POULTRY UNIT, PLAS TIRION FARM

AMMONIA EMISSIONS: IMPACT ASSESSMENT

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1.0 INTRODUCTION

Isopleth Ltd has been commissioned by Roger Parry & Partners LLP, on behalf of D & CH Mackinnon to carry out a detailed assessment of ammonia impacts associated with a proposed extension to an existing poultry unit on land near Plas Tirion Farm, Llanrug, Caernarfon LL55 4PY. Site layout and location plans are shown in Appendix A of this report.

1.1 Background

The potential ammonia impacts on local ecological sites associated with the development of an extension to an existing new poultry (free range layer) building at Plas Tirion Farm has been assessed.

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

An extension to the existing building is proposed. The new facility would therefore consist of 1 extended building housing a maximum of 16000 free range layers in addition to the 32000 birds already at the site (for a maximum of 48000 birds in total). The building layout and husbandry for the extension would remain the same as for the existing unit, as would the range area.

1.2 Previous Applications / Assessments

The site benefits from planning permission for a single 32000 bird house which was approved on 28th February 2018 (Application C17/1022/23/LL):

> *'Codi uned ddofednod ar gyfer cynhyrchu wyau rhydd, rhodfa, man troi, tirweddu, storfa dail ynghyd â 2 seilo / Erection of a poultry unit for the production of free range eggs, track, turning area, landscaping, muck store and 2 silos'*

Natural Resources Wales and the ecology department of Gwynedd Council were consulted in relation to Application C17/1022/23/LL and provided responses at that time. Any specific responses which are relevant to the current application are referenced, as appropriate.

The operators of the farm have confirmed that the unit was fully operational by November 2018.

1.3 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.

1.4 Scope

This report is aimed at comparing the predictions of the ammonia modelling with limit values described by Natural Resources Wales and Gwynnedd 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 Gwynnedd Council.

2.0 APPROACH

2.1 General Approach

On 13th May 2021 NRW released a web-based guidance suite focussed on the assessment of ammonia emissions from farming. This draws together previous NRW guidance[1] [2] [3] 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 for modelling and reporting;
- Emission factors for pigs for modelling and reporting;
- Emission factors for cattle for modelling and reporting;
- Emission factor for anaerobic digestion feedstock and digestate for modelling and reporting; and
- Reducing ammonia emissions from agriculture.

The 2021 NRW Guidance suite 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] 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

[2] 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

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

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 ammonia, nutrient nitrogen and acid deposition 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.

The 'development' (i.e. the extension) will house a maximum of 16000 free range layers with manure belt removal. As such, the NRW Guidance suggests that an ecological screening distance of 3 kilometres is used. However, as the existing site was built in 2018 this is within the date range for APIS backgrounds (2017-2019). For this reason, and to ensure that a cautious approach has been taken, an ecological screening distance of 5 kilometres has been used. This applicable for all free range layer sites with manure belt removal housing a maximum of 100000 birds.

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 (µg/m³)	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[4] (i.e. NRW opendata sensitivity maps). The opendata sensitivity maps provide additional information to confirm which of the ancient woodland sites are ammonia sensitive (and therefore the critical level of 1.0 µg/m³ is appropriate) and which are not, where a critical level of 3.0 µg/m³ has been applied.

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[5]. The contribution to critical loads for Nitrogen deposition are recorded as KgN/ha/yr.

[4] NRW Open Access Map available at https://nrw.maps.arcgis.com/
[5] www.apis.ac.uk

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

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 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/m^3, as stated in NRW *Modelling the concentration and deposition of ammonia emitted from intensive farming Reference number: GN036* (version 1.0, December 2019) and repeated in the May 2021 web-based Guidance:

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/m^3)	<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 although for most sites there is no applicable critical load for sites where the designated features are aquatic.

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.

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 31st Dec of the mid year within the three-year average dataset. Sources operational before that date will be considered as part of the background.

2.5 Significance: Interpretation of Results

The May 2021 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 or Load, 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 have now been removed for the May 2021 guidance.

3.0 SITE SETTING AND OPERATIONS

3.1 Location

Plas Tirion Farm is located within the rural settlement of Llanrug and approximately 3.4 miles from Caernarfon. The site itself is located within a grassland field located at approximate site grid reference OS GR 252235, 362540. The location is shown in Appendix A.

3.2 Description of Development

D C & H Mackinnon is a farm business which extends to in excess of 521 acres of owner occupied land. In addition to the existing free range layer building, the business runs a dairy enterprise consisting of milking cows, youngstock for replacements and beef finishing on farm. The dairy and beef finishing operations have been in place for many years, well before the date range of the latest APIS data.

The proposal seeks Planning Permission for the operation of a further 16,000 bird free range poultry rearing unit attached to the existing building with associated infrastructure on the site which already benefits from planning permission for a single poultry building of up to 32000 birds.

The farm will be operated in accordance with best practice and BAT standards in EPR 6.09.

