R J HUGHES POULTRY

ARGOED FARM, TREFEGLWYS, POWYS

AMMONIA ASSESSMENT

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1.0 INTRODUCTION

Isopleth Ltd was been commissioned by Berrys, on behalf of R J Hughes Poultry, to carry out a detailed assessment of ammonia impacts associated with a poultry operation at Argoed Farm, Trefeglwys, Powys. The farm lies within the administrative area of Powys Council.

1.1 Background

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 220,000 birds in 4 buildings, one of which will be the re-purposed layer shed. A plan of the proposed site is included as Appendix A.

1.2 Approach

An assessment of ammonia impacts against critical levels and critical loads for nutrient nitrogen 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.
- 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**
- 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**
- NRW Modelling the concentration and deposition of ammonia emitted from intensive farming Reference number: **GN036** (version 1.0, December 2019)

GN 020, GN036, OGN 41 and *Intensive farming risk assessment for your environmental permit* only requires that the ammonia and nutrient nitrogen critical load calculations are undertaken. There is no requirement for the calculation of acidification as the calculation of the ammonia and nutrient N forms the more stringent test.

1.3 Scope

This report is aimed at comparing the predictions of the ammonia modelling with limit values described by Natural Resources Wales and Powys 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 Powys Council and represents an update to the detailed modelling submitted in support of the Permit Application.

1.4 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 confirm that there are no sites with National or European the following sites are of interest within 5km, the closest being the Coedydd Llawr-y-glyn Special Area of Conservation and SSSI which is just outside this screening area and is designated as an acid sessile oak (*Quercus petraea*) woodland.

BIS & LERC Wales Ltd have provided details of potentially sensitive ancient woodlands and locally designated sites within 2km of Argoed Farm. These have been cross referenced against NRW opendata sensitivity maps.

The location of these ecological sites are shown in Appendix B (MAGIC and BIS maps).

2.0 APPROACH

2.1 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.

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 ($\mu g/m^3$)	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 opendata sensitivity maps.

2.3 Critical Loads

Critical loads are set for the deposition of various substances to sensitive ecosystems. Predicted contributions to 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/m²/s) = ground level concentration (µg/m³) x deposition velocity (m/s)

The applied deposition velocity for ammonia is 0.020 for grassland and 0.030 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/m³, as stated in NRW *Modelling the concentration and deposition of ammonia emitted from intensive farming Reference number: GN036* (version 1.0, December 2019):

Table 1. Recommended ammonia dry deposition velocity at different long term average concentration to be used in an impact assessment.

NH3 conc (farm contribution + background – the PEC) (µg/m³)	<10	10 – 20	20 – 30	30 – 80	>80
Deposition velocity (m/s)	0.02 or 0.03*	0.015	0.01	0.005	0.003

*0.02 m/s for short vegetation and 0.03 m/s for tall vegetation

An applied deposition velocity for ammonia of 0.005m/s for water bodies has been accepted by the NRW for other poultry schemes.

The units are then converted from µg/m²/s to units of kg/ha/year by multiplying the dry deposition flux by a standard conversion factor for ammonia of 259.7.

As nutrient nitrogen depositions forms a more stringent test than acid deposition

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.

2.4 Significance: Interpretation of Results

OGN 41 presents thresholds for livestock developments in relation to European sites (RAMSAR, SPA and SAC) and SSSIs:

- threshold of insignificance (% of the designated site Critical Level or Load): **1%**;
- upper threshold % of the designated site Critical Level or Load: **8%**.

In the case of Local sites such as Sites of Special Interest to Nature Conservation (SINC) and Ancient Woodlands, Natural Resources Wales apply a limit for PC of up to 100% of Critical Level or Critical Load, i.e. the upper and lower thresholds are the same (100%).

2.4.1 Threshold of Insignificance

Where process contributions, considered in isolation, are up to 1% of the designated site Critical Level or Load, then it should be determined that there is no significant environmental effect/no likely significant effect/damage to scientific interest (see section 2.5, below). This also includes cases where there is a betterment, i.e. that impacts are below 0% of the existing. In cases where there is a betterment, i.e. that impacts are below 0% of the existing then no in-combination assessment is required.

2.4.2 In-Combination Range

Potential sources are:

- Argoed Farm (existing);
- Argoed Farm (proposed);
- Baseline (existing)*; and
- Other farms close to receptors potentially impacted by Argoed Farm*.

Where the proposed scheme represents a betterment in relation to the existing operation, i.e. where the scheme is approved the impacts from Argoed Farm will be lower than for the existing, no further assessment of baseline or potential in-combination sites is required. This is because, irrespective of the baseline and any in-combination sites, the ammonia impacts from Argoed Farm will result in an improvement should permission be granted.

Where process contributions, considered in isolation, are between 1% and 8% of the designated site Critical Level or Load, an in-combination assessment is required. Should the in-combination process contributions be between 1% and 8% of the designated site Critical Level or Load then it should be determined that the application would cause no significant environmental effect/likely significant effect/damage to scientific interest.

Within the range between the lower and upper thresholds, whether or not the impact is deemed acceptable is at the discretion of Natural Resources Wales.

2.4.3 Upper Threshold

For units that are assessed as exceeding the 8% threshold either alone, or in combination, the applicant will be required to submit a plan as part of their permit application detailing how the ammonia emissions and nitrogen deposition will be reduced.

2.5 Consistency with other Applications

The most similar recent application within the Powys Council area was Application Reference 19/0710/FUL:

> *Erection of three new broiler accommodation buildings, conversion of existing free range building into a broiler accommodation building, renewables shed, feed bins, and associated yard area and infrastructure at Glanmiheli Farm Chicken Units, Kerry, Newtown, Powys SY16 4LN*

This application was approved on 6th March 2020 and showed a betterment in relation to the existing situation at that site.

3.0 ASSESSMENT INPUTS

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.

3.1 Description

The site currently consists of a single free-range laying building, housing 32,000 laying 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 220,000 broiler birds across the 4 sheds.

In terms of total ammonia mass emission rates, it can be seen that when using the SCAIL emission rates, the new scheme represents a reduction of 19%, as shown below.

Table 3-1
Ecological Receptor Locations

Type	Number of birds	SCAIL Emission (kg NH3 / bird / year)	Total (kg NH^3 / year)
Layers	32000	0.29	9280
Broilers	220000	0.034	7480

3.2 Building Downwash / Entrainment

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 houses have been incorporated into the dispersion model as detailed in the modelling files. The new buildings will each measure approximately 121m by 20m with a height to the eaves of 4.818 metres to the ridge and 5.668 metres at the top of the fans which is the highest point of each new shed.

3.3 Local Wind Speed and Direction Data

The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability. The closest met data stations are as follows, although none would be considered ideal given the setting of the station and distance to Argoed Farm.

- Trawsgoed;
- Lake Vyrnwy No2; and
- Shobdon Airfield.

