Odour Assessment

The Green Hub, Herefordshire

Client: Onnu Ltd

Reference: 8125-1r1

Date: 17th June 2024

Report Issue

Report Title: Odour Assessment - The Green Hub, Herefordshire

Report Reference: 8125-1

Field	Report Version			
	1	2	3	4
Prepared by	Liam Shelmerdine			
Position	Senior Air Quality Consultant			
Reviewed by	Ceri Haines			
Position	Senior Air Quality Consultant			
Authorised by	Ger Parry			
Position	Director			
Date of Issue	17th June 2024			
Comments	-			

Serendipity Labs, Building 7, Exchange Quay, Salford, M5 3EP

info@red-env.co.uk | 0161 706 0075 | www.red-env.co.uk

Executive Summary

Redmore Environmental Ltd was commissioned by Onnu Ltd to undertake an Odour Assessment in support of a planning application and subsequent Environmental Permit Application for a proposed pyrolysis plant, referred to as The Green Hub, on land off Hereford Road, Herefordshire.

The proposed plant has the potential to result in odour emissions and associated impacts at sensitive locations in the vicinity of the site. An Odour Assessment was therefore undertaken to evaluate potential effects as a result of the development.

Emissions from relevant sources were defined based on the size and nature of the plant, as well as information provided by Onnu Ltd. Impacts at sensitive receptors were quantified using dispersion modelling, the results compared with the relevant odour benchmark level and the significance assessed in accordance with the appropriate guidance.

Predicted odour concentrations were below the relevant benchmark level at all sensitive locations in the vicinity of the site for all modelling years. In addition, resultant impacts were classified as not significant at all receptors in accordance with the relevant criteria. As such, potential odour emissions from the plant are not considered to represent a constraint to the development.

Table of Contents

1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by Onnu Ltd to undertake an Odour Assessment in support of a planning application and subsequent Environmental Permit Application for a proposed pyrolysis plant, referred to as The Green Hub, on land off Hereford Road, Herefordshire.

1.1.2 Odour emissions from the facility have the potential to cause impacts at existing sensitive locations. An Odour Assessment was therefore undertaken to evaluate potential effects as a result of the development.

1.2 Site Location and Context

1.2.1 The proposed development is located on land off Hereford Road, Herefordshire, at approximate National Grid Reference (NGR): 351080, 254120. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 It is proposed to construct and operate a plant comprising four C1000 pyrolysis units, each with a thermal input of 1.3MW. The plant will be installed within a dedicated building and process gases will be treated using a wet scrubber prior to exhaust to atmosphere through two dispersion stacks which will terminate at a height of 10m.

1.2.3 The facility has the potential to result in odour emissions during normal operation and associated impacts at existing sensitive locations. As such, an Odour Assessment was undertaken in order to evaluate potential effects as a result of the development.

2.0 ODOUR BACKGROUND

2.1 Odour Definition

2.1.1 The Institute of Air Quality Management (IAQM) guidance[1] defines odour as:

> "[…] the human olfactory response (perception followed by psychological appraisal) to one, or more often a complex mixture of, chemical species in the air."

2.1.2 The stated definition is considered to be relevant in the context of this assessment.

2.2 Odour Impacts

2.2.1 The magnitude of odour impact depends on a number of factors and the potential for complaints varies due to the subjective nature of odour perception. The **FIDOL** acronym (also stated as FIDOR in Environment Agency (EA) guidance[2]) is a useful reminder of the factors that will determine the degree of odour pollution. These are described by the IAQM[3] as follows:

- **F**requency - how often an individual is exposed to odour;
- **I**ntensity - the individual's perception of the strength of the odour;
- **D**uration - the overall duration that individuals are exposed to an odour over time;
- **O**dour unpleasantness - Odour unpleasantness describes the character of an odour as it relates to the 'hedonic tone' (which may be pleasant, neutral or unpleasant) at a given odour concentration/intensity. This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score; and,
- **L**ocation - The type of land use and nature of human activities in the vicinity of an odour source. Tolerance and expectation of the receptor. The 'Location' factor can be considered to encompass the receptor characteristics, receptor sensitivity, and socio-economic factors.

---

1 Guidance on the Assessment of Odour for Planning v1.1., IAQM, 2018.

2 H4: Odour Management, EA, 2011.

3 Guidance on the Assessment of Odour for Planning v1.1., IAQM, 2018.

2.2.2 It is important to note that even infrequent emissions may cause loss of amenity if odours are perceived to be particularly intense or offensive.

2.2.3 The **FIDOL** factors can be further considered to provide the following in regards the potential for an odour emission to cause an impact:

- The rate of emission of the compound(s);
- The duration and frequency of emissions;
- The time of the day that this emission occurs;
- The prevailing meteorology;
- The sensitivity of receptors to the emission i.e. whether the odorous compound is more likely to cause nuisance, such as the sick or elderly, who may be more sensitive;
- The odour detection capacity of individuals to the various compound(s); and,
- The individual perception of the odour (i.e. whether the odour is regarded as unpleasant). This is greatly subjective and may vary significantly from individual to individual. For example, some individuals may consider some odours as pleasant, such as petrol, paint and creosote.

2.3 Odour Legislative Control

2.3.1 The main requirement with respect to odour control from industrial activities is the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments. If a process is deemed potentially odorous then the relevant regulator will usually include an appropriate condition in the site's Environmental Permit to restrict impacts beyond the facility boundary through the implementation of an Odour Management Plant (OMP).

2.3.2 Enforcement of the condition is by the relevant regulator, either the EA for Part A(1) processes, or the Local Authority for Part A(2) and B processes. If the regulator is satisfied that odour from a facility is causing pollution beyond the site boundary, then they can serve an improvement notice that requires remedial works to be undertaken to reduce impacts to an acceptable level. The measures that are deemed appropriate will depend on the industry sector and site-specific circumstances and will take costs and benefits into account. Should appropriate actions not be taken by the operator then the regulator has

a number of available options, cumulating in the revocation of the Environmental Permit and cessation of all activities on site.

2.4 Institute of Air Quality Management Guidance

2.4.1 The IAQM published the 'Guidance on the Assessment of Odour for Planning'[4] on 20th May 2014. This was updated in 2018[5] and specifically deals with assessing odour impacts for planning purposes, namely potential effects on amenity. The assessment methodology outlined in the guidance has been utilised throughout this report where relevant.

2.5 National Planning Policy

2.5.1 The revised National Planning Policy Framework[6] (NPPF) was published in December 2023 and sets out the Government's planning policies for England and how these are expected to be applied.

2.5.2 The purpose of the planning system is to contribute to the achievement of sustainable development. In order to ensure this, the NPPF recognises three overarching objectives, including the following of relevance to odour:

> "c) An environmental objective - to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy"

2.5.3 Chapter 15 of the NPPF details objectives in relation to conserving and enhancing the natural environment. It states that:

> "Planning policies and decisions should contribute to and enhance the natural and local environment by:
>
> […]

4 Guidance on the Assessment of Odour for Planning, IAQM, 2014.

5 Guidance on the Assessment of Odour for Planning v1.1, IAQM, 2018.

6 NPPF, Ministry of Housing, Communities and Local Government, 2023.

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 […]"

2.5.4 The implications of the NPPF have been considered throughout this assessment.

2.6 Local Planning Policy

2.6.1 The Herefordshire Local Plan Core Strategy 2011-2031[7] was adopted by Herefordshire Council (HC) in October 2015. Review of the Core Strategy identified the following policy of relevance to this assessment:

"Policy SD1 - Sustainable design and energy efficiency

Development proposals should create safe, sustainable, well integrated environments for all members of the community. In conjunction with this, all development proposals should incorporate the following requirements:

[…]

ensure new development does not contribute to, or suffer from, adverse impacts arising from noise, light or air contamination, land instability or cause ground water pollution;

[…]."

