.

For the comfort and productivity of the birds the temperature within the houses must be regulated. The existing broiler buildings use capped roof fans, with no vertical momentum to the action of the cap. The proposed buildings will be fitted with high speed roof fans in accordance with modern standards, with a maximum velocity of 12 m/s and no vertical obstruction. 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.

Plans of the existing and proposed shed layouts are shown in Appendix B.



### 3.3 Ecological Receptors

Sites of European interest include Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar Sites. Sites of Special Scientific Interest (SSSIs) are of national importance. 'Natural Assets' include as Local Nature Reserves (LNRs), Local Wildlife Sites (LWS) Priority Habitats and Ancient Woodland (AW).

The following ecological sites are of interest and have been modelled. These sites are shown in Appendix C. There are no sites within 5km with a European designation (i.e. RAMSAR, SPA or SAC).

**Table 3-1**  
**Ecological Receptors**

Site	Description
Coed Nant Mawr SSSI	Ash, Oak and Elm woodland
Mynydd Hiraethog SSSI	Heathland

The opendata maps do not identify any further ammonia sensitive sites.



## 4.0 ASSESSMENT

The model inputs are described below as they relate to the sources, pathway and receptors associated with the existing and proposed developments.

### 4.1 Model Scenarios

Two scenarios have been modelled:

- Scenario 0: Existing site (as built) with 102000 broiler chickens in 8 sheds; and
- Scenario 1: Proposed site with up to 12500 turkeys in 6 new sheds.

A comparison of the models has been undertaken in order to quantify the change in levels of ammonia as a result of the proposed scheme.

### 4.2 Stocking and Layout

The existing broiler houses have been in place for over 20 years and are fitted with capped ridge fans as shown in Figure 4-1 below. There is no vertical efflux velocity from the ridge fans for this reason.

**Figure 4-1**  
**Existing Broiler House at Pen Y Ffridd**



The proposed turkey buildings are fitted with uncapped ridge fans with a maximum efflux velocity of 12 m/s. As ventilation is based on the stocking and ambient temperature, not all fans will be operational at all times.

### 4.3 Dispersion Modelling Inputs

Detailed dispersion modelling has been completed in line with *Guidance on modelling the concentration and deposition of ammonia emitted from intensive farming. Air Quality Modelling and Assessment Unit v3* and also the NRW ammonia guidance suite. The BREEZE AERMOD model has been used.

#### 4.3.1 Buildings

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 site details (existing and proposed) have been provided by the applicant. The height of all existing buildings has been taken as 4m above ground level.

**Table 4-1  
 Building Details: Existing**

Building	Width (m)	Length (m)	Basal Height (mAoD)	Angle (°)
Building 1	21.7	29.5	344	70.1
Building 2	21.7	29.5	344	70.1
Building 3	21.7	29.5	344	70.1
Building 4	21.7	29.5	344	70.1
Building 5	21.7	29.5	344	70.1
Building 6	21.7	29.5	344	70.1
Building 7	21.7	29.5	344	70.1
Building 8	21.7	29.5	344	70.1

The proposed buildings will be as follows. The height of all proposed buildings has been taken as 5m above ground level.

**Table 4-2  
 Building Details: Proposed**

Building	Width (m)	Length (m)	Basal Height (mAoD)	Angle (°)
Building 1	20	34	344	70.7
Building 2	20	34	344	70.7
Building 3	20	34	344	70.7
Building 4	20	34	344	70.7
Building 5	20	34	344	70.7
Building 6	20	34	344	70.7

### 4.3.2 Meteorology

The May 2021 NRW Ammonia guidance states that the model should be run using 5 years (minimum 3 years if not possible) of representative meteorological data from the meteorological station nearest to the proposed site. Suitable meteorological data is not available for all sites, in which case NRW guidance states:

*'If observed suitable meteorological data are not available, then high quality numerical weather prediction (NWP) data, e.g. Met Office high horizontal resolution (1.5 km) NWP data extracted at the proposed site, should be used...'*

In this case, the closest meteorological data stations are:

- Rhyl No 2. WMO Identifier 3313 (76m AoD); and
- Bala. WMO Identifier 3409 (163m AoD).

It is considered that neither of these sites is suitable, particularly in relation to the setting of the meteorological data site and also the elevation (the site is located at 344m AoD). For this reason, a 5 year NWP data set has been obtained in order to ensure compliance with NRW Guidance. This NWP data set covers the years 2016 – 2020.

NWP meteorological data was obtained in .met format and converted to .sfc and .pfl formats for use in AERMOD using AERMET Pro according to US EPA methodology<sup>5</sup>. Surface roughness length is based upon land use characteristics 1km from the point source. The determination of Bowen ratio and albedo is defined by a 10km by 10km region around the site. In this case the site is characterised by water, forest and grassland. A site roughness of 0.1m has been used for the modelling.

### 4.3.3 Topography

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 set on ground at approximately 344m AOD and the height of the surrounding land is highly variable. 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.

### 4.3.4 Source Parameters

Modelling inputs for the existing and proposed buildings are shown in Appendix D.

As shown in Figure 4-1 the existing broiler houses are fitted with capped ridge fans as shown in Figure 4-1 below. There is no vertical efflux velocity from the ridge fans for this reason. For purposes of dispersion modelling, the emissions from the existing houses have therefore been

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<sup>5</sup> US Environmental Protection Agency (2008). AERMOD Implementation Guide, AERMOD Implementation Group.

represented by elevated area sources running the length of the ridge on each building. Area sources have no vertical momentum and neither are they affected by building downwash.

The emission parameters for the new turkey buildings are as shown in Table 4-3 below.

**Table 4-3  
Stack Details**

Building	Stack height (m)	Stack diameter (m)	Velocity (m/s)
Proposed Turkey Buildings	6.0	0.8	12.0

The temperature of emissions from the proposed turkey houses has been taken as 25°C for all hours of the year.

#### 4.3.5 Emission Rate

The process contribution has been calculated using SCAIL factors for the existing broiler houses. The SCAIL emission rate for broilers of 0.034 kgNH<sub>3</sub>/pl/yr has been used.

- Broilers: 102000;
- Emission per bird: 0.034 nh3 kg/pl/yr;
- Total emission per year: 3468 kg;
- Total emission per second: 0.1099696 g;
- Total area of release: 224m (8 buildings with 1m x 28m ridge 'vent'); and
- Specific emission rate: 0.0004909 g/m<sup>2</sup>/s.

The emission rates are shown below for Scenario 1. For the reasons described above the DEFRA *Inventory of Ammonia Emissions from UK Agriculture* emissions data for turkeys of 64 g-N/livestock unit/day has been used instead of SCAIL data which assumes that the turkey is grown at the site for the full life cycle. The full emission calculations for the proposed scenario are shown in Appendix E.

- Turkeys: 5000 males and 7500 females;
- Total emission per second: 0.056 g/s (males: 0.027g, females 0.029g);
- Total no. of stacks: 54;
- Emission per stack: 0.001032257 g/s

#### 4.4 Ecological Receptors

As described in Section 3.3 of this report, ecological site searches 2km (local sites and AW) and 5km (SSSI and European sites) are included as Appendix C to this report. These confirmed that the following sites are of potential interest:

- Coed Nant Mawr SSSI; and
- Mynydd Hiraethog SSSI.

The MAGIC Ecological site search is included within Appendix C. There are no sensitive Ancient woodlands with the potential to be affected by the proposed scheme.

#### 4.4.1 Coed Nant Mawr SSSI

The Coed Nant Mawr SSSI is a good quality and large example of a woodland dominated by a mixture of ash *Fraxinus Excelsior*, wych elm *Ulmus Glabra* and sessile oak *Quercus Petraea* with some sycamore *Acer Pseudoplatanus*.

