HOLLINS LANE, WOODSEAVES

ODOUR IMPACT ASSESSMENT

January 2023

Report Ref: 01.0101.006/Odour v1

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CONTENTS

1.0 INTRODUCTION

Isopleth Ltd has been commissioned by Berrys, on behalf of International Energy Crops Ltd ('IEC'), to carry out a further detailed assessment of odour impacts associated with the proposed expansion to an existing poultry operation at the at Hollins Lane Poultry Unit, Hollins Lane, Woodseaves, Market Drayton TF9 2AP. The location of the site is shown in Appendix A. This assessment presents the result of a detailed dispersion modelling exercise aimed at predicting the odour impact of the proposed facility.

1.1 Planning Background

Permission was granted for poultry houses on 15th September 2015:

> *15/00924/EIA Erection of two poultry sheds and feed bins, ancillary works including access track and associated landscaping works*

The planning application allowed for the erection of four poultry houses on land to the east of Hollins Lane, Woodseaves, Market Drayton. The shed measures 116 metres x 24 metres, with an eaves height of 3 metres and a ridge height of 5.6 metres. Fans extend above the ridge to a height of 6.4 metres. The houses are aligned in two parallel rows, with each pair connected by a central cover access, giving the impression of two parallel long houses. Although the houses could house a maximum of 65,000 birds and remain within the minimum floor space requirements for broiler birds, the existing site operates with a maximum of 232,000 birds across the 4 houses (58,000 per house).

Application ref 19/05127/EIA was validated on 28th November 2019:

> *Construction of two poultry sheds, feed bins and associated ancillary works*

This application seeks to double the size of the unit by constructing an identical pair of buildings (4 houses) to the east of the existing houses approved under application ref 15/00924/EIA. The proposed site layout is shown in Appendix B.

The application has been supported with information relating to emissions such as ammonia:

> *Isopleth Ltd (June 2019) Hollins Lane, Woodseaves. Odour Impact Assessment. Report Ref: 01.0101.001/Odour v1*

Following correspondence Shropshire Council it was decided by the applicant that the only solution in this case is to incorporate a system of chemical scrubbing on all of the proposed new houses and retrofitting of scrubbing on two existing sheds in order to ensure that emissions are within acceptable limits.

1.2 Environmental Permitting

The existing facility is operated in accordance with an Environmental Permit. At the time of writing, an application for an Environmental Permit to cover the enlarged broiler facility has yet to be made to the Environment Agency ('the EA').

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.

Planning and Environmental Permitting processes are separate, but complementary, as discussed further in section 2.2 of this report. Paragraph 188 of the National Planning Policy Framework (NPPF 2021 update) requires that the local planning authority must assume that the Permit will operate effectively, in this case preventing unacceptable levels of odour at relevant receptor locations.

1.3 Scope and Limitations

The scope of this OIA is limited to the prediction, through atmospheric dispersion modelling, of odour 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.

1.4 Aims and Objectives

The objectives of the assessment are as follows:

- To identify the odour sources which will be present at the facility;
- 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 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.

2.1 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 13725[1]. 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): $ou_E/m^2/s$

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: $C_{98,\ 1\ hour}$ X ou_E/m^3.

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

Odour perception, annoyance and nuisance is related to more than simply odour impact, the five 'FIDOL' factors[2] must also be considered when assessing the acceptability of a scheme and the appropriateness of a limit criterion.

2.2 Planning vs. Permitting: National Planning Policy Framework (NPPF)

The Government released the latest version of the National Planning Policy Framework in 2021. The following paragraphs are of direct relevance in relation to odour (referred to as 'amenity'):

> *174. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *…..*
>
> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*

Also:

> *185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.*

As described above, the NPPF also includes information for sites which will fall under the Environmental Permitting regime, regulated by the EA.

> *188. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.*

This is the approach that has been adopted in relation to similar applications in Shropshire, including that for the original broiler farm development at Hollins Lane.

[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,

2.3 Local Planning Policy

Shropshire Local Development Framework: Adopted Core Strategy March 2011 Policy CS6 : *Sustainable Design and Development Principles* states that:

> *To create sustainable places, development will be designed to a high quality using sustainable design principles, to achieve an inclusive and accessible environment which respects and enhances local distinctiveness and which mitigates and adapts to climate change. This will be achieved by [ensuring that all development]:*
>
> *....*
>
> *• Contributes to the health and wellbeing of communities, including safeguarding residential and local amenity and the achievement of local standards for the provision and quality of open space, sport and recreational facilities.*

The draft Shropshire Local Plan (2016 – 2038) was submitted to the Secretary of State for examination on 3 September 2021. Of relevance to this application is Draft Policy SP6. *Health and Wellbeing*:

> *New development should ensure the health and well-being of individuals, communities and places. This will be achieved by ensuring the quality of life and delivery of community well-being, through the use of land; type of development; the safeguarding, maintenance and improvement of community facilities and services; and by ensuring that the form, design, location and layout of new development enhances community wellbeing. Development proposals should:*
>
> *8. Protect against exposure to pollution in line with policy DP18 by:*
>
> *…*
>
> *b. Safeguarding against the environmental impacts of new development in terms of community/public safety, noise, vibrations and odour and the legacy of contaminated land.*

Draft Policy DP18. *Pollution and Public Amenity* states that:

> *Development will comply with existing pollution control regimes and national objectives for pollutants. Proposals should be designed from the outset to; safeguard environmental quality and public amenity; minimise pollution; mitigate adverse effects; and maximise opportunities for improvements where practicable.*

2.4 Environment Agency H4 guidance

EA has published a number of guidance documents relating to odour assessment. These include the Horizontal Guidance EPR H4 – Odour Management[3].

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

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
processes involving septic effluent or sludge
biological landfill odours

Moderately offensive:

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

Less offensive:

brewery
confectionery
coffee roasting
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 ou_E/m^3 as a 98th percentile of hourly means[4], or even 9.7 ou_E/m^3 (as a 98th percentile)[5]. This is consistent with guidance published by the EA in relation to nuisance thresholds as a

[4] Misselbrook, Clarkson and Pain (1993) *Relationship between concentration and intensity of odours for pig slurry and broiler houses.*
[5] 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

function of site setting[6,7] and also regulation applied in Ireland, where the Environmental Protection Agency (EPA, Ireland) recommended criterion is 6.0 ou_E/m^3 as a 98th percentile of hourly means for existing units. The H4 (and IPPC SRG 6.02) 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.

2.5 IAQM Odour Guidance[8]

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') in an agricultural setting as:

- 'negligible' at, or below 3 ou_E/m^3 as a 98th percentile of hourly means; or
- 'slight adverse' from 3 ou_E/m^3 - 5 ou_E/m^3 as a 98th percentile of hourly means; or
- 'moderate adverse' impact above from 5 ou_E/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] EPA (2001) Odour Impacts and Odour Emission Control Measures for Intensive Agriculture. R&D REPORT SERIES No. 14. pp31.
[7] Environment Agency (2002) Assessment of Community Response to Odorous Emissions. R&D Technical Report P4-095/TR. pp63
[8] IAQM (2018) *Guidance on the assessment of odour for planning*

3.0 APPROACH

3.1 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.

