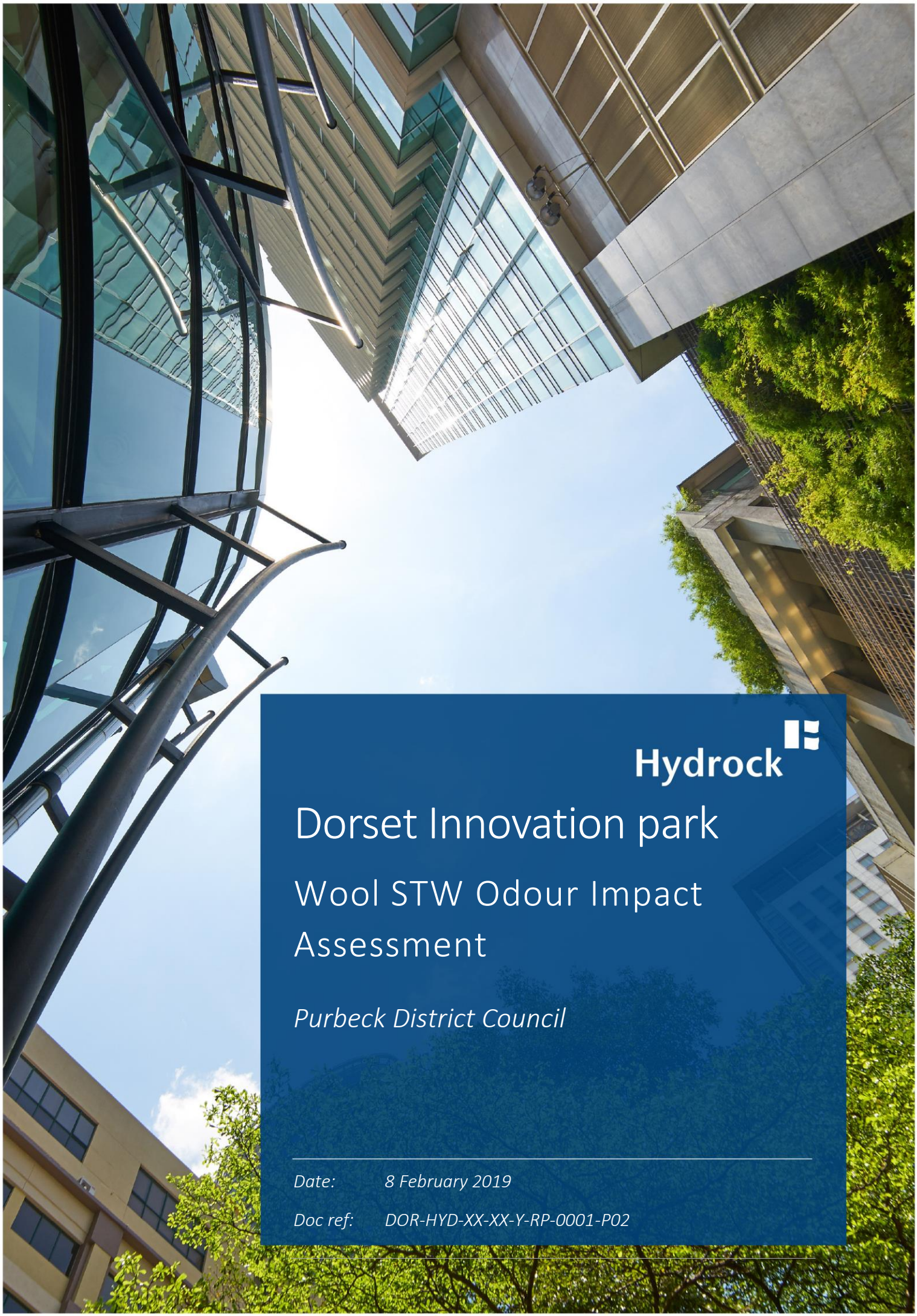

Hydrock

Dorset Innovation park

Wool STW Odour Impact Assessment

Purbeck District Council

Date: *8 February 2019*

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Wool STW Odour Impact Assessment

Hydrock have been appointed on behalf of Stride Treglown to undertake a desktop Odour Impact Assessment (OIA) to assess the risk of odour exposure on the proposed Dorset Innovation Park, from Wool Sewage Treatment Works (STW).

The study area lies within Purbeck District Council (PDC) local authority and 150m away from Wool Sewage Treatment Works (STW), which is owned and operated by Wessex Water. Wessex Water undertook a Preliminary Odour Risk Assessment (PORA) and deemed there to be a risk to the development site from odour and have requested that desktop odour modelling be undertaken.