"Policy SS6 - Environmental quality and local distinctiveness

Development proposals should conserve and enhance those environmental assets that contribute towards the county's distinctiveness, in particular its settlement pattern, landscape, biodiversity and heritage assets and especially those with specific environmental designations. In addition, proposals should

[7] Herefordshire Local Plan Core Strategy 2011 - 2031, HC, 2015.

maintain and improve the effectiveness of those ecosystems essential to the health and wellbeing of the county's residents and its economy. Development proposals should be shaped through an integrated approach to planning the following environmental components from the outset, and based upon sufficient information to determine the effect upon each where they are relevant:

[…]

- local amenity, including light pollution, air quality and tranquillity."

"Policy RA6 - Rural Economy

[…]

A range of economic activities will be supported, including proposals which:

[…]

- do not cause unacceptable adverse impacts to the amenity of nearby residents by virtue of design and mass, noise and dust, lighting and smell."

2.6.2 The above policies were taken into consideration throughout the undertaking of the assessment.

2.7 Odour Benchmark Levels

2.7.1 There is no statutory limit in the UK for ambient odour concentrations, whether set for individual chemical species or for mixtures. However, the EA has issued guidance on odour[8] which contains indicative benchmark levels for use in the assessment of potential impacts from industrial facilities.

2.7.2 Benchmark levels are stated as the 98th percentile (%ile) of hourly mean concentrations in European odour units (ou_E) over a year for odours of different offensiveness. In practice

8 H4: Odour Management, EA, 2011.

this means that for 2% of the year, or 175-hours, concentrations will be higher than this value, whilst for 98% of the year, or 8,585-hours, they will be lower. This parameter reflects the previously described FIDOR factors, where an odour is likely to be noted on several occasions above a particular threshold concentration before an annoyance occurs. EA odour benchmark levels are summarised in Table 1.

Table 1 Odour Benchmark Levels

Relative Offensiveness of Odour	Benchmark Level as 98th %ile of 1-hour Means (ou_E/m^3)
Most offensive odours: • Processes involving decaying animal or fish • Processes involving septic effluent or sludge • Biological landfill odours	1.5
Moderately offensive odours: • Intensive livestock rearing • Fat frying (food processing) • Sugar beet processing • Well aerated green waste composting	3.0
Less offensive odours: • Brewery • Confectionery • Coffee roasting • Bakery	6.0

2.7.3 In accordance with EA guidance H4, odours from the plant would be classified as moderately offensive as they are not associated with processes involving decaying animal or fish remains, septic effluent or sludge or biological landfill type odours, and do not obviously fall within the less offensive category. As such, an odour benchmark level of $3.0ou_E/m^3$ as a 98th %ile 1-hour mean has been utilised throughout the assessment.

2.7.4 In order to provide some context to the odour benchmark values, the Department for Environment, Food and Rural Affairs (DEFRA) have provided the following descriptors[9]:

- $1ou_E/m^3$ is the point of detection;

[9] Odour Guidance for Local Authorities, DEFRA, 2010.

- $5ou_E/m^3$ is a faint odour; and,
- $10ou_E/m^3$ is a distinct odour.

2.7.5 An odour at a strength of $1ou_E/m^3$ is in reality so weak that it would not normally be detected outside the controlled environment of an odour laboratory by the majority of people (that is individuals with odour sensitivity in the "normal" range - approximately 96% of the population[10]). It is important to note that these values are based on laboratory measurements and in the general environment other factors affect our sense of odour perception. These include:

- The population is continuously exposed to a wide range of background odours at a range of different concentrations, and usually people are unaware of there being any background odours at all due to normal habituation. Individuals can also develop a tolerance to background and other specific odours. In an odour laboratory the determination of detection threshold is undertaken by comparison with non-odorous air, and in carefully controlled, odour-free, conditions. Normal background odours such as those from traffic, vegetation, grass mowing etc, can provide background odour concentrations from 5 to $60ou_E/m^3$ or more[11];
- The recognition threshold may be about $3ou_E/m^3$ [12], although it might be less for offensive substances or higher if the receptor is less familiar with the odour or distracted by other stimuli; and,
- An odour which fluctuates rapidly in concentration is often more noticeable than a steady odour at a low concentration.

10 Odour Guidance for Local Authorities, DEFRA, 2010.

11 Odour Guidance for Local Authorities, DEFRA, 2010.

12 Odour Guidance for Local Authorities, DEFRA, 2010.

3.0 METHODOLOGY

3.1 Introduction

3.1.1 The facility may result in odour emissions during normal operation. These were assessed in accordance with the following stages:

- Identification of odour sources;
- Identification of odour emission rates;
- Dispersion modelling of odour emissions; and,
- Comparison of modelling results with relevant criteria.

3.1.2 The following Sections outline the methodology and inputs used for the assessment.

3.2 Odour Sources and Emissions Data

3.2.1 The facility will include four C1000 pyrolysis units which will be installed within a dedicated building. Emissions generated by the units will be treated using a wet scrubber prior to exhaust to atmosphere through two dispersion stacks which terminate at a height of 10m. Emissions from the stacks may have the potential to result in odour impacts at sensitive locations in the vicinity of the site. As such, releases have been considered in detail as part of the dispersion modelling.

3.2.2 It should be noted that all feedstock is to be stored within the main process building and therefore is not considered to be a source of odour as all potential emissions will be contained within the building. Once cooled, the biochar will be moved to an external storage bunker. The biochar is a post process material and as such is anticipated to have a low odour potential. It has therefore not been considered further within the assessment.

3.2.3 There are no Emission Limit Values (ELVs) for odour and as the plant is not operational, estimations of releases from the scrubber stacks had to be made to inform the dispersion model. The European Commission (EC) guidance 'Best Available Techniques (BAT) Reference Document for Waste Treatment'[13] suggests that an odour Associated Emission Level (AEL) range of 200 to 1,000ou_E/m^3 is applicable to channelled emissions to air from

[13] Best Available Techniques Reference Document for Waste Treatment, EC, 2018.

waste processes. The upper range AEL of 1,000ou_E/m^3 is routinely specified as benchmark for abatement systems treating air from waste processes at regulated facilities. As such, this value was utilised to calculate emissions from the scrubber stacks for use in the model.

3.3 Dispersion Modelling

3.3.1 Dispersion modelling was undertaken using ADMS-6 (v6.0.0.1), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS-6 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

3.3.2 The model utilises hourly meteorological data to define conditions for plume rise, transport and diffusion. It estimates the concentration for each source and receptor combination for each hour of input meteorology and calculates user-selected long-term and short-term averages.

3.3.3 The model requires input data that details the following parameters:

- Assessment area;
- Process conditions;
- Pollutant emission rates;
- Terrain information;
- Building dimensions;
- Meteorological data;
- Roughness length (z_0); and,
- Monin-Obukhov length.

3.3.4 These are detailed in the following Sections.

3.4 Modelling Scenarios

3.4.1 The scenarios considered in the modelling assessment are summarised in Table 2.

Table 2 Assessment Scenarios

Parameter	Modelled As	
	Short Term	Long Term
Odour	98th %ile 1-hour mean	-

3.5 Process Conditions

The inputs used to describe the relevant emission sources within the model were derived from the previously stated data and information provided by Onnu Ltd. A summary of the data is provided in the following Sections.