APIS and NRW Opendata information data shows that the woodland has a nutrient nitrogen critical load range of **10-15 Kg N/ha/year** which is representative of acidophilus *Quercus* dominated woodland (EUNIS G1.8). A critical level of **3 µg/m<sup>3</sup>** applies at this site, according to NRW opendata sensitivity mapping information.

#### 4.4.2 Mynydd Hiraethog SSSI

Mynydd Hiraethog represents an extensive tract of sub-montane heather. The drier heath vegetation grades into wetter acidic blanket bog vegetation, where the peat is deeper.

APIS and NRW Opendata information data shows that the woodland has a nutrient nitrogen critical load range of **10-20 Kg N/ha/year** for upland heathland (EUNIS F4). A critical level of **1 µg/m<sup>3</sup>** applies at this site, according to NRW opendata sensitivity mapping information.

#### 4.4.3 Model Input

Modelling was carried out with discrete receptors representing the 2 ecological sites of biological interest. These points represent the closest locations of each SSSI to the proposed development site

**Table 4-4  
 Modelled Receptor Points**

ID	Site	OS Xm	OS Ym	Elevation (m)
ER1	Coed Nant Mawr SSSI 1	307177	361714	107.63
ER2	Coed Nant Mawr SSSI 2	307681	361869	102.11
ER3	Coed Nant Mawr SSSI 3	307113	361905	140.37
D4	Mynydd SSSI 1	298966	358571	410.25
D5	Mynydd SSSI 2	299799	356539	445.31
D6	Mynydd SSSI 3	300355	356174	497.33
D7	Mynydd SSSI 4	297744	362069	370.62
D8	Mynydd SSSI 5	298300	360768	421.08

#### 4.5 Baseline Concentration / Deposition

The existing baseline values for each of the designated site types (i.e. roughness class) are as follows, based on the centre of the proposed development site.

**Table 4-5  
Baseline Conditions**

Site	Vegetation	NH <sub>3</sub> concentration (µg/m <sup>3</sup> )
Coed Nant Mawr	Grassland	3.1
	Woodland	3.1
Mynydd Hiraethog	Grassland	1.2
	Woodland	1.2

The existing concentration of ammonia all sites is:

- Above the upper critical level limit of 3 µg/m<sup>3</sup> at Coed Nant Mawr; and
- below the upper critical level limit of 3 µg/m<sup>3</sup> but at (or above) the limit for sites designated for epiphytes and bryophytes of 1 µg/m<sup>3</sup> at Mynydd Hiraethog.

Where impacts are above 1% of their respective limit, consideration of the existing background will be required.

The operators of the broiler farm have confirmed that the unit has been fully operational for at least the last 2 decades, hence the impacts of the existing farm must be considered to be encompassed withing the latest APIS background data.

## 5.0 RESULTS

The results of the modelling assessment are shown below. The predictions for Process Contribution are shown and the requirement for assessment against existing backgrounds and consideration of potential in-combination effects is discussed in section 5.3.

### 5.1 Scenario 0: Existing Broiler Farm

The dispersion modelling results for the existing site are shown in the tables below.

**Table 5.1**  
**Results: Critical Level**

ID	Site	Conc ( $\mu\text{g}/\text{m}^3$ )	Critical Level	% of C.L.
ER1	Coed Nant Mawr SSSI 1	0.017	3.0	0.57%
ER2	Coed Nant Mawr SSSI 2	0.014	3.0	0.46%
ER3	Coed Nant Mawr SSSI 3	0.018	3.0	0.60%
ER4	Mynydd SSSI 1	0.003	1.0	0.33%
ER5	Mynydd SSSI 2	0.001	1.0	0.14%
ER6	Mynydd SSSI 3	0.001	1.0	0.08%
ER7	Mynydd SSSI 4	0.005	1.0	0.53%
ER8	Mynydd SSSI 5	0.002	1.0	0.24%

Impacts from the existing broiler sheds are below 1% of the relevant critical level at the closest locations within both SSSI. All impacts therefore are below the NRW thresholds for livestock developments.

### 5.2 Scenario 1: Proposed Turkey Farm

The dispersion modelling results for the new site are shown in the tables below.

**Table 5.2**  
**Results: Critical Level**

ID	Site	Conc ( $\mu\text{g}/\text{m}^3$ )	Critical Level	% of C.L.
ER1	Coed Nant Mawr SSSI 1	0.008	3.0	0.27%
ER2	Coed Nant Mawr SSSI 2	0.007	3.0	0.22%
ER3	Coed Nant Mawr SSSI 3	0.008	3.0	0.28%
ER4	Mynydd SSSI 1	0.001	1.0	0.14%
ER5	Mynydd SSSI 2	0.001	1.0	0.06%
ER6	Mynydd SSSI 3	0.000	1.0	0.04%
ER7	Mynydd SSSI 4	0.003	1.0	0.25%
ER8	Mynydd SSSI 5	0.001	1.0	0.10%



Impacts from the proposed turkey sheds remain at below 1% of the relevant critical level at the closest locations within both SSSI. All impacts therefore are below the NRW thresholds for livestock developments.

### 5.3 Scenario Comparison

The results for the two model scenarios are compared below.

**Table 5-3**  
**Results Comparison: Critical Level**

ID	Site	Scenario 0: Conc ( $\mu\text{g}/\text{m}^3$ )	Scenario 1: Conc ( $\mu\text{g}/\text{m}^3$ )	Difference ( $\mu\text{g}/\text{m}^3$ )	Difference % of critical level
ER1	Coed Nant Mawr SSSI 1	0.017	0.008	-0.009	-0.30%
ER2	Coed Nant Mawr SSSI 2	0.014	0.007	-0.007	-0.24%
ER3	Coed Nant Mawr SSSI 3	0.018	0.008	-0.010	-0.32%
ER4	Mynydd SSSI 1	0.003	0.001	-0.002	-0.19%
ER5	Mynydd SSSI 2	0.001	0.001	-0.001	-0.08%
ER6	Mynydd SSSI 3	0.0008	0.0004	-0.0004	-0.04%
ER7	Mynydd SSSI 4	0.005	0.003	-0.003	-0.28%
ER8	Mynydd SSSI 5	0.002	0.001	-0.001	-0.14%

The difference at all assessed receptor locations is less than 0% and therefore the scheme represents a betterment at all locations (i.e. a reduction in ammonia impact when compared with the existing broiler farm).

### 5.4 In Combination Considerations

The impacts all sites from the new buildings are below 1% of the relevant N critical level at the SSSI when compared against the existing situation. Indeed, in all cases the Scenario 1 (i.e. proposed) results represent a betterment when compared with the existing broiler units (Scenario 0). The contribution from the existing buildings will be counted within the latest APIS background figures.

As such the impacts are not significant and there is no requirement for consideration of other sites with the potential to contribute ammonia to the sites and similarly there is no requirement to consider the existing background levels at the SSSI.