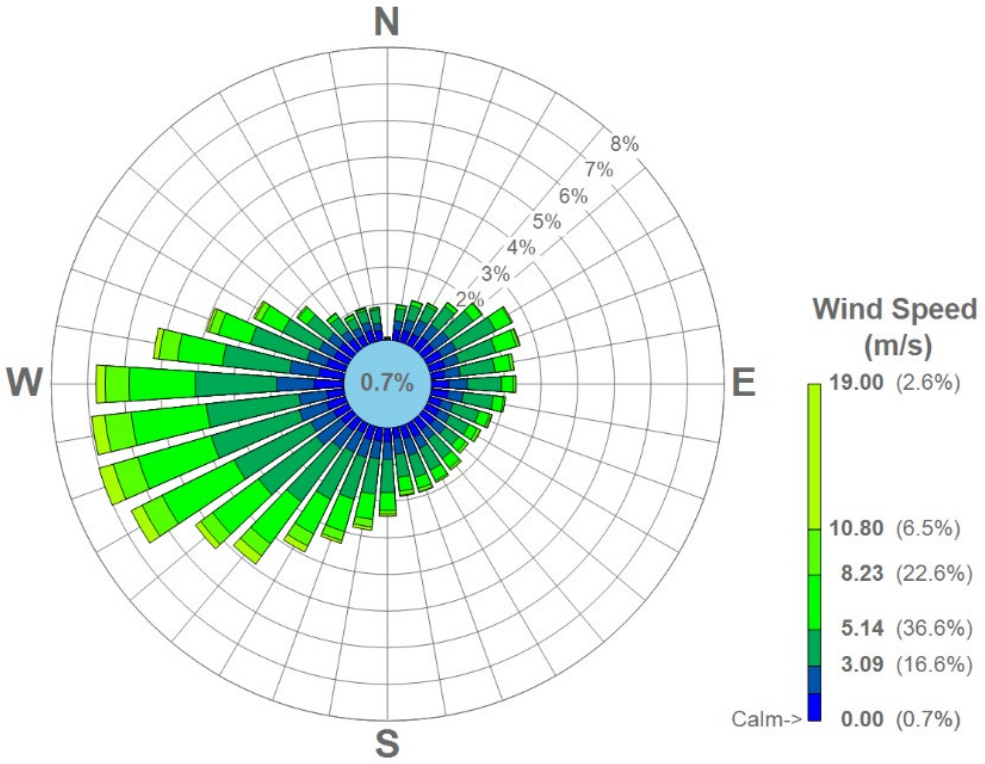
The meteorological data used in this study is therefore obtained from assimilation and short term forecast fields of the Numerical Weather Prediction (NWP) system known as the Global Forecast System (GFS).

The GFS is a spectral model: the physics/dynamics model has an equivalent resolution of approximately 13 km (latterly 9km); terrain is understood to be resolved at a resolution of approximately 2 km (with sub-13 km terrain effects parameterised) and data are archived at a resolution of 0.25 degrees. 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.

The use of NWP data has advantages over traditional meteorological records for purposes of this dispersion modelling at Argoed farm as this is considered to better represent the site being modelled. Wind speeds are modified by the treatment of roughness lengths (see Section 3.6). The use of NWP data has been accepted by Powys Council and NRW in relation to other similar schemes under such circumstances.

A windrose providing the frequency of wind speed and direction for 5 years of Argoed farm NWP data is presented in Figure 3-1, below.

Figure 3-1
NWP Windrose (5 years)



3.4 Receptors

A total of 398 discrete receptors have been used in order to represent the ancient woodland sites shown on the BIS 2km site search. There are no relevant European sites, SSSI or local designations. In some cases more than 1 discrete receptor has been used to represent and ancient woodland site, in particular 371 points have been used (on a 5m grid) for the adjacent woodland in which the laying birds currently range. The NRW opendata sensitivity maps show that there are no ancient woodlands sensitive to ammonia within 2km of the site.

The receptor points are shown on drawing AW1 (Appendix C) and also detailed in Table 3-2, below.

Table 3-2
Ecological Receptor Locations

Receptor	OS Coordinate Xm	OS Coordinate Ym	Height (m AoD)
ER1	300077.9	291387.7	175.4
ER2	300802.1	292088.7	141.1
ER3	300683.4	292454.2	159.7
ER4	300206.0	292300.6	158.2
ER5	299626.2	292265.6	156.2
ER6	299782.2	292226.0	149.5
ER7	299942.9	292540.4	191.5
ER8	299281.5	292535.8	181.7
ER9	299381.7	292598.6	189.9
ER10	299418.9	292677.8	195.9
ER11	298990.5	292538.1	182.9
ER12	298624.9	292619.6	198.0
ER13	298380.4	292996.8	220.3
ER14	297253.3	291457.6	159.9
ER15	298603.9	289983.6	154.5
ER16	298385.0	289888.1	152.6
ER17	298336.1	289587.7	177.2
ER18	298715.7	289592.3	180.6
ER19	298794.9	289520.2	196.8
ER20	299011.4	289701.8	159.4
ER21	299160.4	289725.1	165.9
ER22	299272.2	289750.7	171.4
ER23	299384.0	289822.9	170.2
ER24	299442.2	289853.1	172.2
ER25	299740.3	290076.7	153.6
ER26	299789.2	290174.5	135.4
ER27	300313.1	289997.5	151.0
ER28 - 398	Various (5m grid)	Various (5m grid)	139.9 – 162.8

3.5 Model inputs

Two scenarios have been modelled in order to quantify the impacts from Argoed Farm. These represent:

- Scenario 1: The existing scenario, with 32,000 free range layers birds housed in 1 building and able to move within the range; and
- Scenario 2: The proposed broiler facility with 220,000 birds housed in 4 buildings.

The ammonia emitted from Argoed Farm under the existing situation has been based on assumption that 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 80% indoors and 20% outdoors has been adopted in this assessment based on recent NRW consultation responses for other similar schemes:

- 32000 birds total;
- 80% of droppings in the house (equivalent to 25600 birds); and
- 12% of droppings on the range (equivalent to 6400 birds).

The existing house layout has been modelled with ridge ventilation with a calculated 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 14 Ha). At 530 kgN/year per 1000 birds, a total of 3392 kg/yr N would be deposited, with approximately 35% of this (1187.2 kg/yr N) emitted to the air as ammonia. The specific emission rate for the range is therefore 0.000269 mg/m^2/s.

The ammonia emitted from the farm under the proposed situation, with the standard EA factor of 0.034 kg NH_3/animal place/year are as shown in Table 3-3.

Each of the buildings has been assumed to house 55000 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 3-3
Argoed Farm: Emission Rates (g/s)

Receptor	Emission Sc1	Emission Sc2
Existing House	0.0214012 g/s per fan	0.003953154 g/s per fan
Range (existing)	0.000269 mg/m^2/s	---
House 1 (proposed)	---	0.003953154 g/s per fan
House 2 (proposed)	---	0.003953154 g/s per fan
House 3 (proposed)	---	0.003953154 g/s per fan

The temperature of release has been assumed at 25°C and the efflux velocity at 6m/s for the ridge fans on the buildings when housing broilers (i.e. scenario 2). The emission parameters

per stack are therefore as shown in Table 3-4 below for all stacks modelled in scenario 2. The locations for each stack are as shown in Appendix D.