Table 3 Stack Model Input

Parameter	Unit	Stack 1	Stack 2
Source type	-	Point	Point
Position	NGR	351074.4, 254136.0	351076.8, 254122.1
Height	m	10.0	10.0
Source diameter	m	0.4	0.4
Exhaust gas temperature	°C	60	60
Total exhaust gas flow rate	m^3/s	1.14	1.14
Emission velocity	m/s	9.1	9.1
Odour emission concentration	ou_E/m^3	1,000	1,000
Odour emission rate	ou_E/s	1,140	1,140

3.5.1 Emissions were assumed to be constant, 24-hours per day, 365-days per year. This is considered to be a worst-case assessment scenario as plant shutdown or periods of reduced operating capacity are not reflected in the modelled emissions.

3.6 Assessment Area

3.6.1 The assessment area was defined based on the facility location, anticipated pollutant dispersion patterns and the positioning of sensitive receptors. Ambient concentrations were predicted over NGR: 350300, 253300 to 351800, 254800. One Cartesian grid with a

resolution of 10m was used within the model to produce data suitable for contour plotting using the Surfer software package.

3.6.2 Reference should be made to Figure 2 for a graphical representation of the assessment grid extents.

3.6.3 A desk-top study was undertaken in order to identify any sensitive receptor locations in the vicinity of the site that required specific consideration during the assessment. These are summarised in Table 4.

Table 4 Sensitive Receptor Locations

Receptor		NGR (m)	
		X	Y
R1	Residential - Newton Lane	350914.3	253967.8
R2	Residential - Marlbrook Cottages	350567.0	254537.1
R3	Residential - Marlbrook Cottages	350943.7	254554.3
R4	Residential - A49	351246.8	253764.1
R5	Residential - Newton Lane	350747.8	253715.5

3.6.4 Reference should be made to Figure 3 for a map of the receptor locations.

3.7 Terrain Data

3.7.1 Ordnance Survey OS Terrain 50 data was included in the model for the site and surrounding area in order to take account of the specific flow field produced by variations in ground height throughout the assessment extents. This was pre-processed using the method suggested by CERC[14].

3.8 Building Effects

3.8.1 The dispersion of substances released from elevated sources can be influenced by the presence of buildings close to the emission points. Structures can interrupt the wind flows

[14] Note 105: Setting up Terrain Data for Input to CERC Models, CERC, 2016.

and cause significantly higher ground-level concentrations close to the source than would arise in the absence of the buildings.

3.8.2 Analysis of the site layout indicated that a number of structures should be included within the model in order to take account of effects on pollutant dispersion. Building input geometries are shown in Table 5.

Table 5 Building Geometries

Building	NGR (m)		Height (m)	Length/ Diameter (m)	Width (m)	Angle (°)
	X	Y				
Main Building	351071.3	254121.8	8.5	42.5	26.5	170.5
Biochar Storage	351092.9	254139.5	3.5	15.5	14.3	260.5
Office	351094.1	254106.1	4.7	9.3	11.3	170.5
Woodchip storage	351071.9	254174.9	8.0	8.4	44.1	205.6

3.9 Meteorological Data

3.9.1 Meteorological data used in the assessment was taken from Hereford Credenhill meteorological station over the period 1st January 2018 to 31st December 2022 (inclusive). This observation station is located at NGR: 344997, 242664, which is approximately 12.8km south-west of the facility. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

3.9.2 All meteorological files used in the assessment were provided by Atmospheric Dispersion Modelling Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 4 for wind roses of the utilised meteorological records.

3.10 Roughness Length

3.10.1 A z_0 of 0.3m was used within the model to describe both the modelling extents and meteorological site. This value is considered appropriate for the morphology of both areas and is suggested within ADMS-6 as being suitable for 'agricultural areas (max)'.

3.11 Monin-Obukhov Length

3.11.1 The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 1m was used to describe the modelling extents and meteorological site. This value is considered appropriate for the nature of both areas and is suggested within ADMS-6 as being suitable for 'rural areas'.

3.12 Assessment Criteria

3.12.1 Predicted ground level odour concentrations were compared with the EA odour benchmark level of 3.0ou_E/m^3 as a 98th percentile of 1-hour means.

3.13 Significance of Odour Impacts

3.13.1 The significance of impacts was s of impacts was assessed through the interaction of the predicted 98th %ile of 1-hour mean odour concentrations and receptor sensitivity, as outlined in the IAQM guidance[15]. The relevant assessment matrix is summarised in Table 6.

Table 6 Odour Impact

Odour Exposure Level as 98th %ile of 1-hour Means (ou_E/m^3)	Receptor Sensitivity		
	Low	Medium	High
Greater than 10	Moderate	Moderate	Substantial
5 - 10	Slight	Moderate	Moderate
3 - 5	Negligible	Slight	Moderate
1.5 - 3	Negligible	Negligible	Slight
0.5 - 1.5	Negligible	Negligible	Negligible
Less than 0.5	Negligible	Negligible	Negligible

3.13.2 The IAQM guidance[16] states that an assessment must reach a conclusion on the likely significance of the predicted impact. Where the overall effect is **moderate** or **substantial**, the effect is likely to be considered **significant**, whilst if the impact is **slight** or **negligible**,

15 Guidance on the Assessment of Odour for Planning, IAQM, 2018.

16 Guidance on the Assessment of Odour for Planning, IAQM, 2018.

the impact is likely to be considered **not significant**. It should be noted that this is a binary judgement of either it is **significant** or it is **not significant**.

3.14 Modelling Uncertainty

3.14.1 Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and,
- Variability - randomness of measurements used.

3.14.2 Potential uncertainties in the model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

- Choice of model - ADMS-6 is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Meteorological data - Modelling was undertaken using five annual meteorological data sets from a local observation station to the site to account for inter-year variability. The assessment was based on the worst-case year to ensure maximum concentrations were considered;
- Surface characteristics - The z_0 and Monin-Obukhov length were determined for both the dispersion and meteorological sites based on the surrounding land uses and guidance provided by CERC. Terrain data was included and processed using the method outlined by CERC;
- Operating conditions - Information was provided by Onnu Ltd to describe proposed activities at the plant. As such, these are considered to be representative of likely operating conditions;
- Emission rates - Emission rates were derived from EC guidance[17] and information provided by Onnu Ltd. As such, the data is considered representative of potential releases from the facility;

[17] Best Available Techniques Reference Document for Waste Treatment, EC, 2018.

- Receptor locations - A Cartesian Grid was included in the model in order to provide suitable data for contour plotting. Receptor points were also included at sensitive locations to provide additional consideration of these areas; and,
- Variability - All model inputs are as accurate as possible and worst-case conditions were considered as necessary in order to ensure a robust assessment of potential pollutant concentrations.

3.14.3 Results were considered in the context of the relevant odour benchmark level and IAQM significance criteria. It is considered that the use of the stated measures to reduce uncertainty and the use of worst-case assumptions when necessary has resulted in model accuracy of an acceptable level.

4.0 ASSESSMENT

4.1 Predicted Odour Concentrations

4.1.1 Dispersion modelling of potential odour emissions was undertaken using the input data specified previously. Predicted odour concentrations at the discrete receptor locations are summarised in Table 7. It should be noted that the odour concentrations are presented as a 98th %ile of 1-hour mean values over the relevant assessment year.