### 5.5 Summary

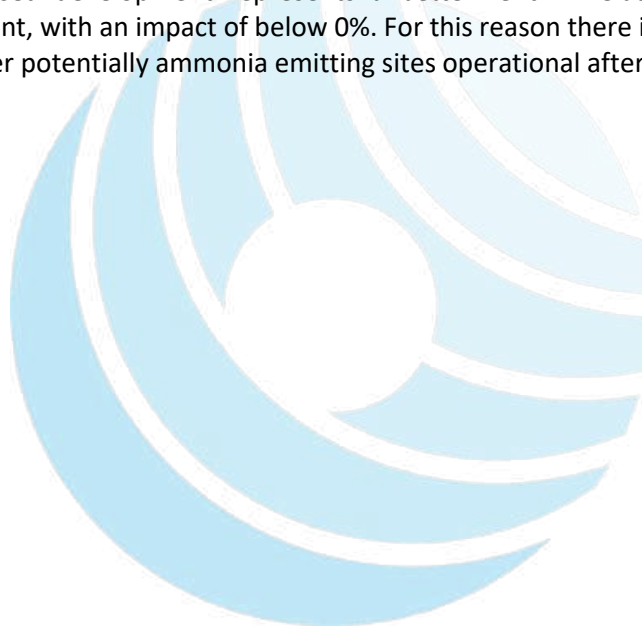
The existing concentration of ammonia at Coed Nant Mawr SSSI is above the upper critical level limit of  $3 \mu\text{g}/\text{m}^3$  which applies at this location. The existing concentration of ammonia at Mynydd Hiraethog SSSI is above the lower critical level limit of  $1 \mu\text{g}/\text{m}^3$  which applies at this location. The impacts from the existing broiler farm fall within this background level, having been constructed (well) before 1<sup>st</sup> January 2020. The new turkey site represents a betterment when compared with the existing broiler farm.

The following NRW Guidance is relevant in this case:

*'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.'*

The dispersion modelling of the proposed extension indicates that, for the proposed turkey unit:

- Impacts at sites where the critical level applies are predicted to be below 1% of the critical level. The impact is therefore insignificant at these sites.
- Impacts at sites where the critical load applies are predicted to be below 1% of the critical load. The impact is therefore insignificant at these sites.
- The proposed development represents a betterment in relation to the existing development, with an impact of below 0%. For this reason there is no requirement to assess other potentially ammonia emitting sites operational after 1<sup>st</sup> January 2020.



## 6.0 MITIGATION

The emission rate used above is calculated from the standard emission factors for turkeys, factored for the size of bird at the farm. No further reduction has been applied for:

- ideal protein diets;
- use of probiotics;
- indirect heating; or
- maintenance of good quality litter across the unit.

Notwithstanding this, Impacts resulting from the redevelopment of the Pen Y Ffridd farm are not predicted to be above 0% at any SSSI when compared with the baseline situation.



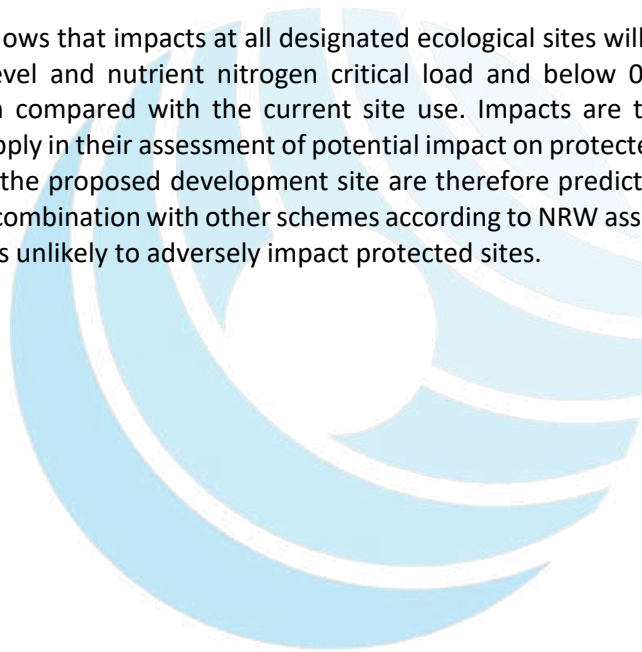
## 7.0 CONCLUSIONS

Isopleth Ltd has been commissioned by Ian Pick Associates, on behalf of Aviagen Turkeys, to carry out a detailed assessment of ammonia impacts associated with the proposed redevelopment of an existing poultry farm at Pen Y Ffridd, Saron, LL16 4SW. When complete, it is planned that the existing broiler farm will be replaced with a turkey breeder selection unit.

The type, source and significance of potential impacts have been identified and detailed modelling undertaken in line with guidance issued by Natural Resources Wales (September 2022).

Predicted ground level concentrations of ammonia and nutrient nitrogen are compared with relevant air quality standards and guidelines for the protection of sensitive habitats located within the 5km screening distance of the site in accordance with NRW Guidance.

The assessment shows that impacts at all designated ecological sites will be below 1% of the relevant critical level and nutrient nitrogen critical load and below 0% (and therefore a betterment) when compared with the current site use. Impacts are therefore below the thresholds NRW apply in their assessment of potential impact on protected sites. The impacts of ammonia from the proposed development site are therefore predicted to be acceptable either alone or in-combination with other schemes according to NRW assessment criteria and the development is unlikely to adversely impact protected sites.



**Notice:**

*This report was produced by Isopleth Ltd to present the results of an ammonia impact assessment for a proposed development at Pen Y Ffridd, Saron.*