- A computer automatically will control ventilation and heating so that heat is not wasted by being drawn out of the building.
- Litter will be kept loose and friable and the manure belts will ensure that it is requlary removed. The quality will be regularly inspected to ensure it does not become excessively wet or dry.
- Temperature in the sheds will meet the health and welfare needs for the age and number of the birds. Heaters will be spaced regularly within the sheds to prevent cold spots and extremes of temperature. The fans are fitted with back draft shutters to prevent drafts and unnecessary heat loss.
- Feed will be delivered from a UKASTA accredited feed mill and blown into bulk feed bins situated adjacent to the house. From the feed bins the feed will be piped into the house and distributed to the birds via a pan feeding system.
- Fallen stock will be recorded daily and securely stored in vermin proof containers awaiting regular collection by a licenced renderer.

Ammonia emissions within the buildings will be reduced through a diet based on ‘ideal’ protein feed and maintaining good environmental conditions.

3.3 Model Scenarios

Two scenarios have been modelled:

- Scenario 0: Existing site (as built) with 32000 free range layers;
- Scenario 1: Proposed site with 32000 + 16000 free range layers.

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

3.4 Stocking and Layout

This ammonia assessment is based on:

- The existing building holding 32000 birds in a single shed; and
- The proposed building holding an average of 16000 birds in a single shed (attached the end of the existing shed).

The building(s) are fitted with ridge venting and pop holes to allow the laying birds to range as required. The buildings are designed around and aviary system with belt manure removal. The temperature is controlled within the buildings with heaters (to warm) and ridge fans (to cool).

3.5 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 May 2021 ammonia guidance suite. The BREEZE AERMOD model has been used.

3.5.1 Building

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 have been provided by the applicant and the specifications for the extension are consistent with those for planning application C17/1022/23/LL. The detailed dispersion model was constructed on this basis and includes the existing building as this has the potential to influence dispersion.

Table 3-1
Building Details

Building	Width (m)	Length (m)	Basal Height (mAoD)	Angle (°)
Existing building	76.3	31.55	115	132.3
Proposed Building	36.5	31.55	115	132.3

3.5.2 Range

NRW May 2021 Guidance states in relation to free range sites:

> *'For free-range animals, the appropriate emission factor will need to be apportioned between the free-range area and any housing in proportion to the time the animals spend in each location.*
>
> *We require the modellers assume that 20% of droppings will occur outside the house. This will only change if agreed with other UK regulators.'*

This is the approach taken in the assessment.

3.5.3 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. In accordance with this guidance, 5 years of meteorological data has been used (2016 – 2020). The closest meteorological data sites to the scheme are:

- Capel Curig. WMO Identifier 3305 (215m AoD)
- Mona, Anglesea, WMO Identifier 3301 (62m AoD); and
- Valley, Anglesea, WMO Identifier 3302 (11m AoD).

None of these sites is ideal for the proposed development location, however the closest of these data sets with good quality data is Capel Curig. This site lies approximately 20km from the proposed development site.

Meteorological data for Capel Curig was obtained in .met format and converted to .sfc and .pfl formats for use in AERMOD using AERMET Pro according to US EPA methodology[6]. 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, grassland and urban. A site roughness of 0.1m has been used for the modelling.

3.5.4 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 115m 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

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

features on the dispersion of emissions from the site. Topographical data has been obtained in digital (.ntf) format and incorporated into the assessment.

3.5.5 Source Parameters

Modelling inputs for the existing and proposed buildings are shown in Appendix C. The emission parameters are as shown in Table 3-2 below. Although the buildings are fitted with multiple stacks, these will not all operate continuously and modelling has therefore assumed that 3 stacks on the existing building and 2 on the extension will be operational at any one time.

Table 3-2
Stack Details

Building	Stack height (m)	Stack diameter (m)	Velocity (m/s)
Existing Building	6.5	1.0	6.0
Proposed Building	6.5	1.0	6.0

The temperature of all emissions has been taken as 20°C for all hours of the year.

A ranging area of 36074.67m^2 has been assumed for both the existing and proposed scenarios. Although the total area is much larger, the birds are most likely to be found closer to the buildings for safety.

3.5.6 Emission Rate

The process contribution is calculated as a result of the emissions from the proposed buildings and range. The SCAIL emission rate for free range (aviary system) of 0.08 NH^3 kg/pl/yr has been used. This is consistent with that accepted for planning application C17/1022/23/LL and accepted by consultees at during the planning and permitting stage. The emission rates are shown below for Scenario 0.

Table 3-3
Stack Emission Rates: Scenario 0

Stack	Emission (kg/yr)	% abatement	Emission (g/s) per stack
Existing S1	682.67	0%	0.0216472
Existing S2	682.67	0%	0.0216472
Existing S3	682.67	0%	0.0216472
Total	**2048**	**0%**	**0.06494**

The emission rates are shown below for Scenario 1.

Table 3-4
Stack Emission Rates: Scenario 1

Stack	Emission (kg/yr)	% abatement	Emission (g/s) per stack
Existing S1	614.40	0%	0.0194825
Existing S2	614.40	0%	0.0194825
Existing S3	614.40	0%	0.0194825
New S1	614.40	0%	0.0194825
New S2	614.40	0%	0.0194825
Total	**3072**	**0%**	**0.09741**

3.6 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 potential interest:

- Afon Gwyrfai A Llyn Cwellyn SAC / SSSI;
- Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC;
- Afon Seiont SSSI;
- Llwyn Y Coed SSSI;
- Pant Cae Haidd SSSI; and
- Llyn Padarn SSSI.