Table 7 Predicted Odour Concentrations

Receptor		Predicted 98th %ile 1-hour Mean Odour Concentration (ou_E/m^3)				
		2018	2019	2020	2021	2022
R1	Residential - Newton Lane	0.14	0.13	0.13	0.14	0.13
R2	Residential - Marlbrook Cottages	0.03	0.03	0.03	0.02	0.03
R3	Residential - Marlbrook Cottages	0.08	0.07	0.07	0.06	0.09
R4	Residential - A49	0.04	0.04	0.04	0.04	0.05
R5	Residential - Newton Lane	0.05	0.05	0.05	0.05	0.05

4.1.2 As indicated in Table 7, predicted odour concentrations were below the EA odour benchmark of 3.0ou_E/m^3 at all receptor locations for all modelling years.

4.1.3 Reference should be made to Figure 5 to Figure 9 for graphical representations of predicted odour concentrations throughout the assessment extents. These indicate maximum levels in close proximity to the site, with levels reducing sharply over a short distance.

4.2 Impact Significance

4.2.1 The significance of predicted odour impacts at the sensitive receptors is summarised in Table 8.

Table 8 Predicted Odour Impacts

Receptor		Odour Exposure Level as 98th %ile of 1-hour Means (ou_E/m^3)	Receptor Sensitivity	Significance of Impact
R1	Residential - Newton Lane	Less than 0.5	High	Negligible
R2	Residential - Marlbrook Cottages	Less than 0.5	High	Negligible
R3	Residential - Marlbrook Cottages	Less than 0.5	High	Negligible
R4	Residential - A49	Less than 0.5	High	Negligible
R5	Residential - Newton Lane	Less than 0.5	High	Negligible

4.2.2 As indicated in Table 8, the significance of odour impacts as a result of emissions from the facility was predicted to be **negligible** at all receptor locations.

4.2.3 The IAQM guidance[18] states that only if the impact is **moderate** or **substantial**, the effect is considered significant. As such, impacts are considered **not significant**, in accordance with the stated methodology.

4.2.4 Based on the dispersion modelling results, odour emissions from the proposed facility are not considered to represent a constraint to the proposed development.

[18] Guidance on the Assessment of Odour for Planning v1.1, IAQM, 2018.

5.0 CONCLUSION

5.1.1 Redmore Environmental Ltd was commissioned by Onnu Ltd to undertake an Odour Assessment in support of a planning application and subsequent Environmental Permit Application for a proposed pyrolysis plant, referred to as The Green Hub, on land off Hereford Road, Herefordshire.

5.1.2 Odour emissions from the facility have the potential to cause impacts at sensitive locations within the vicinity of the site. An Odour Assessment was therefore undertaken to consider effects in the vicinity of the plant.

5.1.3 Potential odour releases were defined based on the size and nature of the proposed plant. These were represented within a dispersion model produced using ADMS-6. Impacts at sensitive receptor locations in the vicinity of the site were quantified, the results compared with the relevant odour benchmark levels and the significance assessed in accordance with the IAQM guidance.

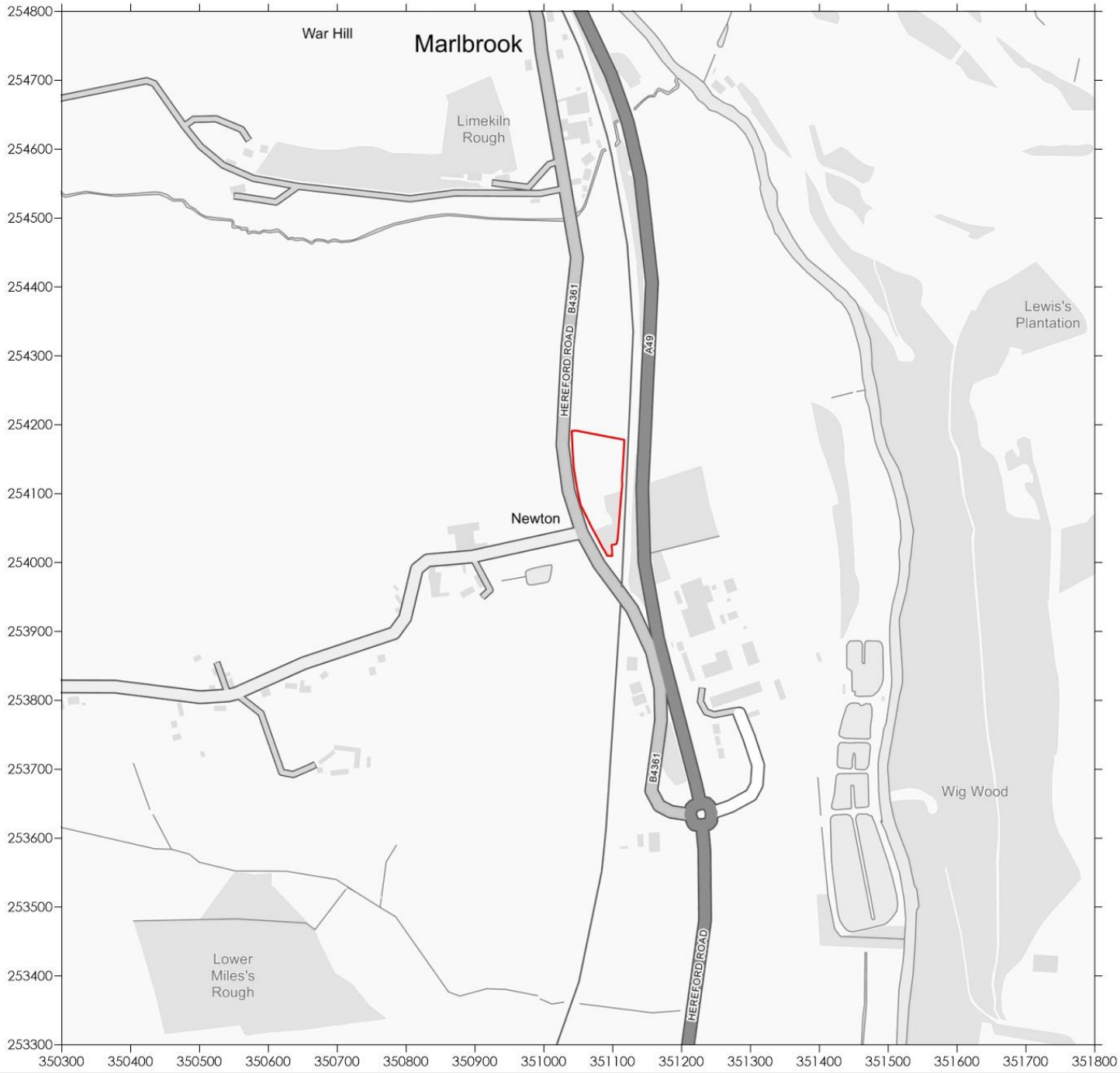
5.1.4 Predicted odour concentrations were below the relevant EA odour benchmark level at all receptor locations for all modelling years. The significance of predicted impacts was defined as **negligible** at all receptor locations. In accordance with the IAQM guidance, the overall odour effects as a result of the proposed plant are considered to be **not significant**.

5.1.5 Based on the findings of the assessment, potential odour emissions from the facility are not considered to represent a constraint to the proposed development.

