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Odour Emissions Assessment

PRESENTED TO

Miltown Composting Systems Limited

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1 INTRODUCTION AND METHODOLOGY

Enviroguide Consulting has been commissioned by Miltown Composting Systems Limited, (hereinafter referred to as the Client) to perform an odour dispersion modelling assessment of the emissions from the composting facility located at Miltown Composting Systems Limited located in Miltownmore, Fethard, Co. Tipperary.

This report has been prepared to support an EPA Industrial Emissions Licence (Ref. W0270-02) review application for proposed increased tonnage at the Site, and reconstruction and extension to agricultural sheds to the west of the existing facility, including a proposed new Biofilter (A2-3). The report has assessed two scenarios:

- **Scenario 1:**
  This is an assessment of current operations onsite - this includes emissions from Biofilter 1 (A2-1) and Biofilter 2 (A2-2); and

- **Scenario 2:**
  This is an assessment of the Site to include the addition of the proposed new material maturation sheds (Sheds 2B and 3B) and the proposed new biofilter air treatment system (A2-3).

Figure 1 details the existing Site, and Figure 2 details the proposed new Maturation Sheds (Shed 2B and Shed 3B) as well as the proposed new Biofilter (A2-3).

The objective of this assessment is to determine whether the emissions from the proposed new onsite Biofilter (A2-3) will result in ambient concentrations which are compliant with the criterion of less than $1.5Ou_E/m^3$ as a 98^{th} percentile of the hourly average concentrations at the Nearest Sensitive Receptor (as per the UK Environment Agency H4 Draft Guidance document).

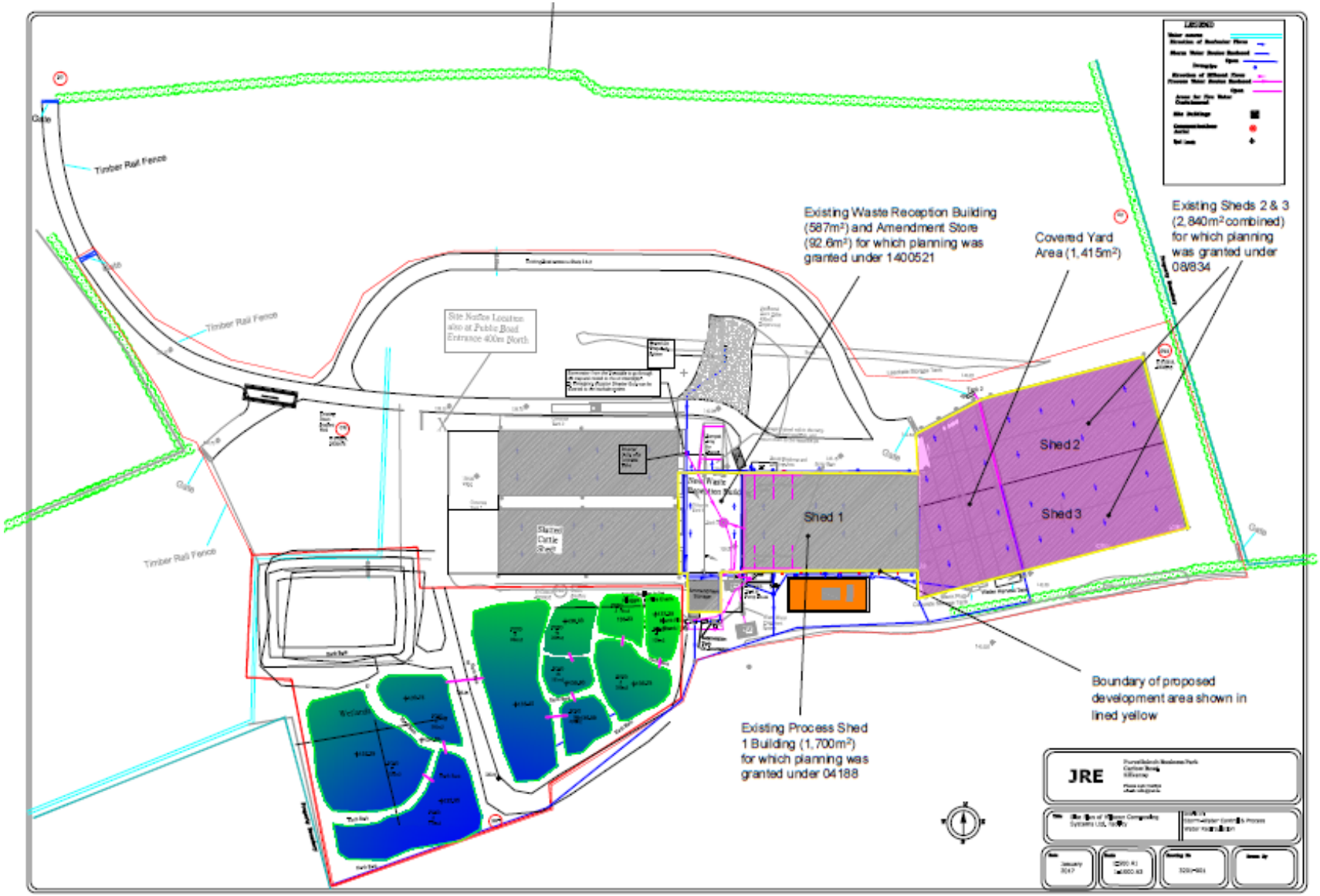

Figure 1: Existing Site Layout (with Shed 4 located adjacent to the east of Shed 1)

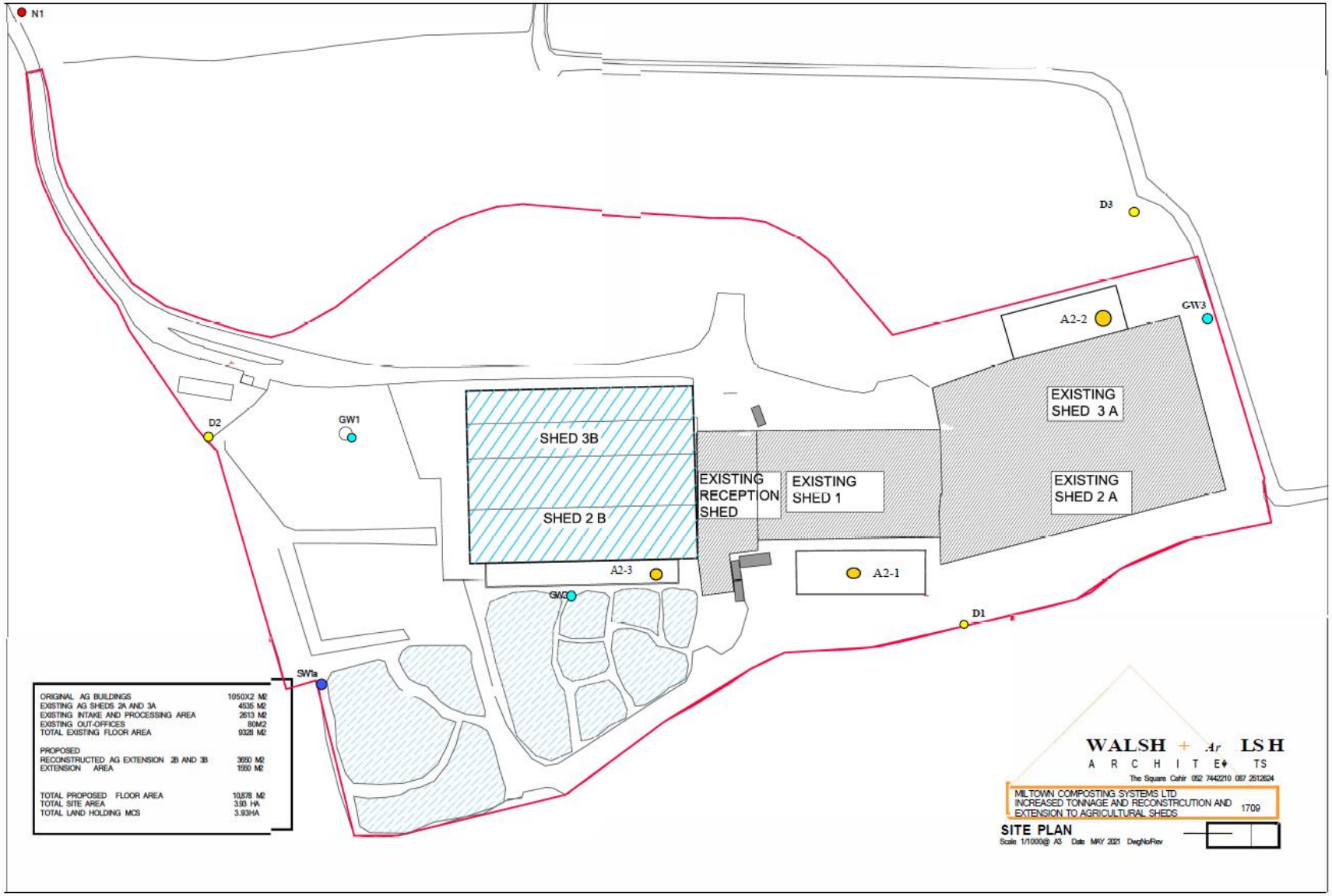

Figure 2: Proposed Site Layout including Shed 2B Shed 3B and Proposed New Biofilter A2-3

1.1 Project Scope

The scope of work undertaken for this assessment included the following tasks:

- Review of relevant site information required for the modelling study;
- Dispersion modelling of odour emissions from the biofilters based on two scenarios;
- Evaluation of predicted ground level concentrations to determine if concentration could exceed the relevant ambient Odour Guidelines limit value with the addition of the proposed new material maturation sheds (Sheds 2B and 3B) and the proposed new biofilter air treatment system (A2-3).