3.2 Odour Monitoring

Odour monitoring was completed at the Hollins Lane site (within the existing buildings) by an MCERTs accredited sampling team and analysed within 30 hours at a UKAS accredited olfactometry laboratory. The sampling report is included as Appendix C to this report.

3.3 Derivation of Emissions

The anticipated odour emissions for the proposal have been calculated from:

- Monitored ventilation flows for the existing houses; and
- Monitored odour concentration for the existing houses.

As such the emission rates are specific to the design, stocking and operation at the Hollins Lane site.

3.4 Quantification of Odour Impact

Data derived from the previous stages is input to an atmospheric dispersion model. For this assessment the AERMOD model[9] has been applied with due consideration to relevant guidance[10]. This model is widely used and accepted by the EA 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.

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

[9] Software used: BREEZE AERMOD Pro, v8.1.0.17
[10] USEPA, Aermod Implementation Workgroup, Aermod Implementation Guide, (EPA-454/B-18-003 April, 2018).

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.

3.5 Assessment Scenarios

A total of 2 No. Scenarios have been completed which relate to the 2 different site layouts reflected in the planning applications for the site (i.e. existing and proposed). The results of the dispersion modelling have been presented in the form of tabulated odour concentrations ($C_{98,\ 1\text{-hour}}$ X ou_E/m^3) at discrete receptor locations to facilitate the discussion of results.

3.5.1 Scenario 1: Existing

The existing farm was constructed and fully operational before 2018. The farm houses up to 232,000 birds in 4 houses (2 buildings). Air drawn from the buildings is exhausted through 36 No. ridge stacks for each of the 2 buildings.

3.5.2 Scenario 2: Proposed

This scenario relates to the farm now proposed. The application documents propose that the farm will house:

- up to 232,000 birds in 4 existing houses (2 buildings); and
- up to 232,000 birds in 4 new houses (2 buildings) with mitigation.

The proposed scheme therefore allows for up to 464,000 birds in total.

4.0 SITE SETTING AND OPERATIONS

4.1 Site Setting

The new houses will be located to the east of the existing houses at the Hollins Lane Poultry Unit. The approximate site grid reference is OS GR 369160, 331600.

The applicant, Mr Keith Wilson on behalf of HLW Farms, owns the land on which the facility is sited as part of the landholding of Old Springs Farm. Historically this 1555 acre farm grew general arable crops in addition to rearing beef cattle. Since 2004 the farm has been growing *miscanthus* (elephant grass) which is used for burning in biomass boilers and is also used for the bedding of broiler chickens. The existing poultry houses were fully operational before 2018.

The closest residences to the facility are Tyreley Farm to the north and Woodseaves Farm off the A529. The location of the site can be seen in Appendix A.

4.2 Development Proposals

The existing farm was constructed and fully operational before 2018. The farm houses up to 232,000 birds in 4 houses (2 buildings). Air drawn from the buildings is exhausted through 36 No. ridge stacks for each of the 2 buildings. The houses are heated indirectly, resulting in drier litter and therefore ammonia emissions lower than EA benchmark emission rates for broiler farms.

The application documents propose that the farm will house:

- up to 232,000 birds in 4 existing houses (2 buildings); and
- up to 232,000 birds in 4 new houses (2 buildings).

The proposed scheme therefore allows for up to 464,000 birds in total. All houses will be heated indirectly, with the new houses also fitted with heat exchangers in order to optimise energy efficiency.

For two of the existing houses, air will continue to be drawn from the buildings is exhausted through ridge stacks. For two of the existing houses and all 4 of the new houses, up to 120,000m3 / hr air per shed will be drawn from the buildings and passed through an ammonia scrubber.

For purposes of this assessment the scrubber design is based on JF McKenna sourced INNO+ systems with a maximum flow capacity of 120,000m3 / hr air per unit. In the event that the total flow exceeds 120,000m3 / hr in any shed the additional air would exhaust through the ridge stacks as for the existing scheme. The INNO+ technical data indicates that an odour mitigation performance of >40% should be expected.

4.3 Sensitive Receptors

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	Old Springs Hall	370064.4	332304.4
D2	Gardeners Cottage	370275.1	332251.8
D3	Cheswardine Park Farm	370946.1	331343.0
D4	Haywood Farm	370691.2	330440.9
D5	Woodseaves Manor Farm	369111.4	330588.7
D6	Woodseaves Grange	368905.4	330754.8
D7	Grange Barns	368849.9	330758.5
D8	Bird in Hand Farm	368717.1	330931.1
D9	Woodseaves R1	368719.5	331010.8
D10	Woodseaves R2	368666.4	331012.0
D11	Woodseaves Farm	368649.5	331200.3
D12	A529 R1	368589.7	331350.2
D13	A529 R2	368569.2	331381.6
D14	A529 R3	368461.9	331475.5
D15	A529 R4	368446.0	331520.9
D16	A529 R5	368424.5	331566.3
D17	A529 R6	368400.6	331603.8
D18	A529 R7	368364.3	331648.1
D19	Avenue Farm	368328.0	331619.7
D20	Sutton Lane R1	368328.5	331759.9
D21	Sutton Lane R2	368292.8	331762.2
D22	Sutton Lane R3	368325.1	331798.9
D23	Hollins Lane R1	368455.5	331834.6
D24	The Four Alls Inn	368288.4	332006.2
D25	Wood View	368489.0	332035.2
D26	Tyrley Road 1	368711.8	332231.3
D27	Tyrely Grange	368874.5	332258.1
D28	Tyrley Farm	369047.3	332160.0
D29	Tyrley Wharf	369097.5	332463.2

The receptor locations included in Table 4-1 are consistent with those used in the previous assessments for this site.