6.0 ABBREVIATIONS

AEL	Associated Emission Level
BAT	Best Available Technique
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EC	European Commission
HC	Herefordshire Council
NGR	National Grid Reference
NPPF	National Planning Policy Framework
OMP	Odour Management Plan
ou_E	European Odour Unit
z_0	Roughness length
%ile	Percentile

Figures



Legend

Site Boundary

Title
Figure 1 - Site Location Plan

Project
Odour Assessment
The Green Hub, Herefordshire

Project Reference
8125-1

Client
Onnu Ltd

Redmore environmental
www.red-env.co.uk | 0161 7060075

Legend

- Site Boundary
- Output Grid
- Building
- Point Source

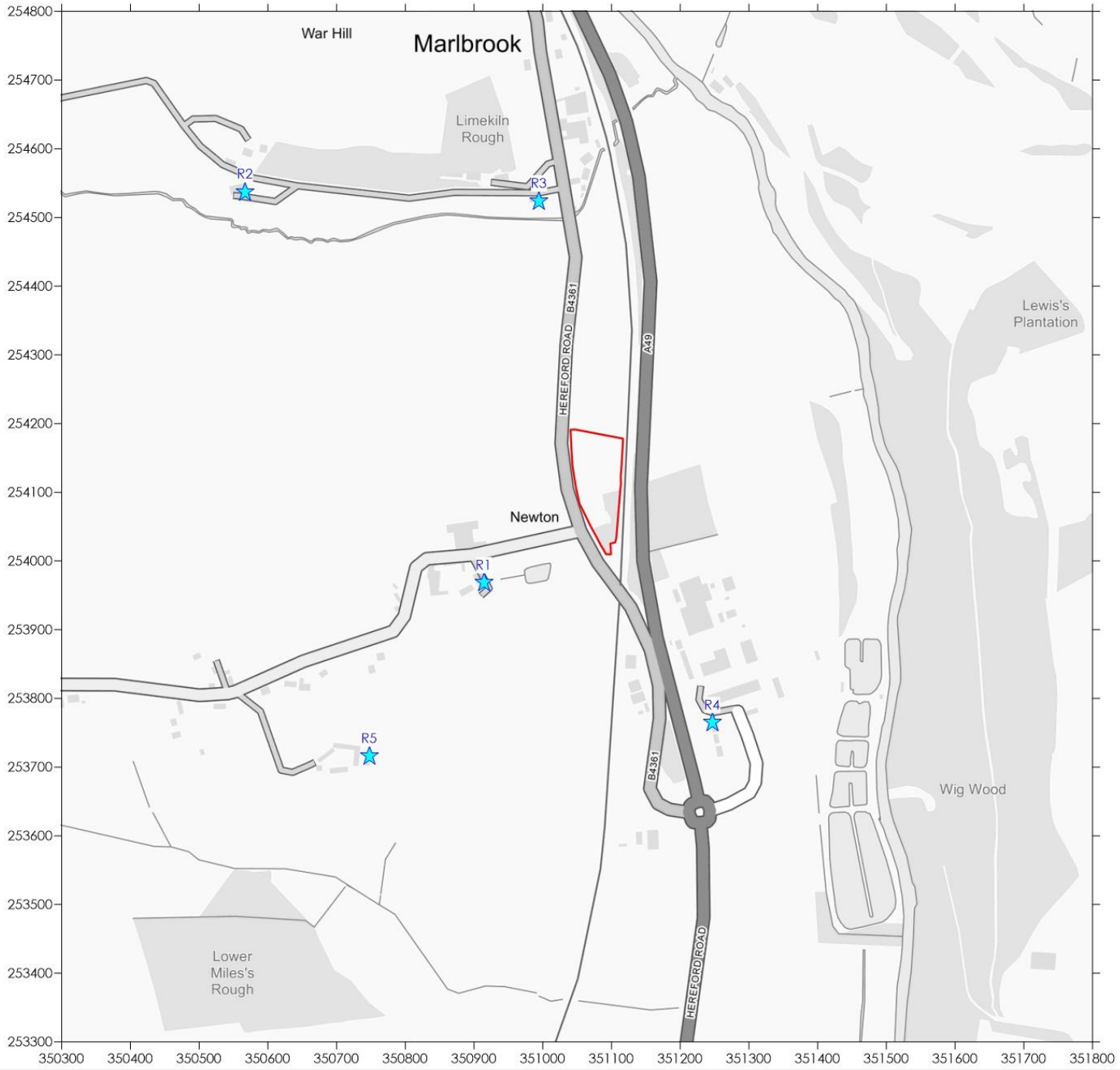
Title
Figure 2 - ADMS-6 Inputs

Project
Odour Assessment
The Green Hub, Herefordshire

Project Reference
8125-1

Client
Onnu Ltd

Redmore environmental
www.red-env.co.uk | 0161 7060075



Legend

Site Boundary

Receptor

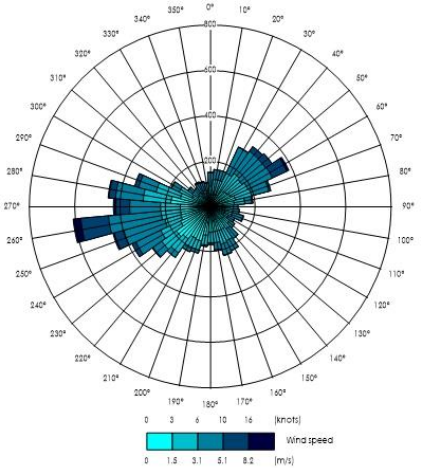
Title
Figure 3 - Sensitive Receptor Locations

Project
Odour Assessment
The Green Hub, Herefordshire

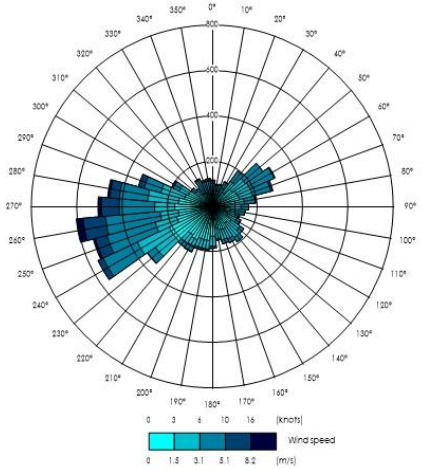
Project Reference
8125-1

Client
Onnu Ltd

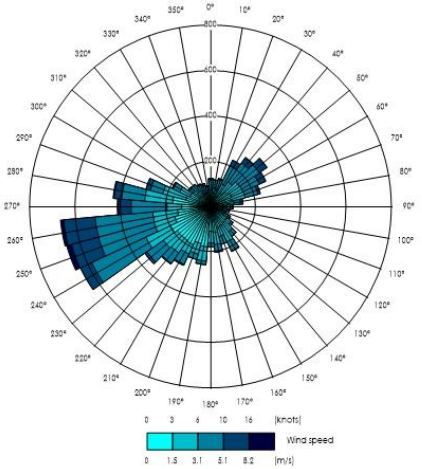
Redmore environmental
www.red-env.co.uk | 0161 7060075