2 FACILITY DESCRIPTION

2.1 Site Location

The Site is located in the townland of Miltownmore, approximately 4.3km southeast of Rosegreen and 4.8km southwest of Fethard.

The Site is located in a rural area used predominantly for agricultural purposes, mainly grassland and tillage. A farmyard, approximately 380m to the west, is the closest property to the Site. The nearest residential property is approximately 720m to the north along the access road.

2.2 Site Layout

The Site encompasses 3.93 hectares and contains an existing composting facility. It is occupied by a waste reception building and process buildings (i.e., Shed 1, Shed 2A, Shed 3A and Shed 4), weighbridge, office, canteen, staff room, plant area, wetlands and agricultural sheds. It is proposed that the existing agricultural sheds (slatted cattle sheds) located west of the existing facility will become the proposed new material maturation sheds (Sheds 2B and 3B) and biofilter air treatment system.

2.3 Facility Processes and Activities

Miltown Composting Systems Limited facility is an in-vessel composting facility which currently operates under an Environmental Protection Agency (EPA) Waste Licence (Ref. W0270-02) issued on 13th September 2019. The facility also has approval from the Department of Agriculture Food and the Marine (DAFM) to operate as a composting plant accepting Category 2 and Category 3 animal by-products.

Waste reception, blending and in-vessel composting is carried out in the waste reception shed (i.e., covered yard area to the west of Shed 1) and Shed No. 1, which occupies an area of approximately 1,700 square meters (m^2). Maturation is carried out in Sheds to the east, which combined occupy a floor area of approximately 2,840 m^2. In the reception area, the organic material may, depending on composition, be shredded to enhance the composting process.

Wastewater treatment sludges or fine structured materials are mixed with a bulking agent (e.g., shredded green waste) to improve porosity to help with the composting process.

The materials are transferred from the reception area to the vessels using the telescopic loaders. The material placed in each of the vessels is assigned an individual batch number to allow performance monitoring during the treatment stages and ensure the maintenance of accurate records. Five temperature probes are placed within the waste body before sheeting is placed over the top of the vessel. There is a computerized process control system, located in the site office, which records the temperature in each vessel to ensure that optimum composting conditions are maintained. In addition to the temperature monitoring, oxygen levels are monitored daily using a handheld probe, the vessels consist of a forced air system and oxygen levels are maintained through on going positive air input to the vessels. The moisture level is assessed either visually or using a handheld moisture meter. In order to comply with the Animal By-Products Regulations a 'two barriers' system is operated in the event that brown bin composting may take place. The objective is to ensure a maximum particle size of 40mm and to achieve a sustained temperature of 60^{o}C over two separate 48 hour periods. The MSW fines typically have a particle size less than 40mm and do not require additional processing. Large items are manually removed before the materials are composted. Maintaining the temperature at 60°C for the required two separate time periods is achieved by composting the same compost batch in two different vessels. In the first vessel, (Barrier 1), the process usually takes one week and when completed, the material is transferred to a second vessel (Barrier 2) where it is thoroughly mixed and again composted until the temperature requirements are met. To avoid cross contamination, different loaders and buckets are used to move the materials into and out of the composting vessels.

When the material has completed the thermophilic stage, it is removed from the second vessel and transferred to Sheds to the east where it is formed into batch piles in Shed 2A and Shed 3A for maturation. The batch piles are formed on an underfloor forced air system that allows for the batch piles to be aerated without the need for regular turning of the material. Temperature, oxygen, and moisture content are regularly monitored, and the moisture and the aeration regime are revised as required to ensure optimum conditions. The mesophilic stage can take up to 5 weeks to complete and the finished compost may, depending on the nature of the source material, need to be screened to remove contaminants. These contaminants are stored on-site, in Shed 4, pending consignment to off-site disposal/treatment facilities.

2.3.1 Proposed Changes

Miltown propose to increase the throughput of material at the composting facility to approximately 240 tonnes per day (not exceeding 75,000 tonnes per annum) and to apply to the Environmental Protection Agency for the review of the current Industrial Emissions Licence continue to regulate the facility. The future licenced area will be the same as the current waste licence (Ref. W0270-02) for the Site. The reception area for organic material will continue to be in the existing reception shed where delivery trucks back in and deposit their loads to the reception area. The Proposed Development will include for the reconstruction of two old agricultural sheds (i.e., maturation Sheds 2B and 3B) as additional maturation capacity for the proposed increased throughput in the composting bays.

The range of waste materials currently accepted at the composting facility will not change. The Site will continue to only accept biological waste material for treatment, and it is envisaged that future operation of the facility will serve to accept increased volumes of these organic

materials from waste collectors. The bio wastes (e.g., food waste and screened organic fines material) will continue to be delivered to site in enclosed trailers for aerobic composting and stabilisation. The increased compost processing throughput at the facility will allow the facility deal with a greater volume of bio-waste and increase the facility's capability to service the Southern Regions waste needs.

The current hours for accepting waste at the facility under the existing Industrial Emission Licence are between 07:00 and 19:00 Monday to Saturday (with the exception of Bank Holidays), with the current operational hours at the facility between 06:00 to 19:00 Monday to Saturday. Under the Proposed Development, Miltown Composting do not propose to change the hours for accepting material or the operational hours. Any increased traffic related to the delivery and removal of organic material would be spread out over the day to avoid traffic issues related to the Site.

2.3.2 Air and Odour Control System

Air is extracted from the reception shed areas and process sheds by means of extraction fans and is released to the atmosphere via the existing biofilter system. Maturation is carried out in Sheds 2A and 3A. Shed 4 is for the storage of finished material. Air from this process is extracted to the biofilter and subsequently treated. The treated air is then emitted to the atmosphere. The air is extracted using fans at an average rate of 1.5 no. air changes per hour. This ensures that the sheds remain under negative pressure, avoiding the risk of odour impact by fugitive emissions.

The current odour control measures are to ensure that the shed doors are closed at all times when not receiving or removing material. The air handling system is engineered to provide 1.5 air changes per hour inside the sheds and all air is exhausted to the biofilters. The Reception Shed and Shed 1 air is exhausted to Biofilter A2-1 (located south of Shed 1) and air from Sheds 2A, 3A and 4 is exhausted to Biofilter A2-2 (located north of Shed 3). The reception shed has a fast action door that opens when trucks arrive and close when trucks leave. It is proposed that the air from the new Shed 2B and Shed 3B will be exhausted to Biofilter A2-3.

Biofilter A2-1 treats air extracted from the waste acceptance shed and the existing composting process Shed 1. The waste acceptance Shed is where the initial organic material is accepted on site. The material then enters the thermophilic stage of the process where it is transferred to the composting bays in Shed 1 and composted by a forced air system at a temperature of 60^{o}C for approximately two weeks. These initial stages of the composting process, where organic waste is received and the composting process is taking place, would be expected to produce the highest odour as organic material is in the highest stages of decomposition. The air inside these sheds is extracted and treated in Biofilter A2-1.

When the material in Shed 1 has completed the composting process, the material then moves to the mesophilic stage of the process. The material is moved to the existing Sheds 2A and 3A for maturation. At this stage, most of the organic content in the waste material has been consumed by microbial action and the material is removed to the maturation air beds where any residual organic content in the material is consumed by microbial action. The material can remain in the maturation sheds for up to five weeks until it has reached stabilisation. Because there is only residual organic content in the maturing material, the

odour content is not as high as the initial stages of the process. The air from the maturation sheds is extracted and treated in Biofilter A2-2.

Due to the nature of the material and the stages of processing that take place at different areas of the composting facility, the air extracted to Biofilter A2-1 (i.e., waste reception and composting bays in Shed 1) would be expected to be significantly higher than the air extracted to Biofilter A2-2 (i.e., maturation Sheds 2A and 3A). This is shown in the variation of odour monitoring results obtained from each biofilter in 2022 (available in Appendix C of this Report).

The Proposed Development involves the reconstruction of two existing agricultural sheds (i.e., Sheds 2B and 3B) to provide added maturation capacity at the Site. As the material that would be stored at the proposed new Sheds (2B and 3B) would be the same as the material currently stored and matured in Sheds 2A and 3A, it is expected that the odour emissions from proposed Biofilter A2-3 would be similar to the odour currently emitted at Biofilter A2-2.

3 BACKGROUND TO ODOUR MONITORING AND MODELLING

Modelling of odour may be required where an industrial installation releases odour which is likely to cause annoyance. Examples of such industries include rendering installations, composting, waste transfer stations, food and drink industries, chemical manufacture, and intensive livestock industries.

AERMOD modelling software is approved by the Irish Environmental Protection Agency for odour modelling assessments. AERMOD was developed by the US EPA and the American Meteorological Society and is the official US EPA near field regulatory dispersion model. The software is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources There are two input data processors that are regulatory components of the AERMOD modelling system: AERMET, a meteorological data pre-processor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP, a terrain data pre-processor that incorporates complex terrain using USGS Digital Elevation Data.

According to the EPA *Odour Emissions Guidance Note* (AG9, 2019), the scale of exposure (impact) is determined by two factors; the concentration and the duration of time that the odour may be perceived by the receptor. By definition, 1 Ou_E/m^3 is the detection threshold of 50% of a qualified panel of observers in an odour-free laboratory using odour-free air as the zero reference (the selection criteria result in the qualified panel being more sensitive to a particular odorant than the general population). The recognition threshold is generally between 1 and 5 times this concentration (1-5 Ou_E/m^3) and the concentration at which the odour may be considered a nuisance is between 5 and 10 Ou_E/m^3 (EPA, 2001).

