

R J HUGHES POULTRY
ARGOED FARM, TREFEGLWYS, POWYS

ODOUR IMPACT ASSESSMENT

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CONTENTS

1.0	INTRODUCTION	3
1.1	Site Location	3
1.2	Proposed Development.....	3
1.3	Environmental Permitting	4
1.4	Scope and Limitations	4
1.5	Aims and Objectives	4
2.0	ASSESSMENT METHODOLOGY	5
2.1	General Approach.....	5
2.2	Assessment of Odour Exposure.....	5
2.3	Identification of Odour Sources	6
2.4	Derivation of Emissions	6
2.5	Quantification of Odour Impact	6
2.6	Assessment Scenarios	7
3.0	REGULATORY STANDARDS AND GUIDELINES	8
3.1	UK Guidance	8
3.2	Planning vs. Permitting: Planning Policy Wales.....	8
3.3	NRW H4 guidance.....	9
3.4	IAQM Odour Guidance	10
4.0	RECEPTORS, VENTILATION FLOWS AND EMISSIONS	11
4.1	Site Setting.....	11
4.2	Ventilation flows.....	12
4.3	Emission Rates.....	13
4.3.1	Free Range (Existing)	13
4.3.2	Broiler (Proposed)	13
5.0	ODOUR IMPACT ASSESSMENT	15
5.1	Model Domain	15
5.2	Model Assumptions.....	15
5.3	Building Downwash / Entrainment	15
5.4	Local Wind Speed and Direction Data	15
5.5	Temperature.....	17
5.6	Met Data Preparation.....	17

5.7	Topography.....	17
5.8	Modelled Release Parameters	18
6.0	RESULTS.....	19
7.0	CONCLUSIONS	21
	Appendix A.....	22
	Appendix B	25
	Appendix C	29



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1.0 INTRODUCTION

Additional poultry rearing (broiler) sheds are proposed on land adjacent to an existing free range (laying) shed at Argoed Farm, Trefeglwys, Powys. This farm lies within the administrative area of Powys Council. 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.

This assessment presents the result of the detailed dispersion modelling exercise aimed at predicting the odour impact of the proposed facility.

1.1 Site Location

The application site is located south of the B4569 between Trefeglwys approximately 2km to the SW and Caersws 3.5km to the east at OS GR 299115, 291345. The site setting can be seen in Appendix A, which are drawings submitted with the planning application and have been reproduced courtesy of Berrys.

The closest residences to the poultry facility are those associated with Argoed Farm (i.e. the applicant, family and tenants). Argoed Farm is shown, alongside assessed receptors, some of which are also associated with the farm, in Drawing OIA1.

1.2 Proposed Development

The site currently consists of a single free-range laying building, housing 32,000 birds. The applicant is now seeking to adapt the existing building to accept broilers as well as constructing 3 additional houses for a total maximum capacity of 220,000 birds across the 4 sheds.

The broilers will be brought in as day old chicks at a 50-50 mix of males and females. The 36 day growth period will lead to birds being around 2.0kg in weight by clearout.

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.

For the comfort and productivity of the birds the temperature within the houses must be regulated. The fans will operate at a variable rate dependent upon the age of the birds and will only be switched off when the sheds are vacant. There is sufficient fan capacity (including back-up systems) to ensure that the comfort of the birds is maintained even in the event that the outside ambient temperature rises above 30°C.

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

1.3 Environmental Permitting

The Planning and Environmental Permitting processes are separate, but complementary, as discussed further in section 3.2 of this report. At the time of writing, an application for an Environmental Permit to cover the broiler facility has yet to be made to Natural Resources Wales (NRW). An Odour Management Plan aimed at ensuring that the operation of the facility will be acceptable in relation to odour will be prepared in support of that application.

Paragraph 5.13.3 of Planning Policy Wales (Edition 10, December 2018) requires that the local planning authority must assume that the Permit will operate effectively in preventing unacceptable levels of odour at relevant receptor locations.

1.4 Scope and Limitations

The scope of this OIA is limited to the prediction, through atmospheric dispersion modelling, of impacts at local sensitive receptors based on design information and desktop emission rates.

Assessment of impacts associated with emissions of ammonia on sensitive ecological sites is outside the scope of this report, which deals with issues of odour only.

1.5 Aims and Objectives

The objectives of the assessment are as follows:

- To estimate odour emissions from the proposed facility with additional sheds and birds;
- To quantify impacts on sensitive receptors based upon the emission values; and
- To assess the significance of these impacts.

2.0 ASSESSMENT METHODOLOGY

2.1 General Approach

The approach taken in this assessment is consistent with that for other broiler applications in Powys, where the same general approach has been regarded as acceptable, for example:

1. Application Ref. No: P/2017/1109. Proposed erection of a broiler shed to include 2 no. feed silos and associated works. Ddole Farm, Llanbister LD1 6SS.
2. Application Ref. No: P/2017/1031 Erection of an agricultural building for free range broiler production and associated works. Tanhouse Dolau, Llandrindod Wells LD1 5TL.
3. Application Ref. No: P/2017/0325. Proposed erection of 2 no. Poultry buildings for broiler breeder rearing, four no. feed bins, new access track, improvements to existing entrance, creation of one new passing place installation of septic tank and associated development. Cwmroches, Llandrindod Wells, LD1 5SY.

In the above cases Powys Council has referred to the requirement for an NRW Environmental Permit and therefore has complied with Paragraph 5.13.3 of Planning Policy Wales thus avoiding duplication between the two regulatory regimes.

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.

2.2 Assessment of Odour Exposure

In the UK, odour assessments for poultry facilities are most commonly undertaken using the concept of the European Odour Unit (ou_E), as defined in BS EN 13725¹. This approach allows impact assessment of any odorous gas as it is independent of chemical constituents and centres instead on multiples of the detection threshold of the gas in question.

As the odour unit is a Standard Unit in the same way as gram or milligram, the notation used in odour assessment follows the conventions of any mass emission unit as follows:

- concentration: ou_E/m^3
- emission: ou_E/s
- specific emission (emission per unit area): $ou_E/m^2/s$

¹ BS EN 13725:2003 *Air Quality – Determination of Odour Concentration by Dynamic Olfactometry*.

Like air quality standards for individual pollutants, exposure to odour is given in terms of a percentile of averages over the course of a year. The exposure criteria most accepted in the UK at present is given in terms of (concentration) European Odour Units as a 98th percentile (C_{98}) of hourly averages. This allows 2% of the year when the impact may be above the limit criterion (175 hours). The notation for impact is therefore: $C_{98, 1 \text{ hour}} \times \text{ou}_E/\text{m}^3$.