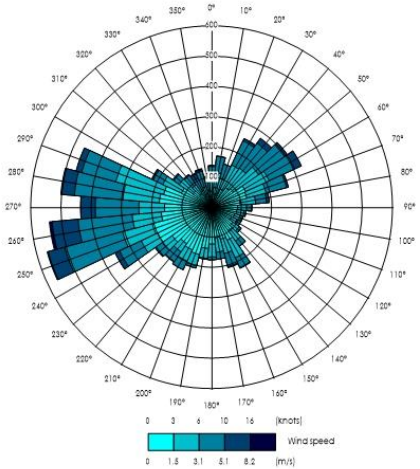
2018 Meteorological Data



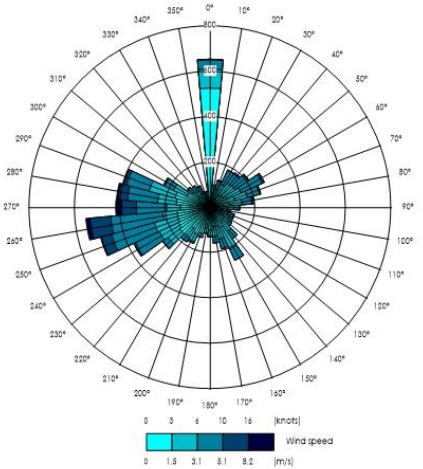
2019 Meteorological Data



2020 Meteorological Data



2021 Meteorological Data



2022 Meteorological Data

Legend

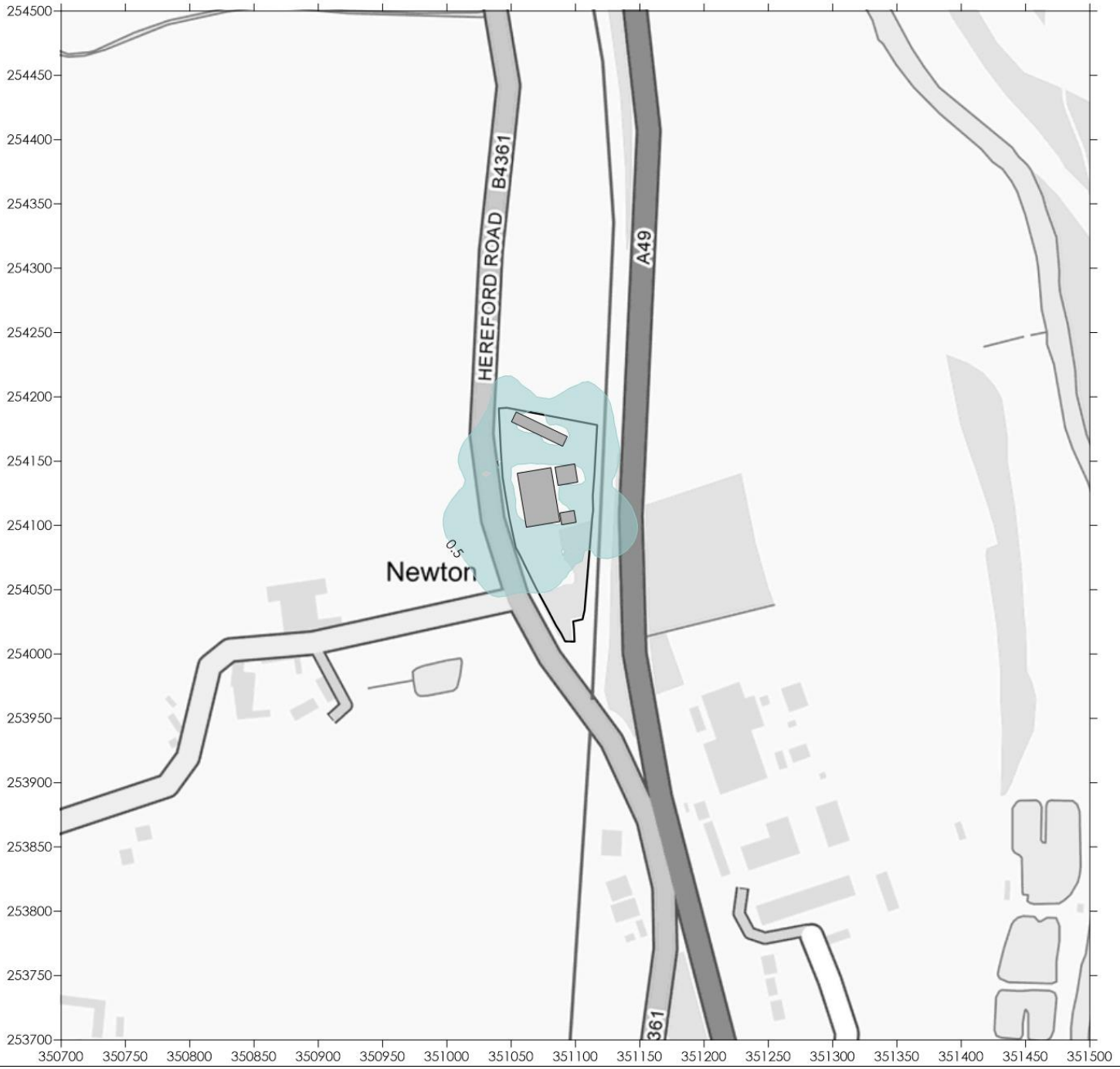
Title
Figure 4 - Wind Roses of 2018 to 2022 Hereford Meteorological Data

Project
Odour Assessment
The Green Hub, Herefordshire

Project Reference
8125-1

Client
Onnu Ltd

Redmore environmental
www.red-env.co.uk | 0161 7060075



Legend

Site Boundary

10
5
3
1.5
0.5

Predicted 98th %ile 1-hour Mean Odour Concentration (ou_E/m^3)

Title

Figure 5 - Predicted 98th %ile 1-hour Mean Odour Concentrations (ou_E/m^3) 2018 Meteorological Data