Table 3-4
Argoed Farm: Emission Parameters

Stack height (m)	Temp (°C)	Velocity (m/s)	Stack Diameter (m)
5.668	22	6.0	0.8

3.6 Met Data Preparation

Meteorological data was obtained in .met format and converted to .sfc and .pfl formats for use in AERMOD using AERMET Pro. GFS (NWP) meteorological data has been processed according to US EPA methodology[2]. 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. The surrounding land use has been characterised as grassland (90%) and deciduous forest (10%).

3.7 Topography

The topography of the surrounding area within the modelling grid is variable, lying between approximately 121AoD towards the south and south east into the valley and 224m AoD in the north west at Pen-y-Ddol.

Site elevation data has been included in the dispersion model, with the base of the facility lying between 175m (existing building and new building 1) and 178.5m AoD (new buildings 2 and 3).

[2] US Environmental Protection Agency (2008). AERMOD Implementation Guide, AERMOD Implementation Group.

4.0 RESULTS

4.1 Critical Levels

The Scenario 1 (i.e. existing) dispersion modelling results against critical levels are shown in the tables below. For ER28 – 398 the average impact has been presented. As noted above, the critical level at all of the ancient woodland sites is 3µg/m3 according to the NRW ammonia sensitivity maps.

Table 4-1
PC Scenario 1 Results: Critical Levels

Site	NH_3 Concentration (µg/m^3)	% of Critical Level 3 µg/m^3
ER1	0.73	24.4%
ER2	0.18	6.0%
ER3	0.16	5.4%
ER4	0.23	7.7%
ER5	0.28	9.3%
ER6	0.27	9.1%
ER7	0.16	5.4%
ER8	0.21	6.9%
ER9	0.17	5.7%
ER10	0.14	4.6%
ER11	0.18	6.0%
ER12	0.10	3.3%
ER13	0.03	1.1%
ER14	0.11	3.8%
ER15	0.13	4.2%
ER16	0.11	3.8%
ER17	0.09	3.1%
ER18	0.08	2.6%
ER19	0.05	1.8%
ER20	0.06	1.9%
ER21	0.05	1.8%
ER22	0.06	2.1%
ER23	0.09	2.9%
ER24	0.10	3.2%
ER25	0.12	4.0%
ER26	0.12	4.1%
ER27	0.11	3.5%
ER28 - 398	12.79	426.4%

The existing impacts from the free-range layer operation are above 1% of the critical level at all sites and above 100% at the adjacent ancient woodland, at 426.4% of the critical level as an average across that site.

The Scenario 2 (i.e. proposed development) dispersion modelling results are shown in the tables below. For ER28 – 398 the maximum impact has been presented.

Table 4-2
PC Scenario 2 Results: Critical Levels

Site	NH_3 Concentration (µg/m^3)	% of Critical Level 3 µg/m^3
ER1	0.53	17.8%
ER2	0.14	4.8%
ER3	0.13	4.4%
ER4	0.18	6.1%
ER5	0.21	7.1%
ER6	0.22	7.2%
ER7	0.14	4.6%
ER8	0.16	5.4%
ER9	0.14	4.7%
ER10	0.12	4.0%
ER11	0.14	4.7%
ER12	0.09	2.9%
ER13	0.03	1.0%
ER14	0.09	2.9%
ER15	0.09	2.9%
ER16	0.08	2.7%
ER17	0.07	2.3%
ER18	0.06	1.9%
ER19	0.04	1.4%
ER20	0.04	1.3%
ER21	0.04	1.3%
ER22	0.05	1.6%
ER23	0.06	2.1%
ER24	0.07	2.3%
ER25	0.08	2.6%
ER26	0.08	2.8%
ER27	0.07	2.5%
ER28 - 398	2.93	97.8%

The existing impacts from the proposed broiler operation are above 1% of the critical level at all sites but below 100% at the adjacent ancient woodland, at 97.8% of the critical level as an average across that site.

A comparison of the existing and proposed site impacts are shown below. For ER28 – 398 the average impact has been presented.

Table 4-3
Critical Levels: Comparison

Site	Scenario 1: % of Critical Level	Scenario 2: % of Critical Level	Difference (%)
ER1	24.4%	17.8%	-6.6%
ER2	6.0%	4.8%	-1.2%
ER3	5.4%	4.4%	-1.0%
ER4	7.7%	6.1%	-1.6%
ER5	9.3%	7.1%	-2.1%
ER6	9.1%	7.2%	-1.9%
ER7	5.4%	4.6%	-0.8%
ER8	6.9%	5.4%	-1.5%
ER9	5.7%	4.7%	-1.0%
ER10	4.6%	4.0%	-0.6%
ER11	6.0%	4.7%	-1.2%
ER12	3.3%	2.9%	-0.4%
ER13	1.1%	1.0%	-0.1%
ER14	3.8%	2.9%	-0.9%
ER15	4.2%	2.9%	-1.3%
ER16	3.8%	2.7%	-1.1%
ER17	3.1%	2.3%	-0.7%
ER18	2.6%	1.9%	-0.7%
ER19	1.8%	1.4%	-0.4%
ER20	1.9%	1.3%	-0.7%
ER21	1.8%	1.3%	-0.5%
ER22	2.1%	1.6%	-0.5%
ER23	2.9%	2.1%	-0.8%
ER24	3.2%	2.3%	-0.9%
ER25	4.0%	2.6%	-1.3%
ER26	4.1%	2.8%	-1.3%
ER27	3.5%	2.5%	-1.0%
ER28 - 398	426.4%	97.8%	-328.6%

The scenario comparison shows a betterment at all of the ancient woodland sites, including a significant improvement at Park Wood (ER1) and the adjacent woodland.

4.2 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. For ER28 – 398 the average impact has been presented.

Ancient woodlands do not have an APIS site specific critical load attributed to them in the same way as a European site or SSSI would have. For purposes of the comparison below a Nutrient Nitrogen critical load of 10-20 kg N/ha/year has been used, which is consistent with the ranges for all Broadleaved, Mixed and Yew Woodland types:

- Broadleaved deciduous woodland: 10-20 kg N/ha/year;
- Fagus woodland: 10-20 kg N/ha/year;
- Acidophilous Quercus-dominated woodland: 10-15 kg N/ha/year; and
- Meso- and eutrophic Quercus woodland: 15-20 kg N/ha/year.