Odour perception, annoyance and nuisance is related to more than simply odour impact, the five 'FIDOL' factors² must also be considered when assessing the acceptability of a scheme and the appropriateness of a limit criterion.

2.3 Identification of Odour Sources

Potential sources of odorous emissions from the proposed facility have been identified on the basis of a review of the proposed development design. This involves identifying sources of potential releases to atmosphere. The identified potential odour sources are as follows:

- Point sources (from the broiler house ventilation); and
- Waste product handling and spillages etc.

Control of fugitive / intermittent releases of odour will be addressed by a site Odour Management Plan as part of the Permitting process.

2.4 Derivation of Emissions

The anticipated odour emissions for the proposal have been estimated using values given in published literature in the UK and Europe for similar facilities. Ventilation flows are based on standard best practice design for UK broiler houses.

The odour emission rates applied should be considered worst case as they have been measured at facilities which do not apply the same odour prevention measures as will be adopted at the facility at Argoed Farm. In reality emission rates would be expected to be significantly lower.

2.5 Quantification of Odour Impact

Data derived from the previous stages is input to an atmospheric dispersion model. For this assessment the AERMOD model³ has been applied with due consideration to relevant guidance⁴. This model is widely used and accepted by the NRW and UK planning authorities for undertaking such assessments and its predictions have been validated against real-time monitoring data by the USEPA. It is therefore considered a suitable model for this assessment.

² The FIDOL factors are defined as **F**requency, **I**ntensity (and therefore concentration), **D**uration, relative **O**ffensiveness (hedonic tone/character) and **L**ocation,

³ Software used: BREEZE AERMOD Pro, v8.1.0.17

⁴ USEPA, Aermod Implementation Workgroup, Aermod Implementation Guide, (EPA-454/B-18-003 April, 2018).

Dispersion modelling guidance indicates that at least 3 (and ideally 5) years of meteorological data should be applied to ensure that infrequent weather conditions do not unduly bias the results. This results in a range of predicted impacts for different years of meteorological data and the average value is used to assess compliance, with the range of impacts used to assess likely variation between years and the risk of shorter-term impacts. This is particularly important in relation to odour, where acceptability of impacts is assessed by receptor over long time periods rather than as a result of infrequent or unusual meteorological conditions.

2.6 Assessment Scenarios

Two scenarios have been modelled to represent the existing emissions from the free-range layer facility and also the typical operation of the proposed facility, with the maximum proposed number of broilers on a 36 day cycle with thinning at day 30.

The results of the dispersion modelling have been presented in the form of:

- illustrations of the odour footprint as isopleths (contours of concentration) for the criteria selected enabling determination of impact at any locations within the study area; and
- tabulated odour concentrations ($C_{98, 1\text{-hour}} \times \text{ou}_E/\text{m}^3$) at discrete receptor locations to facilitate the discussion of results.

3.0 REGULATORY STANDARDS AND GUIDELINES

Currently, in the UK there are no statutory numerical standards for assessing the acceptability of predicted odour impacts from quantitative odour impact assessments. On this basis, odour impact criteria are typically based upon guideline documents (predominately based on research from outside of the UK), case law and research which differ depending on the regime i.e. planning (to avoid significant detriment to amenity) or permitting (to avoid unacceptable pollution).

The numerical limits applied have largely been derived from the findings of a limited number of epidemiological assessments where modelled odour impacts have been compared to the findings of quality of life surveys; a dose-effect study. These dose-effect studies have only been undertaken for a limited number of odour types; however they have been used as the foundation for the setting of acceptable odour standards in many countries.

The actual acceptable level of impact will be dependent on the nature (offensiveness) of the odour and the broad sensitivity of the population. To account for this differing numerical limits are often set not only depending on the offensiveness of the odour but also the broad sensitivity of the environment.

3.1 UK Guidance

UK guidance identifies a range of odour impact criteria depending primarily on the nature of the odour (i.e. its pleasantness/unpleasantness) and the likelihood of causing unacceptable impacts based on the 98th percentile of predicted hourly average concentrations over a year.

It is therefore evident that such criteria apply only to locations where an individual's exposure is likely to occur for prolonged periods of time i.e. residential properties. Where exposure is more transient (i.e. roads, footpaths etc.) the direct application of such criteria should be treated with caution and further consideration should be given to how the duration and frequency of exposure of the individual will influence the acceptability of the predicted impact.

3.2 Planning vs. Permitting: Planning Policy Wales

The Welsh Government released Planning Policy Wales (Edition 10) in December 2018. As described above, this includes information for sites which will fall under the Environmental Permitting regime, regulated by NRW:

'5.13.3 Planning authorities, other relevant local authority departments and Natural Resources Wales (NRW) must work closely together to ensure that conditions attached to planning permissions and those attached to Environmental Permits are complementary and do not duplicate one another. Sufficient information should accompany development proposals in order for planning authorities to be satisfied that proposals are capable of effective regulation. NRW should assist the planning authority in establishing this position through the provision of appropriate advice. The parallel tracking of planning and environmental permitting applications should be the

preferred approach, particularly where proposals are complex, so as to assist in mitigating delays, refusal of applications or conditions which may duplicate the permit/licence.'

This is the approach that has been adopted in relation to similar applications in Powys.

3.3 NRW H4 guidance

NRW has published a number of guidance documents relating to odour assessment. These include the Horizontal Guidance EPR H4 – Odour Management⁵.

The H4 guidance proposes the use of installation-specific exposure criteria (benchmarks) on the basis that not all odours are equally offensive, and not all receptors are equally sensitive. The conditions of a Permit will balance these installation-specific odour exposure criteria against what is realistically achievable in accordance with the concept of Best Available Techniques (BAT).

The Guidance states:

'..benchmarks are based on the 98th percentile of hourly average concentrations of odour modelled over a year at the site/installation boundary. The benchmarks are:

1.5 odour units for most offensive odours;

3 odour units for moderately offensive odours;

6 odour units for less offensive odours.'

Examples of these three categories are:

'Highly offensive:

processes involving animal or fish remains biological landfill odours
processes involving septic effluent or sludge

Moderately offensive:

intensive livestock rearing sugar beet processing
fat frying (food processing) well aerated green waste composting

Less offensive:

brewery coffee roasting
confectionery bakery'

These benchmark limits are precautionary and may be relaxed in cases where the source is familiar to the location. This is particularly the case in relation to intensive agriculture in a rural setting. For example, research relating to broiler farms indicates that a more representative nuisance threshold for an agricultural area should be anywhere from 3.3 – 8.8

⁵ H4 Odour Management: How to comply with your environmental permit.