A quantitative odour modelling assessment, using ADMS 5.2, has been carried out to establish the future odour situation in the area. Odour emission rates were defined based on reference odour concentrations and emission rates data from Wessex Water[7], UKWIR emission rates[1] and sampled emission rates from other sewage.

- The assets at Wool STW include: inlet works, two circular activated sludge plants, two final settlement tanks, a drum thickener and two sludge tanks. An additional odour source comes from exporting of sludge offsite.
- Wool STW is predicted to have an overall odour emission rate of approximately 14,000 ou_E/s, with the majority coming from the sludge assets (46%) and the remainder coming from the secondary (30%), preliminary (21%) and final treatment (3%).
- Dispersion modelling indicates the maximum 98th percentile concentration over the proposed development site is to be less than the chosen 5 ou_E/m^3 odour criteria.

In this case the extent of the risk is dependent on the odour criteria chosen i.e. the risk appetite of the parties involved. Based on guidance, 5 ou_E/m^3 is deemed suitable for a small sewage works near receptors that will not be expecting as high a level of amenity as residential. Using this level there is unlikely to be adverse odour impacts. If a lower odour criterion is deemed appropriate, there is small disagreement between the models and therefore a risk of a slight adverse impact to the very northern boundary of the site.

The absence of any complaints from the current users of Dorset Innovation park (Brownsea House), gives weight to complaints being unlikely if used by receptors of a similar sensitivity.

In accordance with Wessex Water recommendations (see section 8.2) an environmental protection (compliance) component has been incorporated within the Pre-Development Notice. This requires future detailed development projects to demonstrate a suitable approach to control the internal air quality within buildings in plots Juno, Zebra and Dimple.

[1] John Hobson, "Odour Control In Wastewater Treatment - A Technical Reference Document" (UKWIR, 2014).

1. INTRODUCTION

Hydrock have been appointed by Stride Treglown (the instructing organisation) on behalf of Purbeck District Council (the client) to undertake a desktop Odour Impact Assessment (OIA) to assess the risk of odour exposure on the proposed Dorset Innovation Park, from Wool Sewage Treatment Works (STW).

The study area lies within Purbeck District Council (PDC) local authority and 150m away from Wool Sewage Treatment Works (STW), which is owned and operated by Wessex Water. Wessex Water undertook a Preliminary Odour Risk Assessment (PORA) and deemed there to be a risk to the development site from odour and have requested that odour modelling be undertaken.

A dispersion model has been developed using ADMS 5.2 and reference odour emissions to predict the odour at the development site from Wool STW. Hydrock have been in contact with Wessex Water and have agreed, given the size of the STW and the sensitivity of the receptors that a desktop OIA is sufficient at this stage to assess the risk to the development.

2. SITE LOCATION

2.1 Site location

It is proposed to develop Dorset Innovation Park (DIP) on the site of the former Winfrith nuclear energy test facility on the edge of Wool village near Wareham. The entire development will consist of a mixture of buildings comprising of light industrial, research & design, industrial and distribution.

The study area lies within Purbeck District Council (PDC) local authority and 150 away from Wool Sewage Treatment Works (STW), which is owned and operated by Wessex Water. A figure below presents the location of Dorset Innovation Park relative to Wool STW. Wool STW process has not significantly changed in recent years and there are no major changes to the site planned.

Figure 1 - Site location of the proposed development (red), Brownsea House (blue) and Wool STW in green

2.2 Complaints Data

Wool STW is located in a rural area with few nearby receptors, the closest receptors include the current users of Dorset Innovation Park (the nearest being the QINETIG commercial property Brownsea House), Cliff cottage; a bed and breakfast, and the Severn Stars Inn. Of the time of writing there have been no odour complaints to Purbeck Council and 3 odour complaints have been made to Wessex Water, the last being in 2009.

3. RELEVANT LEGISLATION

Odour is a mixture of chemicals that when combined produce different smells. Depending on the offensiveness of the smell and the sensitivity of the person, a smell has the potential to cause an adverse effect. The likelihood of an adverse reaction is dependent on a number of factors known as FIDOL (Frequency, Intensity, Duration, Offensiveness and Location). As the magnitude of these FIDOL factors increases the adverse reaction can increase from detection of the odour through annoyance and nuisance stages and ultimately complaint action.

Odour assessments do not deal with risk to human health from the impact of the chemicals within odours and are generally more related to a person's amenity and quality of life, which can be severely impacted by such nuisances as odour. England's National planning policies do not refer to odour specifically but consider the prevention of nuisance, of which odour could be classed, as a material consideration. Specific guidance on odour assessment has been developed by DEFRA, the Environment Agency and the IAQM.

3.1 IAQM

Guidance on the assessment of odour for planning[2], produced by IAQM, is the latest of the guidance to be published (July 2018). It gives an overview the varying types of odour assessment, odour assessment criteria and methods for drawing significance from predicted impacts.