The predicted impacts are as follows:

Table 4-4
PC Scenario 1 Results: N Critical Loads

Site	Conc (µg/m^3)	N Dep kg/ha/yr	% of Lower C.L.	% of Upper C.L.
ER1	0.731	0.022	57.0%	28.5%
ER2	0.179	0.005	13.9%	7.0%
ER3	0.163	0.005	12.7%	6.3%
ER4	0.232	0.007	18.1%	9.1%
ER5	0.278	0.008	21.6%	10.8%
ER6	0.272	0.008	21.2%	10.6%
ER7	0.161	0.005	12.5%	6.3%
ER8	0.208	0.006	16.2%	8.1%
ER9	0.170	0.005	13.3%	6.6%
ER10	0.138	0.004	10.8%	5.4%
ER11	0.179	0.005	14.0%	7.0%
ER12	0.100	0.003	7.8%	3.9%
ER13	0.033	0.001	2.5%	1.3%
ER14	0.114	0.003	8.9%	4.4%
ER15	0.126	0.004	9.8%	4.9%
ER16	0.113	0.003	8.8%	4.4%
ER17	0.093	0.003	7.2%	3.6%
ER18	0.079	0.002	6.2%	3.1%
ER19	0.053	0.002	4.1%	2.1%
ER20	0.058	0.002	4.6%	2.3%
ER21	0.054	0.002	4.2%	2.1%
ER22	0.062	0.002	4.9%	2.4%
ER23	0.087	0.003	6.8%	3.4%
ER24	0.097	0.003	7.5%	3.8%
ER25	0.119	0.004	9.3%	4.6%
ER26	0.122	0.004	9.5%	4.8%
ER27	0.106	0.003	8.3%	4.1%
ER28 - 398	12.791	0.384	997.7%	498.9%

The existing impacts from the free-range layer operation are above 1% of the critical load at all sites and above 100% at the adjacent ancient woodland, at 997.7% and 426.4% of the lower and upper critical load as an average across that site, respectively.

The Scenario 2 (i.e. proposed development) dispersion modelling results against nutrient nitrogen critical load are shown in the tables below. For ER28 – 398 the average impact has been presented.

Table 4-5
PC Scenario 2 Results: N Critical Loads

Site	Conc (µg/m^3)	N Dep kg/ha/yr	% of Lower C.L.	% of Upper C.L.
ER1	0.533	0.016	41.6%	20.8%
ER2	0.143	0.004	11.2%	5.6%
ER3	0.131	0.004	10.2%	5.1%
ER4	0.184	0.006	14.4%	7.2%
ER5	0.214	0.006	16.7%	8.4%
ER6	0.216	0.006	16.8%	8.4%
ER7	0.138	0.004	10.8%	5.4%
ER8	0.163	0.005	12.7%	6.4%
ER9	0.140	0.004	10.9%	5.4%
ER10	0.119	0.004	9.3%	4.6%
ER11	0.142	0.004	11.1%	5.5%
ER12	0.088	0.003	6.9%	3.4%
ER13	0.029	0.001	2.3%	1.1%
ER14	0.086	0.003	6.7%	3.4%
ER15	0.086	0.003	6.7%	3.3%
ER16	0.080	0.002	6.2%	3.1%
ER17	0.070	0.002	5.5%	2.7%
ER18	0.057	0.002	4.5%	2.2%
ER19	0.041	0.001	3.2%	1.6%
ER20	0.039	0.001	3.0%	1.5%
ER21	0.038	0.001	2.9%	1.5%
ER22	0.047	0.001	3.7%	1.8%
ER23	0.063	0.002	4.9%	2.5%
ER24	0.070	0.002	5.5%	2.7%
ER25	0.079	0.002	6.2%	3.1%
ER26	0.083	0.002	6.5%	3.2%
ER27	0.075	0.002	5.8%	2.9%
ER28 - 398	2.933	0.088	228.8%	114.4%

The existing impacts from the proposed broiler operation are above 1% of the critical load at all sites and above 100% at the adjacent ancient woodland, at 997.7% and 426.4% of the lower and upper critical load as an average across that site, respectively.

A comparison of the existing and proposed site impacts are shown below. For ER28 – 398 the average impact has been presented.

Table 4-6
N Critical Loads: Comparison

Site	Scenario 1: % of Lower Critical Load	Scenario 2: % of Lower Critical Load	Difference (%)
ER1	57.0%	41.6%	-15.5%
ER2	13.9%	11.2%	-2.8%
ER3	12.7%	10.2%	-2.5%
ER4	18.1%	14.4%	-3.7%
ER5	21.6%	16.7%	-4.9%
ER6	21.2%	16.8%	-4.4%
ER7	12.5%	10.8%	-1.8%
ER8	16.2%	12.7%	-3.5%
ER9	13.3%	10.9%	-2.4%
ER10	10.8%	9.3%	-1.5%
ER11	14.0%	11.1%	-2.9%
ER12	7.8%	6.9%	-0.9%
ER13	2.5%	2.3%	-0.3%
ER14	8.9%	6.7%	-2.1%
ER15	9.8%	6.7%	-3.1%
ER16	8.8%	6.2%	-2.6%
ER17	7.2%	5.5%	-1.7%
ER18	6.2%	4.5%	-1.7%
ER19	4.1%	3.2%	-0.9%
ER20	4.6%	3.0%	-1.5%
ER21	4.2%	2.9%	-1.2%
ER22	4.9%	3.7%	-1.2%
ER23	6.8%	4.9%	-1.9%
ER24	7.5%	5.5%	-2.0%
ER25	9.3%	6.2%	-3.1%
ER26	9.5%	6.5%	-3.0%
ER27	8.3%	5.8%	-2.4%
ER28 - 398	997.7%	228.8%	-768.9%

The scenario comparison shows a betterment at all of the ancient woodland sites, including a significant improvement at Park Wood (ER1) and the adjacent woodland.

It must also be remembered that the result above only relate to deposition of N nitrogen from the air. In reality additional benefits would be realised when birds are prevented from ranging in the adjacent ancient woodland.

5.0 CONCLUSIONS

The potential ammonia impacts of an expansion to Argoed Farm on local ecological sites has been completed. 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:

- The total mass emission of ammonia is predicted to be 19% lower for the proposed broiler farm than for the existing layer farm when using SCAIL factors;
- The existing ammonia impacts from the free-range layer operation are above 1% of the critical level at all sites and above 100% at the adjacent ancient woodland, at 426.4% of the critical level as an average across that site.
- The existing impacts from the free-range layer operation are above 1% of the critical load at all sites and above 100% at the adjacent ancient woodland, at 997.7% and 426.4% of the lower and upper critical load as an average across that site, respectively.
- The proposed farm will reduce these impacts. The proposed development is therefore regarded as a significant improvement in air quality terms at ecological receptor locations;

On the basis of the 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, indeed they are a significant benefit. This is particularly the case when also considering the direct deposition of nitrogen by birds using the existing ranging area.

The most similar recent application within the Powys Council area was Application Reference 19/0710/FUL. This application was approved on 6th March 2020 and showed a betterment in relation to the existing situation at that site. The Argoed Farm proposals are similar to those for that scheme and the benefits are comparable. For this reason the Argoed Farm proposals should also be regarded as positive in relation to ammonia and nutrient nitrogen impacts when compared with the existing 32,000 bird layer operation at the farm.

Notice:

This report was produced by Isopleth Ltd to present the results of an ammonia impact assessment for proposed poultry units at Argoed Farm.