$\text{ou}_\text{E}/\text{m}^3$ as a 98th percentile of hourly means⁶, or even $9.7 \text{ ou}_\text{E}/\text{m}^3$ (as a 98th percentile)⁷. This is consistent with guidance published by the EA in relation to nuisance thresholds as a function of site setting^{8,9} and also regulation applied in Ireland, where the Environmental Protection Agency (EPA, Ireland) recommended criterion is $6.0 \text{ ou}_\text{E}/\text{m}^3$ as a 98th percentile of hourly means for existing units. The H4 (and IPPC SRG 6.02, below) benchmarks should therefore be seen as a guide of the relative likelihood of an odour issue being caused rather than an absolute limit value, particularly in an agricultural setting.

3.4 IAQM Odour Guidance¹⁰

On 20th May 2014 the Institute of Air Quality Management released guidance on the assessment of odour for planning. This was updated in 2018.

The guidance is for assessing odour impacts for planning purposes. It provides background information relating to requirements for odour impact assessments and suitable impact criteria and draws from other sources of information such as that described in the H4 guidance (Section 3.3, above).

The IAQM odour guidance requires a degree of professional judgement when considering potential effects of environmental odours. Given the site setting and the number of residences potentially affected, the IAQM odour guidance may be used to classify to the impact from an intensive agricultural facility (i.e. for a 'moderately offensive odour') at a high sensitivity receptor as:

- 'negligible' at below $1.5 \text{ ou}_\text{E}/\text{m}^3$;
- 'slight adverse' from $1.5 \text{ ou}_\text{E}/\text{m}^3$ – $3.0 \text{ ou}_\text{E}/\text{m}^3$ as a 98th percentile of hourly means; or
- 'moderate adverse' impact above from $3.0 \text{ ou}_\text{E}/\text{m}^3$ to $5.0 \text{ ou}_\text{E}/\text{m}^3$ as a 98th percentile of hourly means.

Only a moderate impact (or greater) would be regarded as 'significant' for purposes of environmental assessment when considering the overall planning balance.

This document is not intended to provide guidance on odour for environmental protection regulatory purposes (e.g. Environmental Permitting).

⁶ Misselbrook, Clarkson and Pain (1993) *Relationship between concentration and intensity of odours for pig slurry and broiler houses*.

⁷ Hayes, E.T., Curran, T.P and Dodd, V.A. (2006) *Odour and ammonia emissions from intensive poultry units in Ireland*. Bioresource Technology 97 pp933-939

⁸ EPA (2001) *Odour Impacts and Odour Emission Control Measures for Intensive Agriculture*. R&D REPORT SERIES No. 14. pp31.

⁹ Environment Agency (2002) *Assessment of Community Response to Odorous Emissions*. R&D Technical Report P4-095/TR. pp63

¹⁰ IAQM (2018) *Guidance on the assessment of odour for planning*

4.0 RECEPTORS, VENTILATION FLOWS AND EMISSIONS

4.1 Site Setting

Discrete receptor locations have been selected for comparative purposes to facilitate the discussion of predicted odour impacts; in general they represent the closest residential locations in each direction. These are as presented in Table 4-1 and shown in Drawing OIA1.

Table 4-1
Discrete Receptor Locations Modelled

Reference	Description	National Grid Reference	
		OS Xm	OS Ym
D1	Argoed Farm (not sensitive)	298903.1	291335.8
D2	Tan Y Graig (not sensitive)	298987.2	291476.8
D3	Oaktree Cottage	299024.2	291546.0
D4	Pen Ffrydd (not sensitive)	298951.5	291534.9
D5	Penrhos	298891.6	291547.3
D6	Ysgubor Hir	298864.3	291583.9
D7	Llys Trannon	298706.6	291429.6
D8	Heulwen	298555.7	291609.2
D9	Cefn	299180.9	291799.3
D10	Ffrid-uchaf	299550.1	291867.6
D11	Coed-Y-Ffridd	299706.2	291829.5
D12	Fron-Derw	299628.6	291689.2
D13	Pen-Y-ffynnon	299652.0	291578.0
D14	Caesidanen	299542.9	291391.3
D15	Ddreenan-Ddu	299536.8	291242.3
D16	Llechwedd-Ddyrys	299739.8	291238.3
D17	Mid Wales Clay target centre	298307.4	291078.1

The occupants of Argoed Farm (D1) have a vested (economic) interest in the success of this development and also are in a position to directly affect the emissions from the facility and their movements in relation to them. They must therefore not be regarded as sensitive receptors for purposes of odour assessment. Similarly, the family also owns properties:

- D2: Tan Y Graig; and
- D4: Pen Ffrydd

Receptor D3 Oaktree Cottage has not been occupied for over 5 years although there is the potential for this to be occupied in the future.

In addition to assessment of impact at discrete receptors, a receptor grid has been used to allow the production of and odour isopleth drawing.

4.2 Ventilation flows

Ventilation is important for the birds' health and will therefore affect production levels. It is applied when cooling is required, and for maintaining the composition of the indoor air at the required levels.

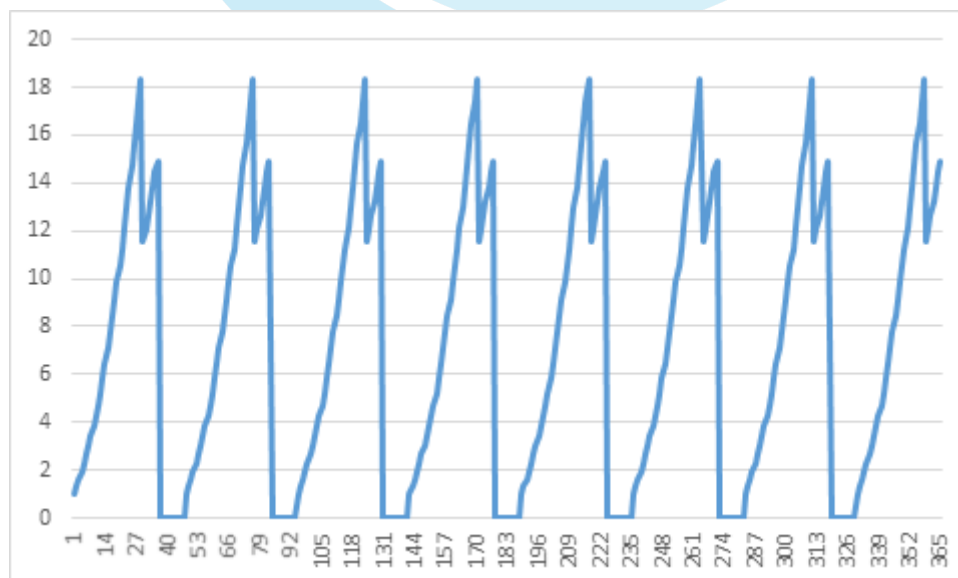
Directive 2007/43/EC lays down minimum requirements for environmental parameters that need to be ensured, namely:

- NH_3 concentration not exceeding 20 ppm;
- CO_2 concentration not exceeding 3 000 ppm;
- indoor temperature, when the outside temperature measured in the shade exceeds 30 °C, not exceeding this outside temperature by more than 3 °C; and
- indoor average humidity, measured over 48 hours, not exceeding 70 % when the outdoor temperature is below 10 °C.