5.0 EMISSIONS

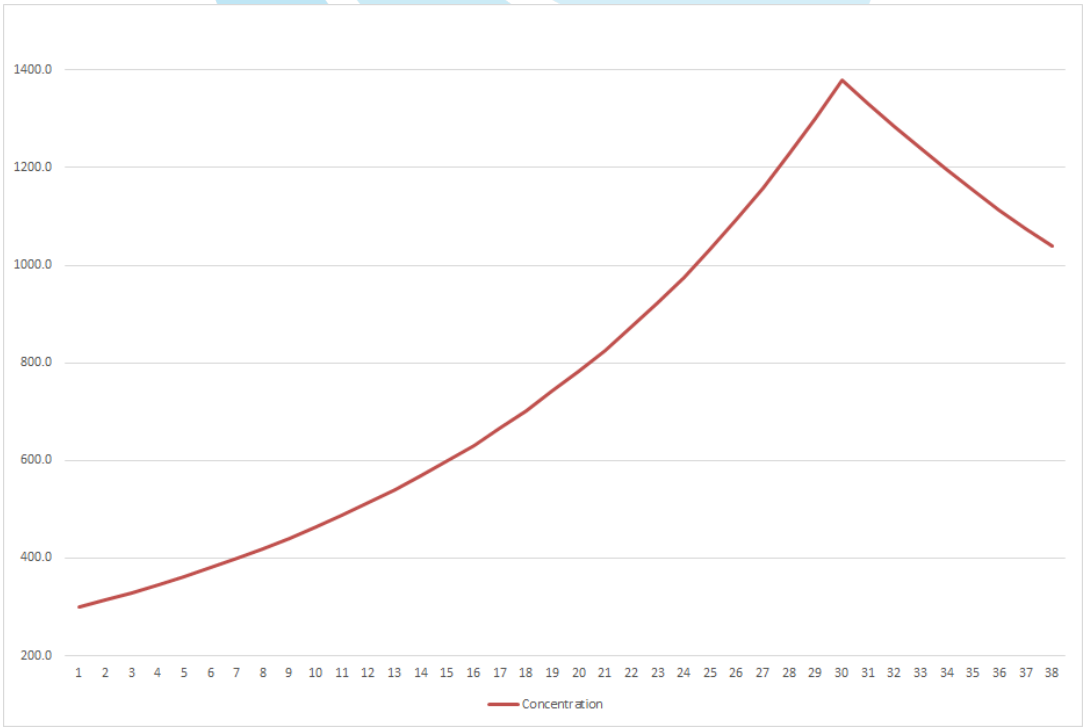
5.1 Ventilation flows

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. Design ventilation flows are based on typical industry standards. The ventilation system will prioritise extraction through the INNO+ scrubber system with roof ridge fans available in the event that the temperature within the house may not be maintained by the scrubber fans. This is therefore a back-up system only for use on the hottest days and towards the latter stages of the crop. The existing gable end fans should not be required. The ventilation rates within the existing houses over 1 year were monitored and have been used at the basis for the emission calculation.

5.2 Odour Concentration

The monitoring data for this (and other sites) shows a clear trend in relation to odour concentration. A chart illustrating these findings are shown below. The concentration shows an increase with bird size and age of litter up to thinning at approximately day 31, when a proportion of birds are removed. The mass of birds within the house is then reduced, as is the flock density however the ventilation rate will typically continue to increase. As such there is a purging effect on the house and the concentration at emptying will always be lower than that at thinning.

Figure 5-1
Internal Concentration (ou_E/m^3)

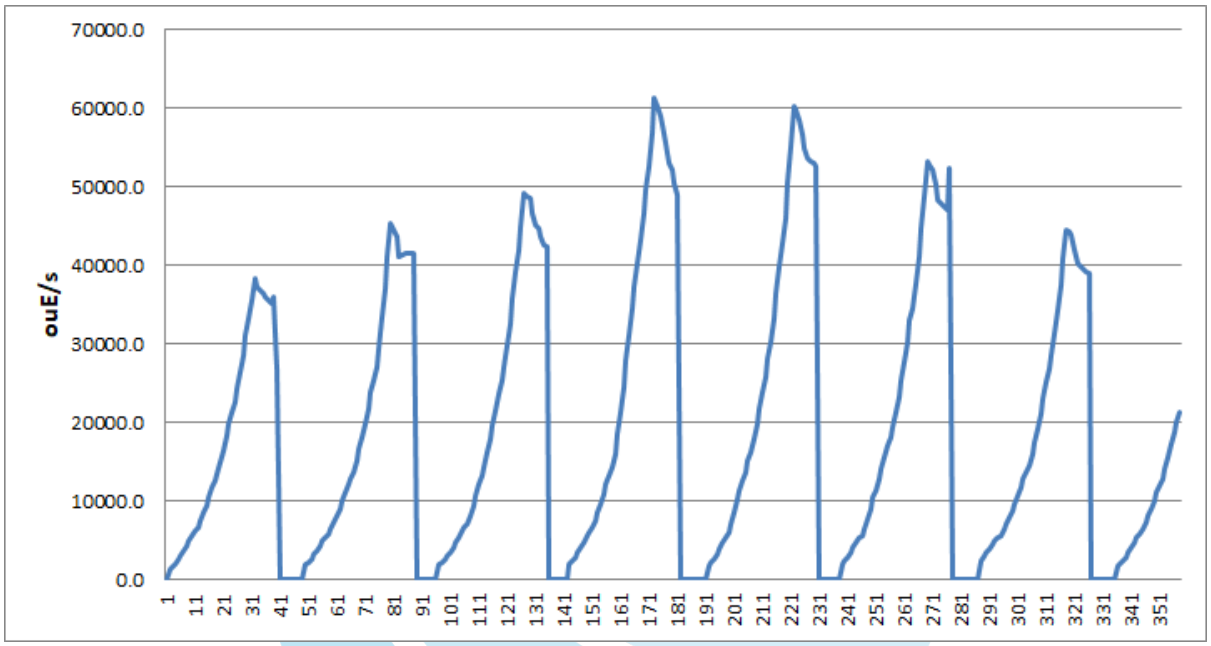


5.3 Emission Rates

The emission rates used are calculated from the monitoring data described above. The time varying emission rates used represent the emissions for each room (i.e. half of each shed housing 58,000 birds) is as shown in Figure 5-2.

It can be seen in Figure 5-2 that the relative proportion of (unscrubbed) emissions will vary across the cycle according to ventilation, external temperature and stage of the crop cycle.

Figure 5-2
Emission rate (ou_E/s per room)



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.

As described above, for purposes of this assessment the scrubber design is based on JF McKenna sourced INNO+ systems with a maximum flow capacity of 120,000m^3 / hr air per unit. In the event that the total flow exceeds 120,000m^3 / hr in any shed the additional air would exhaust through the ridge stacks as for the existing scheme. The INNO+ technical data indicates that an odour mitigation performance of >40% should be expected.

6.0 ODOUR IMPACT ASSESSMENT

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

6.1 Model Domain

The identified potentially sensitive locations, detailed in Table 4-1 and shown in Appendix A, were modelled as discrete receptors.

6.2 Model Assumptions

The temperature of the flows from the units has been assumed at 23ºC.

The velocity of releases from the ridge fans has been taken as 3m/s and the velocity of releases from the scrubber fans has been taken as 4.15 m/s which has been calculated as the velocity from 5 No. fans with a total flow of 120,000m3 / hr.

6.3 Building Downwash / Entrainment

The stack height has been taken as 5.815m for the ridge fans and 5m for the scrubber fans.

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 a detailed dispersion model constructed on this basis, with the height taken as 4.815m for the buildings (average of eaves to ridge) and 4.9 for the scrubber boxes.

6.4 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.

For meteorological data to be suitable for dispersion modelling purposes a number of meteorological parameters need to be measured on a continuous basis. There are only a limited number of sites where the required meteorological measurements are made. In the UK, all of these sites are quality controlled by the Met Office.

The closest Met Office sites to the Hollins site is Shawbury (16.8 km from the site, 75.9m AoD).

6.5 Met Data Preparation

Meteorological data was obtained in .met format and converted to .sfc and .pfl formats for use in AERMOD using AERMET Pro. Shawbury meteorological data has been processed

according to US EPA methodology[11]. 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 (40%), forest (20%) and cultivated land (40%).