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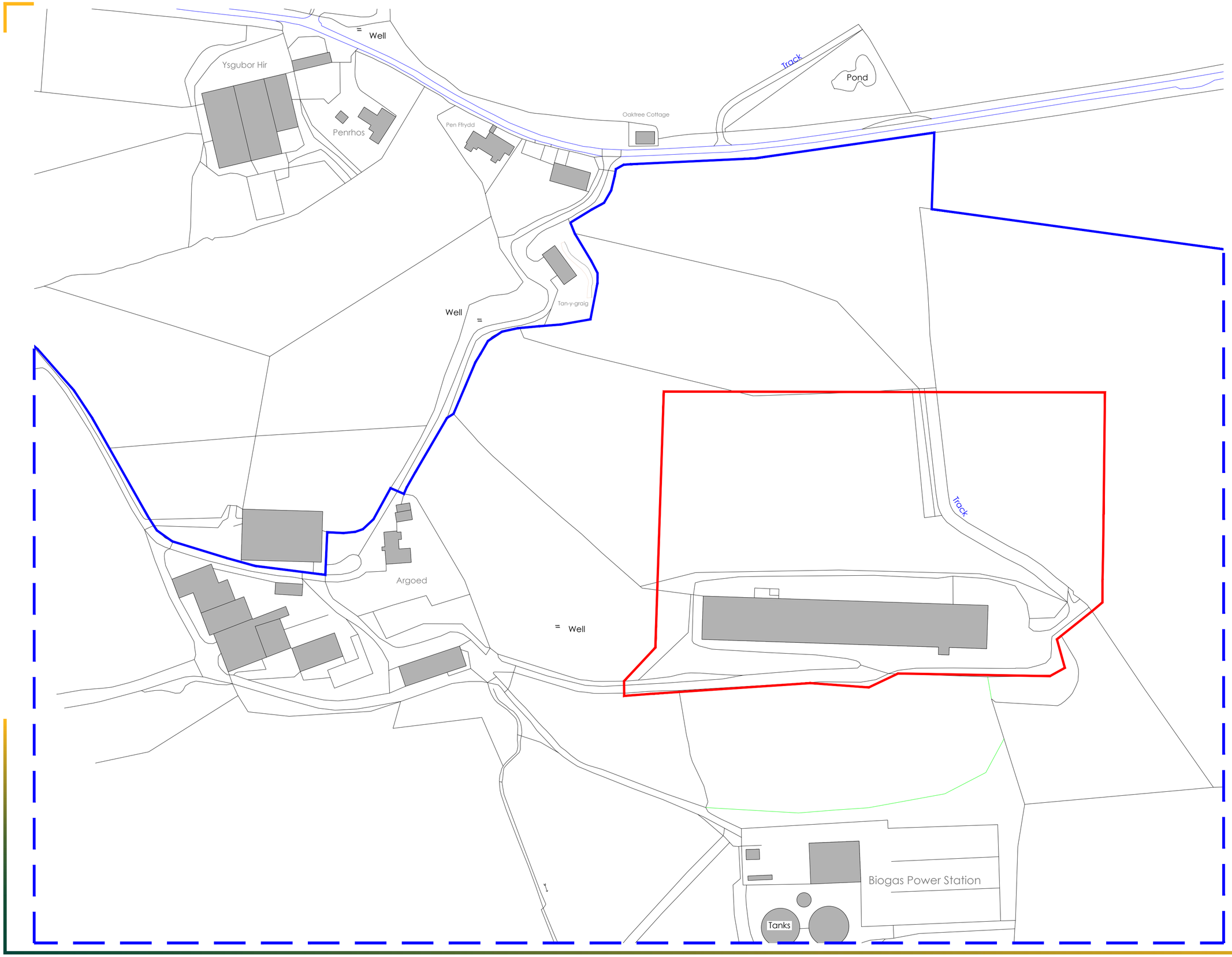
APPENDIX A

(plans reproduced courtesy of Berrys)



Site Area:
32,000 m²
3.2 hectares

Drawing Revisions:

A	Red line adjusted	18.06.2020

BERRYS
PROPERTY | BUSINESS | PLANNING
01743 271697 | SY2 6FG
www.berrys.uk.com

Client:
R J Hughes & Co

Project:
Proposed 4 Broiler Sheds, Argoed Farm, Trefeglwys, Powys, SY17 5QT

Drawing:
Location Plan

Drawing Number:	Rev.	Scale	Paper	Drawn By: AW
SA36495_PL_01	A	1:1250	A2	Date: 26.5.2020

Drawing Revisions:

A	Arrangement adjusted	18.06.2020

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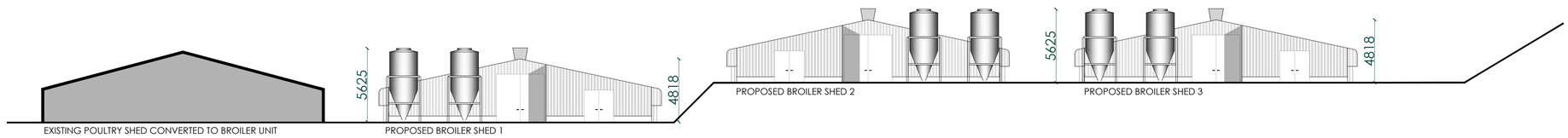
Client:
R J Hughes & Co

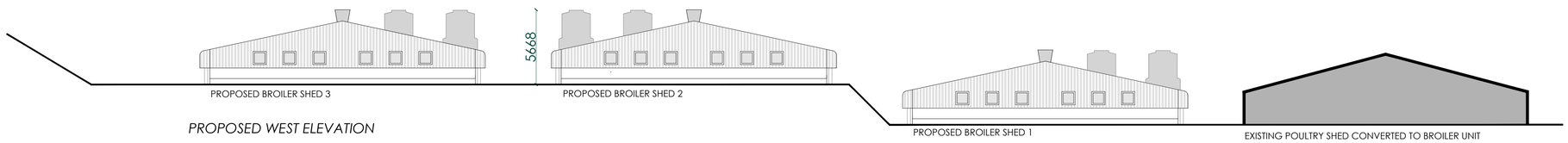
Project:
Proposed 4 Broiler Sheds, Argoed Farm, Trefeglwys, Powys, SY17 5QT

Drawing:
Block Plan

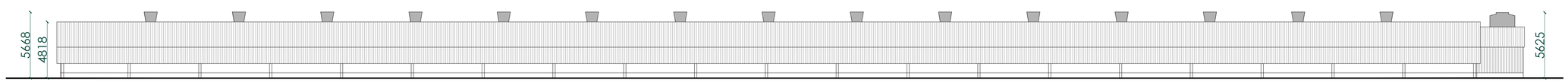
Drawing Number:	Rev.	Scale	Paper	Drawn By: AW
SA36495_PL_02	A	1:750	A2	Date: 26.5.2020