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## APPENDIX A

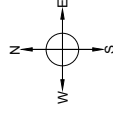


NOTES

LEGEND

SITE BOUNDARY

ECOLOGICAL RECEPTOR LOCATION



SITE

Pen Y Frith

PROJECT

Air Quality Assessment

DRAWING TITLE

Site Setting and Receptor Locations

DRAWING NUMBER

AQ1

REVISION

0

DATE

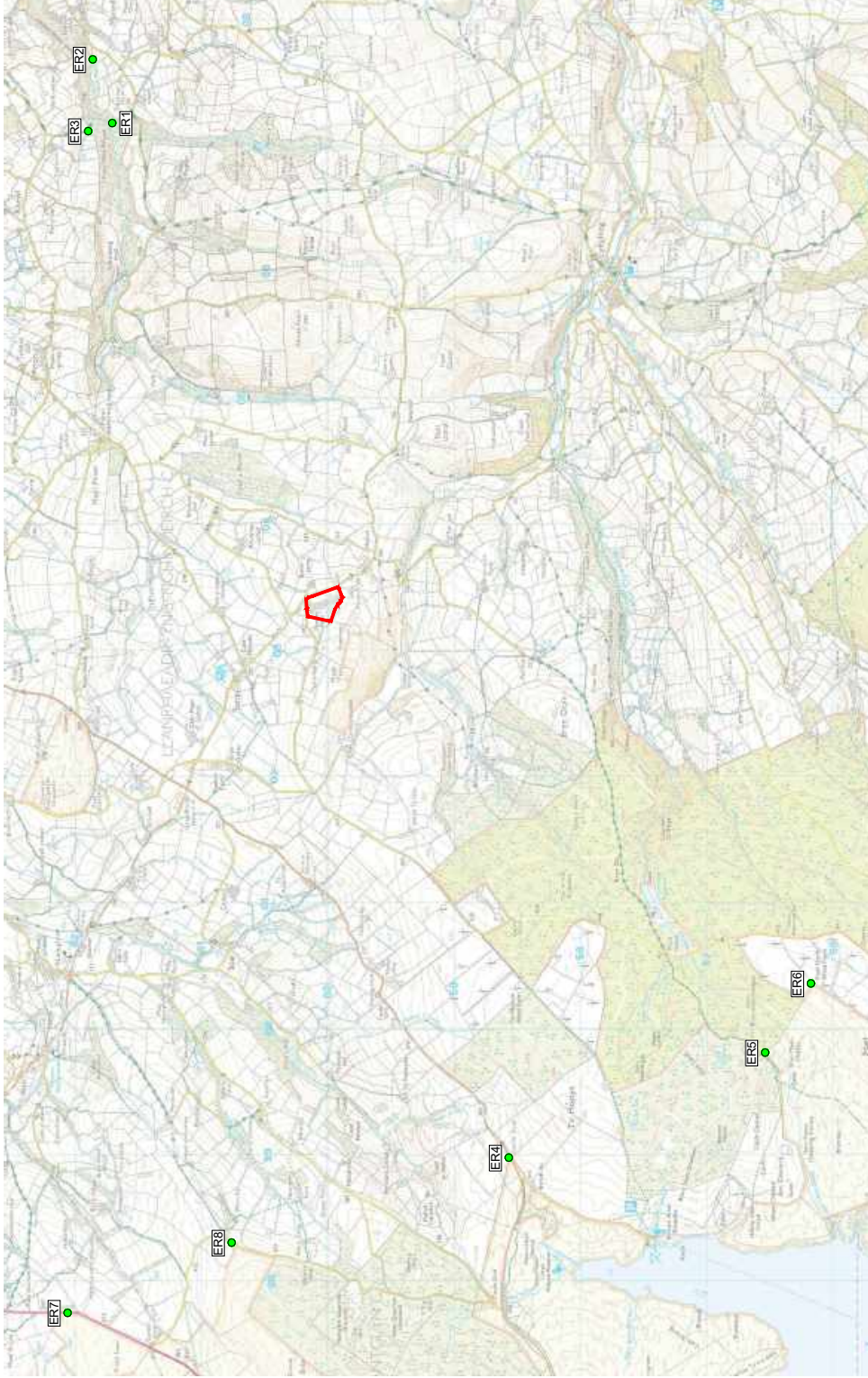
09.02.2023

SCALE

1:35000 @ A3



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Ordnance Survey 100001979  
OS data licence expiration: 09.02.2024.



## APPENDIX B

*[Drawings reproduced courtesy of Ian Pick Associates]*





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 Knights Construction

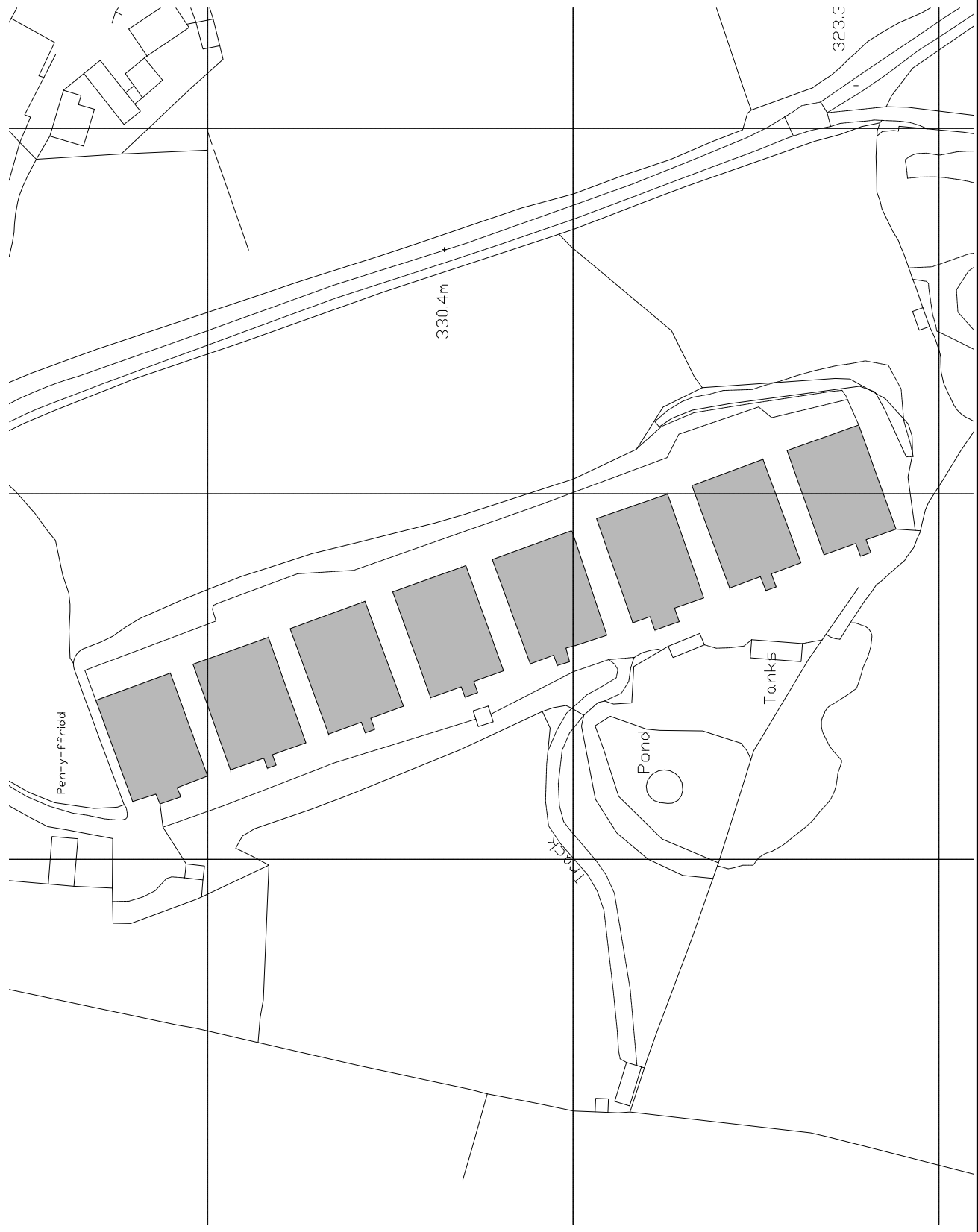
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 Poultry Unit Redevelopment at  
 Pen Y Ffridd, Saron, LL16 4SW