6.6 Topography

The site is located at approximately 117m AOD. Information relating to the topography of the area surrounding the site has been used to assess the impact of terrain features on the dispersion of emissions from the site. Topographical data has been obtained in digital (.ntf) format and incorporated into the assessment.

6.7 Modelled Release Parameters

The locations and release parameters for each stack are as shown in Appendix D.

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

7.0 RESULTS

Results for both scenarios may be compared against the benchmark criterion of 3 ou_E/m^3 as a 98th percentile of hourly means appropriate for a 'moderately offensive' odour. The 5-year average odour exposures predicted as a result of emission from the existing (scenario 1) and proposed (Scenario 2) facilities are presented in Tables 7-1 and 7-2 below.

Table 7-1
Results Sc1 (ou_E/m^3)

Ref	2016	2017	2018	2019	2020	Sc1 Ave
D1	0.9	1.0	0.8	0.8	0.6	0.8
D2	0.7	0.9	0.7	0.7	0.6	0.7
D3	0.2	0.2	0.1	0.2	0.2	0.2
D4	0.1	0.1	0.1	0.1	0.1	0.1
D5	0.3	0.1	0.5	0.2	0.3	0.3
D6	0.2	0.1	0.2	0.2	0.2	0.2
D7	0.2	0.1	0.2	0.1	0.2	0.2
D8	0.3	0.1	0.2	0.1	0.2	0.2
D9	0.4	0.1	0.3	0.2	0.3	0.2
D10	0.4	0.1	0.3	0.1	0.3	0.2
D11	0.8	0.2	0.5	0.3	0.5	0.5
D12	1.3	0.4	1.0	1.2	1.0	1.0
D13	1.4	0.4	1.1	1.5	1.1	1.1
D14	1.2	0.5	0.9	1.7	1.4	1.1
D15	1.2	0.6	0.9	1.7	1.4	1.2
D16	1.2	0.6	0.9	1.7	1.3	1.1
D17	1.1	0.7	0.9	1.5	1.1	1.0
D18	1.0	0.6	0.8	1.3	1.0	1.0
D19	0.9	0.6	0.7	1.2	0.9	0.8
D20	0.9	0.6	0.6	1.0	0.7	0.7
D21	0.8	0.5	0.5	0.9	0.6	0.7
D22	0.9	0.6	0.6	0.9	0.6	0.7
D23	1.1	0.9	0.8	1.2	0.7	0.9
D24	0.4	0.5	0.4	0.5	0.4	0.5
D25	0.7	0.8	0.6	0.7	0.5	0.7
D26	0.7	1.0	0.7	1.0	0.7	0.8
D27	1.0	1.3	0.9	1.2	0.9	1.1
D28	1.7	1.7	1.5	1.6	1.7	1.6
D29	0.7	0.6	0.6	0.6	0.7	0.6

The 5 year average modelled odour concentration is predicted to be below 3 ou_E/m^3 as a 98th percentile of hourly means for all receptors.

Table 7-2
Results Sc2 (ou_E/m^3)

Ref	2016	2017	2018	2019	2020	Sc2 Ave
D1	1.7	1.9	1.4	1.6	1.3	1.6
D2	1.2	1.5	1.3	1.3	1.1	1.3
D3	0.3	0.5	0.2	0.3	0.4	0.3
D4	0.2	0.3	0.2	0.3	0.2	0.2
D5	0.6	0.3	0.8	0.4	0.4	0.5
D6	0.5	0.2	0.4	0.3	0.4	0.4
D7	0.4	0.1	0.4	0.2	0.3	0.3
D8	0.6	0.1	0.5	0.2	0.4	0.4
D9	0.7	0.2	0.5	0.3	0.5	0.4
D10	0.7	0.2	0.5	0.2	0.5	0.4
D11	1.4	0.5	1.1	0.5	0.9	0.9
D12	2.1	0.7	1.7	2.0	1.7	1.6
D13	2.2	0.8	1.7	2.5	2.0	1.8
D14	1.9	0.9	1.5	2.6	2.1	1.8
D15	1.9	1.0	1.5	2.6	2.1	1.8
D16	1.7	1.1	1.4	2.7	1.9	1.8
D17	1.6	1.1	1.3	2.4	1.7	1.6
D18	1.4	1.0	1.1	2.2	1.4	1.4
D19	1.3	0.9	1.1	2.0	1.4	1.3
D20	1.3	0.9	1.0	1.6	1.1	1.2
D21	1.2	0.9	0.9	1.5	1.0	1.1
D22	1.2	0.9	0.9	1.5	0.9	1.1
D23	1.5	1.3	1.2	1.8	1.1	1.4
D24	0.7	0.8	0.8	0.9	0.6	0.8
D25	1.0	1.3	1.1	1.2	0.9	1.1
D26	1.2	1.6	1.2	1.6	1.2	1.4
D27	1.7	2.1	1.6	2.2	1.7	1.9
D28	3.1	2.9	2.7	2.9	2.8	2.9
D29	1.4	1.1	1.2	1.2	1.3	1.2

The 5 year average modelled odour concentration is predicted to be below 3 ou_E/m^3 as a 98^{th} percentile of hourly means for all receptors.

Table 7-3
Results Comparison (ou_E/m^3)

Receptor	Sc1	Sc2	increase
D1	0.8	1.6	0.8
D2	0.7	1.3	0.6
D3	0.2	0.3	0.2
D4	0.1	0.2	0.1
D5	0.3	0.5	0.2
D6	0.2	0.4	0.2
D7	0.2	0.3	0.1
D8	0.2	0.4	0.2
D9	0.2	0.4	0.2
D10	0.2	0.4	0.2
D11	0.5	0.9	0.4
D12	1.0	1.6	0.7
D13	1.1	1.8	0.7
D14	1.1	1.8	0.7
D15	1.2	1.8	0.6
D16	1.1	1.8	0.6
D17	1.0	1.6	0.6
D18	1.0	1.4	0.5
D19	0.8	1.3	0.5
D20	0.7	1.2	0.4
D21	0.7	1.1	0.4
D22	0.7	1.1	0.4
D23	0.9	1.4	0.4
D24	0.5	0.8	0.3
D25	0.7	1.1	0.4
D26	0.8	1.4	0.5
D27	1.1	1.9	0.8
D28	1.6	2.9	1.2
D29	0.6	1.2	0.6

Given the site setting and the number of residences potentially affected, the IAQM odour guidance would regard the impact as:

- 'negligible' at, or below this concentration; or
- 'slight adverse' from 3 ou_E/m^3 - 5 ou_E/m^3 as a 98th percentile of hourly means; or
- 'moderate adverse' impact above from 5 ou_E/m^3 as a 98th percentile of hourly means.

The highest average predicted impacts from the existing and proposed broiler facility are at D28 Tyrley Farm (2.9 ou_E/m^3 average).