IAQM advocates combining multiple assessment tools due to the subjective nature of odour and the different uncertainties associated with each technique. Techniques for assessing odour are split into predictive and empirical and range from a Source-Pathway-Receptor (S-P-R) qualitative assessment and sniff tests to detailed dispersion modelling and chemical speciation.

3.2 DEFRA

DEFRA[3] has previously published the Guidance on the control of Odour and Noise from commercial Kitchens Exhaust Systems and Odour Guidance for Local Authorities[4] which have both since been withdrawn. They have not been replaced with additional odour guidance and are still a good point of reference for guidance, along with guidance by the IAQM and the Environment Agency.

3.3 Environment Agency

Environment Agency have produced "Horizontal Guidance 4 odour management"[5] which is aimed at providing advice for larger installation to assess odour for environmental permits. This document was withdrawn in 2016 in an attempt to simplify guidance, however this document contains large amounts of information on the science of olfactometry, odour abatement techniques, odour monitoring and is still referenced within IAQM as a source of modelling assessment criteria.

[2] IAQM, "Guidance on the Assessment of Odour for Planning," July 2018, http://www.iaqm.co.uk/text/guidance/odour-guidance-2014.pdf.
[3] DEFRA, "Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems," January 2005, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/645289/pb10527-kitchen-exhaust-0105.pdf. [Withdrawn]
[4] DEFRA.2010. Odour Guidance for Local Authorities. [Withdrawn].
[5] Environment Agency.2011.Horizontal Guidance 4 Odour management. [Withdrawn].

4. ASSESSMENT METHODOLOGY

An assessment has been carried out based on the methodologies and guidance set out in the Local Air Quality Management Technical Guidance LAQM TG(16)[6], H4, the IAQM Guidance on the assessment of odour for planning[7] and Wessex Waters odour risk assessment procedure for Proposed new developments[8].

At this stage a desktop assessment using reference emission rates has been undertaken. This approach has increased uncertainty when compared to using measurements from at source sampling, as a result conservative assumption have been used to assess the risk from Wool STW.

A site visit has been undertaken to gain a snapshot of real-world conditions and to understand the processes at the STW, which will affect the generation of odours. At this site visit the general methodology was agreed with Wessex Water.

4.1 Scope of Assessment

The main purpose of the assessment is to quantitively assess the odour impact on Dorset Innovation Park from the existing Wool Sewage Treatment Works (STW). This will be achieved using the following objectives:

- Undertake a site visit to gain a snapshot of real-world conditions and understand the processes at the STW that will affect the generation of odour.
- Define odour emissions rates for each aspects of the works using information collected at site and references emissions rates.
- Undertake dispersion modelling using ADMS 5.2 to quantitively assess the odour impact on the proposed site.

4.1.1 Stage 1: Site visit

A site visit to Wool Sewage Treatment Works was undertaken on the 5th December 2018 to review the site configurations, gain an understanding of normal site operations and gain a snap shot of odour conditions at the site. This was undertaken in the presence of a Wessex Water site operator. A limited sniffing assessment was also conducted onsite to gain a snapshot of odour conditions at various locations around the site, during the visit no odour was detected at Dorset Innovation Park.

4.1.2 Stage 2: Defining odour emissions rate

Odour emission rates were defined based on reference odour concentrations and emission rates data from Wessex Water[7], UKWIR emission rates[9] and sampled emission rates from other sewage works. Consideration was made to the following when defining emission rates:

- The dimension of each source;
- Any disturbance/turbulence within the sewage treatment process;

[6] Defra, "LAQM Technical Guidance LAQM.TG16," April 2016, http://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf.
[7] IAQM, "Land-Use Planning & Development Control: Planning for Air Quality" (Institute for Air Quality Management (IAQM), January 2017), http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf.
[8] James Humphries, "ODOUR RISK ASSESSMENT PROCEDURE FOR PROPOSED NEW DEVELOPMENT" (Wessex Water, January 2018).
[9] Hobson, "Odour Control In Wastewater Treatment - A Technical Reference Document."

- The frequency and timing of any treatment activity.

At the request of Wessex Water, the proposed odour emission rates were reviewed, and following this review there was a general agreement as to what odour emission rates should be applied. At the request of Wessex Water, no seasonality factors have been applied to the preliminary/primary stages of the works.

4.1.3 Stage 3: Odour dispersion modelling

A quantitative odour modelling assessment, using ADMS 5.2, has been carried out to establish the future odour situation in the area. This methodology is based on the FIDOL (Frequency, Intensity, Duration, Offensiveness and Location) factors and looks at the characteristics of the odour source, the effectiveness of the pathway, and the sensitivity of the receptors.