DWG. TITLE  
 Existing Site Plan A1

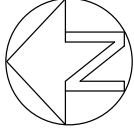
SCALE 1:500  
 DRN SH

DWG. NUMBER  
 IP/KC01

DATE June 21  
 REV







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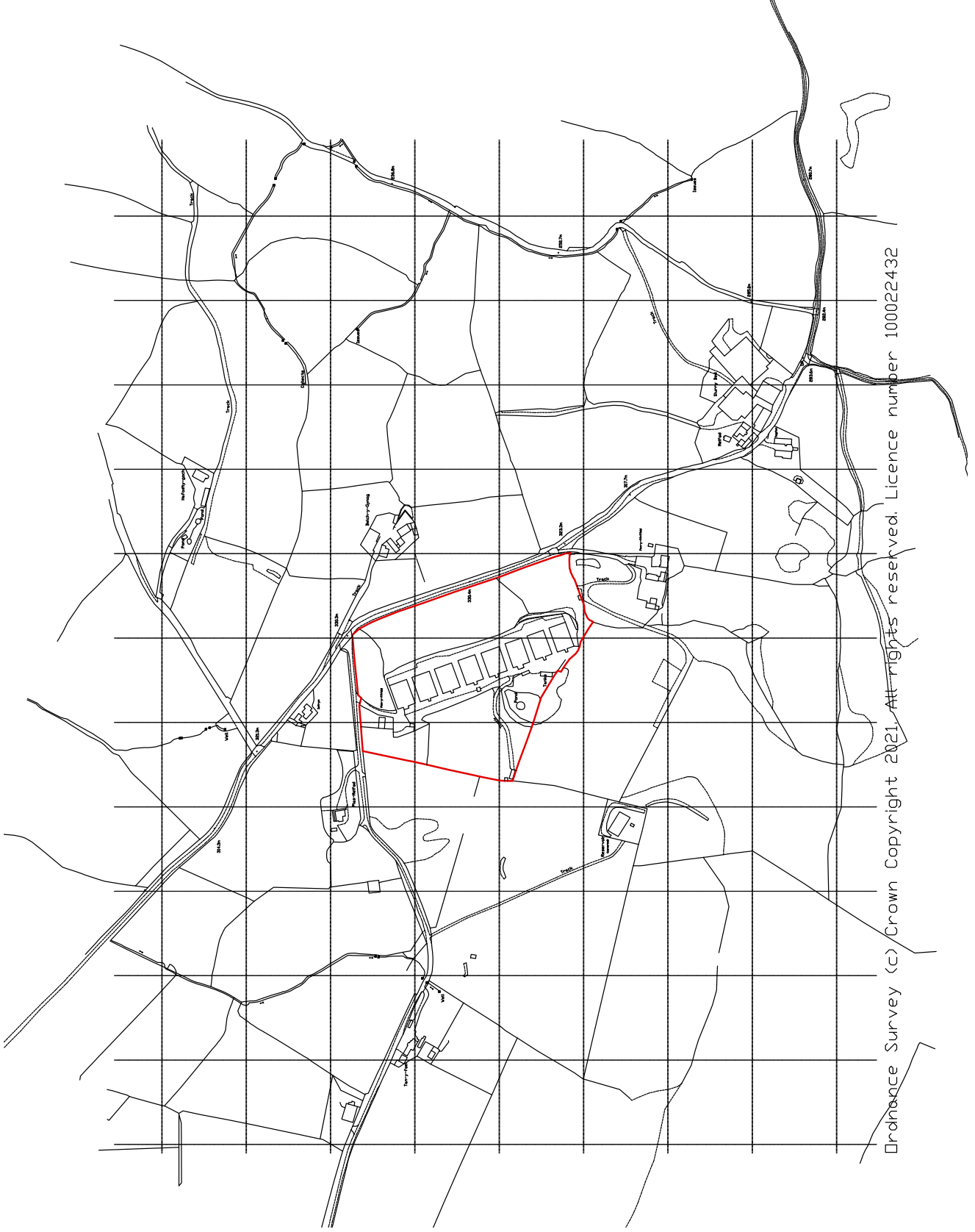
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Poultry Unit Redevelopment at  
Pen Y Ffridd, Saron, LL16 4SW

DWG. TITLE  
Location Plan

SCALE 1:2500  
DRW IP

DWG. NUMBER  
IP/KC02

DATE REV  
June 21 -



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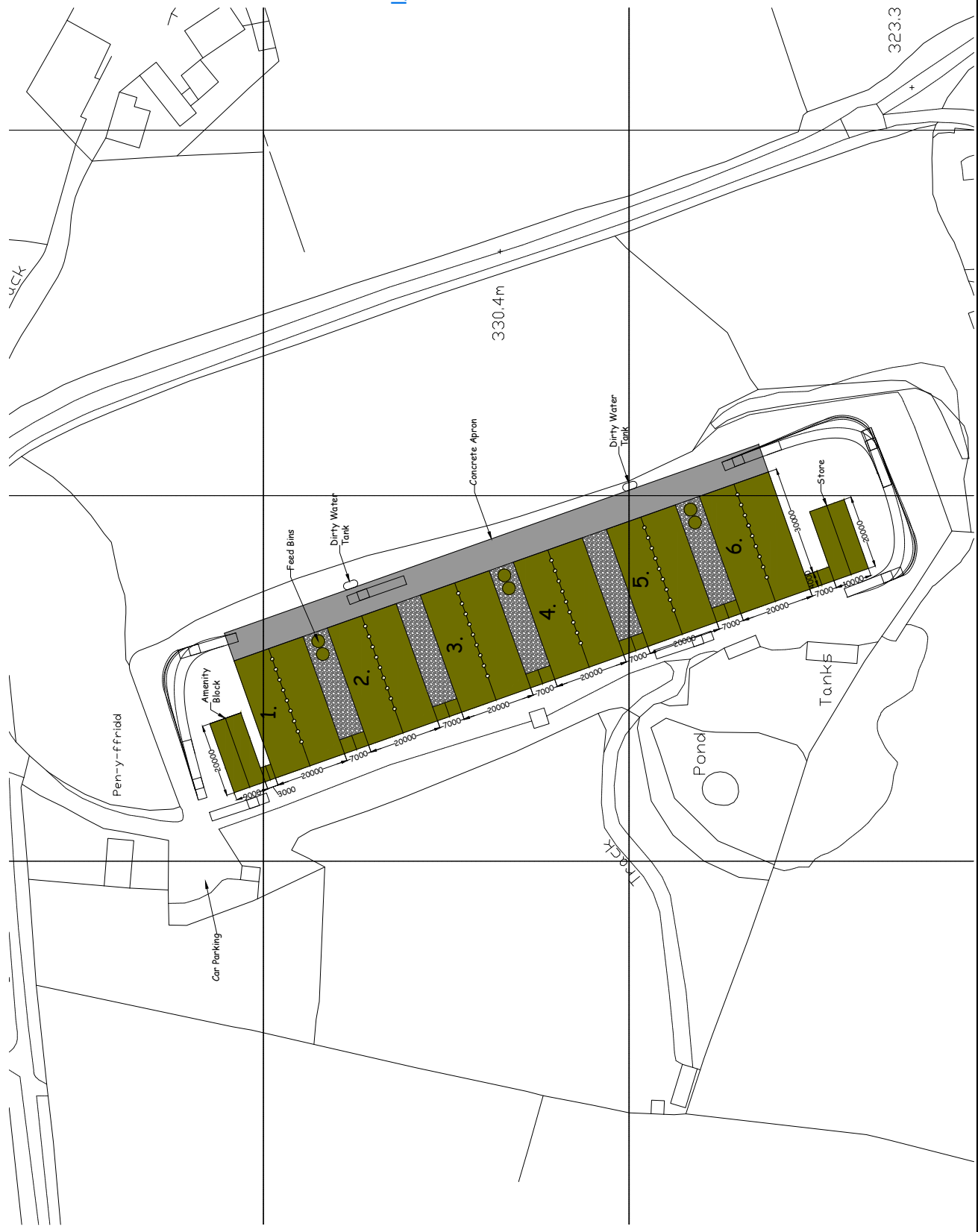
JOB TITLE  
Poultry Unit Redevelopment at  
Pen Y Fridd, Saron, LL16 4SW