As described in section 3.7 of this report, this would be considered as a 'negligible' effect. It must be noted that the facility will not be odour free. Odour will be perceived locations such as propertied on the A529, Tyrely Grange and Tyrley Farm, however this will not be at a level which would normally be considered unacceptable at this location according to IAQM Guidance or that from the EA.

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.

8.0 CONCLUSIONS

This report presents a detailed odour impact assessment (OIA) of the proposed IEC poultry house extension at their Hollins Lane site.

Dispersion modelling has been completed, which predicts that the 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 by the EA 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.

APPENDIX A

HR1 HR2 HR3 HR4 HR5 HR6 HR7 HR9 HR10 HR11 HR12 HR13 HR14 HR15 HR16 HR17 HR18 HR19 HR20 HR21 HR22 HR23 HR24 HR25 HR26 HR27 HR28 HR29

Oak Wood
Meiklejohn Farm
Birch Wood
Tyrley Locks
Stoneyford
Waterside
Church
Tyrley Grange
Tyrley Farm
Sluice
Top Lodge
Round Wood
Wood Farm
Garden Cott
Saw Pit Wood
Hall Wood
The Fouralls
Hedgeview
Avenue Farm
Bridlands Wood
Black Wood
Oaklands Hou
Brickyard F
Cheswardine Park Farm
Woodseaves Farm
Bird in Hand Farm
Woodseaves
Woodseaves Manor Farm
The Sydnall
The Pines
Lower Sydnall
Gills Wood
Haywood Drumble
Haywood Plantation
Haywood Farm
Bridge Farm
Bramble Edge

TYRLEY ROAD
TAG LANE
HOLLINS LANE
SYDNALL LANE
HAYWOOD LANE
A529
Track
Path
Drain
Iss
Sks
Shropshire Union Canal

NOTES

LEGEND

SITE LOCATION

HUMAN RECEPTOR LOCATION

N
W E
S

IEC

SITE
Hollins Lane, Woodseaves

PROJECT
Air Quality Assessment

DRAWING TITLE
Odour Receptors

DRAWING NUMBER	REVISION
AQ2	0
SCALE	DATE
1:10000 @ A3	19.01.2023

ISOPLETH

APPENDIX B

DISCLAIMER NOTES:

0 10 20 30 40 50
SCALE 1:1000 m

N

SCALE BAR & NORTH POINT:

RIBA Chartered Practice

BEECH HOUSE
SHREWSBURY BUSINESS PARK
SHREWSBURY
SHROPSHIRE
SY2 6FG
TEL: 01743 271697
shrewsbury@berrys.uk.com
www.berrys.uk.com

ORIGINATING OFFICE:

Site Area
8.5 Ha

REV	DESCRIPTION	DATE	BY	CHKD
A	Red line amended	27.11.19		
B	Additional landscape added	17.4.20		
C	Additional buildings added	25.4.20		
D	Client adjustments	18.5.20		
E	Client adjustments	26.5.20		
F	Client adjustments	14.7.22		
G	Client adjustments	10.01.23	-	-

BERRYS

STATUS: PLANNING

CLIENT: K Wilson

PROJECT: Hollins Lane Poultry Farm

DRAWING: Proposed Site Plan

SCALE @ A1:	DRAWN BY:	CHKD BY:	DATE:
1:1000	AW	NW	10.01.23

DRAWING No: SA22638 -BRY- 00 -PL- A - 02 _ G

REVISION:

APPENDIX C

Air Spectrum Environmental Limited
Spectrum Environmental Support

Spectrum House
Checketts Lane
Checketts Lane Industrial Estate
Worcester
WR3 7JW

Aidan Wrynne

Odour & ammonia emissions monitoring assessment. Hollins lane Poultry facility International energy crops Limited

Keith Wilson.

International energy crops ltd
Markey Drayton
Shropshire
TF9 2AP

Site monitoring dates: 5th & 12th October 2022.
Report reference: JL 24242 V 1.0
Reporting date: 27/10/2022

EXECUTIVE SUMMARY

Air Spectrum Environmental ltd were commissioned by International Energy Crops Limited to conduct a programme of Odour & Ammonia emissions monitoring from their Poultry shed processes at their site at Hollins Lane, Woodseaves, Market Drayton Shropshire, TFI 2AP.

The programme of Odour & Ammonia emissions monitoring was carried out on two separate dates which correlated with the following stages of the process:

I. **Immediately prior to thinning stage**

II. **Immediately prior to clearing stage**

Odour emissions monitoring was carried out on two representative poultry sheds using the methodology stipulated in the European reference standard **BS EN 13725:2003** Air Quality - Determination of odour concentration via dynamic dilution olfactometry.

Ammonia emissions monitoring was conducted using the same sampling methodology as for the odour sample. The analytical technique deployed was the use of Gastec colorimetric sample tube.

Table 1 & 2 summarises the Odour emissions monitoring data obtained from each sampling date.

TABLE 1 Summary of poultry shed odour emission monitoring results

Poultry shed – emission point	Geometric mean odour concentration (ou_E/m^3) – Thinning stage	Geometric mean odour concentration (ou_E/m^3) – Clearing stage
Shed 1	**1384**	**1068**
Shed 2	**1040**	**957**

Table 2 Summary of Ammonia emissions monitoring results

Poultry shed – emission point	Average Ammonia concentration (ppm) Thinning stage	Average Ammonia concentration (ppm) Clearing stage
Shed 1	**0.25**	**2.0**
Shed 2	**0.17**	**0.6**

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www.airspectrum.com | +44 1905 362 100

3.2 Ventilation rates

The ventilation rates within the poultry sheds were recorded from the computerised control systems during each monitoring period.

Tables 12 & 13 presents the poultry shed ventilation rates at each stage of the crop cycle.

TABLE 12 – Ventilation rates in Poultry sheds 1 & 4 – Thinning stage – 5th October 2022

Sample location	Ventilation rate – m^3/hour	Ventilation rate – m^3/ second
Poultry shed 1	**136400**	**37.88**
Poultry shed 2	**129000**	**35.83**

TABLE 13 – Ventilation rates in Poultry sheds 1 & 2 – Clearing stage – 12th October 2022

Sample location	Ventilation rate – m^3/hour	Ventilation rate – m^3/ second
Poultry shed 1	**121000**	**33.61**
Poultry shed 2	**126600**	**35.16**

3.3 Poultry shed process conditions

Tables 14 & 15 present the key process information for the poultry buildings during the monitoring periods.