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

3.6.1 Afon Gwyrfai A Llyn Cwellyn SAC / SSSI

The SSSI citation for this site describes the Afon Gwyrfai A Llyn Cwellyn as follows:

> *'Afon Gwyrfai a Llyn Cwellyn is of special scientific interest for its geological and biological features. Features of special interest on this site are running and standing water, aquatic plant assemblage, floating water-plantain Luronium natans, Arctic charr Salvelinus alpinus, Atlantic salmon Salmo salar and otter Lutra lutra'*

OpenData maps and APIS indicate that this site is not sensitive to ammonia and / or nutrient nitrogen deposition.

3.6.2 Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC

The citation for this SAC shows that the site is characterised by:

- Shallow inlets and bays
- Intertidal mudflats and sandflats
- Reefs
- Subtidal sandbanks
- Sea caves

OpenData maps and APIS indicate that this site is not sensitive to ammonia and / or nutrient nitrogen deposition.

3.6.3 Afon Seiont SSSI

The Afon Seiont SSSI is a geological (stratigraphical) designation:

> *'Afon Seiont is a small, tidal river in the town of Caernarfon, North Wales. This site is of special interest for strata which are exposed in the west river bank (cliff) of Afon Seiont and in a former river cliff, inland, alongside the A487 some 200 m east of the river. The exposed rocks include strata from two series within the Ordovician Period, namely the Arenig and overlying Llanvirn series.'*

OpenData maps and APIS indicate that this site is not sensitive to ammonia and / or nutrient nitrogen deposition.

3.6.4 Llwyn Y Coed SSSI

The Llwyn Y Coed SSSI is a small but important Oak / Birch site with bryophites and epiphytes noted on the designation:

> *A small grazed sessile oakwood of the Teucrium scorodonia – Quercus/Betula (wood sage-oak/birch) type situated on a steep rocky north-east facing slope. The principle interest of the wood is its Atlantic flora which includes both British species of filmy ferns (Hymenophyllum wilsonii and H tunbrigense and an abundance of oceanic mosses, liverworts and lichens. It is one of the most important woodland sites in North Gwynedd for its woodland Atlantic bryophyte flora which includes the mosses, Grimmia hartmanii and Hyphen callichroun, and the liverworts, Adelanthus decipiens, Aphanolejeunea microscopica, Dreopanolejeunea hamatifolia and Jubula hutchinsiae. The continuity of a broadleaved tree cover on this ancient woodland site has helped this flora to survive.*

APIS and NRW Opendata information data shows that the woodland has a nutrient nitrogen critical load range of **10-15 Kg N/ha/year**. A critical level of **1 µg/m^3** applies at this site, according to NRW opendata sensitivity mapping information.

3.6.5 Pant Cae Haidd SSSI

The site is of special interest for its lowland fen meadow vegetation and associated habitats. APIS and NRW Opendata information data shows that the site (Moist and wet oligotrophic grasslands) has a nutrient nitrogen critical load range of **10-20 Kg N/ha/year**. A critical level of **3 µg/m^3** applies at this site.

3.6.6 Llyn Padarn SSSI

This site is notified for its biological (water based) and geological interest:

> *It is one of only three remaining natural localities in Wales for the Arctic charr Salvelinus alpinus L., a glacial relict fish species, and is a classic geological site of national importance.*

APIS and NRW Opendata information data shows that the site is not sensitive to the deposition of nutrient nitrogen. However, a critical level of **3 µg/m^3** applies at this site.

3.6.7 Model Input

Modelling was carried out with discrete receptors representing the 3 ecological sites of biological interest.

Table 3-5
Receptor Points

ID	Site	OS Xm	OS Ym	Elevation (m)
D1	Llwyn Y Coed	255532	362095	151.4
D2	Pant Cae Haidd	251733	360609	133.1
D3	Llyn Padarn	255731	362404	105.0

3.7 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 3-6
Baseline Conditions

Site	Vegetation	NH_3 concentration (µg/m^3)	Nutrient N (kg/ha/yr)
Llwyn Y Coed	Grassland	1.0	16.1
	Woodland	1.0	24.0
Pant Cae Haidd	Grassland	1.4	15.3
	Woodland	1.4	24.0
Llyn Padarn	Grassland	1.0	16.1
	Woodland	1.0	24.0

The existing concentration of ammonia all sites is below the upper critical level limit of 3 µg/m^3 but at (or above) the limit for sites designated for epiphytes and bryophites of 1 µg/m^3. Where impacts are above 1% of their respective limit, consideration of the existing background will be required.

The operators of the farm have confirmed that the unit was fully operational by November 2018, hence the impacts of the existing farm must be considered to be encompassed withing the latest APIS background data.

4.0 IMPACTS: PROCESS CONTRIBUTION

The results of the ammonia modelling for the proposed sheds is presented below.