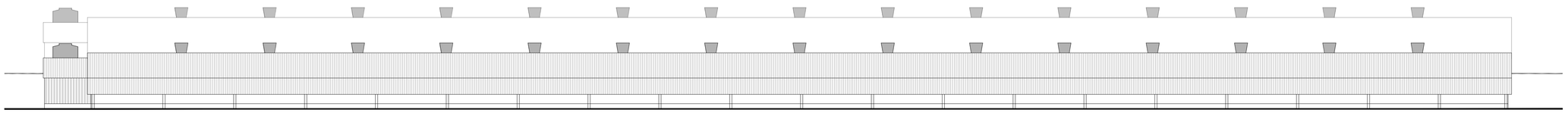
PROPOSED EAST ELEVATION



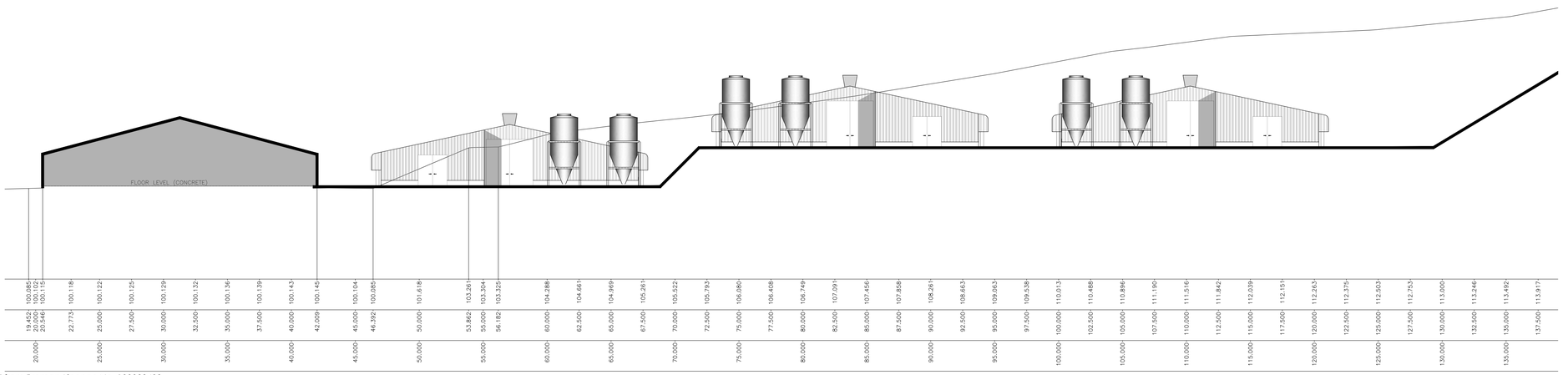
PROPOSED WEST ELEVATION



PROPOSED SOUTH ELEVATION



PROPOSED NORTH ELEVATION



Drawing Revisions:

A	Arrangement adjusted	18.6.2020

BERRYS
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Client:
R J Hughes & Co

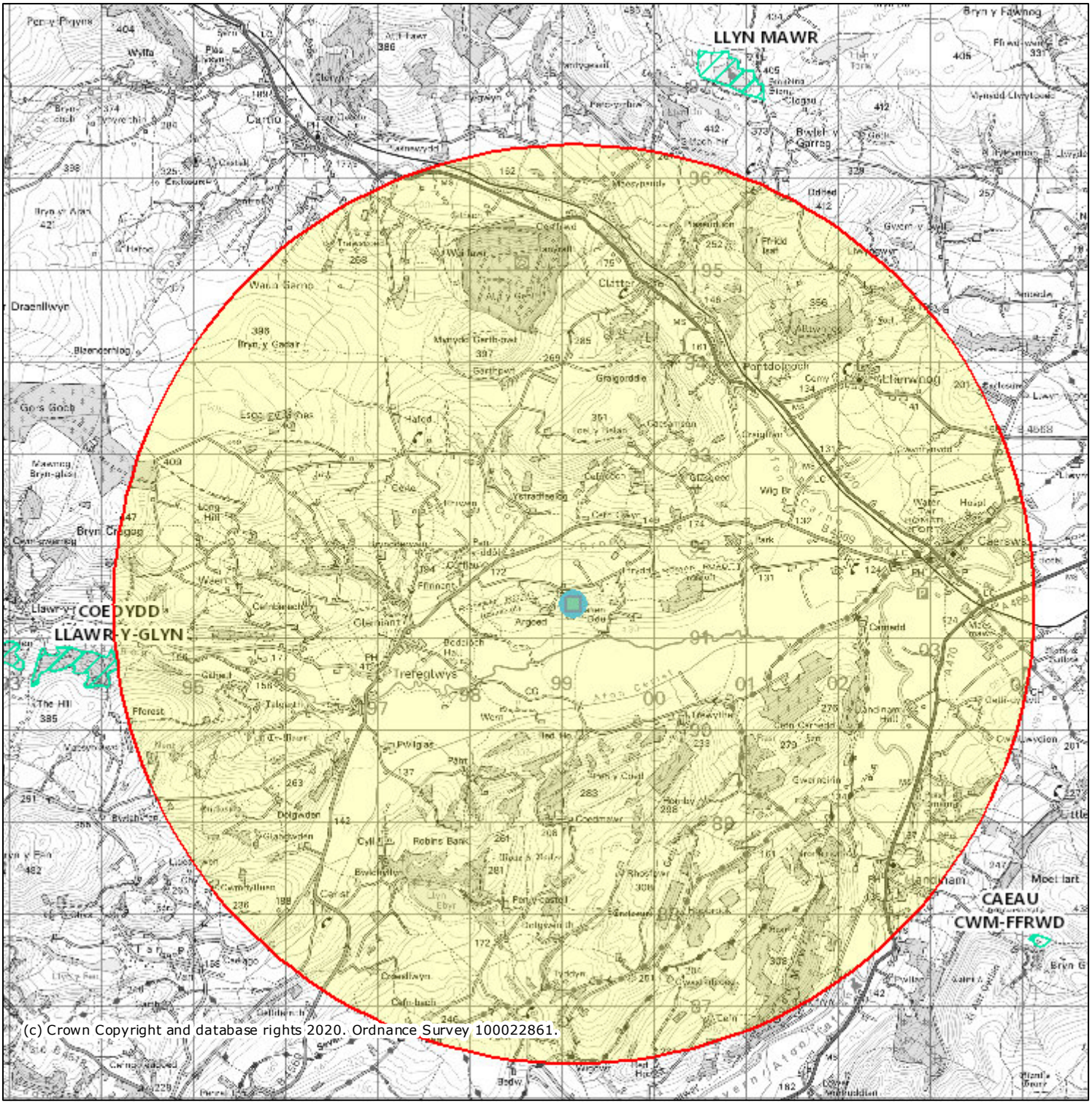
Project:
Proposed 4 Broiler Sheds, Argoed Farm, Trefeglwys, Powys, SY17 5QT

Drawing:
Proposed Elevations

Drawing Number:	Rev.	Scale	Paper	Drawn By: AW
SA36495_PL_04	A	1:200	A1	Date: 26.5.2020