DWG. TITLE  
Proposed Site Plan A1

SCALE 1:500  
DRN IP

DWG. NUMBER  
IPIATL03

DATE Nov 22  
REV



323.3

330.4m

Pen-y-fridd

Car Parking

Feed Bins

Dirty Water Tank

Concrete Apron

Dirty Water Tank

Stone

Pond

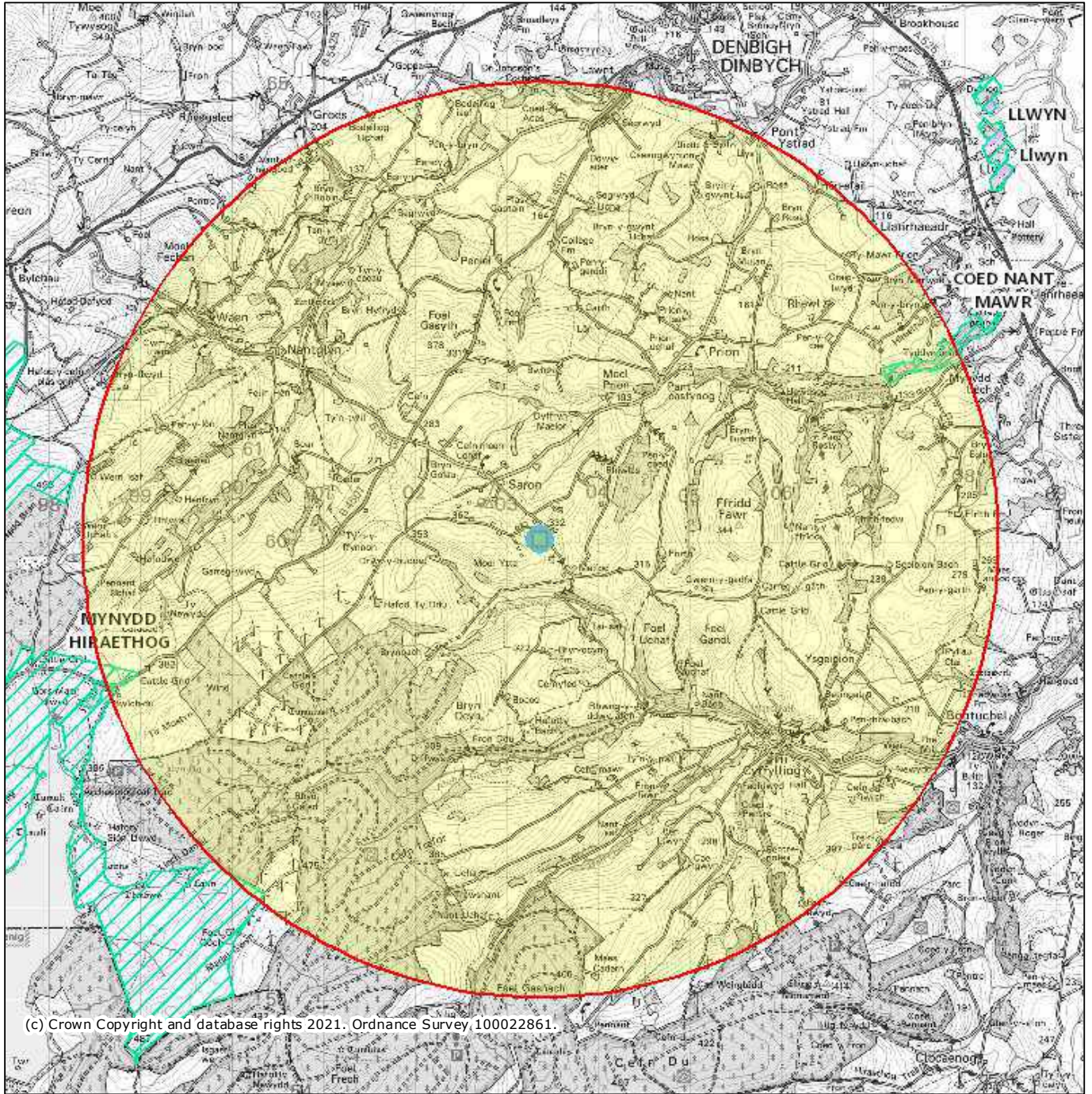
Tanks

TRACK





## APPENDIX C

*[Courtesy of MAGIC Maps]*





## Legend

-  Ramsar Sites (Wales)
-  Sites of Special Scientific Interest (Wales)
-  Special Areas of Conservation (Wales)
-  Special Protection Areas (Wales)

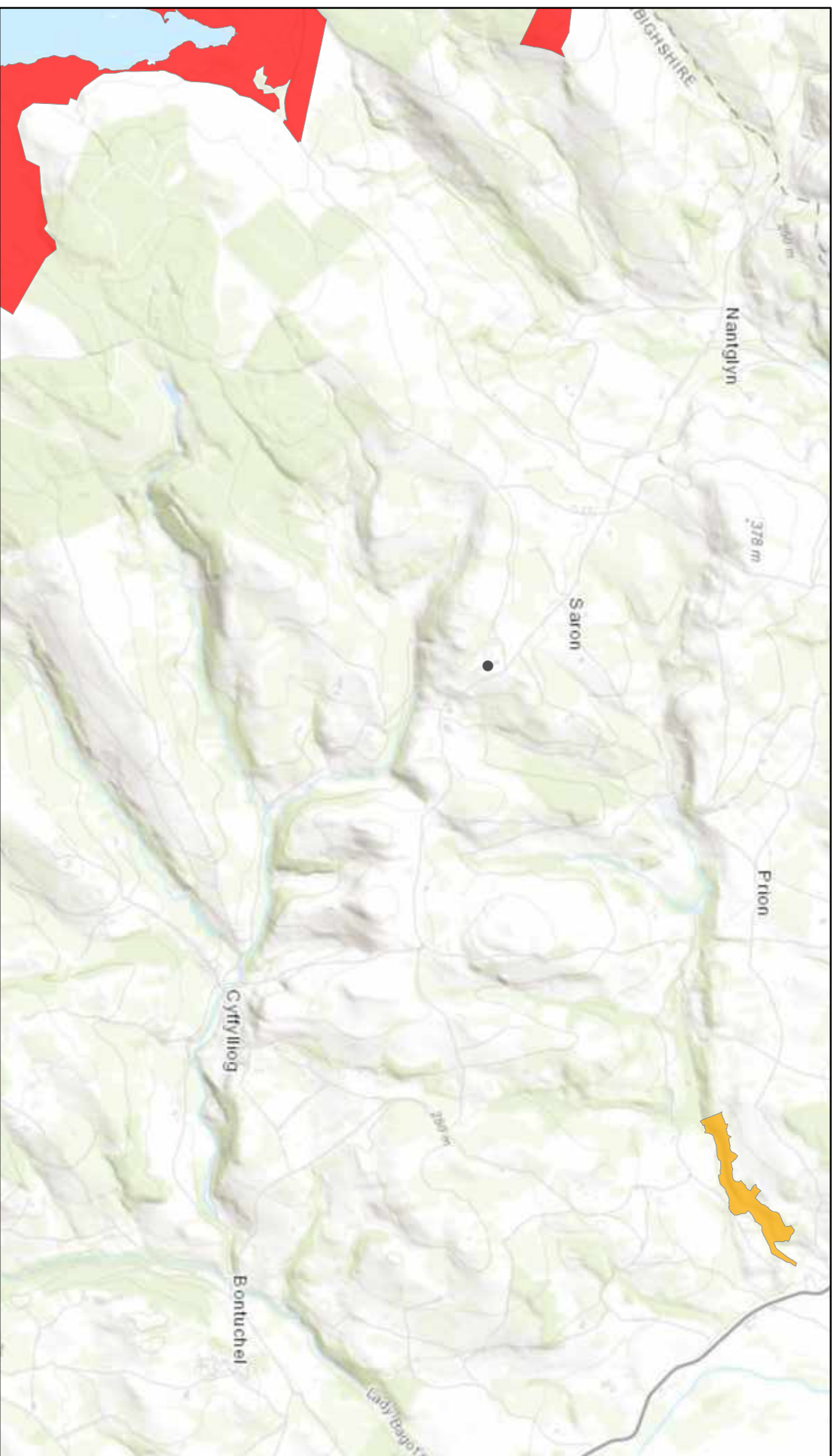


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 xmax = 318500  
 ymax = 367600

Map produced by MAGiC on 23 July, 2021.

Copyright resides with the data suppliers and the map must not be reproduced without their permission. Some information in MAGiC is a snapshot of the information that is being maintained or continually updated by the originating organisation. Please refer to the metadata for details as information may be illustrative or representative rather than definitive at this stage.