Clarkson and Misslebrook (1991) propose that a “faint odour” was an acceptable threshold criterion for the assessment of odour as a nuisance. Historically, it has been generally accepted that odour concentrations of between 5 and 10 Ou_E/m^3 would give rise to a faint odour only, and that only a distinct odour (concentration of >10 Ou_E/m^3) could give rise to a nuisance (McGovern & Clarkson, 1991). However, this criterion has generally been based on wastewater treatment plants where the source of the odour is usually hydrogen sulphide. In 1990, a survey of the populations surrounding 200 industrial odour sources in the Netherlands

showed that there were no justifiable complaints when 98%ile compliance with an odour exposure standard of a "faint odour" (5-10 Ou_E/m^3) was achieved (CH2M Beca Ltd, 2000).

Currently, there is no statutory odour standard in Ireland relating to industrial installations. Guidance from the UK (EA, 2011), and adapted for Irish EPA use, recommends that odour standards should vary from 1.5-6.0 Ou_E/m^3 as a 98^{th}%ile of one hour averaging periods at the worst-case sensitive receptor based on the offensiveness of the odour and with adjustments for local factors such as population density. A summary of the indicative criterion (taken from (EA, 2011) and adapted for Irish EPA use) is given in Table 1.

Table 1: Indicative Odour Standards Based on Offensiveness of Odour taken from EA, 2011 and adapted for Irish EPA use (Source: AG9, 2019)

Industrial Sectors	Relative Offensiveness of Odour	Indicative Criterion
• Processes involving decaying animal or fish remains; • Processes involving septic effluent or sludge; • Waste sites including landfills, waste transfer stations and non-green waste composting facilities.	Most Offensive	1.5 Ou_E/m^3 as a 98^{th}%ile of one hour averaging periods at the worst-case sensitive receptor.[1]
• Intensive livestock rearing; • Fat frying / meat cooking (food processing); • Animal feed; • Sugar beet processing; • Well aerated green waste composting Most odours from regulated processes fall into this category i.e. any industrial sector which does not obviously fall within the 'most offensive' or 'less offensive' categories.	Moderately Offensive	3.0 Ou_E/m^3 as a 98^{th}%ile of one hour averaging periods at the worst-case sensitive receptor.
• Brewery / Grain / Oats Production • Coffee Roasting • Bakery • Confectionery	Less Offensive	6.0 Ou_E/m^3 as a 98th percentile of hourly averages at the worst-case sensitive receptor

[1] Professional judgement should be applied in the determination of where the worst-case sensitive receptor is located

From Table 1, it can be determined that the indicative criterion for the current assessment (waste sites) is 1.5 Ou_E/m^3 as a 98th%ile of one hour averaging periods at the worst-case sensitive receptor.

The UK Department for Environment, Food and Rural Affairs (DEFRA) has published detailed guidance on appropriate odour threshold levels based, in part, on the offensiveness of the odour. Table 2 shows the European and UK rankings extended to cover industrial odours. It is noted that these odours have been ranked in order of their relative unpleasantness, and hedonic scores have not been produced for individual odours. Therefore, these figures are strictly rank order and do not provide a comparative magnitude.

Table 2: Ranking Table for Various Industrial Sources

Environmental Odour Rankings			
	UK Median	**UK Mean**	**Dutch Mean**
Bread factory	1	2.5	1.7
Coffee Roaster	2	3.9	4.6
Chocolate factory	3	4.6	5.1
Beer brewery	6	7.7	8.1
Fragrance and flavour factory	8	8.5	9.8
Charcoal production	8	9.2	9.4
Green fraction composting	9	10.3	14
Frozen chips production	9	10.5	9.8
Fish smoking	10	11	9.6
Sugar factory	11	11.3	9.8
Car paint shop	12	11.7	9.8
Livestock odours	12	12.6	12.8
Asphalt	13	12.7	11.2
Livestock feed factory	15	14.2	13.2
Oil refinery	14	14.3	13.2
Car park building	15	14.4	8.3
Wastewater treatment	17	16.1	12.9
Fat and grease processing	18	17.3	15.7
Creamery/milk products	10	17.7	n/a
Pet food manufacture	19	17.7	n/a
Brickworks (burning rubber)	18	17.8	n/a
Slaughterhouse	19	18.3	17.0
Landfill	20	18.5	14.1

The most applicable source outlined in Table 2 to the operations at Miltown Composting Systems Limited is Green Fraction Composting, with UK median and mean rankings of 9 and 10.3, respectively.

4 ASSESSMENT METHODOLOGY

An air dispersion model was carried out in order to assess the impacts of odour emissions. An air dispersion model is a tool that is used to assess the air quality impact of an emission source within a defined modelling domain. Rather than replicating atmospheric processes in detail, the purpose of a dispersion model is to perform a mathematical approximation of dispersion and to provide a means for estimating ambient pollutant concentrations at a given location (EPA, 2020). The U.S. EPA approved AERMOD dispersion modelling software (ver. 18081), incorporating steady state Gaussian plume modelling, was used to determine the overall odorous impact of the Proposed Development. This software programme uses a host of specified input parameters to model hourly ground level concentrations (GLC) of pollutants at and beyond the facility boundary. The results of the air dispersion model were extracted and interpreted in order to assess the likely impact on the receiving environment from the Proposed Development.

The assessment used BREEZE AERMOD to predict the impacts of the Proposed Development operations in two scenarios. Each scenario provides results for two time periods:

- Results 1: Worst-case scenario year
- Results 2: 5-year averaging period

4.1 Meteorological Data

Five full years of hourly sequential meteorological data (Oak Park 2018-2022) was screened within the model to provide a 5-year average and determine the worst year for each scenario. A wind rose for each year is provided in Appendix A.

4.2 Background Concentration

There is no database of information available on background concentrations. Given the rural location of the facility, it is possible that agricultural activities may exert a higher level of odour on the surrounding environment on an operational basis. The EPA Guidance Note on Air Dispersion Modelling from Industrial Installations (AG4, 2020) suggests that modelling of background odours is inappropriate and cannot be added to modelled odour concentration; therefore, background odours have been set at zero.

4.3 Model Inputs

4.3.1 Source Information

4.3.1.1 Odour Emission Limit Value

To accurately assess the impact of odour emission from a source, the odour emission rate must be established. This is achieved by multiplying the odour threshold value and the volumetric emission rate which is then expressed in odour units per second.

Odour monitoring was carried out at the facility last year (2022) by Matrix Environmental. An Environmental Consultant subsequently visited the Site on the 21st of June and the 22nd of October to conduct the monitoring events for 2022. The results of the monitoring include the following:

21st of June 2022 event:

- OD1 was taken at Biofilter A2-1 and had an odour result of 111 ouE/m3; and
- OD2 was taken at Biofilter A2-2 and had an odour result of 71 ouE/m3.

22nd of October 2022 event:

- OD1 was taken at Biofilter A2-1 and had an odour result of 161 ouE/m3; and
- OD2 was taken at Biofilter A2-2 and had an odour result of 60 ouE/m3.

Taking account of the odour monitoring results obtained in 2022, an emission limit value of 350 Ou_e/m^3 has been selected for this assessment for the purpose of modelling a worst-case scenario. This is more than double the worst-case emission value of 161 ouE/m3 sampled at Biofilter A2-1 in 2022 and more than four times the worst-case emission value of 71 ouE/m3 sampled at Biofilter A2-2 in 2022. The Proposed Development is to reconstruct two existing agricultural sheds (i.e., Sheds 2B and 3B) to provide added maturation capacity at the Site. As the material that would be stored at the proposed new sheds (2B and 3B) would be the same as the material currently stored and matured in sheds 2A and 3A, it is expected that the odour emissions from proposed Biofilter A2-3 would be similar to the odour currently emitted at Biofilter A2-2. Therefore, an emission limit value of 350 Ou_e/m^3 is considered worst-case for all Biofilters onsite.

Odour monitoring results can be found in Appendix C.

4.3.1.1.1 Extraction Rates

Normal operating extraction rates from the sheds to the biofilters would be based on 1.5 air changes per hour. Based on the operating air extraction rate and bringing that forward for the proposed maturation sheds the average volume of air extracted to the biofilters would be as follows:

- Biofilter A2-1 – air flow to biofilter at 1.5 air changes per hour would be 26,561m^3 per hour;
- Biofilter A2-2 - air flow to Biofilter at 1.5 air changes per hour would be 55,950 m^3 per hour; and
- Proposed Biofilter A2-3 - air flow to Biofilter at 1.5 air changes per hour would be 48,960 m^3 per hour.

However, for the purpose of modelling a worst-case scenario, maximum flow rates have been applied to the model, as follows:

- Biofilter A2-1 – 31,884 m^3;
- Biofilter A2-2 – 70,865 m^3; and
- Proposed Biofilter A2 – 3 – 71,600 m^3.

Site specific data such at the locations and dimensions for the biofilters has been obtained for the model and are presented in Table 3.

Table 3: Emission Point Details

Source	UTM Coordinates		Source Type	Dimensions	Flow (m^3/hour)
	X	Y			
Biofilter A2-1	583651.1	5812037.8	Area	38m x 13.7m	31,884
Biofilter A2-2	583717.6	5812114.1	Area	35.4m x 13.7m	70,865
Biofilter A2-3 (proposed biofilter)	583554.8	5812045.4	Area	58.8m x 7.75	71,600

4.3.2 Source Parameters

4.3.2.1 Scenario 1

Odour source parameters for the facility for Scenario 1 are detailed in the following Tables. Emissions were modelled assuming 24 hours, 365 days a year operation.