ADM 5.2 software is commercially available, has been validated for this type of assessment and is used extensively for OIA's.

This model will consider/use the following data:

- Time varying profiles for the drum thickeners and sludge exports sources.
- Reference emissions data from UKWIR and Wessex Water as well as onsite measurement from other sewage works.
- Sewage asset dimensions from google earth and onsite measurements.
- Weather data for the period 01/01/2013 to 31/12/2017 taken from Bournemouth International Airport.
- OS50 terrain data from the Ordnance survey®.
- Sensitivity analysis using AERMOD[10] air dispersion modelling software

4.2 Odour assessment criteria

Within the UK there is a range of odour criteria that could be applied to dispersion modelling results in order to assess potential annoyance. These methods are primarily based on a mathematical relationship that links odour annoyance with the 98th percentile odour concentration. A summary of the available odour criteria within each guidance document is presented below:

4.2.1 Environment Agency

Initial odour guidance was released within the Environment Agency H4[4] guidance which was designed to give advice relating to large scale installations (landfills, STWs, composting sector etc.), which were subject to the permitting regulations. Table 1 presents the odour criteria contained within the H4 guidance, which suggests minimum acceptable 98th percentile concentrations based on the odour offensive from the site. In this criterion the sensitivity of the receptors is not considered.

[10]The Latest US EPA AERMOD executable (18081) has been used.

Table 1 - H4 Benchmark odour criteria

Criterion, C_{98} ou_E/m^3	Offensiveness	Odour Emission Sources
1.5	Most Offensive	Processes involving decaying animal or fish remains Processes involving septic effluent or sludge Biological landfill odours
3	Moderately Offensive	Intensive livestock rearing Fat frying (food processing) Sugar beet processing Well aerated green waste composting
5	Less Offensive	Brewery Confectionery Coffee

4.2.2 Chartered Institution of Water and Environmental Management (CIWEM)

Guidance[11] produced by the Chartered Institution of Water and Environmental Management (CIWEM) states that:

"the following framework is the most reliable that can be defined on the basis of the limited research undertaken in the UK at the time of writing:

- C_{98}, 1-hour >10ou_E /m^3 - complaints are highly likely and odour exposure at these levels represents an actionable nuisance;
- C_{98}, 1-hour >5ou_E /m^3 - complaints may occur and depending on the sensitivity of the locality and nature of the odour this level may constitute a nuisance; and
- C_{98}, 1-hour > 3ou_E/m^3 - complaints are unlikely to occur and exposure below this level are unlikely to constitute significant pollution or significant detriment to amenity unless the locality is highly sensitive or the odour highly unpleasant in nature."

4.2.3 IAQM

IAQM have recently published a 2018 update to their odour guidance for planning[12], which contains a literature review of available odour emissions criteria as well as a proposed impact table for odour from dispersion modelling. The table below presents the IAQM impact table for moderately offensive odours in which the IAQM classes sewage works, unless they are deemed to have particular septic conditions.

Table 2 – IAQM proposed odour effect descriptor for impacts of predictive modelling – "Moderately offensive" odours

Odour exposure level C_{98} ou_E/m^3	Receptor sensitivity		
	Low	Medium	High
>10	Moderate	Substantial	Substantial
5-<10	Slight	Moderate	Substantial
3-<5	Negligible	Slight	Moderate
1.5-<3	Negligible	Negligible	Slight
0.5-<1.5	Negligible	Negligible	Negligible
<0.5	Negligible	Negligible	Negligible

[11] CIWEM (2012) Position Policy Statement – Control of Odour.
[12] IAQM.2018.Guidance on the Assessment of Odour for Planning."

There is some debate as to which odour criteria should be used, with most planning cases focusing on residential receptors, where the criteria of 3 and 5 ou_E/m^3 have been accepted in the past. However, this should be taken on a case by case basis with consideration of receptor sensitivity, specific site operations and consideration of the level of impact which may cause complaints.

Based on the above guidance on odour impact criteria and taking into account the type of receptors (light industrial, offices, research & design, industrial and distribution), which have been judged to be of low/medium sensitivity, the primary odour criteria that will be used within this assessment is the 5 ou_E/m^3 criterion.

5. SEWAGE TREATMENT PROCCES

5.1 Wool Sewage Treatment works

Wool Sewage Treatment works is a small works on the outskirts of the town of Wool, Dorset. It has a population equivalent of approximately 10,200 and treats sewage from a domestic origin. Sewage is pumped into the works from 5 rising mains within the Lulworth region into an open reception chamber. Sewage is then passed through two 6mm screens, where rags are removed, and effluent passed into a detritor where grit is allowed to settle. Both rags and grit are deposited and stored within two open skips for removal offsite. During high flow events there is a bypass channel, this channel bypasses the screens directly into the detritor.