4.1 Scenario 0: Baseline

4.1.1 Results: Critical Levels

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

Table 4-1
Results: Critical Levels (µg/m³)

ID	Site	Result	Critical Level	% of C.L.
D1	Llwyn Y Coed	0.01539	1.0	1.5%
D2	Pant Cae Haidd	0.01753	3.0	0.6%
D3	Llyn Padarn	0.02336	3.0	0.8%

Impacts at sites where the critical level applies are predicted to be below 1% of the critical level at D2 and D3 but above 1% at Llwyn Y Coed. The impact is therefore insignificant at D2 and D3 but not insignificant at D3. As the existing building was constructed prior to 1st January 2019 this impact will form part of the APIS background.

4.1.2 Results: N Nitrogen Critical Load

The nutrient nitrogen critical load result at each ecological site is shown in table 4-2.

Table 4-2
Results: N Deposition (kgN/ha/yr)

ID	Site	Result	Critical Load	% of C.L.
D1	Llwyn Y Coed	0.120	10.0	1.2%
D2	Pant Cae Haidd	0.091	10.0	0.9%
D3	Llyn Padarn	0.030	---	---

Impacts at D1 Llwyn Y Coed are predicted to be above 1% of the critical load. At all other sites the impact is below 1% or the site is not sensitive to N deposition. As the existing building was constructed prior to 1st January 2019 this impact will form part of the APIS background.

4.2 Scenario 1: Proposed

4.2.1 Results: Critical Levels

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

Table 4-3
Results: Critical Levels (µg/m³)

ID	Site	Result	Critical Level	% of C.L.
D1	Llwyn Y Coed	0.0233	1.0	2.3%
D2	Pant Cae Haidd	0.0264	3.0	0.9%
D3	Llyn Padarn	0.0352	3.0	1.2%

Impacts at Llwyn Y Coed and Llyn Padarn from the existing and proposed developments are predicted to be above 1% of the critical level. At Pant Cae Haidd the impact is predicted to be less than 1%. As the existing building was constructed prior to 1st January 2019 the impact of the existing building will form part of the APIS background.

4.2.2 Results: N Nitrogen Critical Load

The nutrient nitrogen critical load result at each ecological site is shown in table 4-4.

Table 4-4
Results: N Deposition (kgN/ha/yr)

ID	Site	Result	Critical Load	% of C.L.
D1	Llwyn Y Coed	0.181	10.0	1.8%
D2	Pant Cae Haidd	0.137	10.0	1.4%
D3	Llyn Padarn	0.046	---	---

Impacts at Llwyn Y Coed and Pant Cae Haidd from the existing and proposed developments are predicted to be above 1% of the critical load. Llyn Padarn is not sensitive to nutrient nitrogen deposition. As the existing building was constructed prior to 1st January 2019 the impact of the existing building will form part of the APIS background.

4.3 Scenario Comparison

The operators of the farm have confirmed that the unit was fully operational by November 2018, hence the impacts of the existing farm must be considered to be encompassed withing the latest APIS background data.

4.3.1 Results: Critical Levels

The increase in ammonia impacts at each of the three receptors as a result of the scheme is presented below.

Table 4-5
Results: Critical Levels (µg/m³)

ID	Site	Existing	Proposed	Increase	% of C.L.
D1	Llwyn Y Coed	0.0154	0.0233	0.0079	0.8%
D2	Pant Cae Haidd	0.0175	0.0264	0.0089	0.3%
D3	Llyn Padarn	0.0234	0.0352	0.0119	0.4%

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.

4.3.2 Results: N Nitrogen Critical Load

The increase in nutrient Nitrogen impacts at each of the three receptors as a result of the scheme is presented below.

Table 4-6
Results: Critical Levels (µg/m³)

ID	Site	Existing	Proposed	Increase	% of C.L.
D1	Llwyn Y Coed	0.120	0.181	0.061	0.61%
D2	Pant Cae Haidd	0.091	0.137	0.046	0.46%
D3	Llyn Padarn	0.030	0.046	0.015	---

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.

4.4 In-Combination Effects

A search of new sites (from 1st January 2019) within 5km of one of the above ecological sites and with the potential to emit ammonia has been undertaken. The results are as shown below. There are no sources with the potential to have a significant impact on the SSSIs which are not included within the APIS background and require further assessment or consideration.

4.4.1 Poultry

Application Ref: **C20/0555/32/SC**. Screening Opinion. Crugeran, Sarn Mellteyrn, Pwllheli, Gwynedd, LL53 8DT. Screening opinion for a poultry unit for 32,000 hens This source is 40km away from the application site.

4.4.2 Broilers

There are no relevant applications on the planning portal.

4.4.3 Pigs

There are no relevant applications on the planning portal.

4.4.4 Slurry Lagoon

Application Ref: **C20/1053/41/LL.** Full Planning. Cefn Gwyn, Chwilog, Pwllheli, Gwynedd, LL53 6PR. Erection of new Livestock cubicle building together with the formation of lined slurry lagoon. This source is 27km away from the application site.

Application Ref: **C20/0150/46/LL**. Full Planning. Pant Gwyn, Tudweiliog, Pwllheli, Gwynedd, LL53 8PE. Create slurry store underneath the floor of an existing agricultural building This source is 38km away from the application site.