Table 4: Source Parameters for Biofilter A2-1 for Scenario 1

Input Type	Value
Source ID	Biofilter A2-1
Type of source	Area
Coordinates X	583651.1
Coordinates Y	5812037.8
Odour emission rate	The odour emission rate is equal to the odour threshold concentration (Ou_E/m^{-3}) of the discharge air multiplied by the flow rate (flow rate divided by the total area of the source ($m^{-3}m^{-2}s^{-1}$)). It is equaled to the volume of air contaminated every second to the threshold odour limit ($Ou_E\ s^{-1}m^{-2}$).

Input Type	Value
	0.01701242156 $m^{-3}m^{-2}s^{-1}$ x 161 $OU_E m^{-3}$ = 2.739 $\boldsymbol{OU_E s^{-1} m^{-2}}$
Release height (m)	50% of the source height: 0.425m
Initial Vertical Dimension	Vertical dimension of adjoining building divided by 2.15: 9.25 / 2.15 = 4.3m
Elevation	127.4m
X Length	38m
Y Length	13.7m
Area	520.6m^2

Table 5: Source Parameters for Biofilter A2-2 for Scenario 1

Input Type	Value
Source ID	Biofilter A2-2
Type of source	Area
Coordinates X	583717.6
Coordinates Y	5812114.1
Odour emission rate	0.04058706 $m^{-3}m^{-2}s^{-1}$ x 71 $OU_E m^{-3}$ = 2.881681 $\boldsymbol{OU_E s^{-1} m^{-2}}$
Release height (m)	50% of the source height: 0.835m
Initial Vertical Dimension	Vertical dimension of adjoining building divided by 2.15: 9.5 / 2.15 = 4.418605m
Elevation	126.03m

Input Type	Value
X Length	35.4m
Y Length	13.7m
Area	485m^2

4.3.2.2 Scenario 2

Odour source parameters for the facility for Scenario 2 are detailed in the following Tables. Emissions were modelled assuming 24 hours, 365 days a year operation.

Table 6: Source Parameters for Biofilter A2-1 for Scenario 2

Input Type	Value
Source ID	Biofilter A2-1
Type of source	Area
Coordinates X	583651.1
Coordinates Y	5812037.8
Odour emission rate	0.01701242 $m^{-3}m^{-2}s^{-1}$ x 350 $OU_E m^{-3}$ = 5.95434755 $\boldsymbol{OU_E s^{-1} m^{-2}}$
Release height (m)	50% of the 0.425m
Initial Vertical Dimension	Vertical dimension of adjoining building divided by 2.15: 9.25 / 2.15 = 4.3m
Elevation	127.4
X Length	38m
Y Length	13.7m
Area	520.6m^2

Table 7: Source Parameters for Biofilter A2-2 for Scenario 2

Input Type	Value
Source ID	Biofilter A2-2
Type of source	Area
Coordinates X	583717.6
Coordinates Y	5812114.1
Odour emission rate	0.04058706 $m^{-3}m^{-2}s^{-1}$ x 350 $OU_E m^{-3}$ = 14.2054696 $\boldsymbol{OU_E s^{-1} m^{-2}}$
Release height (m)	50% of the source height: 0.835m
Initial Vertical Dimension	Vertical dimension of adjoining building divided by 2.15: 9.5 / 2.15 4.418605m
Elevation	126.03m
X Length	35.4m
Y Length	13.7m
Area	485m^2

Table 8: Source Parameters for Proposed New Biofilter A2-3 for Scenario 2

Input Type	Value
Source ID	Biofilter A2-3
Type of source	Area
Coordinates X	583554.8
Coordinates Y	5812045.4
Odour emission rate	0.0436447 $m^{-3}m^{-2}s^{-1}$ x 350 $OU_E m^{-3}$ = 15.2756443 $\boldsymbol{OU_E s^{-1} m^{-2}}$
Release height (m)	50% of the source height: 0.95m
Initial Vertical Dimension	Vertical dimension of adjoining building divided by 2.15:

Input Type	Value
	11.39 / 2.15 = 5.297675m
Elevation	125.12m
X Length	58.8m
Y Length	7.75m
Area	455.7m^2

4.3.3 Surface Parameters

AERMET requires user input data on site-specific surface characteristics such as surface roughness, Bowen ratio, and Albedo. Surface roughness is a measure of the aerodynamic roughness of the surface and is associated with the height of the roughness element. Albedo is a measure of the reflectivity of the surface, whilst the Bowen ratio is a measure of the availability of surface moisture (EPA AG4, 2020).

Table 9 provides the surface characteristics for the lands surrounding Oak Park meteorological station:

Table 9: Land use statistics for sectors around the meteorological station at Oak Park

Sector (degrees)	Land use description	Surface roughness (m)	Albedo	Bowen ratio
90-270	Cultivated land	0.0725	0.264125	0.8665
270-90	Deciduous forest	0.90	0.264125	0.8665

4.3.3.1 Geophysical Data

Building Downwash

Any physical structure that is in close proximity to an emission point may hinder the dispersion characteristics through an occurrence known as ‘building downwash’. The potential for building downwash is dependent on the relevant differences in height between the stack and the building.

The AERMOD BPIP processor can only be applied to account for building downwash from point sources; therefore, where area sources have been included, building downwash has been manually applied to the model by calculating the initial vertical dimension (height of side divided by 2.15). If the source is located on or near a building, the initial vertical dimension has been based on the adjacent building height.

Terrain

The presence of terrain can lead to significantly higher ambient concentrations than would occur in the absence of the terrain feature. In particular, where there is significant relative difference in elevation between the source and off-site receptors, large ground level concentrations can result. Thus, the accurate determination of terrain elevation in air dispersion models is vital (EPA AG4, 2020).

Complex terrain is defined as terrain above the effective stack height (which is the stack height plus an additional height due to the buoyancy of a hotter than ambient air plume). Intermediate terrain is defined as terrain above stack height but below the effective stack height. Simple terrain is terrain below the top of the stack. According to AG4, when modelling in a region of flat terrain, no digital mapping of terrain will be necessary. However, in Ireland, areas of flat terrain will be quite rare and digital mapping of terrain may be necessary in many cases. Therefore, to account for the presence of terrain in the current assessment, the AERMOD terrain pre-processor (AERMAP) has been applied using terrain data for the area sourced in the USGS Digital Elevation Model (DEM) format.

4.3.4 Receptors

Two receptor grids of a variable density were created around the Site as shown in Figure 3. These grids were based on Cartesian grids with the Site at the centre. An outer grid extended to 3000m with concentrations calculated at 100m intervals. A smaller grid was also created which extended to 1000m with concentrations calculated at 50m intervals. Boundary receptor locations were also placed along the boundary of the Site at 100m intervals giving a total of 5017 calculation points for the model. Figure 3 details the Receptor grids around the Site of the Proposed Development.

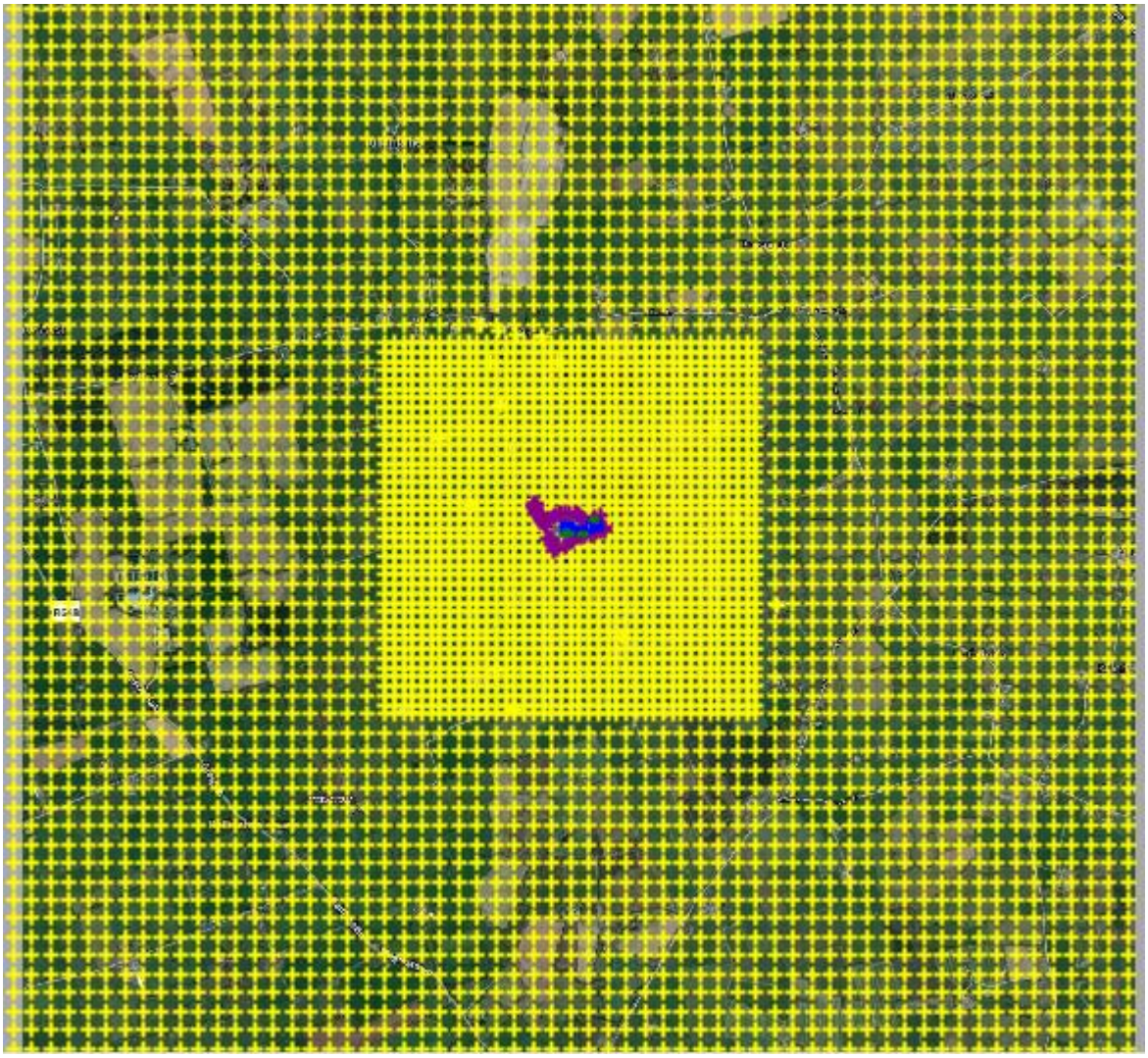

Figure 3: Receptor Grid

The area around the Site is predominantly rural with surrounding land uses of agriculture, forestry, and a number of one-off residential dwellings. Fifteen (15 No.) discrete sensitive receptors were identified in the surrounding area; fourteen (14 No.) of which are residential dwellings and one (1 No.) has been identified as a farmyard (this has been labelled SR1 as per Figure 4).