APPENDIX B

Magic Map



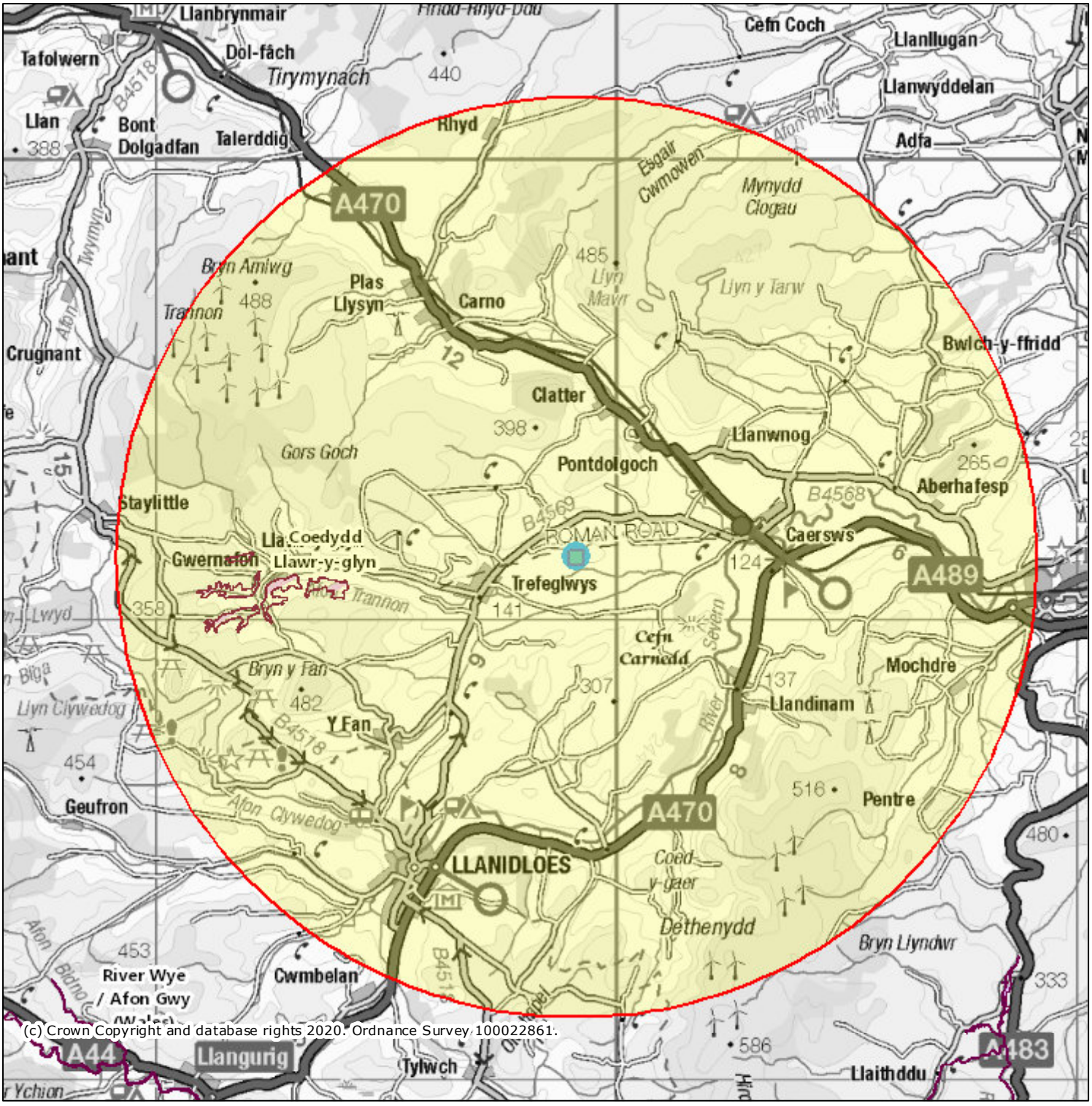
Legend

Sites of Special Scientific Interest (Wales)

0 1.5 3
km

Projection = OSGB36
xmin = 283700
ymin = 284900
xmax = 313900
ymax = 299000

Magic Map



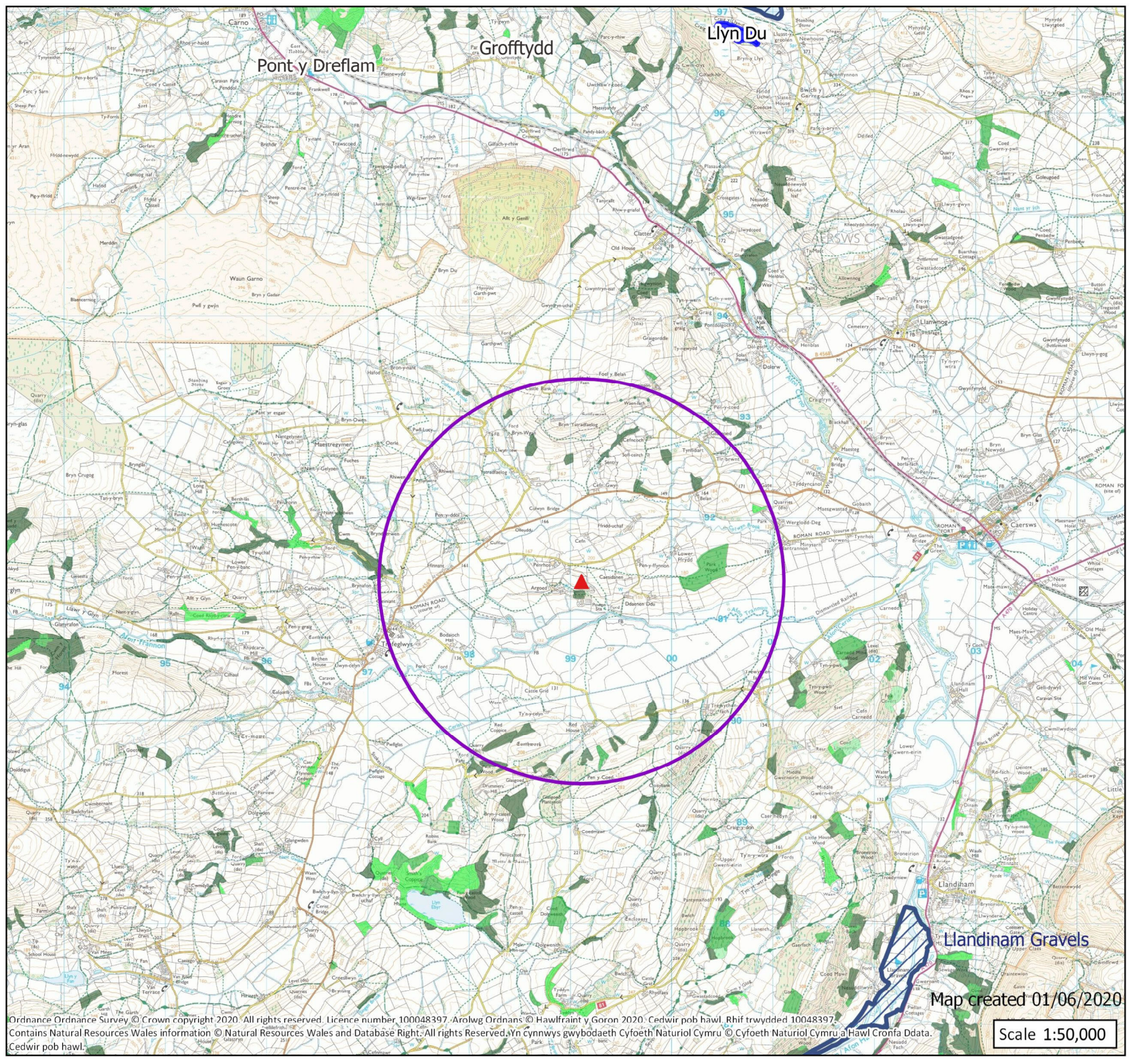
Legend

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

0 3.5 7
km

Projection = OSGB36
xmin = 268300
ymin = 276600
xmax = 328700
ymax = 306300

Map produced by MAGIC on 27 May, 2020.