Design ventilation flows have been provided by the designers of the facility. The 15 No. roof ridge fans per building are likely to be Fancom 800mm units, or equivalent. Each fan is capable of moving a maximum of 17500m³/hr (4.9m³/s) air. The units will also be fitted with gable end tunnel fans in case of additional ventilation requirement on the hottest days. For purposes of modelling it has been assumed that all flows are from the ridge fans.

The variation in ventilation rate is based on the welfare needs of the birds and is a function of external temperature and bird age / size. Figure 4-1 below presents the variation in flow (m³/s) per shed (X axis) against the days over 365 days (Y axis) for a minimum ventilation rate. This ventilation rate will increase with ambient temperature. The drop at day 30 in the graph relates to the reduced numbers after thinning of the crop.

Figure 4-1
Required Ventilation Rate (total)



4.3 Emission Rates

4.3.1 Free Range (Existing)

Odours from free range operations are generally lower than for intensive broiler operations due to the birds being more widely spaced and also able to range away from the house. The odour emission rate for a free range layer shed will be largely constant and for purposes of this modelling is based on a NRW accepted odour emission factor of 0.47 ou_E/s per bird:

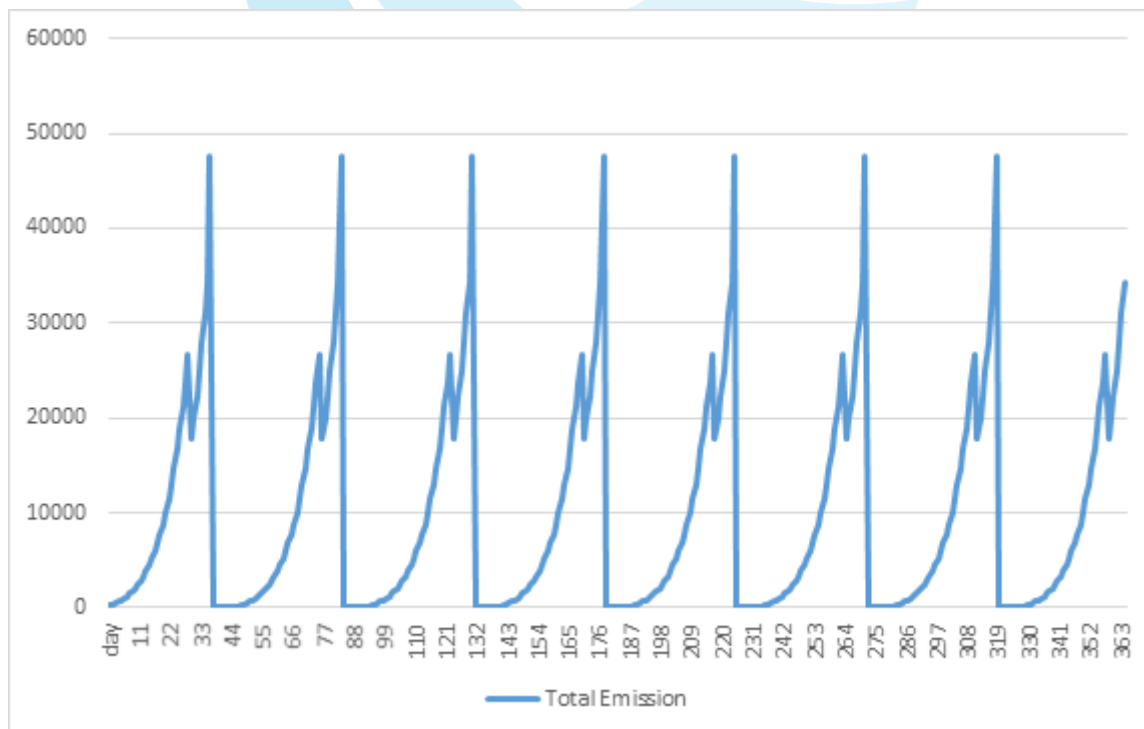
- 32000 birds;
- 15040 ou_E/s;
- 11 stacks;
- 1367.3 ou_E/s per stack.

Due to the lower ventilation requirements for layers an efflux velocity of 3m/s has been applied for purposes of modelling.

4.3.2 Broiler (Proposed)

The emission rates used are calculated from an internal concentration of odour taken from published values which indicate a likely range for a well run modern farm of 300ou_E/m³ – 2300 ou_E/m³ across a 36 day growth cycle. The use of this concentration range has been accepted for multiple sites by both Powys Council and NRW. The time varying emission rates used represent the emissions for each sheds (housing 55,000 birds) is as shown below.

Figure 4-2
Emission rate (ou_E/s per house)



It can be seen in Figure 4-2 that the relative proportion of emissions will vary across the cycle, with the peak during clearing out (as would be expected).

Research has shown that the use of indirect heating, will result in a significantly improved building environment and lower emissions, particularly of ammonia and carbon dioxide. This in turn improves the growth rate and performance of the birds. The quality of the litter and in particular the moisture content, will also determine the overall odour emission.



5.0 ODOUR IMPACT ASSESSMENT

The dispersion model was constructed based on the input parameters described below.

5.1 Model Domain

Modelling was carried out at 40m resolution over a 1.2 km by 1.2 km grid. In addition, the identified potentially sensitive locations, detailed in Table 4-1, were modelled as discrete receptors.

Other receptors may be relevant, such as other individual residences in Trefeglwys and for these receptors, the odour isopleths are available.

5.2 Model Assumptions

The temperature of the flows from the fan units has been assumed at 22°C, which is at the lower end of the range for the entire cycle (the younger birds will typically be housed at a temperature slightly above this). The velocity from the ridge fans has been taken as 6m/s which is regarded as cautious in terms of dispersion.

5.3 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 houses have a pronounced ridge which cannot be incorporated into the model. The roof height modelled is 4.818m.

5.4 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.