In the current assessment, professional judgment has been applied in considering the location of the worst-case sensitive receptors. The worst-case sensitive receptor has been identified as SR3. This receptor has been selected based on its proximity to the Site boundary and its position in relation to existing terrain, physical structures, and frequently occurring wind conditions.

Results for each of the 15 No. sensitive receptors have been provided in each scenario, however the worst-case year has been determined based on the odour exposure experienced at the worst-case sensitive receptor (SR3).

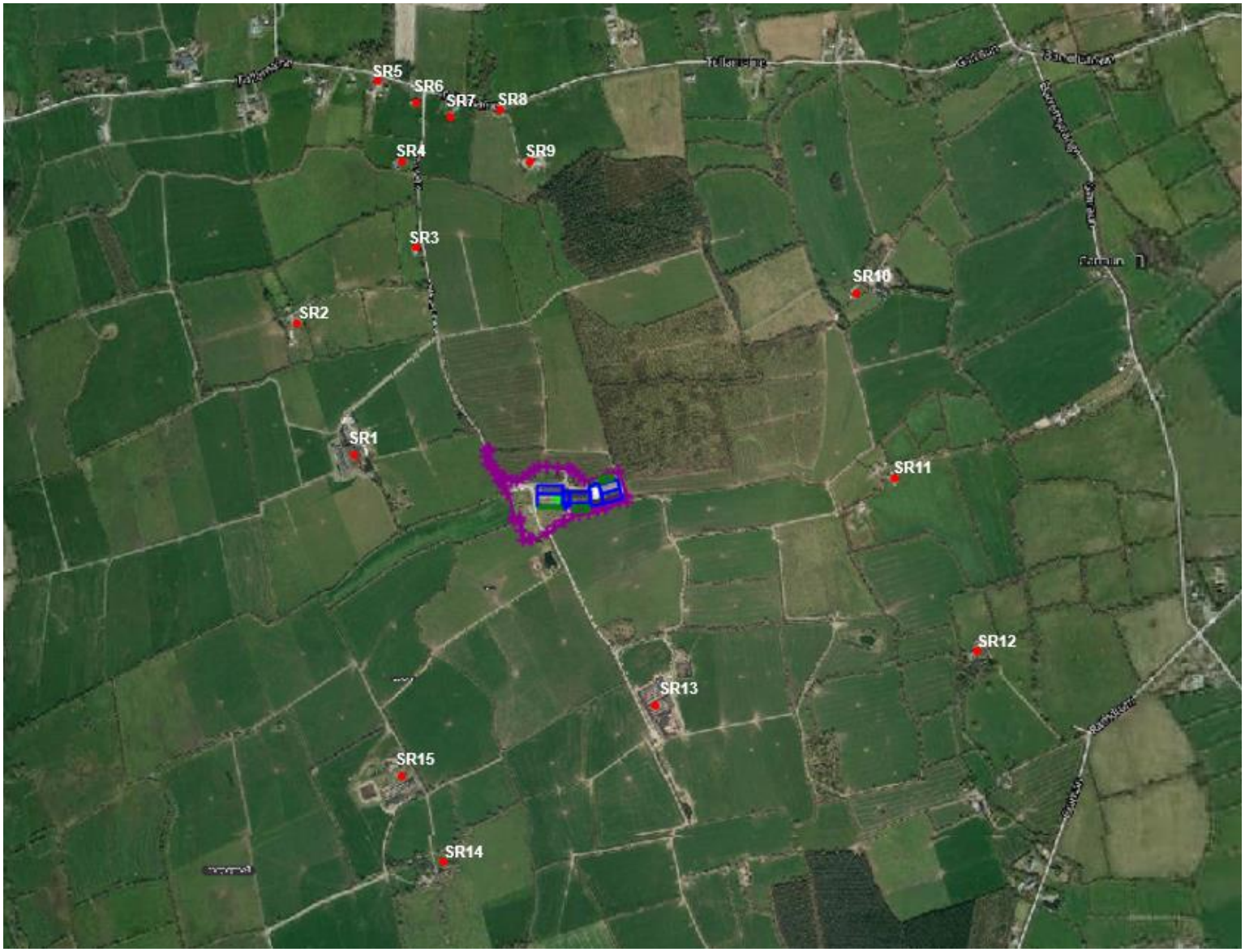

Figure 4: Discrete Sensitive Receptors

5 RESULTS

The results of the dispersion model at each sensitive receptor are presented in the following sections. For each receptor, the odour exposure [Ou_E/m^3] is expressed as a 98th percentile of hourly average concentrations for the worst-case year of the individual 5 years (in this case 2021). Odour exposure has also been expressed as a 98th percentile of hourly average concentrations over the full 5-year period. Results for each individual year are presented in Appendix B.

5.1 Scenario 1

Table 10: Predicted worst-case odour concentrations at nearest sensitive receptors (2021) for Scenario 1

Receptor ID	Location UTM		Odour exposure [OUE/m^3] expressed as a 98th percentile of hourly average concentrations for worst case year 2021
	X	Y	
SR1	583077.3	5812194	0.0318893
SR2	582908	5812555.6	0.07513608
SR3	583230.7	5812733.8	0.2491662
SR4	583179.5	5812969.7	0.1332756
SR5	583124.6	5813171.5	0.08714014
SR6	583225.6	5813140.5	0.1104684
SR7	583319.2	5813115.7	0.0976735
SR8	583456	5813108.3	0.1140211
SR9	583539	5812971.5	0.1384022
SR10	584391.3	5812614.1	0.01289361
SR11	584498	5812127.3	0.02537213
SR12	584727.8	5811659.2	0.0159885
SR13	583889.2	5811492.1	0.04161341
SR14	583309.8	5811092.4	0.01204091
SR15	583216.2	5811306.2	0.009893459

Table 11: Predicted 5-year odour concentrations at nearest sensitive receptors for Scenario 1

Receptor ID	Location UTM		Odour exposure [OU_E/m^3] expressed as a 98th percentile of hourly average concentrations for a 5-year period
	X	Y	
SR1	583077.3	5812194	0.0334006
SR2	582908	5812555.6	0.0746778
SR3	583230.7	5812733.8	0.1883307
SR4	583179.5	5812969.7	0.09606154
SR5	583124.6	5813171.5	0.07132853
SR6	583225.6	5813140.5	0.1098775
SR7	583319.2	5813115.7	0.09760376
SR8	583456	5813108.3	0.09252854
SR9	583539	5812971.5	0.1035831
SR10	584391.3	5812614.1	0.02268445
SR11	584498	5812127.3	0.02537244
SR12	584727.8	5811659.2	0.01443345
SR13	583889.2	5811492.1	0.04157846
SR14	583309.8	5811092.4	0.01177802
SR15	583216.2	5811306.2	0.01064053

As is evident from Table 10 and Table 11, the concentrations at the nearest sensitive receptors are below the threshold of $1.5Ou_E/m^3$ for Scenario 1.

Figure 5 details the predicted offsite odour concentration contours for the worst-case year (2021) for Scenario 1.

Figure 5: Predicted offsite odour concentration contours: worst-case year (2021) for Scenario 1

5.2 Scenario 2

Table 12: Predicted worst-case odour concentrations at nearest sensitive receptors (2021) for Scenario 2

Receptor ID	Location UTM		Odour exposure [OUE/m^3] expressed as a 98th percentile of hourly average concentrations for worst case year 2021
	X	Y	
SR1	583077.3	5812194	0.24740347
SR2	582908	5812555.6	0.9895476
SR3	583230.7	5812733.8	1.452481
SR4	583179.5	5812969.7	0.677173
SR5	583124.6	5813171.5	0.6617358
SR6	583225.6	5813140.5	0.5382348
SR7	583319.2	5813115.7	0.596101
SR8	583456	5813108.3	0.596518
SR9	583539	5812971.5	0.6874478
SR10	584391.3	5812614.1	0.08190881
SR11	584498	5812127.3	0.1425148
SR12	584727.8	5811659.2	0.09088843
SR13	583889.2	5811492.1	0.2563103
SR14	583309.8	5811092.4	0.09235561
SR15	583216.2	5811306.2	0.08069668

Table 13: Predicted 5-year odour concentrations at nearest sensitive receptors for Scenario 2

Receptor ID	Location UTM		Odour exposure [OUE/m^3] expressed as a 98th percentile of hourly average concentrations for a 5-year period
	X	Y	
SR1	583077.3	5812194	0.2688886
SR2	582908	5812555.6	0.872765
SR3	583230.7	5812733.8	1.074188
SR4	583179.5	5812969.7	0.5980235
SR5	583124.6	5813171.5	0.6579994
SR6	583225.6	5813140.5	0.5369577
SR7	583319.2	5813115.7	0.5493307
SR8	583456	5813108.3	0.5031044
SR9	583539	5812971.5	0.5903042
SR10	584391.3	5812614.1	0.1316282

Receptor ID	Location UTM		Odour exposure [OU_E/m^3] expressed as a 98th percentile of hourly average concentrations for a 5-year period
	X	Y	
SR11	584498	5812127.3	0.141885
SR12	584727.8	5811659.2	0.08120891
SR13	583889.2	5811492.1	0.2392741
SR14	583309.8	5811092.4	0.09235561
SR15	583216.2	5811306.2	0.08288136

As is evident from Table 12 and Table 13, the concentrations at the nearest sensitive receptors are below the threshold of $1.5Ou_E/m^3$ for Scenario 2.