Table 14 – Poultry shed process conditions – Thinning stage

Process condition	Building 1	Building 2
Number of birds	54607	55037
Internal Temperature	24.7	24.3
Internal Humidity	49	47.5
Age of birds	30 days	30 days

Table 15 – Poultry shed process conditions – Clearing stage

Process condition	Building 1	Building 2
Number of birds	42789	41380
Internal Temperature	22.5	22.35
Internal Humidity	45.5	46
Age of birds	37 days	37 days

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APPENDIX D

Table D-1
Existing: Stack Locations (Houses 1 and 2)

Ref	Source	Xm	Ym	Zm	Height (m)	Diameter (m)	Velocity (m/s)
S1	Stack 1	369058.4	331519.1	117	5.815	0.8	3.0
S2	Stack 2	369062.5	331530.6	117	5.815	0.8	3.0
S3	Stack 3	369066.7	331542.0	117	5.815	0.8	3.0
S4	Stack 4	369070.8	331553.5	117	5.815	0.8	3.0
S5	Stack 5	369075.0	331564.9	117	5.815	0.8	3.0
S6	Stack 6	369079.1	331576.4	117	5.815	0.8	3.0
S7	Stack 7	369083.2	331587.8	117	5.815	0.8	3.0
S8	Stack 8	369087.4	331599.3	117	5.815	0.8	3.0
S9	Stack 9	369091.5	331610.7	117	5.815	0.8	3.0
S10	Stack 10	369095.6	331622.2	117	5.815	0.8	3.0
S11	Stack 11	369099.7	331633.7	117	5.815	0.8	3.0
S12	Stack 12	369103.9	331645.1	117	5.815	0.8	3.0
S13	Stack 13	369108.0	331656.6	117	5.815	0.8	3.0
S14	Stack 14	369112.2	331668.0	117	5.815	0.8	3.0
S15	Stack 15	369116.3	331679.5	117	5.815	0.8	3.0
S16	Stack 16	369120.4	331690.9	117	5.815	0.8	3.0
S17	Stack 17	369124.6	331702.4	117	5.815	0.8	3.0
S18	Stack 18	369128.7	331713.8	117	5.815	0.8	3.0
S19	Stack 19	369059.0	331512.3	117	5.815	0.8	3.0
S20	Stack 20	369063.1	331523.8	117	5.815	0.8	3.0
S21	Stack 21	369067.3	331535.2	117	5.815	0.8	3.0
S22	Stack 22	369071.4	331546.7	117	5.815	0.8	3.0
S23	Stack 23	369075.6	331558.1	117	5.815	0.8	3.0
S24	Stack 24	369079.7	331569.6	117	5.815	0.8	3.0
S25	Stack 25	369083.8	331581.0	117	5.815	0.8	3.0
S26	Stack 26	369088.0	331592.5	117	5.815	0.8	3.0
S27	Stack 27	369092.1	331603.9	117	5.815	0.8	3.0
S28	Stack 28	369096.5	331615.5	117	5.815	0.8	3.0
S29	Stack 29	369100.6	331627.0	117	5.815	0.8	3.0
S30	Stack 30	369104.8	331638.4	117	5.815	0.8	3.0
S31	Stack 31	369108.9	331649.9	117	5.815	0.8	3.0
S32	Stack 32	369113.1	331661.3	117	5.815	0.8	3.0
S33	Stack 33	369117.2	331672.8	117	5.815	0.8	3.0
S34	Stack 34	369121.3	331684.2	117	5.815	0.8	3.0
S35	Stack 35	369125.5	331695.7	117	5.815	0.8	3.0
S36	Stack 36	369129.6	331707.1	117	5.815	0.8	3.0

Ref	Source	Xm	Ym	Zm	Height (m)	Diameter (m)	Velocity (m/s)
S37	Stack 37	369089.0	331508.0	117	5.815	0.8	3.0
S38	Stack 38	369093.1	331519.5	117	5.815	0.8	3.0
S39	Stack 39	369097.3	331530.9	117	5.815	0.8	3.0
S40	Stack 40	369101.4	331542.4	117	5.815	0.8	3.0
S41	Stack 41	369105.6	331553.8	117	5.815	0.8	3.0
S42	Stack 42	369109.7	331565.3	117	5.815	0.8	3.0
S43	Stack 43	369113.8	331576.7	117	5.815	0.8	3.0
S44	Stack 44	369118.0	331588.2	117	5.815	0.8	3.0
S45	Stack 45	369122.1	331599.6	117	5.815	0.8	3.0
S46	Stack 46	369089.6	331501.1	117	5.815	0.8	3.0
S47	Stack 47	369093.7	331512.6	117	5.815	0.8	3.0
S48	Stack 48	369097.9	331524.0	117	5.815	0.8	3.0
S49	Stack 49	369102.0	331535.5	117	5.815	0.8	3.0
S50	Stack 50	369106.2	331546.9	117	5.815	0.8	3.0
S51	Stack 51	369110.3	331558.4	117	5.815	0.8	3.0
S52	Stack 52	369114.4	331569.8	117	5.815	0.8	3.0
S53	Stack 53	369118.6	331581.3	117	5.815	0.8	3.0
S54	Stack 54	369122.7	331592.7	117	5.815	0.8	3.0
S55	Stack 55	369126.8	331610.6	117	5.815	0.8	3.0
S56	Stack 56	369130.9	331622.1	117	5.815	0.8	3.0
S57	Stack 57	369135.1	331633.5	117	5.815	0.8	3.0
S58	Stack 58	369139.2	331645.0	117	5.815	0.8	3.0
S59	Stack 59	369143.4	331656.4	117	5.815	0.8	3.0
S60	Stack 60	369147.5	331667.9	117	5.815	0.8	3.0
S61	Stack 61	369151.6	331679.3	117	5.815	0.8	3.0
S62	Stack 62	369155.8	331690.8	117	5.815	0.8	3.0
S63	Stack 63	369159.9	331702.2	117	5.815	0.8	3.0
S64	Stack 64	369127.5	331604.5	117	5.815	0.8	3.0
S65	Stack 65	369131.6	331616.0	117	5.815	0.8	3.0
S66	Stack 66	369135.8	331627.4	117	5.815	0.8	3.0
S67	Stack 67	369139.9	331638.9	117	5.815	0.8	3.0
S68	Stack 68	369144.1	331650.3	117	5.815	0.8	3.0
S69	Stack 69	369148.2	331661.8	117	5.815	0.8	3.0
S70	Stack 70	369152.3	331673.2	117	5.815	0.8	3.0
S71	Stack 71	369156.5	331684.7	117	5.815	0.8	3.0
S72	Stack 72	369160.6	331696.1	117	5.815	0.8	3.0

Table D-2
Proposed: Stack Locations (Houses 3 and 4)