Project

Odour Assessment
The Green Hub, Herefordshire

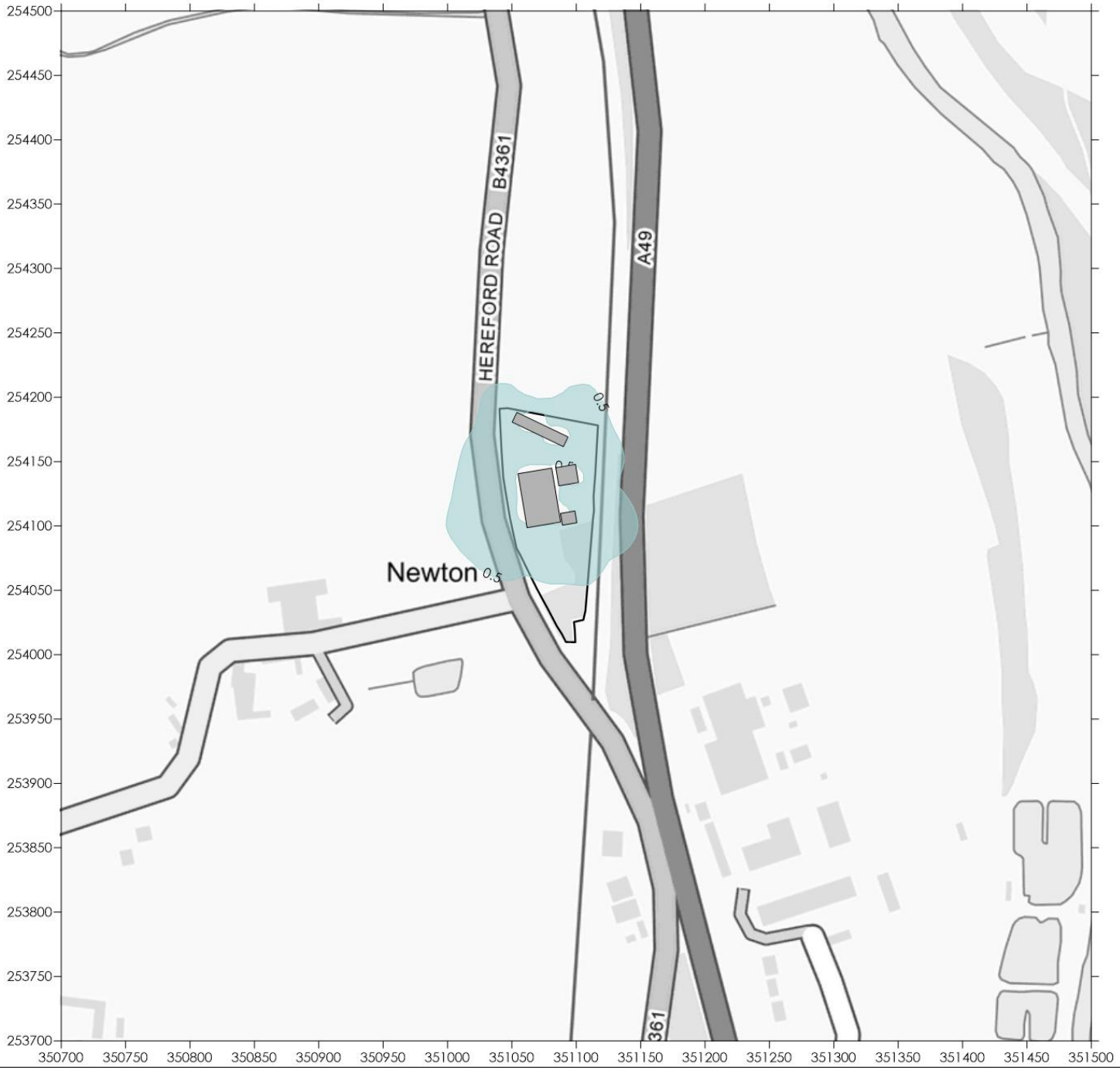
Project Reference

8125-1

Client

Onnu Ltd

Redmore environmental
www.red-env.co.uk | 0161 7060075



Legend

Site Boundary

Predicted 98th %ile 1-hour Mean Odour Concentration (ou_E/m^3)

10
5
3
1.5
0.5

Title

Figure 6 - Predicted 98th %ile 1-hour Mean Odour Concentrations (ou_E/m^3) 2019 Meteorological Data

Project

Odour Assessment
The Green Hub, Herefordshire

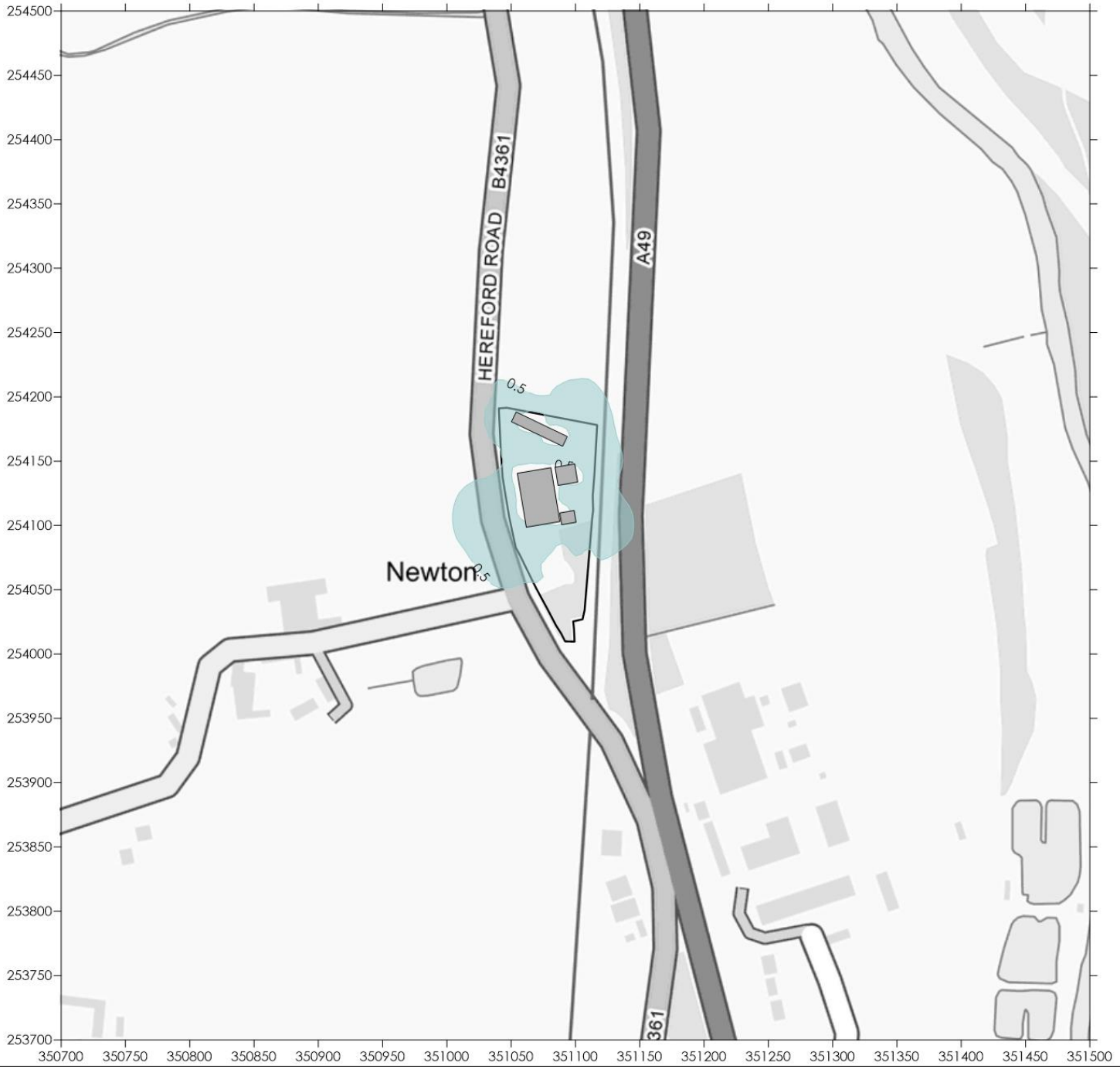
Project Reference

8125-1

Client

Onnu Ltd

Redmore environmental
www.red-env.co.uk | 0161 7060075



Legend

Site Boundary

Predicted 98th %ile 1-hour Mean Odour Concentration (ou_E/m^3)

10
5
3
1.5
0.5

Title

Figure 7 - Predicted 98th %ile 1-hour Mean Odour Concentrations (ou_E/m^3) 2020 Meteorological Data