# NRW SMNR Portal

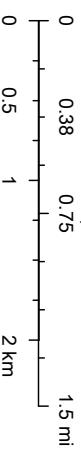


7/23/2021, 3:25:21 PM

SSSI NH3 Critical Levels

- Use 1ug/m3 NH3 Critical Level due to very N-sensitive Features
- Use 3ug/m3 NH3 Critical Level due to N-sensitive Features

1:72,224



Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS, METINASA, NGA

**CYNGOR CEFN GWLAD CYMRU  
COUNTRYSIDE COUNCIL FOR WALES**

SITE OF SPECIAL SCIENTIFIC INTEREST CITATION

**DENBIGHSHIRE**

**COED NANT MAWR**

<b><u>Date of Notification:</u></b>	1985
<b><u>National Grid reference:</u></b>	SJ077619
<b><u>O.S. Maps:</u></b>	1:50,000 Sheet number: 116 1:25,000 Sheet number: SJ06
<b><u>Site Area:</u></b>	21.5 ha

**Description:**

A particularly good example of a woodland type largely restricted to Wales and south-west England but also found in the Midlands and north-east England. In North Wales the majority of sites are in Clwyd, the remainder being in West Gwynedd and Coed Nant Mawr is regarded as one of the best and also one of the larger examples.

The wood occupies both sides of the steeply incised valley of Nant Mawr, a tributary of the River Clywedog, on rocks of the Ludlow Series (Silurian) with, at the eastern end of the site, outcrops of rock of the Carboniferous Limestone series. The southern and eastern part of the wood is dominated by a mixture of ash *Fraxinus Excelsior*, wych elm *Ulmus Glabra* and sessile oak *Quercus Petraea* with some sycamore *Acer Pseudoplatanus*. Lack of grazing has resulted in a well-developed shrub layer, dominated by hazel *Corylus Avellana*, together with hawthorn *Crataegus Monogyna*, holly *Ilex Aquifolium* and, locally, guelder rose *Viburnum Opulus* and spindle *Euonymus Europaeus*. The herb layer is varied, with dog's mercury *Mercurialis Perennis* dominant and replaced in some areas by greater woodrush *Luzula Sylvatica*. A species of particular note is herb paris *Paris Quadrifolia*.

The north-western part of the wood has a more acidic ground flora under areas dominated by sessile oak and, occasionally, hairy birch *Betula Pubescens*. Wavy hair-grass *Deschampsia Flexuosa* occurs, together with hard-fern *Blechnum Spicant*, ling *Calluna Vulgaris* and wood sage *Teucrium Scorodonia*.

Flushed areas adjacent to the stream support a flora including great horsetail *Equisetum Telmateia*, meadow-sweet *Filipendula Ulmaria* and opposite-leaved golden saxifrage *Chrysosplenium oppositifolium*.

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**CYNGOR CEFN GWLAD CYMRU  
COUNTRYSIDE COUNCIL FOR WALES**

SITE OF SPECIAL SCIENTIFIC INTEREST CITATION

**CONWY/DENBIGHSHIRE**

**MYNYDD HIRAETHOG**

<b><u>Date of notification:</u></b>	1977, 1983, 1988
<b><u>National Grid Reference:</u></b>	SH920585
<b><u>O.S. Maps:</u></b>	1:50000 Sheet Number: 116 1:25000 Sheet Number: SH85; SH86; SH95; SH96; SJ05
<b><u>Site Area:</u></b>	6321 ha

**Description:**

Mynydd Hiraethog represents one of the four remaining extensive tracts of sub-montane heather, *Calluna vulgaris* heath in the former county of Clwyd. It has been traditionally managed as a grouse moor. Locally this vegetation type has declined considerably in recent years particularly because of extensive afforestation to the east. Other ericaceous shrubs of note in the heath are crowberry *Empetrum nigrum* and cowberry, *Vaccinium vitis-idaea*. The drier heath vegetation grades into wetter acidic blanket bog vegetation, where the peat is deeper. The blanket bog is normally dominated by heather and hare's-tail cotton-grass *Eriophotum vaginatum*, but in parts it has been degraded and lost its heather. Notable species present include lesser twayblade *Listera cordata* and the nationally uncommon bog rosemary, *Andromeda polifolia*. Large blocks of blanket bog are rare in the former county of Clwyd and Mynydd Hiraethog and the Berwyn Mountains are the only significant examples in the county. Mynydd Hiraethog also supports extensive areas of soligenous mires, often with a more mesotrophic flora including species such as the tussock sedge, *Carex paniculata*, and of acid grassland of variable dominance. Natural oligotrophic lakes are also present of which Llyn Alwen is the largest and most notable. It supports plant species characteristic of oligotrophic status, e.g. quillwort, *Isoetes lacustris* and water lobelia *Lobelia dortmanna*, rare elsewhere in the county.

A diverse upland breeding bird community is supported. The second largest breeding population of golden plover in Wales is present. Other breeding wader species include dunlin (also a rare breeder in Wales), snipe, curlew, lapwing and common sandpiper. The red grouse population is still significant although like similar sites elsewhere in the county, the numbers have declined in recent years. Hunting and nesting raptors include peregrine falcon, kestrel, buzzard, merlin, hen-harrier and short-eared owl. A large colony of black-headed gulls is also present.

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## APPENDIX D

**Table D-1**  
**Sc0: Building Locations**

ID	Ref	OSGR Xm	OSGR Ym
B1	Building 1	303315.7	360120.8
B2	Building 2	303324.5	360094.1
B3	Building 3	303334.2	360067.1
B4	Building 4	303344.1	360039.4
B5	Building 5	303353.5	360012.1
B6	Building 6	303364.7	359984.1
B7	Building 7	303374.3	359957.5
B8	Building 8	303383.3	359931.8

**Table D-2**  
**Sc0: Source Locations**

ID	Ref	OSGR Xm	OSGR Ym
B1	Building 1	303319.9	360111.3
B2	Building 2	303329.0	360084.2
B3	Building 3	303338.4	360058.0
B4	Building 4	303348.4	360030.4
B5	Building 5	303357.8	360003.1
B6	Building 6	303368.7	359975.3
B7	Building 7	303378.4	359948.9
B8	Building 8	303387.2	359923.1

**Table D-3**  
**Sc1: Building Locations**

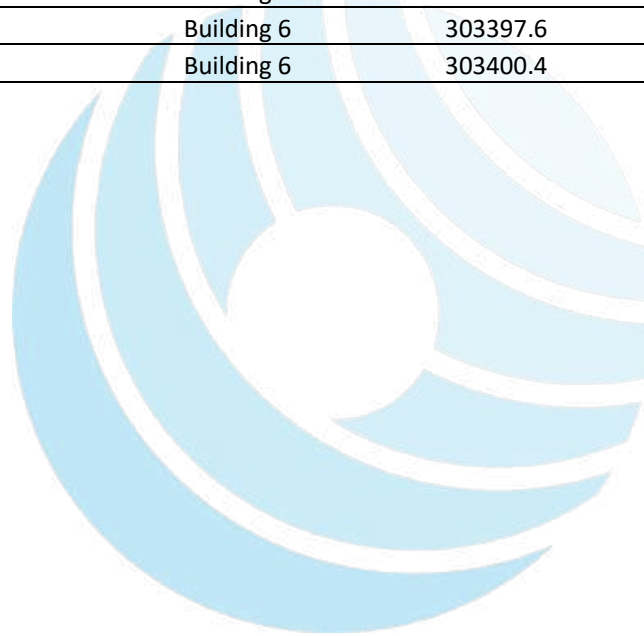
ID	Ref	OSGR Xm	OSGR Ym
B1	Building 1	303322.8	360096.9
B2	Building 2	303331.9	360071.4
B3	Building 3	303340.9	360045.9
B4	Building 4	303349.8	360020.6
B5	Building 5	303358.8	359995.2
B6	Building 6	303367.8	359969.8