Application Ref: **C19/1169/14/LL**. Full Planning. Pengelli Isaf Bethel Road, Caernarfon, Gwynedd, LL55 1UH. Creation of slurry lagoon and construction of agricultural structure. This source is 5.6km away from Llwyn Y Coed SSSI and 3. 7km from Pant Cae Haidd SSSI.

Application Ref: **C19/0530/20/LL**. Full Planning. Fferm Bryn, Llanfair Is Gaer, Caernarfon, Gwynedd, LL551TU. Engineering works to create an external slurry lagoon This source is 5.6km away from Llwyn Y Coed SSSI and 5.0 km from Pant Cae Haidd SSSI.

Application Ref: **C19/0500/35/LL**. Full Planning Fferm Penystumllyn, Ffordd Porthmadog, Criccieth, Gwynedd, LL520PS. Construction of agricultural building with a slurry store underneath. This source is 25km away from the application site.

Application Ref: **C19/0456/32/LL**. Full Planning. Bod Gaeaf Uchaf, Bryncroes, Pwllheli, LL538EB. Extend slurry and manure store and construction of roof above. This source is 43km away from the application site.

Application Ref: **C19/0277/30/LL**. Full Planning. Cae'r Odyn, Rhiw, Pwllheli, Gwynedd, LL538AS. Agricultural shed to store manure and slurry store. This source is 48km away from the application site.

Application Ref: **C18/1139/46/LL**. Full Planning. Construction of agricultural building to include milking parlour and underground slurry tank. This source is 37km away from the application site.

Application Ref: **C18/0387/40/LL**. Full Planning. Agricultural building with underground slurry pit and new access. This source is 29km away from the application site.

4.5 Summary

The existing concentration of ammonia all sites is below the upper critical level limit of 3 µg/m^3 but at (or above) the limit for sites designated for epiphytes and bryophites of 1 µg/m^3. The existing nutrient nitrogen deposition rate is above the lower N critical load for each of the 3 SSSI. The existing shed falls within this background level, having been constructed before 1st January 2019.

The following NRW May 2021 Guidance is therefore 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 extension only:

- 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.
- There are no other schemes with the potential to increase the APIS background.

5.0 CONCLUSIONS

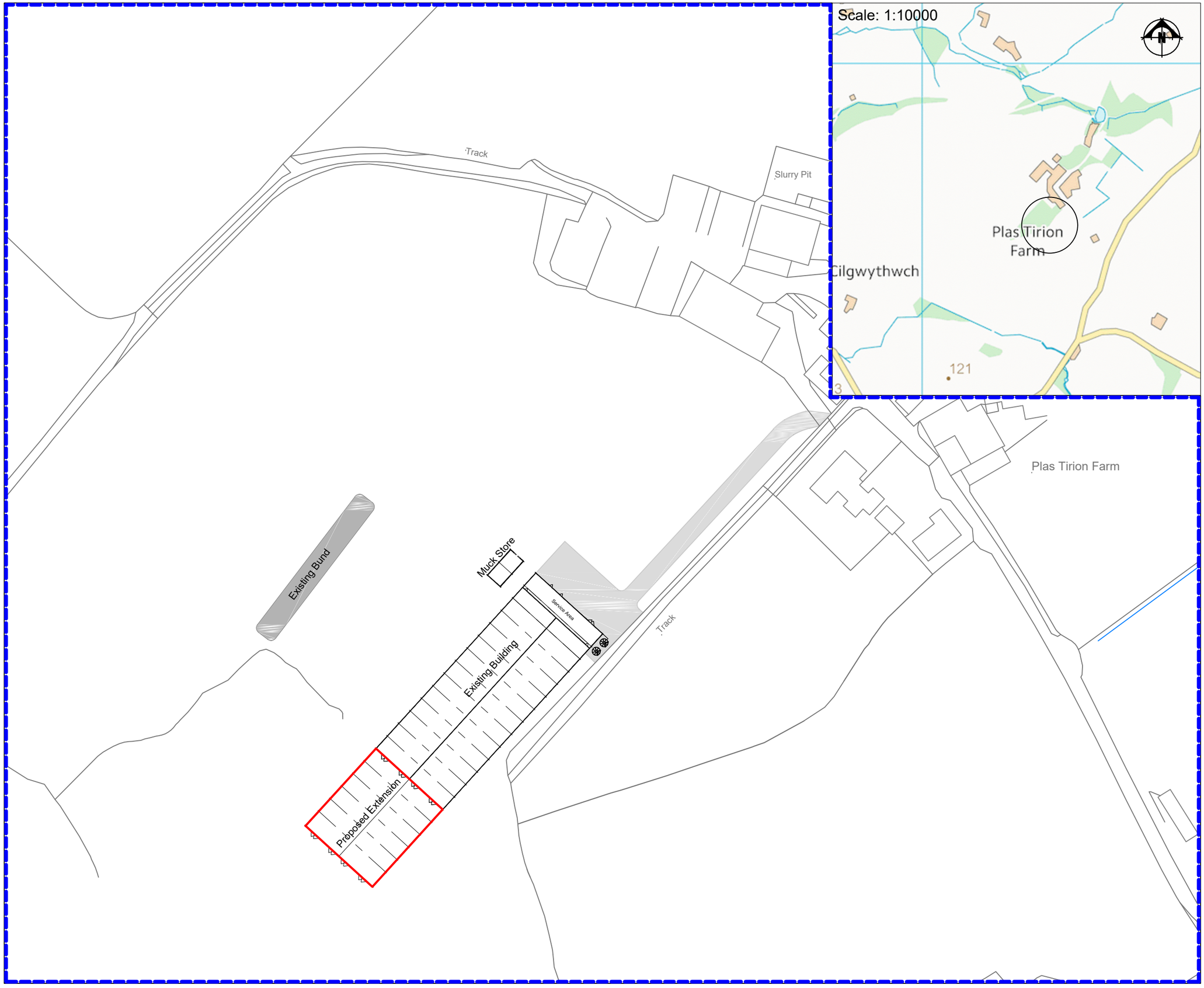
Isopleth Ltd has been commissioned by Roger Parry & Partners LLP, on behalf of D & CH Mackinnon to carry out a detailed assessment of ammonia impacts associated with a proposed extension to an existing poultry unit on land near Plas Tirion Farm, Llanrug, Caernarfon LL55 4PY.