From the detritor sewage is transferred, via covered pipes, into one of two circular activated sludge plants (ASP) which are split into anoxic and aerated zones; at this stage ferric chloride is dosed to control the levels of phosphorus within the settled sewage. The anoxic zone makes up approximately a quarter of each lane, with the rest consisting of an aerated zone. Mixed liquors then flow into the middle of the circular tank for final settlement and then out, fully treated, into the River Frome.

Excess sludge is pumped within a fully covered system to an open raw sludge tank on the north end of the site, from here it is de-watered and fed into a drum thickener (within a separate building). This drum thickener operates for 4 hours a day, with thickened sludge pumped to a separate open tank for transfer offsite. Thickened sludge is transferred offsite two days a week, using 8 tankers.

Figure 2 – Location of assets within Wool Sewage Treatment Works

The table below describes in more detail the sources of odour at the site that have been considered within this assessment.

Table 3 – Table of odour sources at Wool STW.

Source	Stage of works	Nature of source
Inlet Chamber	Preliminary	Open channel (turbulent)
Screen	Preliminary	Open channel (turbulent)
Detritor	Preliminary	Open channel
Grit skip	Preliminary	Open skip
Screening skip	Preliminary	Open skip
Anoxic zone	Secondary	Open tank
Aerobic Zone	Secondary	Open tank
Final Settlement Tank	Tertiary	Open tank
Raw sludge tank	Sludge	Open tank
Dewatering chamber	Sludge	Open channel
Drum thickener fugitive	Sludge	Enclosed, fugitive emissions
Thickened sludge tank	Sludge	Open tank
Sludge export	Sludge	Enclosed, fugitive emissions

6. ESTIMATION OF ODOUR EMISSIONS

As described in section 4.1.2. odour emission rates have been defined based on reference odour concentrations and emission rates data from: Odour Control In Wastewater Treatment - A Technical Reference Document[13], UKWIR emission rates[14] and sampled emission rates from other sewage works. Consideration has been made to the following when defining emission rates:

- The dimension of each source
- Any disturbance/turbulence within the sewage treatment process
- The frequency and timing of any sewage treatment process activity

All area sources emission rates have been calculated by multiplying the total emission rate ($ou_E/m^2/s$) by the surface area of the source.

Emissions from the drum thickener have been calculated assuming fugitive emissions from the drum thickening building (approx. 755 m^3). The emission rate was calculated based on an odour concentration of 1462[15] ou_E/m^3 and a volume of the drum thickener of 1 m^3, thus giving a total odour emission rate of 1462 ou_E/s. Wessex Water have confirmed that the drum thickeners are operational for 4 hours of the day and have been modelled as such.

Emissions from the sludge exports have been calculated based on an odour concentration of 100,000[16] ou_E/m^3 and assuming that four 27m^2 tankers are evacuated over 1 hour. This gives an odour displacement of 0.03m^3/s and a total emission rate of 3000 ou_E/s. Wessex Water have confirmed that there are approximately 8 tankers exporting the sludge per week, therefore emission from offsite tanker exports are included within the model for 2 hours per week.

All sources with the exception of the drum thickener and tanker exports have been assumed to be released continuously. Emission rates and turbulence assumptions chosen have been presented in Table 4

[13] Humphries, "ODOUR RISK ASSESSMENT PROCEDURE FOR PROPOSED NEW DEVELOPMENT."
[14] John Hobson, "Odour Control In Wastewater Treatment - A Technical Reference Document" (UKWIR, 2014)
[15] SLR, "MEADOW VIEW CARE FACILITY WIVELISCOMBE BUSINESS PARK," January 9, 2013, https://www2.tauntondeane.gov.uk/WebPages/Imaging/ViewImage/ViewImage.aspx?SRBarCode=Ty1DGSFELrbPQ0CBdT&ExtID=PDF.
[16] Odournet UK, "Odour Impact Assessment for Princes Risborough Sewage Treatment Works," December 1, 2017, https://www.wycombe.gov.uk/uploads/public/documents/Planning/New-local-plan/Local-plan-publication-version/Odour-impact-assessment-for-Princes-Risborough-sewage-treatment-works.pdf.

Table 4 – Table of odour sources at Wool STW.