Project

Odour Assessment
The Green Hub, Herefordshire

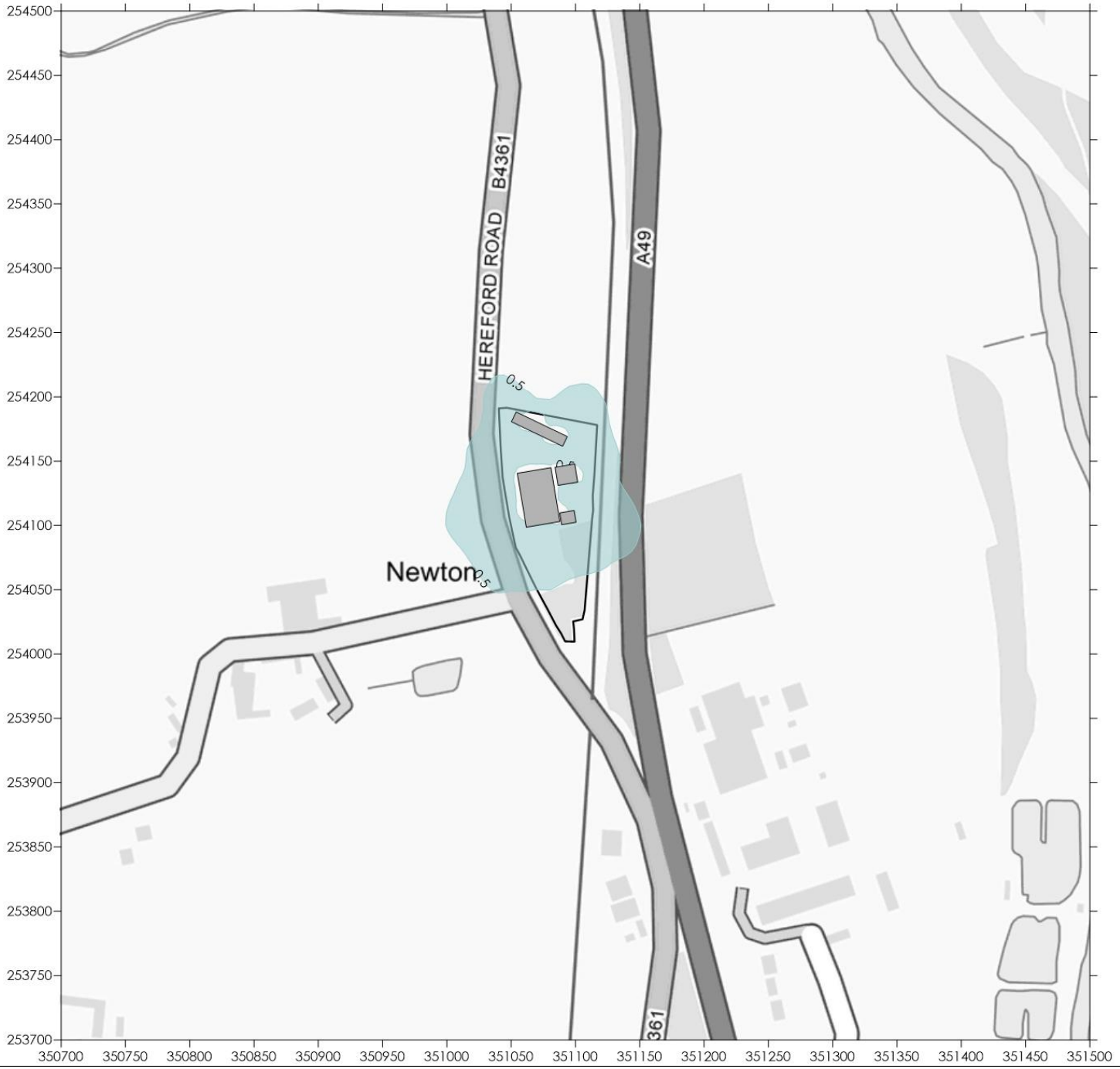
Project Reference

8125-1

Client

Onnu Ltd

Redmore environmental
www.red-env.co.uk | 0161 7060075



Legend

Site Boundary

Predicted 98th %ile 1-hour Mean Odour Concentration (ou_E/m^3)

10
5
3
1.5
0.5

Title

Figure 8 - Predicted 98th %ile 1-hour Mean Odour Concentrations (ou_E/m^3) 2021 Meteorological Data

Project

Odour Assessment
The Green Hub, Herefordshire

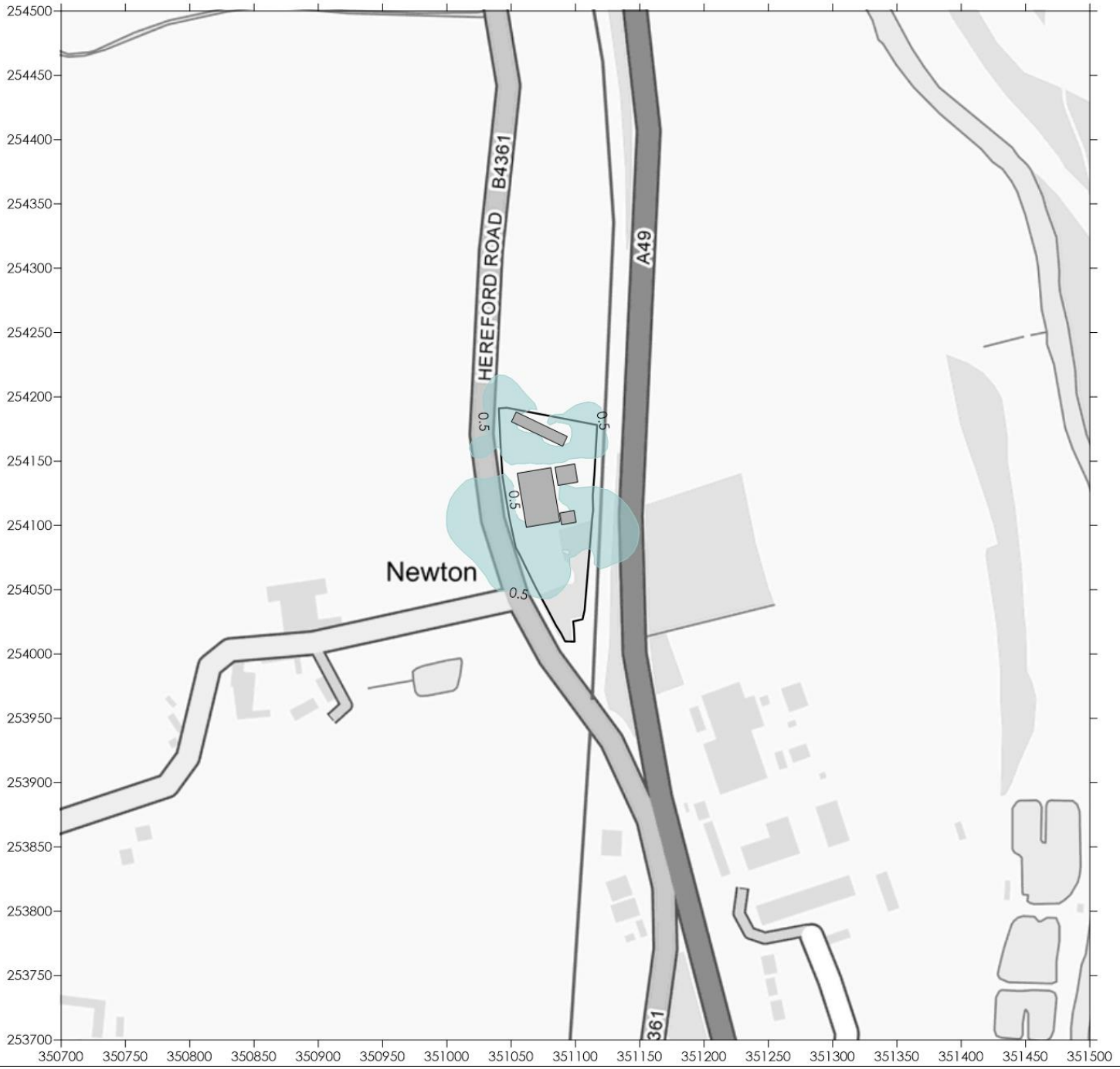
Project Reference

8125-1

Client

Onnu Ltd

Redmore environmental
www.red-env.co.uk | 0161 7060075



Legend

Site Boundary

Predicted 98th %ile 1-hour Mean Odour Concentration (ou_E/m^3)

10
5
3
1.5
0.5

Title

Figure 9 - Predicted 98th %ile 1-hour Mean Odour Concentrations (ou_E/m^3) 2022 Meteorological Data

Project

Odour Assessment
The Green Hub, Herefordshire

Project Reference

8125-1

Client

Onnu Ltd

Redmore environmental

www.red-env.co.uk | 0161 7060075