The type, source and significance of potential impacts have been identified and detailed modelling undertaken in line with guidance issued by Natural Resources Wales (May 2021).

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 shows that impacts at all designated ecological sites will be below 1% of the relevant critical level and nutrient nitrogen critical load and 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 Gwynedd and NRW assessment criteria. As such the development is unlikely to adversely impact protected sites.

APPENDIX A



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Blue Boundary

Red Boundary

Rev	Description	Date	Dr by	App by

Original by

Roger Parry & Partners

Residential - Agricultural - Commercial

Job	Extension to a free range egg production unit
Title	Location Plan
Location	Plas Tirion Farm Llanrug Caernarfon LL55 4PY
Client	.
Scales	1:1250 @ A3
Drawing No.	RJC-AZ170-11
Drawn by	AZ
Date	21/05/2021

HOGSTOW HALL, MINSTERLEY
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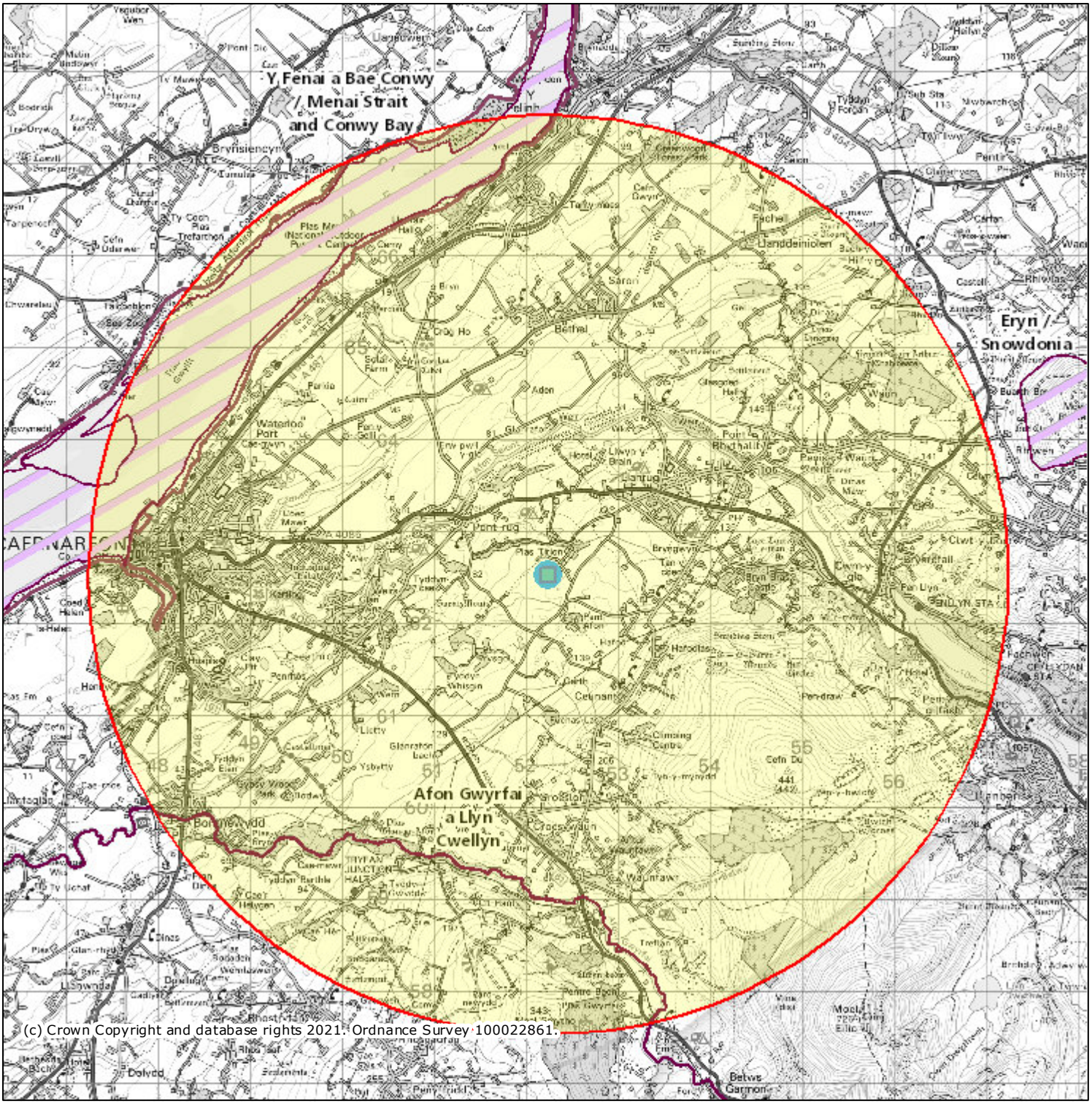
Tel: 01743 791336 Fax: 01743 792770
email: mail@rogerparry.net
Web address: www.rogerparry.net