Source	Base emission rate ($ou_E/m^2/s$)	Turbulence factor	Total emission rate ($ou_E/m^2/s$)	Area (m^2)	Time factor	Total emissions ($ou_E/m^2/s$)	Percentage of emissions
Inlet below reception pipe	31[17]	12	372	1.0	1	372.0	2.6%
Inlet Chamber	31[18]	3	93	3.5	1	325.5	2.3%
Screen	31[18]	6	186	4.0	1	744.0	5.2%
Detritor	31[18]	1	31	40.0	1	1240.0	8.7%
Detritor outlet	31[18]	3	93	1.3	1	120.0	0.8%
Grit skip	53[18]	1	53	3.0	1	159.0	1.1%
Screening skip	25[19]	1	25	3.0	1	75.0	0.5%
Anoxic zone inlet x 2	8[19]	3	24	2.0	1	48.0	0.3%
Anoxic zone x 2	8[20]	1	8	209.6	1	1677.5	11.7%
Aerobic Zone x 2	4[19]	1	4	635.0	1	2540.3	17.8%
FST x 2	0.7[19]	1	0.7	567.2	1	397.0	2.8%
Raw sludge tank	40[19]	1	40	78.6	1	3142.0	22.0%
Dewatering chamber	5	1	5	1.0	1	5.0	<0.1%
Drum thickener fugitive	1462 ou_E/s	n/a	n/a	n/a	0.167	243.7	1.7%
Thickened sludge tank	40 [19]	1	40	78.6	1	3142	22.0%
Sludge export	3000 ou_E/s	n/a	n/a	n/a	0.012	35.6	0.2%
Total						14250.6	100.0%

The total odour emissions from the site has been predicated to be approximately 14,000 ou_E/s. The inlet works accounts for approximately 21% of emissions with 30% and 3% coming from secondary and tertiary treatment respectively. Sludge assets are estimated to account for most of the odour emissions from the site at 46%, with the majority of emissions coming from the open sludge tanks.

[17] Humphries, "ODOUR RISK ASSESSMENT PROCEDURE FOR PROPOSED NEW DEVELOPMENT."
[18] John Hobson, "Odour Control In Wastewater Treatment - A Technical Reference Document" (UKWIR, 2014)
[19] Estimates based on typical UKWIR emission rates for the aerated zone of an activated sludge plant

7. DISPERSION MODEL SETUP AND ASSUMPTIONS

The assumptions and data used within the creation of the odour dispersion model have been presented below:

7.1 Dispersion model

ADM 5.2 software has been used to model odour emissions from Wool STW, this modelling software is commercially available and has been validated for this type of assessment and is used extensively for OIA's. At Wessex Waters request a sensitivity analysis using dispersion model AERMOD (executable 18081) has been undertaken.

7.2 Meteorological assumptions

Weather data was taken from Bournemouth international airport approximately 31km to the northeast of the site for the individual years of 2013-2017. Isle of Portland met station is closer, approximately 20km to the south west, however, due to its location on a coastal peninsula was not deemed representative. Both Bournemouth and Wool STW are at similar elevations, have no significant nearby topographical features and are 8km and 6km away from the coast, respectively.

Surface roughness has been defined as 0.7 for the dispersion site and 0.3 for the meteorological site. The dispersion site is surrounded by a significant area of trees followed by Dorset Innovation Park itself (a mixture of tall buildings and grassland) therefore a high surface roughness has been chosen. Appendix E shows the plans for the northern boundary of the site, Purbeck council have also stated:

"I have attached a copy of the relevant part of the design guide which illustrates the landscaping proposals for the northern part of the site. Purbeck is and will remain the landowner and is responsible for implementation, maintenance and management of this area in perpetuity"

A wind rose for the 5 years of weather data from Bournemouth international airport is presented within Appendix B, with AERMOD's met site surface roughness presented in Annex D.

The default Monin-Obukhov length of 1m has been used, the Monin-Obukhov length represents the ratio of turbulence generated by wind shear and thermal buoyancy, a lower value such as 1 - 10m represents a rural area.

7.3 Terrain

A terrain file was derived from OS50 map data, this terrain data has a resolution of 50m. As the terrain features within the area of the STW could be described as a gentle slope and terrain between the STW and the site having a gradient of less than 1:10, 50m terrain is deemed appropriate.

7.4 Receptor Grid

A 2.1km x 2.2km cartesian receptor grid with a resolution of 20m has been used to capture the extent of odour in the area surrounding Wool STW.

7.5 Buildings

No point sources have been included within the model, therefore no buildings have been included within the dispersion model (see section 7.7).

7.6 Volume/ area Sources

To represent emissions from tanks and open channels area sources have been used with fugitive emissions from the drum thickener building and tanker exports being modelled as volume sources. All area sources have been modelled assuming an ambient temperature release therefore not benefiting from any thermal buoyancy. A full table of source parameters can be seen in the appendix A.

7.7 Limitations

A number of factors are unable to be considered in the ADMS 5.2 simulation

- ADMS cannot account for the effects of building downwash on releases from area and volume sources, as there are no point sources within the model, buildings have not been considered within this assessment.
- While the modelling of intermittent tanker emissions has been included within the models, the short-term impact may not be satisfactory assessed using an annual odour emissions criterion. However, given the short-term and infrequent nature of the emissions and the low sensitivity of the receptors, tanker emissions from this site are not likely to cause adverse effects.
- Abnormal operations and breakdown events which may cause events of higher odour conditions have not been included within this assessment.