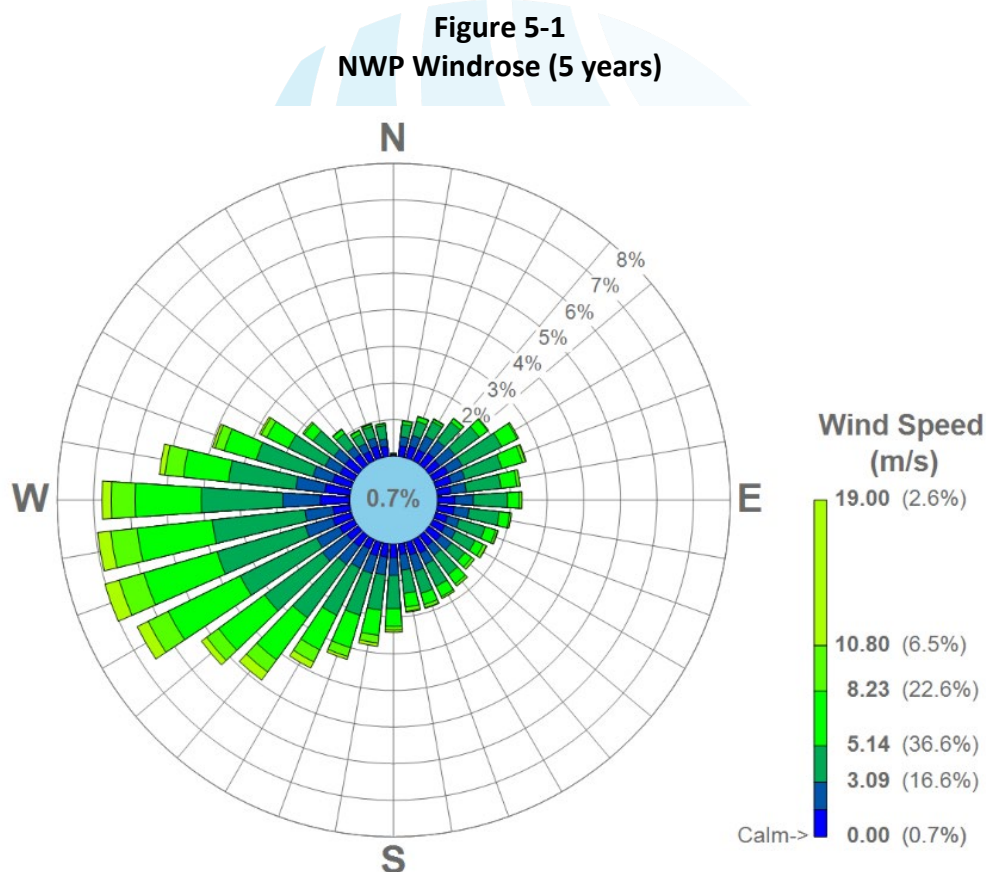
- Trawsgoed;
- Lake Vyrnwy No2; and
- Shobdon Airfield.

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 5.6). 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 5-1, below.



5.5 Temperature

Analysis of 5 years (2014-2018) meteorological data recorded at Shobdon shows that temperatures very rarely exceed 25°C. Missing data has been excluded.

Table 5-1
Shobdon Meteorological Summary (5 years data)

Minimum Temp °C	Maximum Temp °C	Number of Hours	% of year	% of year cumulative	Average hours per year
	<-10	4	0.01%	0.01%	1
-10	-5	100	0.2%	0.24%	20
-5	0	1753	4.0%	4.26%	351
0	5	7198	16.5%	20.80%	1440
5	10	13071	30.0%	50.82%	2614
10	15	12726	29.2%	80.04%	2545
15	20	6914	15.9%	95.92%	1383
20	25	1545	3.5%	99.47%	309
25	30	225	0.5%	99.99%	45
30		6	0.0%	100.00%	1
TOTAL		43542	100%		8708

5.6 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 methodology¹¹. 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%).

5.7 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).

¹¹ US Environmental Protection Agency (2008). AERMOD Implementation Guide, AERMOD Implementation Group.

5.8 Modelled Release Parameters

The release parameters for each stack are as shown in Appendix B.



6.0 RESULTS

Results may be compared against the benchmark criterion of 3 ou_E/m³ as a 98th percentile of hourly means appropriate for a 'moderately offensive' odour although this should be regarded as precautionary as should the emission rates. Given the site setting and the number of residences potentially affected, the IAQM odour guidance would regard the impact as:

- 'negligible' at below 1.5 ou_E/m³;
- 'slight adverse' from 1.5 ou_E/m³ – 3.0 ou_E/m³ as a 98th percentile of hourly means; or
- 'moderate adverse' impact above from 3.0 ou_E/m³ to 5.0 ou_E/m³ as a 98th percentile of hourly means.

The 5-year average odour exposures predicted as a result of emission from the facility are presented in Table 6-1 below and Appendix C.

Table 6-1
Results (average)

Ref	Description	Existing Impact (ou _E /m ³)	Future Impact (ou _E /m ³)
D1	Argoed (not sensitive)	1.02	2.33
D2	Tan Y Graig (not sensitive)	1.00	2.76
D3	Oaktree Cottage	0.66	1.66
D4	Pen Ffrydd (not sensitive)	0.53	1.32
D5	Penrhos	0.37	0.80
D6	Ysgubor Hir	0.29	0.60
D7	Llys Trannon	0.35	0.70
D8	Heulwen	0.12	0.23
D9	Cefn	0.33	0.55
D10	Ffrid-uchaf	0.32	0.60
D11	Coed-Y-Ffridd	0.31	0.62
D12	Fron-Derw	0.46	0.98
D13	Pen-Y-ffynnon	0.55	1.21
D14	Caesidanen	0.99	2.38
D15	Ddreenen-Ddu	0.91	1.54
D16	Llechwedd-Ddyrys	0.55	0.93
D17	Mid Wales Clay target centre	0.12	0.19

The odour impacts of the existing layer operation are predicted to be low (negligible). The highest average predicted impacts from the proposed 220,000 bird broiler facility are at the nearest houses to the west and north west, at Argoed Farm and Tan Y Graig, both of which are owned by those associated with the farm. The highest impact at a receptor not associated with the farm is at D14 Caesidanen. As described in section 3.7 of this report, this would be considered as a 'slight adverse' effect. Odour will be perceived this location (i.e. it will not be

‘odour free’), however this will not be at a level which would normally be considered unacceptable at this location according to IAQM Guidance or NRW. It should be noted that, at 2.38 ou_E/m³ the impacts at D14 Caesidanen are just below the NRW limit for new facilities and the threshold of IAQM significance for moderately offensive odour impacts at high sensitivity receptors.