APPENDIX B

Magic Map



Legend

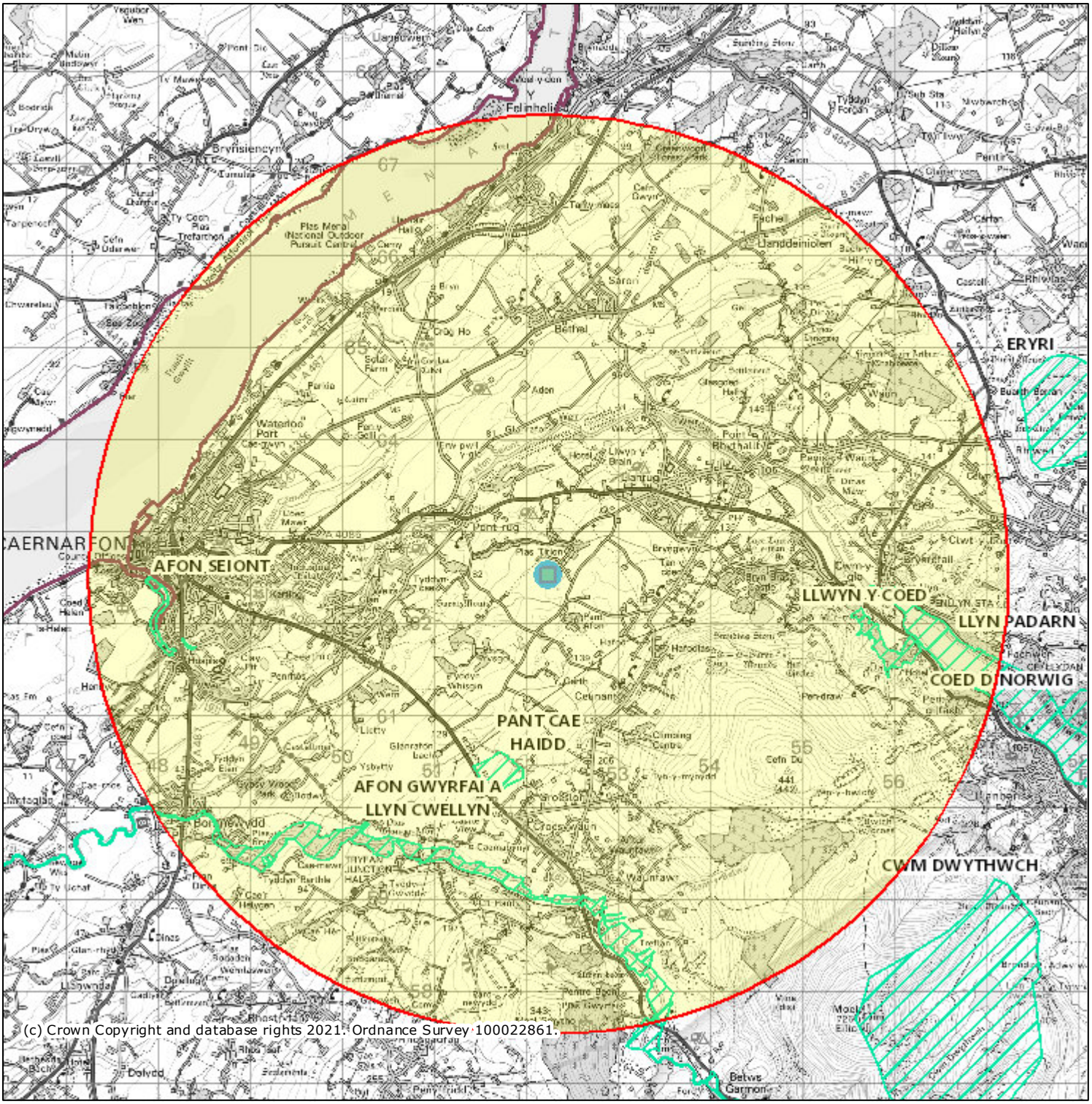
- Ramsar Sites (Wales)
- Special Areas of Conservation (Wales)
- Special Protection Areas (Wales)

0 1.5 3
km

Projection = OSGB36
xmin = 237100
ymin = 355500
xmax = 267300
ymax = 370000

Map produced by MAGIC on 24 June, 2021.