Figure 6 details the predicted offsite odour concentration contours for the worst-case year (2021) for Scenario 2.

Figure 6: Predicted offsite odour concentration contours: worst-case year (2021) for Scenario 2

6 DISCUSSION

This assessment has provided an evaluation of the current (scenario 1) and predicted (scenario 2) ground level odour concentrations from the Site. The purpose of this assessment is to determine if concentrations could exceed the relevant ambient Odour Guidelines limit value with the addition of the proposed new material maturation sheds (Sheds 2B and 3B) and the proposed new biofilter air treatment system (A2-3).

The assessment has determined that in ambient conditions, emissions from the Site will result in offsite concentrations which exceed the criterion of $1.5Ou_E/m^3$ as a 98^{th} percentile of the hourly average concentrations. However, any exceedances will only occur in close proximity to the Site boundary and sensitive receptors are not affected. The worst-case scenario odour concentrations at the nearest sensitive receptors are all less than $0.2\ Ou_E/m^3$ for scenario 1 and $1.45Ou_E/m^3$ for scenario 2; therefore, both scenarios are compliant with the criterion of $1.5Ou_E/m^3$ as a 98^{th} percentile of the hourly average concentrations, as is evident from Table 10 to Table 13, and Figure 5 to Figure 6.

It can therefore be concluded that the addition of the proposed new material maturation sheds (Sheds 2B and 3B) and the proposed new biofilter air treatment system (A2-3) will not result in odour concentrations which exceed the criterion of $1.5Ou_E/m^3$ at the nearest sensitive receptors.

7 REFERENCES

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EPA (2020) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4);

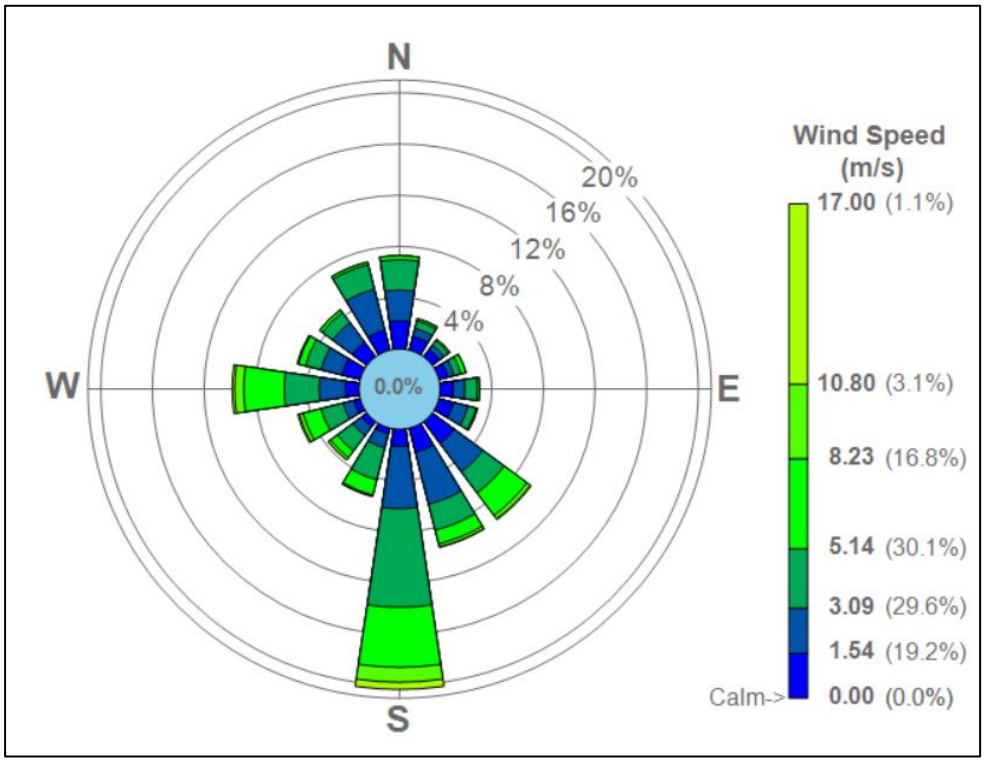
USEPA (2004) AERMOD Description of Model Formulation;

J.E. McGovern & C.R. Clarkson (1994) in “The Development of Northumbrian Water Limited’s Approach to Odour Abatement for Wastewater Facilities”, Proceedings of Symposium on Odour Control and Prevention in the Water Industry;

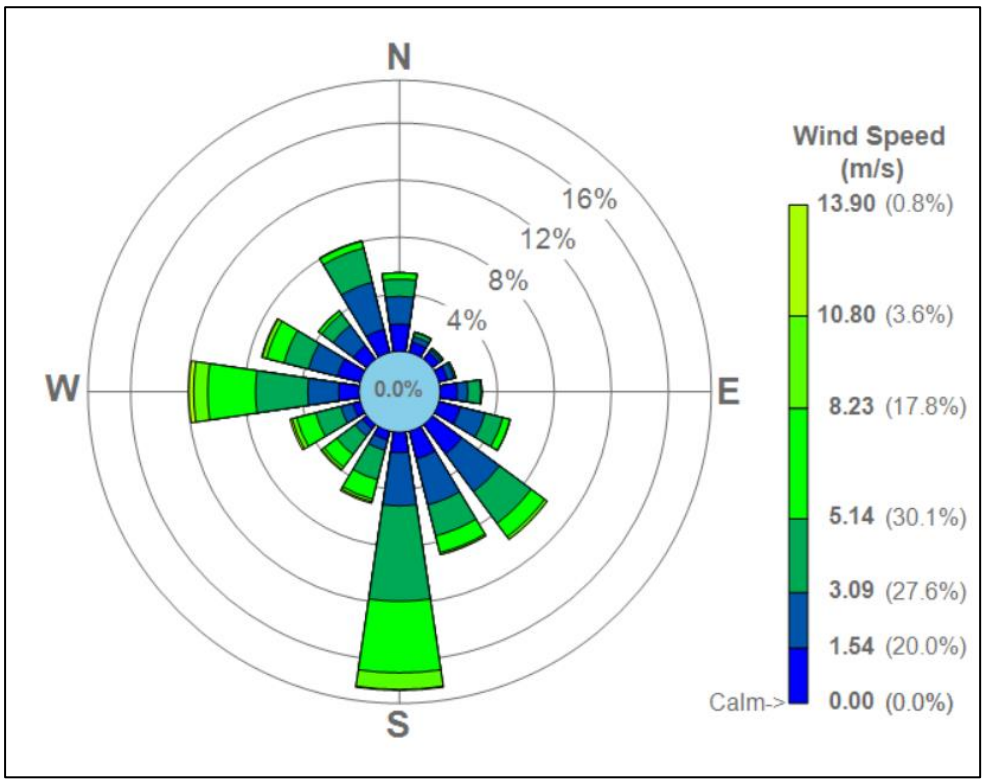
Warren Spring Laboratory (1980) Odour Control – a concise guide, F.F.H. Valentine and A.A. North (Eds).

Appendix A. Wind Rose for Oak Park

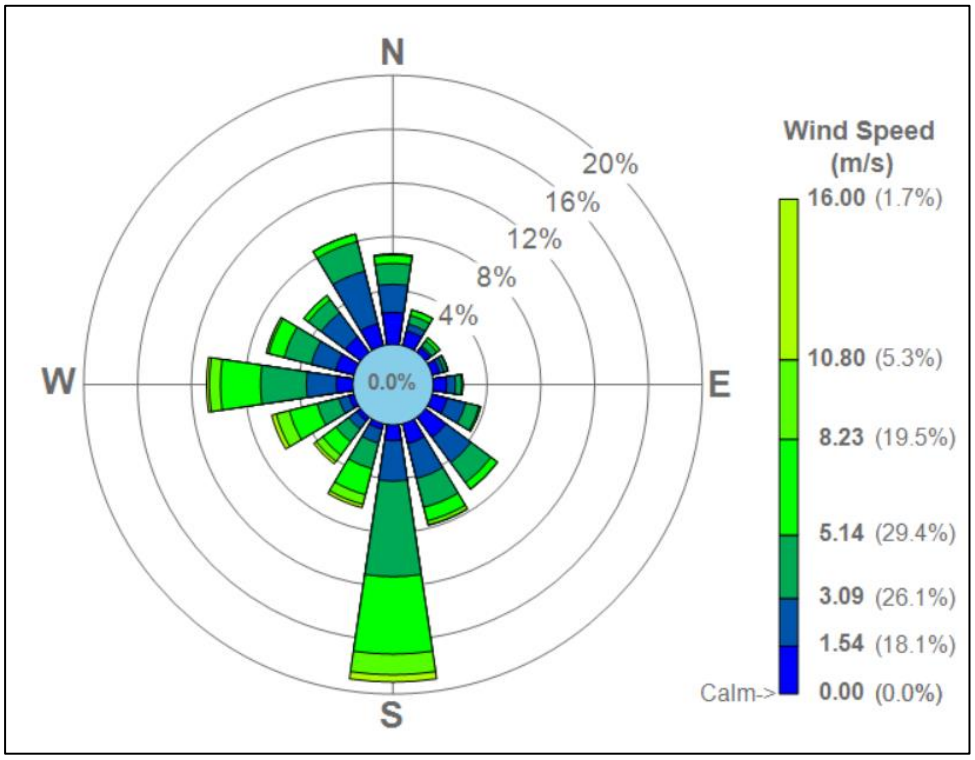
2018


N
E
S
W
20%
16%
12%
8%
4%
0.0%
Wind Speed
(m/s)
17.00 (1.1%)
10.80 (3.1%)
8.23 (16.8%)
5.14 (30.1%)
3.09 (29.6%)
1.54 (19.2%)
Calm->
0.00 (0.0%)