Ref	Source	Xm	Ym	Zm	Height (m)	Diameter (m)	Velocity (m/s)
S1	Stack 1	369058.4	331519.1	117	5.815	0.8	3.0
S2	Stack 2	369062.5	331530.6	117	5.815	0.8	3.0
S3	Stack 3	369066.7	331542.0	117	5.815	0.8	3.0
S4	Stack 4	369070.8	331553.5	117	5.815	0.8	3.0
S5	Stack 5	369075.0	331564.9	117	5.815	0.8	3.0
S6	Stack 6	369079.1	331576.4	117	5.815	0.8	3.0
S7	Stack 7	369083.2	331587.8	117	5.815	0.8	3.0
S8	Stack 8	369087.4	331599.3	117	5.815	0.8	3.0
S9	Stack 9	369091.5	331610.7	117	5.815	0.8	3.0
S10	Stack 10	369095.6	331622.2	117	5.815	0.8	3.0
S11	Stack 11	369099.7	331633.7	117	5.815	0.8	3.0
S12	Stack 12	369103.9	331645.1	117	5.815	0.8	3.0
S13	Stack 13	369108.0	331656.6	117	5.815	0.8	3.0
S14	Stack 14	369112.2	331668.0	117	5.815	0.8	3.0
S15	Stack 15	369116.3	331679.5	117	5.815	0.8	3.0
S16	Stack 16	369120.4	331690.9	117	5.815	0.8	3.0
S17	Stack 17	369124.6	331702.4	117	5.815	0.8	3.0
S18	Stack 18	369128.7	331713.8	117	5.815	0.8	3.0
S19	Stack 19	369059.0	331512.3	117	5.815	0.8	3.0
S20	Stack 20	369063.1	331523.8	117	5.815	0.8	3.0
S21	Stack 21	369067.3	331535.2	117	5.815	0.8	3.0
S22	Stack 22	369071.4	331546.7	117	5.815	0.8	3.0
S23	Stack 23	369075.6	331558.1	117	5.815	0.8	3.0
S24	Stack 24	369079.7	331569.6	117	5.815	0.8	3.0
S25	Stack 25	369083.8	331581.0	117	5.815	0.8	3.0
S26	Stack 26	369088.0	331592.5	117	5.815	0.8	3.0
S27	Stack 27	369092.1	331603.9	117	5.815	0.8	3.0
S28	Stack 28	369096.5	331615.5	117	5.815	0.8	3.0
S29	Stack 29	369100.6	331627.0	117	5.815	0.8	3.0
S30	Stack 30	369104.8	331638.4	117	5.815	0.8	3.0
S31	Stack 31	369108.9	331649.9	117	5.815	0.8	3.0
S32	Stack 32	369113.1	331661.3	117	5.815	0.8	3.0
S33	Stack 33	369117.2	331672.8	117	5.815	0.8	3.0
S34	Stack 34	369121.3	331684.2	117	5.815	0.8	3.0
S35	Stack 35	369125.5	331695.7	117	5.815	0.8	3.0
S36	Stack 36	369129.6	331707.1	117	5.815	0.8	3.0
S37	Stack 37	369089.0	331508.0	117	5.815	0.8	3.0
S38	Stack 38	369093.1	331519.5	117	5.815	0.8	3.0

Ref	Source	Xm	Ym	Zm	Height (m)	Diameter (m)	Velocity (m/s)
S39	Stack 39	369097.3	331530.9	117	5.815	0.8	3.0
S40	Stack 40	369101.4	331542.4	117	5.815	0.8	3.0
S41	Stack 41	369105.6	331553.8	117	5.815	0.8	3.0
S42	Stack 42	369109.7	331565.3	117	5.815	0.8	3.0
S43	Stack 43	369113.8	331576.7	117	5.815	0.8	3.0
S44	Stack 44	369118.0	331588.2	117	5.815	0.8	3.0
S45	Stack 45	369122.1	331599.6	117	5.815	0.8	3.0
S46	Stack 46	369089.6	331501.1	117	5.815	0.8	3.0
S47	Stack 47	369093.7	331512.6	117	5.815	0.8	3.0
S48	Stack 48	369097.9	331524.0	117	5.815	0.8	3.0
S49	Stack 49	369102.0	331535.5	117	5.815	0.8	3.0
S50	Stack 50	369106.2	331546.9	117	5.815	0.8	3.0
S51	Stack 51	369110.3	331558.4	117	5.815	0.8	3.0
S52	Stack 52	369114.4	331569.8	117	5.815	0.8	3.0
S53	Stack 53	369118.6	331581.3	117	5.815	0.8	3.0
S54	Stack 54	369122.7	331592.7	117	5.815	0.8	3.0
S55	Stack 55	369126.8	331610.6	117	5.815	0.8	3.0
S56	Stack 56	369130.9	331622.1	117	5.815	0.8	3.0
S57	Stack 57	369135.1	331633.5	117	5.815	0.8	3.0
S58	Stack 58	369139.2	331645.0	117	5.815	0.8	3.0
S59	Stack 59	369143.4	331656.4	117	5.815	0.8	3.0
S60	Stack 60	369147.5	331667.9	117	5.815	0.8	3.0
S61	Stack 61	369151.6	331679.3	117	5.815	0.8	3.0
S62	Stack 62	369155.8	331690.8	117	5.815	0.8	3.0
S63	Stack 63	369159.9	331702.2	117	5.815	0.8	3.0
S64	Stack 64	369127.5	331604.5	117	5.815	0.8	3.0
S65	Stack 65	369131.6	331616.0	117	5.815	0.8	3.0
S66	Stack 66	369135.8	331627.4	117	5.815	0.8	3.0
S67	Stack 67	369139.9	331638.9	117	5.815	0.8	3.0
S68	Stack 68	369144.1	331650.3	117	5.815	0.8	3.0
S69	Stack 69	369148.2	331661.8	117	5.815	0.8	3.0
S70	Stack 70	369152.3	331673.2	117	5.815	0.8	3.0
S71	Stack 71	369156.5	331684.7	117	5.815	0.8	3.0
S72	Stack 72	369160.6	331696.1	117	5.815	0.8	3.0
S73	Stack 73	369124.8	331494.9	117	5.815	0.8	3.0
S74	Stack 74	369128.9	331506.4	117	5.815	0.8	3.0
S75	Stack 75	369133.1	331517.8	117	5.815	0.8	3.0
S76	Stack 76	369137.2	331529.3	117	5.815	0.8	3.0
S77	Stack 77	369141.4	331540.7	117	5.815	0.8	3.0
S78	Stack 78	369145.5	331552.2	117	5.815	0.8	3.0