Magic Map



Legend

Sites of Special Scientific Interest (Wales)

0 1.5 3
km

Projection = OSGB36
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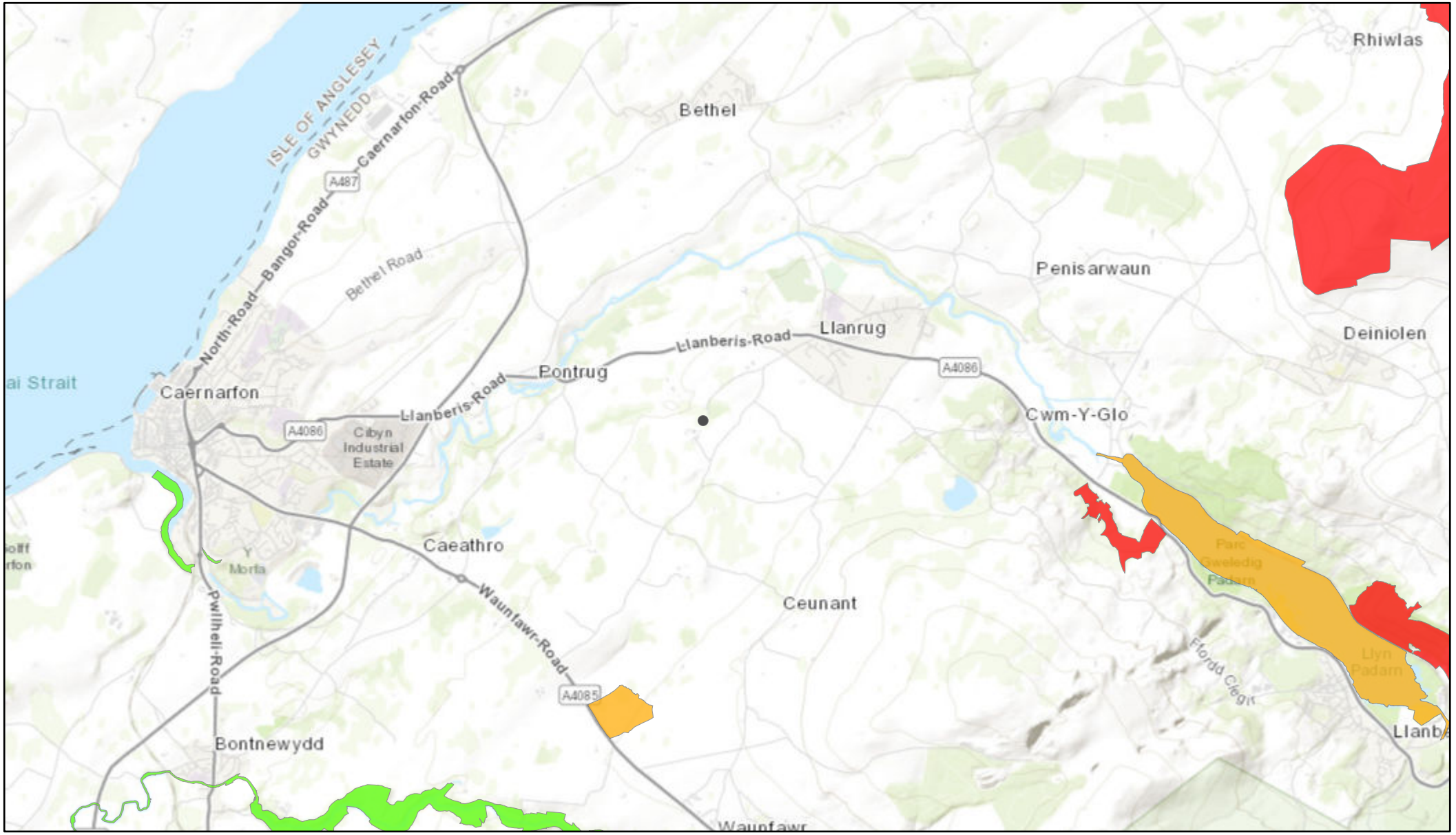
ymax = 370000

Map produced by MAGIC on 24 June, 2021.

NRW SMNR Portal



6/23/2021, 3:35:40 PM

SSSI NH3 Critical Levels

- Features considered Not Sensitive to NH3
- 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

0 0.38 0.75 1.5 mi

0 0.5 1 2 km

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA

Cyfoeth Naturiol Cymru Natural Resources Wales

APPENDIX C

Table C-1
Source Locations: Stacks

Stack ID	Reference	Location (OS Xm)	Location (OS Ym)	Basal Height (mAoD)
EBS1	Existing S1	252247.5	362565.7	115
EBS2	Existing S2	252231.7	362548.3	115
EBS3	Existing S3	252215.8	362530.9	115
NBS1	New S1	252200.0	362513.3	115
NBS2	New S2	252191.9	362504.2	115

Table C-1
Source Locations: Ranging Area (Nodes)

Node	Location (OS Ym)	Basal Height (mAoD)
1	252240.6	362584.4
2	252168.3	362504.5
3	252195.3	362479.7
4	252267.1	362560.6
5	252324.8	362509.9
6	252188.8	362350.2
7	252048.5	362491.5
8	252180.7	362639.9

[total Area: 36074.67m^2]

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