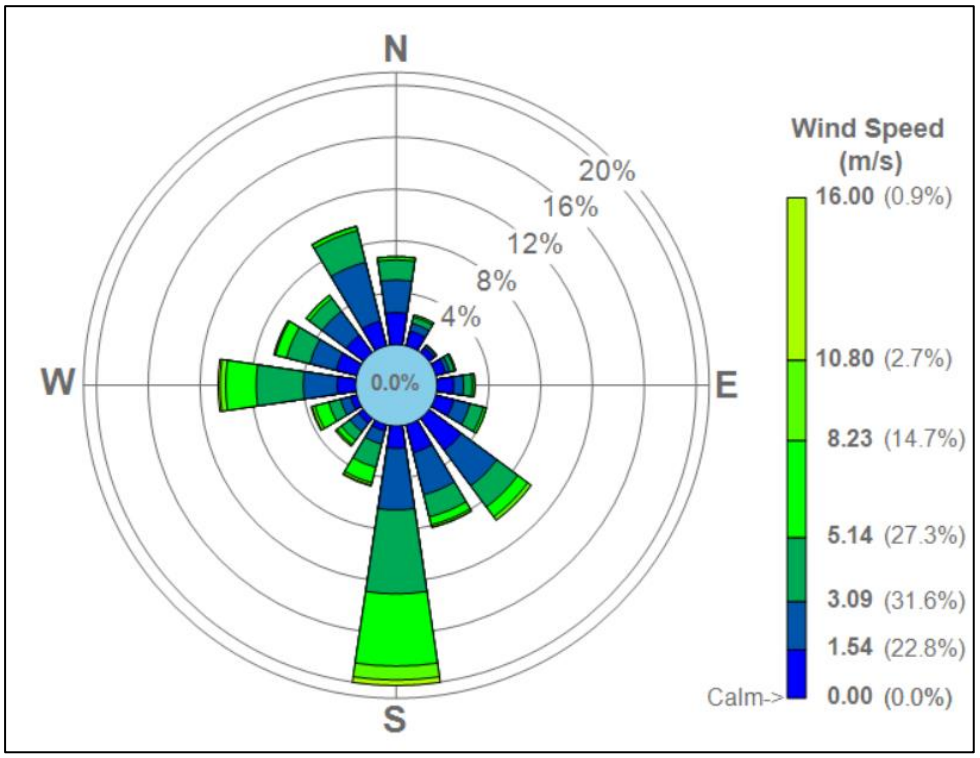
2019


N
E
S
W
16%
12%
8%
4%
0.0%
Wind Speed
(m/s)
13.90 (0.8%)
10.80 (3.6%)
8.23 (17.8%)
5.14 (30.1%)
3.09 (27.6%)
1.54 (20.0%)
Calm->
0.00 (0.0%)

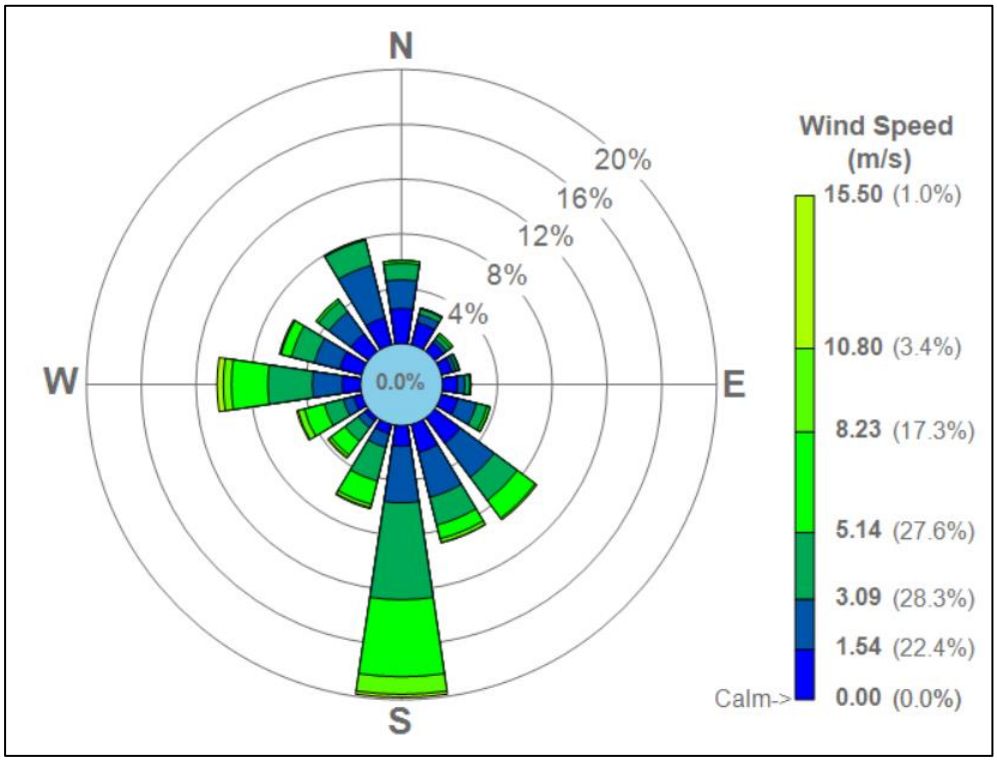
2020


N
E
S
W
20%
16%
12%
8%
4%
0.0%
Wind Speed
(m/s)
16.00 (1.7%)
10.80 (5.3%)
8.23 (19.5%)
5.14 (29.4%)
3.09 (26.1%)
1.54 (18.1%)
0.00 (0.0%)
Calm->

2021


N
E
S
W
20%
16%
12%
8%
4%
0.0%
Wind Speed
(m/s)
16.00 (0.9%)
10.80 (2.7%)
8.23 (14.7%)
5.14 (27.3%)
3.09 (31.6%)
1.54 (22.8%)
0.00 (0.0%)
Calm->

2022


N
E
S
W
20%
16%
12%
8%
4%
0.0%
Wind Speed
(m/s)
15.50 (1.0%)
10.80 (3.4%)
8.23 (17.3%)
5.14 (27.6%)
3.09 (28.3%)
1.54 (22.4%)
Calm-> 0.00 (0.0%)

Appendix B. Odour Concentrations for each individual Meteorological year (2018-2022)

Scenario 1:

Receptor ID	Location UTM		2018	2019	2020	2021	2022
	X	Y					
SR1	583077.3	5812194	0.032976	0.049767	0.029054	0.031889	0.026357
SR2	582908	5812555.6	0.051679	0.103547	0.063346	0.075136	0.074678
SR3	583230.7	5812733.8	0.188132	0.190533	0.163185	0.249166	0.187744
SR4	583179.5	5812969.7	0.119478	0.133153	0.072627	0.133276	0.096026
SR5	583124.6	5813171.5	0.098062	0.096848	0.054209	0.09824	0.071224
SR6	583225.6	5813140.5	0.110389	0.11027	0.083601	0.110468	0.109117
SR7	583319.2	5813115.7	0.133122	0.097604	0.08146	0.097674	0.097604
SR8	583456	5813108.3	0.113795	0.089711	0.081118	0.114021	0.092602
SR9	583539	5812971.5	0.123329	0.095447	0.081085	0.138402	0.103583
SR10	584391.3	5812614.1	0.029033	0.025165	0.022008	0.012894	0.022408
SR11	584498	5812127.3	0.020828	0.030476	0.022605	0.025372	0.025372
SR12	584727.8	5811659.2	0.012008	0.016	0.011069	0.015989	0.015949
SR13	583889.2	5811492.1	0.041569	0.039992	0.041552	0.041613	0.044489
SR14	583309.8	5811092.4	0.032976	0.007179	0.011778	0.012041	0.020755
SR15	583216.2	5811306.2	0.051679	0.00669	0.00994	0.009893	0.016165

Scenario 2:

Receptor ID	Location UTM		2018	2019	2020	2021	2022
	X	Y					
SR1	583077.3	5812194	0.229537	0.387573	0.201282	0.274035	0.196639
SR2	582908	5812555.6	0.657685	0.988125	0.674957	0.989548	0.913324
SR3	583230.7	5812733.8	1.074188	1.075292	0.890095	1.452481	1.072318
SR4	583179.5	5812969.7	0.599056	0.601144	0.583336	0.677173	0.598023
SR5	583124.6	5813171.5	0.66076	0.661111	0.445884	0.661736	0.653203
SR6	583225.6	5813140.5	0.538235	0.537286	0.522875	0.538235	0.536345
SR7	583319.2	5813115.7	0.596449	0.553058	0.437937	0.596101	0.508385
SR8	583456	5813108.3	0.556027	0.499182	0.391785	0.596518	0.552805
SR9	583539	5812971.5	0.621168	0.503591	0.451714	0.687448	0.590304
SR10	584391.3	5812614.1	0.194382	0.149299	0.143709	0.081909	0.117124
SR11	584498	5812127.3	0.12508	0.167039	0.127815	0.142515	0.141885
SR12	584727.8	5811659.2	0.06482	0.090968	0.064785	0.090888	0.090576
SR13	583889.2	5811492.1	0.239001	0.226841	0.255313	0.25631	0.263902
SR14	583309.8	5811092.4	0.06825	0.045099	0.096916	0.092356	0.119373
SR15	583216.2	5811306.2	0.081722	0.045262	0.082088	0.080697	0.149301