The future impacts for each individual year are presented below:

Table 6-2
Results (each year): ou_E/m³

Ref	Description	2015	2016	2017	2018	2019
D1	Argoed	2.66	2.86	1.27	3.09	2.08
D2	Tan Y Graig	2.37	3.57	2.21	1.97	4.17
D3	Oaktree Cottage	1.11	1.76	0.99	1.67	2.81
D4	Pen Ffrydd	1.01	1.90	0.91	1.04	2.18
D5	Penrhos	0.71	1.06	0.61	0.62	1.38
D6	Ysgubor Hir	0.54	0.82	0.41	0.44	0.98
D7	Llys Trannon	0.88	0.79	0.35	0.55	0.96
D8	Heulwen	0.25	0.24	0.15	0.16	0.42
D9	Cefn	0.44	0.44	0.46	0.52	0.80
D10	Ffrid-uchaf	0.46	0.50	0.63	0.69	0.78
D11	Coed-Y-Ffridd	0.47	0.48	0.69	0.83	0.73
D12	Fron-Derw	0.75	0.75	1.08	1.19	1.16
D13	Pen-Y-ffynnon	0.95	1.13	1.23	1.46	1.25
D14	Caesidanen	1.66	2.39	2.68	2.66	2.87
D15	Ddreanen-Ddu	1.40	1.41	2.28	1.19	1.59
D16	Llechwedd-Ddyrys	0.77	0.81	1.34	0.76	1.02
D17	Clay target centre	0.20	0.26	0.11	0.31	0.10

If additional measures are taken to mitigate this odour, particularly in relation to prevention of odour within the houses through effective litter management (particularly when cleaning out the buildings at the end of the cropping cycle) this would be reduced still further.

These additional operational measures (i.e. control of processes or emissions) remain matters for the environmental permitting process and therefore regulated through the Environmental Permit as detailed in a site Odour Management Plan to be submitted with the Permit application.

7.0 CONCLUSIONS

This report presents a detailed odour impact assessment (OIA) of the proposed extension to the poultry development at Argoed Farm.

Dispersion modelling has been completed, which predicts that the occasional odour will be perceived the closest locations, however the proposed development is unlikely to lead to odour impacts at a level which would be regarded as unacceptable, when operated in accordance with best practice.

Should the odour control measures detailed in a site odour management plan be followed during typical operation and abnormal events, these potential impacts will be reduced even further.



Notice:

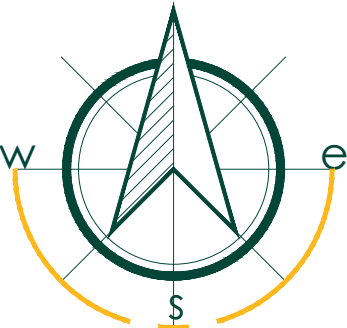
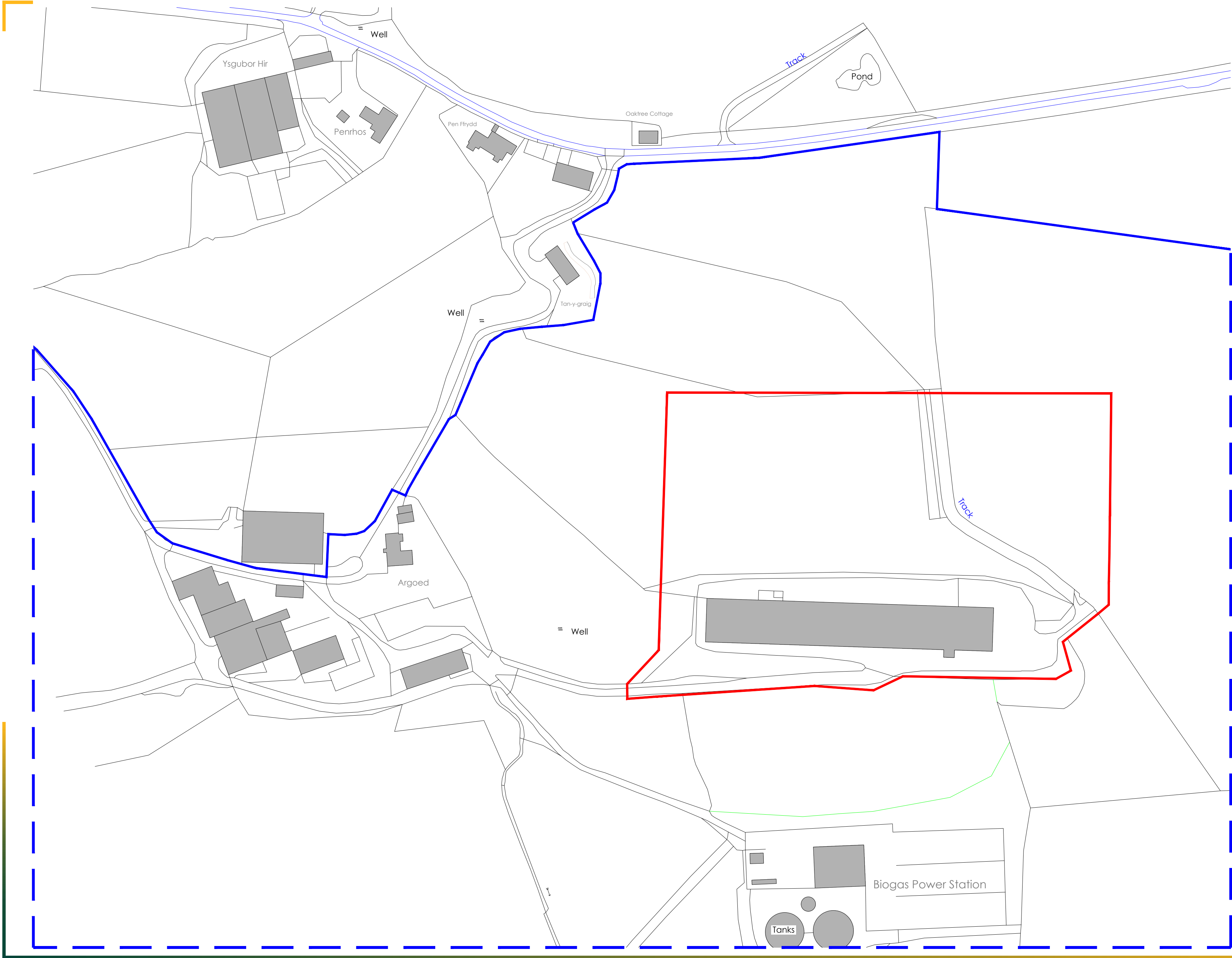
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APPENDIX A

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Site Area:
32,000 m²
3.2 hectares

Drawing Revisions:
A | Red line adjusted | 18.06.2020

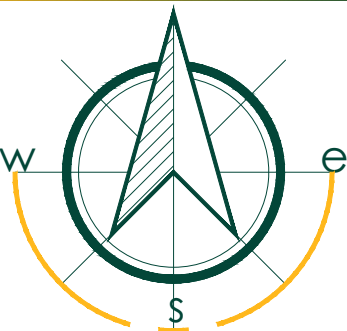
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Client:
R J Hughes & Co