8. DISPERSION MODELLING RESULTS

8.1 Modelling results

The model outputs for the current works operation for each of the individual years modelled are presented in appendix C. Review of these 5 outputs indicates that 2016 is to be considered the worst-case meteorological year (in terms of exposure levels predicted across the development area). This 2016 model output is presented in Figure 3 below. At the request of Wessex Water the 1.5 and 3 ou_E/m^3 odour contour has been included along with the 5 ou_E/m^3 contour.

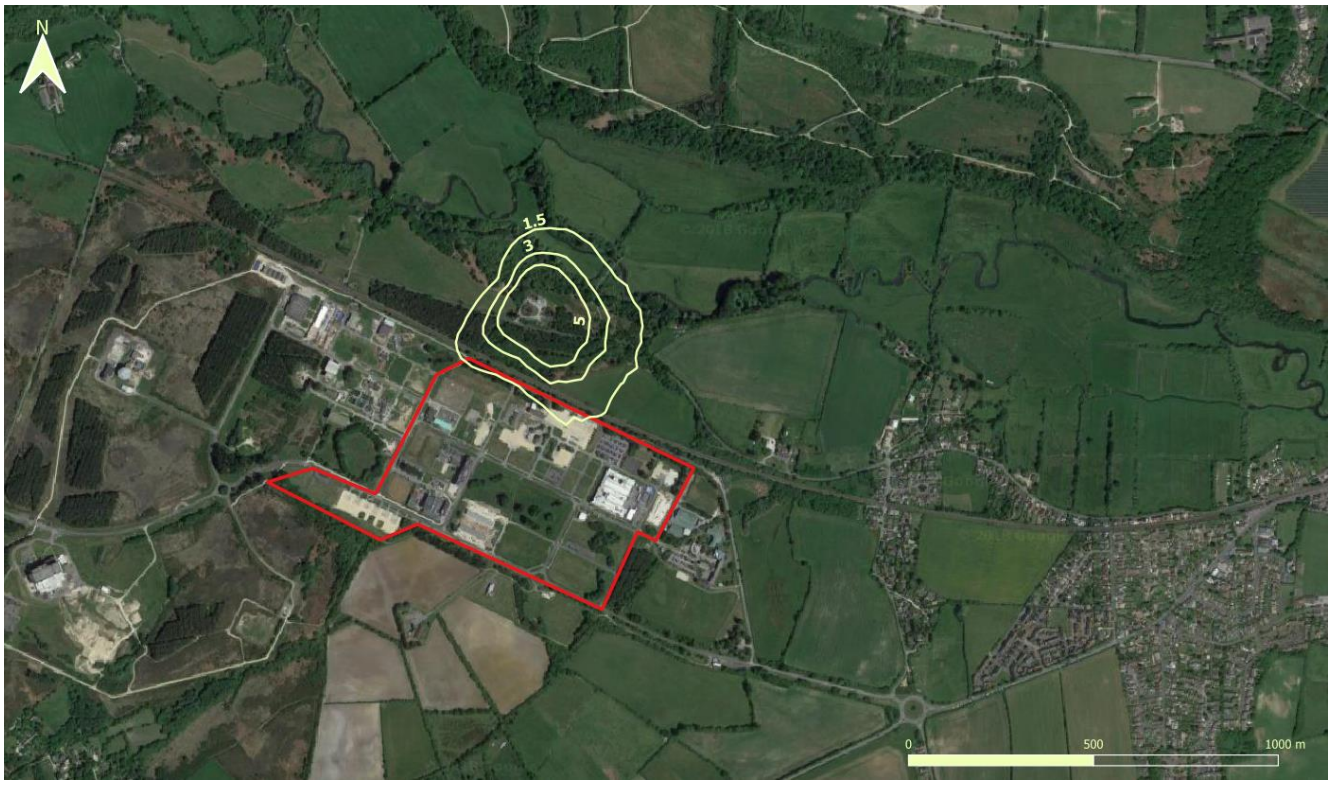

Figure 3 – Dispersion modelling plot using ADMS 5.2 and 2016 meteorological data from Bournemouth

Review of the figure above indicates that under the current operational conditions the 3 and 5 ou_E/m^3 98th percentile hourly odour exposure contour is not predicted to cover any part of the development.

At Wessex Waters request sensitivity using the US EPA recommended dispersion model AERMOD was undertaken. The 2016 model output assuming the same modelling parameters as in the ADMS 5.2 model is presented below.