**Table D-2**  
**Sc1: Stack Locations**

<b>ID</b>	<b>Ref</b>	<b>OSGR Xm</b>	<b>OSGR Ym</b>
B1S1	Building 1	303332.9	360089.7
B1S2	Building 1	303335.7	360090.7
B1S3	Building 1	303338.5	360091.7
B1S4	Building 1	303341.3	360092.7
B1S5	Building 1	303344.2	360093.7
B1S6	Building 1	303347.0	360094.7
B1S7	Building 1	303349.8	360095.8
B1S8	Building 1	303352.6	360096.8
B1S9	Building 1	303355.5	360097.7
B2S1	Building 2	303341.9	360064.3
B2S2	Building 2	303344.7	360065.3
B2S3	Building 2	303347.5	360066.3
B2S4	Building 2	303350.3	360067.2
B2S5	Building 2	303353.1	360068.3
B2S6	Building 2	303356.0	360069.3
B2S7	Building 2	303358.8	360070.3
B2S8	Building 2	303361.6	360071.2
B2S9	Building 2	303364.4	360072.3
B3S1	Building 3	303350.8	360038.9
B3S2	Building 3	303353.7	360039.9
B3S3	Building 3	303356.5	360040.8
B3S4	Building 3	303359.3	360041.9
B3S5	Building 3	303362.2	360042.8
B3S6	Building 3	303365.0	360043.9
B3S7	Building 3	303367.8	360044.9
B3S8	Building 3	303370.6	360045.9
B3S9	Building 3	303373.5	360046.9
B4S1	Building 4	303359.8	360013.4
B4S2	Building 4	303362.7	360014.4
B4S3	Building 4	303365.5	360015.4
B4S4	Building 4	303368.3	360016.4
B4S5	Building 4	303371.1	360017.4
B4S6	Building 4	303373.9	360018.5
B4S7	Building 4	303376.8	360019.5
B4S8	Building 4	303379.6	360020.5
B4S9	Building 4	303382.4	360021.5
B5S1	Building 5	303368.8	359988.0
B5S2	Building 5	303371.6	359989.0
B5S3	Building 5	303374.4	359990.0

ID	Ref	OSGR Xm	OSGR Ym
B5S4	Building 5	303377.3	359991.0
B5S5	Building 5	303380.1	359992.0
B5S6	Building 5	303382.9	359993.0
B5S7	Building 5	303385.7	359994.0
B5S8	Building 5	303388.6	359995.0
B5S9	Building 5	303391.4	359996.0
B6S1	Building 6	303377.8	359962.6
B6S2	Building 6	303380.6	359963.6
B6S3	Building 6	303383.5	359964.6
B6S4	Building 6	303386.3	359965.6
B6S5	Building 6	303389.1	359966.6
B6S6	Building 6	303391.9	359967.6
B6S7	Building 6	303394.8	359968.6
B6S8	Building 6	303397.6	359969.6
B6S9	Building 6	303400.4	359970.6



## APPENDIX E

**Table E-1**  
**Sc1: Stocking and Ammonia Emissions (Males)**

Week	% remaining	number remaining	Total mass (g)	livestock units	NH3 (g / sec)
0	100.0	5000	1100000	2.2	0.001
1	97.6	4880	1805780	3.6	0.002
2	97.1	4855	4175195	8.4	0.004
3	96.9	4844	6539268	13.1	0.007
4	94.3	4715	8674927	17.3	0.009
5	93.2	4661	10860073	21.7	0.011
6	92.6	4632	14775146	29.6	0.015
7	91.8	4588	18580610	37.2	0.019
8	91.5	4574	22460256	44.9	0.023
9	91.1	4557	26295720	52.6	0.027
10	90.7	4534	32192439	64.4	0.033
11	90.3	4515	38103512	76.2	0.040
12	90.1	4505	44012659	88.0	0.046
13	89.6	4478	49706341	99.4	0.052
14	88.9	4444	55593220	111.2	0.058
15	88.4	4418	61546817	123.1	0.064
16	87.9	4395	67421171	134.8	0.070
17	84.6	4230	70902976	141.8	0.074
18	81.0	4049	72837561	145.7	0.076
19	79.2	3959	76083073	152.2	0.079
20	45.2	2261	46236951	92.5	0.048
21	35.8	1788	38741732	77.5	0.040
22	29.5	1476	33201220	66.4	0.034
23	22.4	1118	26078585	52.2	0.027
24	21.5	1076	25965220	51.9	0.027
25	19.7	984	24564293	49.1	0.025
26	16.7	835	21118049	42.2	0.022
27	13.6	678	17364829	34.7	0.018
28	11.4	568	14741512	29.5	0.015
29	9.3	463	12169268	24.3	0.013
clean 1	0.0	0	0	0.0	0.000
clean 2	0.0	0	0	0.0	0.000
clean 3	0.0	0	0	0.0	0.000
clean 4	0.0	0	0	0.0	0.000
clean 5	0.0	0	0	0.0	0.000
clean 6	0.0	0	0	0.0	0.000

**Table E-2**  
**Sc1: Stocking and Ammonia Emissions (Feales)**

Week	% remaining	number remaining	Total mass (g)	livestock units	NH3 (g / sec)
0	100.0	7500	1350000	2.7	0.001
1	97.6	7321	2269427	4.5	0.002
2	97.1	7282	5243268	10.5	0.005
3	96.9	7266	8210415	16.4	0.009
4	94.3	7072	10890805	21.8	0.011
5	93.2	6991	13633354	27.3	0.014
6	92.6	6948	18758415	37.5	0.019
7	91.8	6882	23810707	47.6	0.025
8	91.5	6862	28955890	57.9	0.030
9	91.1	6836	34043159	68.1	0.035
10	90.7	6801	39243037	78.5	0.041
11	90.3	6772	44424000	88.8	0.046
12	90.1	6757	49733854	99.5	0.052
13	89.6	6717	54744146	109.5	0.057
14	88.9	6666	58926146	117.9	0.061
15	88.4	6627	63159494	126.3	0.065
16	87.9	6593	67377220	134.8	0.070
17	84.6	6346	69231933	138.5	0.072
18	81.0	6073	70873902	141.7	0.073
19	79.2	5938	73806915	147.6	0.077
20	45.2	3391	44733402	89.5	0.046
21	35.8	2682	37436634	74.9	0.039
22	29.5	2213	32138780	64.3	0.033
23	22.4	1677	25295780	50.6	0.026
24	21.5	1613	25249939	50.5	0.026
25	19.7	1476	23929518	47.9	0.025
26	16.7	1253	20575061	41.2	0.021
27	13.6	1017	16924098	33.8	0.018
28	11.4	852	14363598	28.7	0.015
29	9.3	695	11858780	23.7	0.012
clean 1	0.0	0	0	0.0	0.000
clean 2	0.0	0	0	0.0	0.000
clean 3	0.0	0	0	0.0	0.000
clean 4	0.0	0	0	0.0	0.000
clean 5	0.0	0	0	0.0	0.000
clean 6	0.0	0	0	0.0	0.000

[Notes: Emissions calculated from DEFRA *Inventory of Ammonia Emissions from UK Agriculture* emissions data for turkeys of 64 g-N/livestock unit/day and 70% N available as NH<sub>3</sub>. One 'livestock unit' = 500kg.]





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