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

Drawing:
Location Plan

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



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Drawing Revisions:
A/ Arrangement adjusted 18.06.2020

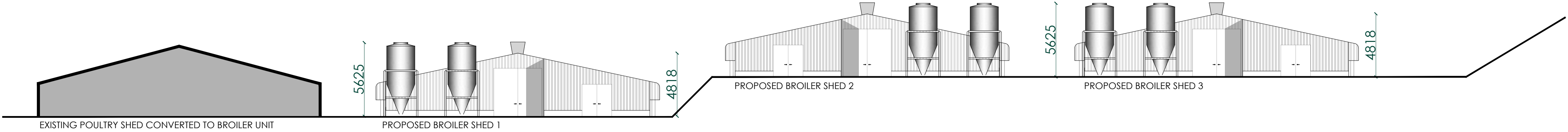
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Client:
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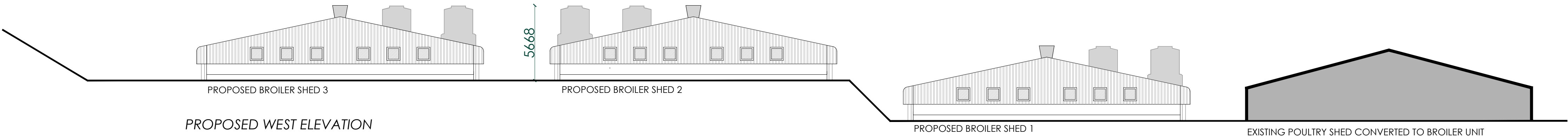
Project:
Proposed 4 Broiler Sheds, Argoed Farm,
Trefeglwys, Powys, SY17 5QT

Drawing:
Block Plan

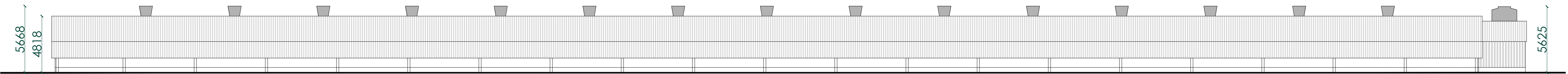
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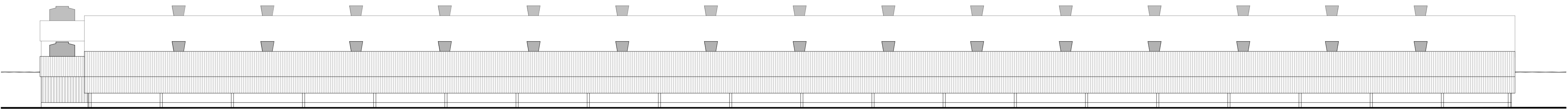
PROPOSED EAST ELEVATION



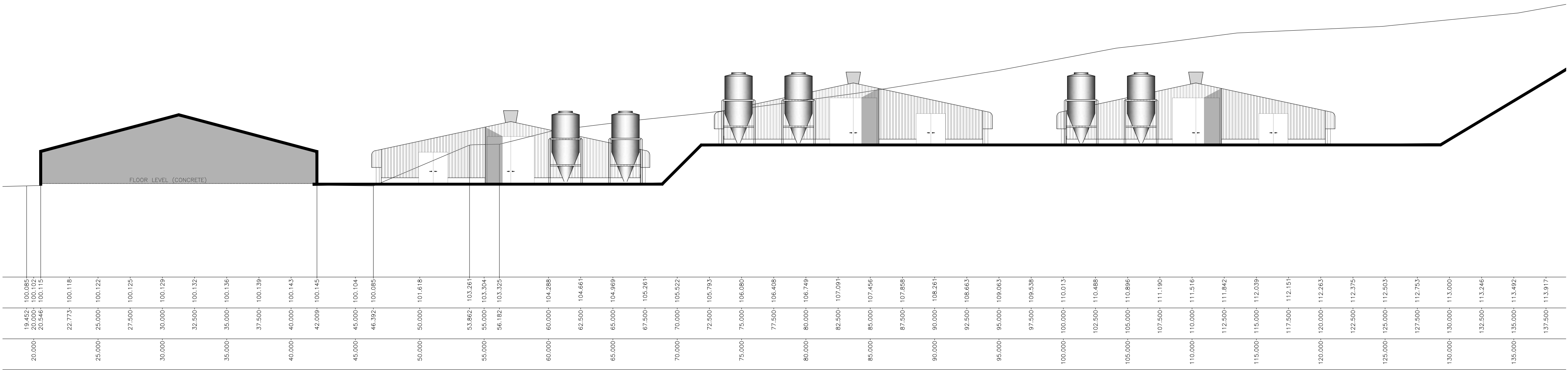
PROPOSED WEST ELEVATION



PROPOSED SOUTH ELEVATION



PROPOSED NORTH ELEVATION



Drawing Revisions:
A | Arrangement adjusted 18.6.2020

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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: SA36495_FL_04	Rev: A	Scale: 1:200	Paper: A1	Drawn By: AW	Date: 26.5.2020
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APPENDIX B



Table B-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

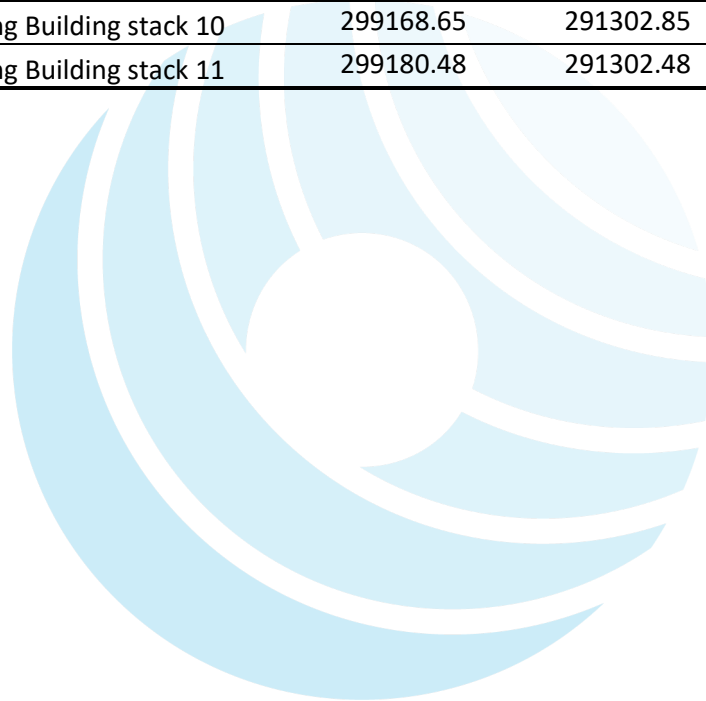


Table B-2
Stack Locations: Proposed

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

APPENDIX C



Figure C-1
Impacts: Scenario 1 (Existing)