Appendix C. Odour Monitoring Results

Matrix Environmental

ODOUR MONITORING AT THE MILLTOWN COMPOST SITE, MILLTOWNMORE, FETHARD, CO. TIPPERARY. 2022 MONITORING W0270-02

For the Attention of:

Mr David Ronan
Milltown Composting
Milltownmore
Fethard
Co. Tipperary

Prepared by:

Mr. Craig Mallinson
Environmental Consultant

Ref: Odour Monitoring 2022

Executive Summary

Matrix Environmental was contracted by Milltown Composting to undertake ambient odour sampling and analysis at their facility at Milltown Mor, Fethard, County Tipperary. An Environmental Consultant subsequently visited the site on the 21st of June and the 22nd of October to conduct the monitoring events for 2022.

21st of June 2022 event:
OD1 was taken at Biofilter 1 and had an odour result of 111 ou_E/m^3.
OD2 was taken at Biofilter 2 and had an odour result of 71 ou_E/m^3

22nd of October 2022 event:
OD1 was taken at Biofilter 1 and had an odour result of 161 ou_E/m^3
OD2 was taken at Biofilter 2 and had an odour result of 60 ou_E/m^3

All the above results are within the licence limit of 750 ou_E/m^3.

The recorded levels reflect the on-site meteorological conditions during the sampling period.

This report is certified as accurate and representative of the sampling and associated analysis carried out.

1.0 INTRODUCTION

In compliance with the requirements of their waste licence (W0270-02) Milltown Compost Ltd are required to carry out ambient odour monitoring on a biannual basis and provides two emission points for monitoring – A 2-1 (Biofilter1) and A2-2 (Biofilter 2)

Matrix Environmental was commissioned to undertake the sampling and reporting. An Environmental Consultant subsequently visited the site on the 21st of June and the 22nd of October to conduct the monitoring events for 2022.

This report presents details of the sampling and analytical methodology carried out together with a broad interpretation of the results.

2.0 SCOPE

LICENCE W0270-02

Table 2.2 shows the scope of the monitoring survey: The scope outlined below was determined in conjunction with staff at the facility, Environmental Consultants within Matrix Environmental and with regards to Schedule B in the waste licence.

Table 2.2: Parameter - Location

Parameter	Locations
Odour	Biofilter Unit 1 (downwind corner of unit) OD 01
	Biofilter Unit 2 (downwind corner of unit) OD 02

3.0 METHODOLOGY

Odour Sampling and Olfactometry

Odour Sampling

Samples of gas of approximately 60 litres were collected via Teflon tubing into Nalophane® gas sampling bags by means of the "lung principle" method. Using this method, the sample bag is housed in a sealed car buoy that is evacuated using a small air pump. The volume of air removed from the car buoy is replaced by sample gas entering the bag, thus avoiding contamination of sample by pumps or meters. Sampling shall be carried out in accordance with the standard I. S. EN 13725:2003 entitled 'Air Quality – Determination of Odour Concentration by Dynamic Olfactometry'.

Dynamic Olfactometry

The samples were analysed by Dynamic Olfactometry. The instrument used will be an Olfactomat-e Olfactometer (Project Research Amsterdam) and the analytical procedures were in accordance with the I. S. EN 13725:2003 using a trained panel of assessors. The odour concentration of the sample is expressed in odour units per cubic metre of gas (ou_E/m^3). These values, sometimes referred to as "dilutions to threshold" are equivalent to the number of times the sample gas required dilution with odour free air to reach the panels odour threshold (i.e. the concentration at which there is a 50% probability of the panellists detecting the odour). The results are expressed in ou_E/m^3.

4.0 RESULTS

Table 4.1 Meteorological Conditions 21/6/22			
Parameter		**Parameter**	
Weather	Clear	Wind speed	11-12 km/hr
Temp	17-18ºC	Wind Direction	South Westerly
General Air Quality	Good	Bar Pressure	1010 mbar

Table 4.2: Odour Sampling Results 21/6/22	
Locations	**Results**
OD 01	111 ou_E/m^3
OD 02	71 ou_E/m^3

Table 4.3 Meteorological Conditions 22/10/22			
Parameter		**Parameter**	
Weather	Clear	Wind speed	18-20 km/hr
Temp	14ºC	Wind Direction	Southerly
General Air Quality	Good	Bar Pressure	999 mbar

Table 4.4 Odour Sampling Results 22/10/22	
Locations	**Results**
OD 01	161 ou_E/m^3
OD 02	60 ou_E/m^3

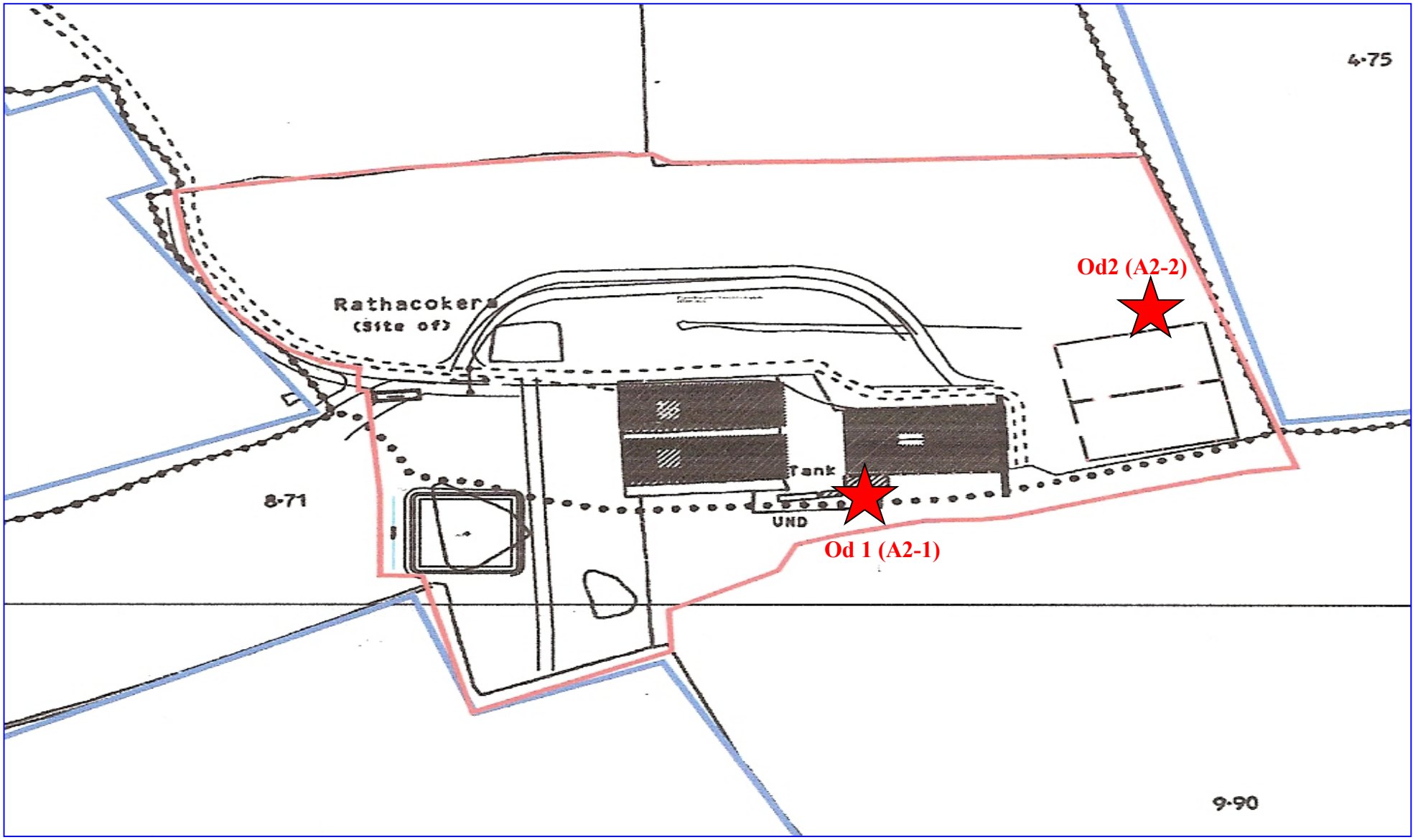
5.0 COMMENT

Odour sampling was carried out on a biannual basis during 2022 at the facility. The odour emissions from the two Biofilter units - Biofilter 1 (A 2-1) and Biofilter 2 (A2-2) were within the licence limit of 750ou_E/m3 for all monitoring events. On-site observations made during the monitoring event noted a distinct compost odour at the Biofilter units during each monitoring event.

The recorded odour levels represent the odour conditions in the vicinity of the facility and at the Biofilter units on the day of sampling and under the specific meteorological conditions of that day. Ambient odour is a combination of both natural and anthropogenic odour emissions.

Appendix 1

Sample Location Map


4·75
Od2 (A2-2)
Rathacokers
(Site of)
Tank
8·71
UND
Od 1 (A2-1)
9·90