BIODIVERSITY INFORMATION SERVICE
FOR POWYS AND BRECON BEACONS NATIONAL PARK
GWASANAETH GWYBODAETH FIOAMRYWIAETH
POWYS A PHARC CENEDLAETHOL BANNAU BRYCHEINIOG

Isopleth Data Search - Local sites and ancient woodland within 2km of site SN9912291366 Argoed

- Argoed
- 2km buffer

Non-statutory Sites

- Road Verge Nature Reserves
- Wildlife Sites
- MWT Reserves

Ancient Woodland Inventory 2017

- Ancient Semi Natural Woodland
- Ancient Woodland Site of Unknown Category
- Plantation on Ancient Woodland Site
- Restored Ancient Woodland Site

APPENDIX C

LEGEND

SITE BOUNDARY

ECOLOGICAL RECEPTOR LOCATION

AW ECOLOGICAL RECEPTOR LOCATION

N
W
E
S

RJ Hughes & Co

SITE
Argoed Farm, Trefeglwys

PROJECT
Air Quality Assessment

DRAWING TITLE
Site Setting and Ecological Receptors

DRAWING NUMBER	REVISION
AQ1	0
SCALE	DATE
1:15000 @ A3	09.06.2020

ISOPLETH

APPENDIX D

Table D-1
Stack Locations: Existing

ID	Reference	OS GR X	OS GR Y	Base Height (m AoD)
EB1S1	Existing Building stack 1	299062.23	291306.23	175.0
EB1S2	Existing Building stack 2	299074.05	291305.85	175.0
EB1S3	Existing Building stack 3	299085.88	291305.48	175.0
EB1S4	Existing Building stack 4	299097.70	291305.10	175.0
EB1S5	Existing Building stack 5	299109.53	291304.73	175.0
EB1S6	Existing Building stack 6	299121.35	291304.35	175.0
EB1S7	Existing Building stack 7	299133.18	291303.98	175.0
EB1S8	Existing Building stack 8	299145.00	291303.60	175.0
EB1S9	Existing Building stack 9	299156.83	291303.23	175.0
EB1S10	Existing Building stack 10	299168.65	291302.85	175.0
EB1S11	Existing Building stack 11	299180.48	291302.48	175.0

Table D-2
Stack Locations: Proposed

ID	Reference	OS GR X	OS GR Y	Base Height (m AoD)
B1S1	Building 1 stack 1	299058.9	291333.2	175.0
B1S2	Building 1 stack 2	299066.5	291333.0	175.0
B1S3	Building 1 stack 3	299074.1	291332.7	175.0
B1S4	Building 1 stack 4	299081.7	291332.5	175.0
B1S5	Building 1 stack 5	299089.3	291332.2	175.0
B1S6	Building 1 stack 6	299096.9	291331.9	175.0
B1S7	Building 1 stack 7	299104.5	291331.7	175.0
B1S8	Building 1 stack 8	299112.1	291331.4	175.0
B1S9	Building 1 stack 9	299119.7	291331.1	175.0
B1S10	Building 1 stack 10	299127.3	291330.9	175.0
B1S11	Building 1 stack 11	299134.9	291330.6	175.0
B1S12	Building 1 stack 12	299142.5	291330.4	175.0
B1S13	Building 1 stack 13	299150.1	291330.1	175.0
B1S14	Building 1 stack 14	299157.7	291329.8	175.0
B1S15	Building 1 stack 15	299165.3	291329.6	175.0
B2S1	Building 2 stack 1	299060.0	291360.3	178.5
B2S2	Building 2 stack 2	299067.6	291360.0	178.5
B2S3	Building 2 stack 3	299075.2	291359.8	178.5
B2S4	Building 2 stack 4	299082.8	291359.5	178.5
B2S5	Building 2 stack 5	299090.4	291359.3	178.5
B2S6	Building 2 stack 6	299098.0	291359.0	178.5
B2S7	Building 2 stack 7	299105.6	291358.8	178.5
B2S8	Building 2 stack 8	299113.3	291358.5	178.5
B2S9	Building 2 stack 9	299120.9	291358.3	178.5
B2S10	Building 2 stack 10	299128.5	291358.0	178.5
B2S11	Building 2 stack 11	299136.1	291357.8	178.5
B2S12	Building 2 stack 12	299143.7	291357.5	178.5
B2S13	Building 2 stack 13	299151.3	291357.3	178.5
B2S14	Building 2 stack 14	299158.9	291357.0	178.5
B2S15	Building 2 stack 15	299166.5	291356.8	178.5
B3S1	Building 3 stack 1	299060.9	291387.4	178.5
B3S2	Building 3 stack 2	299068.5	291387.2	178.5
B3S3	Building 3 stack 3	299076.1	291386.9	178.5
B3S4	Building 3 stack 4	299083.7	291386.7	178.5
B3S5	Building 3 stack 5	299091.3	291386.4	178.5
B3S6	Building 3 stack 6	299098.9	291386.2	178.5

ID	Reference	OS GR X	OS GR Y	Base Height (m AoD)
B3S7	Building 3 stack 7	299106.5	291385.9	178.5
B3S8	Building 3 stack 8	299114.2	291385.7	178.5
B3S9	Building 3 stack 9	299121.8	291385.4	178.5
B3S10	Building 3 stack 10	299129.4	291385.1	178.5
B3S11	Building 3 stack 11	299137.0	291384.9	178.5
B3S12	Building 3 stack 12	299144.6	291384.6	178.5
B3S13	Building 3 stack 13	299152.2	291384.4	178.5
B3S14	Building 3 stack 14	299159.8	291384.1	178.5
B3S15	Building 3 stack 15	299167.4	291383.9	178.5
EB1S1	Existing Building stack 1	299059.3	291306.3	175.0
EB1S2	Existing Building stack 2	299068.1	291306.0	175.0
EB1S3	Existing Building stack 3	299077.0	291305.8	175.0
EB1S4	Existing Building stack 4	299085.9	291305.5	175.0
EB1S5	Existing Building stack 5	299094.7	291305.2	175.0
EB1S6	Existing Building stack 6	299103.6	291304.9	175.0
EB1S7	Existing Building stack 7	299112.5	291304.6	175.0
EB1S8	Existing Building stack 8	299121.4	291304.4	175.0
EB1S9	Existing Building stack 9	299130.2	291304.1	175.0
EB1S10	Existing Building stack 10	299139.1	291303.8	175.0
EB1S11	Existing Building stack 11	299148.0	291303.5	175.0
EB1S12	Existing Building stack 12	299156.8	291303.2	175.0
EB1S13	Existing Building stack 13	299165.7	291302.9	175.0
EB1S14	Existing Building stack 14	299174.6	291302.7	175.0
EB1S15	Existing Building stack 15	299183.4	291302.4	175.0

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