Ref	Source	Xm	Ym	Zm	Height (m)	Diameter (m)	Velocity (m/s)
S79	Stack 79	369149.6	331563.6	117	5.815	0.8	3.0
S80	Stack 80	369153.8	331575.1	117	5.815	0.8	3.0
S81	Stack 81	369157.9	331586.5	117	5.815	0.8	3.0
S82	Stack 82	369162.0	331598.0	117	5.815	0.8	3.0
S83	Stack 83	369166.1	331609.5	117	5.815	0.8	3.0
S84	Stack 84	369170.3	331620.9	117	5.815	0.8	3.0
S85	Stack 85	369174.4	331632.4	117	5.815	0.8	3.0
S86	Stack 86	369178.6	331643.8	117	5.815	0.8	3.0
S87	Stack 87	369182.7	331655.3	117	5.815	0.8	3.0
S88	Stack 88	369186.8	331666.7	117	5.815	0.8	3.0
S89	Stack 89	369191.0	331678.2	117	5.815	0.8	3.0
S90	Stack 90	369195.1	331689.6	117	5.815	0.8	3.0
S91	Stack 91	369125.4	331488.1	117	5.815	0.8	3.0
S92	Stack 92	369129.5	331499.6	117	5.815	0.8	3.0
S93	Stack 93	369133.7	331511.0	117	5.815	0.8	3.0
S94	Stack 94	369137.8	331522.5	117	5.815	0.8	3.0
S95	Stack 95	369142.0	331533.9	117	5.815	0.8	3.0
S96	Stack 96	369146.1	331545.4	117	5.815	0.8	3.0
S97	Stack 97	369150.2	331556.8	117	5.815	0.8	3.0
S98	Stack 98	369154.4	331568.3	117	5.815	0.8	3.0
S99	Stack 99	369158.5	331579.7	117	5.815	0.8	3.0
S100	Stack 100	369162.9	331591.3	117	5.815	0.8	3.0
S101	Stack 101	369167.0	331602.8	117	5.815	0.8	3.0
S102	Stack 102	369171.2	331614.2	117	5.815	0.8	3.0
S103	Stack 103	369175.3	331625.7	117	5.815	0.8	3.0
S104	Stack 104	369179.5	331637.1	117	5.815	0.8	3.0
S105	Stack 105	369183.6	331648.6	117	5.815	0.8	3.0
S106	Stack 106	369187.7	331660.0	117	5.815	0.8	3.0
S107	Stack 107	369191.9	331671.5	117	5.815	0.8	3.0
S108	Stack 108	369196.0	331682.9	117	5.815	0.8	3.0
S109	Stack 109	369159.6	331482.3	117	5.815	0.8	3.0
S110	Stack 110	369163.7	331493.8	117	5.815	0.8	3.0
S111	Stack 111	369167.9	331505.2	117	5.815	0.8	3.0
S112	Stack 112	369172.0	331516.7	117	5.815	0.8	3.0
S113	Stack 113	369176.2	331528.1	117	5.815	0.8	3.0
S114	Stack 114	369180.3	331539.6	117	5.815	0.8	3.0
S115	Stack 115	369184.4	331551.0	117	5.815	0.8	3.0
S116	Stack 116	369188.6	331562.5	117	5.815	0.8	3.0
S117	Stack 117	369192.7	331573.9	117	5.815	0.8	3.0
S118	Stack 118	369160.2	331475.4	117	5.815	0.8	3.0

Ref	Source	Xm	Ym	Zm	Height (m)	Diameter (m)	Velocity (m/s)
S119	Stack 119	369164.3	331486.9	117	5.815	0.8	3.0
S120	Stack 120	369168.5	331498.3	117	5.815	0.8	3.0
S121	Stack 121	369172.6	331509.8	117	5.815	0.8	3.0
S122	Stack 122	369176.8	331521.2	117	5.815	0.8	3.0
S123	Stack 123	369180.9	331532.7	117	5.815	0.8	3.0
S124	Stack 124	369185.0	331544.1	117	5.815	0.8	3.0
S125	Stack 125	369189.2	331555.6	117	5.815	0.8	3.0
S126	Stack 126	369193.3	331567.0	117	5.815	0.8	3.0
S127	Stack 127	369197.4	331584.9	117	5.815	0.8	3.0
S128	Stack 128	369201.5	331596.4	117	5.815	0.8	3.0
S129	Stack 129	369205.7	331607.8	117	5.815	0.8	3.0
S130	Stack 130	369209.8	331619.3	117	5.815	0.8	3.0
S131	Stack 131	369214.0	331630.7	117	5.815	0.8	3.0
S132	Stack 132	369218.1	331642.2	117	5.815	0.8	3.0
S133	Stack 133	369222.2	331653.6	117	5.815	0.8	3.0
S134	Stack 134	369226.4	331665.1	117	5.815	0.8	3.0
S135	Stack 135	369230.5	331676.5	117	5.815	0.8	3.0
S136	Stack 136	369198.1	331578.8	117	5.815	0.8	3.0
S137	Stack 137	369202.2	331590.3	117	5.815	0.8	3.0
S138	Stack 138	369206.4	331601.7	117	5.815	0.8	3.0
S139	Stack 139	369210.5	331613.2	117	5.815	0.8	3.0
S140	Stack 140	369214.7	331624.6	117	5.815	0.8	3.0
S141	Stack 141	369218.8	331636.1	117	5.815	0.8	3.0
S142	Stack 142	369222.9	331647.5	117	5.815	0.8	3.0
S143	Stack 143	369227.1	331659.0	117	5.815	0.8	3.0
S144	Stack 144	369231.2	331670.4	117	5.815	0.8	3.0
SB1S1	SB1S1	369164.4	331647.8	117	5.2	1.6	4.2
SB1S2	SB1S2	369163.8	331645.9	117	5.2	1.8	4.2
SB1S3	SB1S3	369163.1	331643.9	117	5.2	1.8	4.2
SB1S4	SB1S4	369162.4	331642.0	117	5.2	1.8	4.2
SB1S5	SB1S5	369161.6	331639.8	117	5.2	1.8	4.2
SB2S1	SB2S1	369199.7	331634.5	117	5.2	1.8	4.2
SB2S2	SB2S2	369199.1	331632.6	117	5.2	1.8	4.2
SB2S3	SB2S3	369198.4	331630.6	117	5.2	1.8	4.2
SB2S4	SB2S4	369197.7	331628.7	117	5.2	1.8	4.2
SB2S5	SB2S5	369197.0	331626.8	117	5.2	1.8	4.2
SB3S1	SB3S1	369160.3	331525.9	117	5.2	1.8	4.2
SB3S2	SB3S2	369159.7	331524.0	117	5.2	1.8	4.2
SB3S3	SB3S3	369159.0	331522.0	117	5.2	1.8	4.2
SB3S4	SB3S4	369158.3	331520.1	117	5.2	1.8	4.2

Ref	Source	Xm	Ym	Zm	Height (m)	Diameter (m)	Velocity (m/s)
SB3S5	SB3S5	369157.6	331518.1	117	5.2	1.8	4.2
SB4S1	SB4S1	369200.6	331649.5	117	5.2	1.8	4.2
SB4S2	SB4S2	369200.0	331647.6	117	5.2	1.8	4.2
SB4S3	SB4S3	369199.3	331645.6	117	5.2	1.8	4.2
SB4S4	SB4S4	369198.6	331643.7	117	5.2	1.8	4.2
SB4S5	SB4S5	369201.4	331651.5	117	5.2	1.8	4.2
SB5S1	SB5S1	369161.0	331540.7	117	5.2	1.8	4.2
SB5S2	SB5S2	369160.4	331538.8	117	5.2	1.8	4.2
SB5S3	SB5S3	369159.7	331536.8	117	5.2	1.8	4.2
SB5S4	SB5S4	369159.0	331534.9	117	5.2	1.8	4.2
SB5S5	SB5S5	369161.5	331542.4	117	5.2	1.8	4.2
SB6S1	SB6S1	369130.3	331554.0	117	5.2	1.8	4.2
SB6S2	SB6S2	369129.5	331552.1	117	5.2	1.8	4.2
SB6S3	SB6S3	369128.7	331549.7	117	5.2	1.8	4.2
SB6S4	SB6S4	369128.0	331547.8	117	5.2	1.8	4.2
SB6S5	SB6S5	369127.3	331546.0	117	5.2	1.8	4.2

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