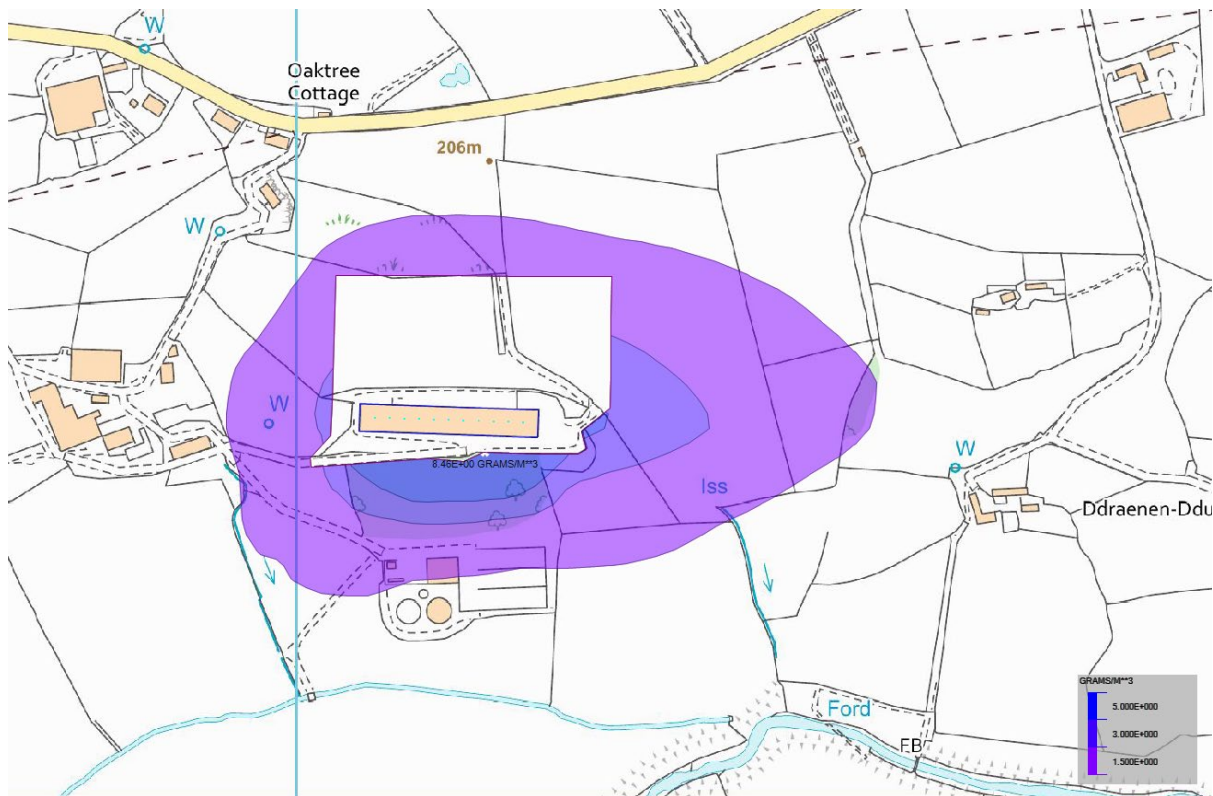
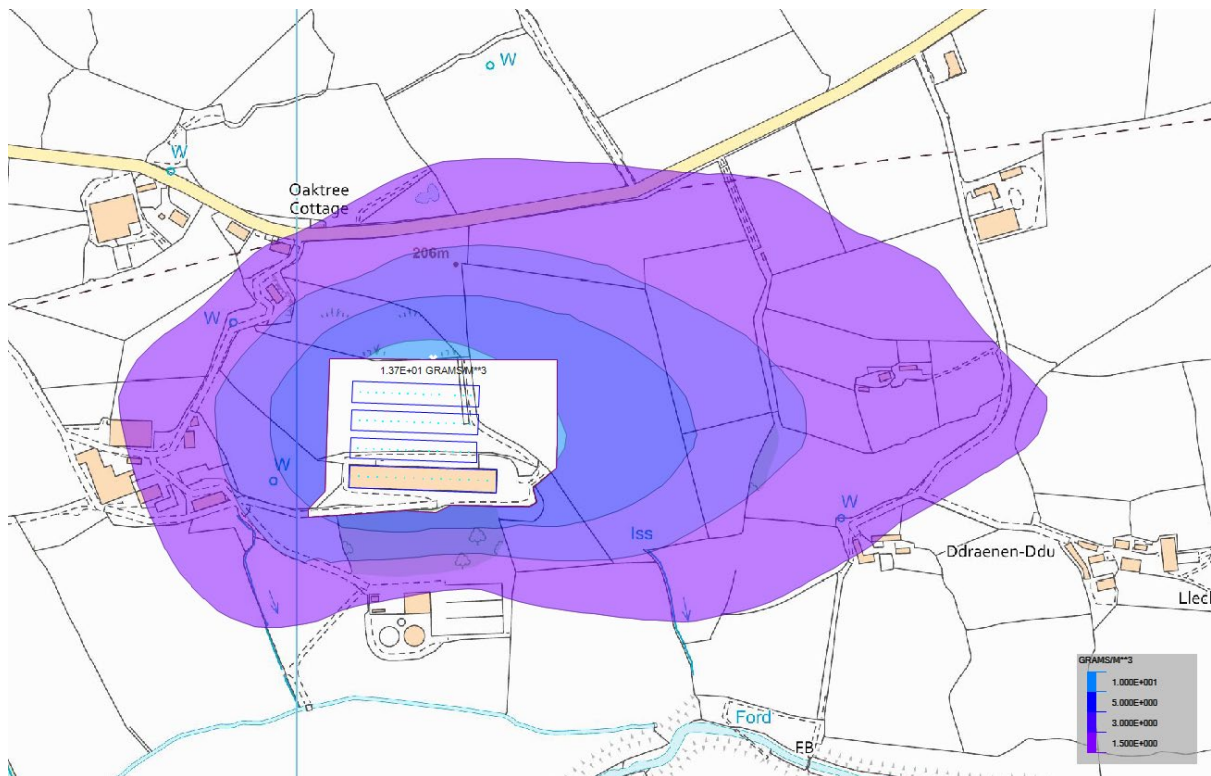


Figure C-2
Impacts: Scenario 2 (Proposed)





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