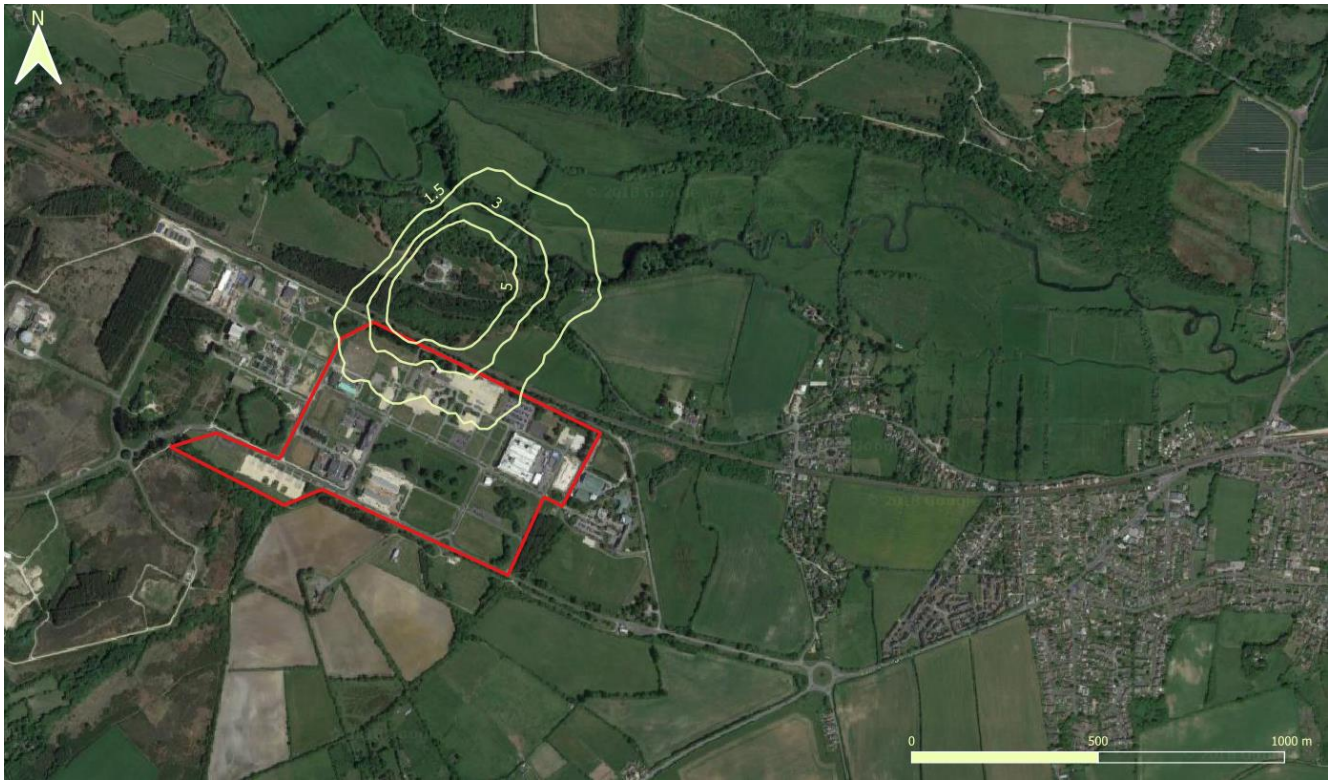

Figure 4 – Dispersion modelling plot using AERMOD and 2016 meteorological data from Bournemouth

Review of the figure above indicates that under the current operational conditions the 5 ou_E/m^3 98th percentile hourly odour exposure contour is not predicted to cover any part of the development. The AERMOD model output is slightly larger than the ADMS 5.2 output, with the 3 ou_E/m^3 contour covering a small section to the north of the site.

8.2 Discussion

This assessment uses desktop emissions rates, as a result there is some uncertainty as to the odour exposure from the site when compared to using onsite measured data. Conservative assumptions have therefore been used for emission rates from the inlet works with seasonal time factors also removed from liquid sources.

Based on figure 3 and 4 there is some disagreement between the models about the level of odour exposure across Dorset Innovation Park.

The ADMS dispersion modelling gives an indication that the maximum 98th percentile concentration over the proposed development site is to be no greater than 3 ou_E/m^3. While AERMOD indicates that the maximum 98th percentile concentration over the site will be between 3 and 5 ou_E/m^3.

Based on the modelling results it indicates that the maximum 98th percentile concentration over the proposed development site is to be no greater than 5 ou_E/m^3 and therefore using the chosen odour criteria of 5 ou_E/m^3 an adverse odour impact is unlikely.

Based on guidance, 5 ou_E/m^3 is deemed suitable for a small sewage works near receptors that will not be expecting as high a level of amenity as residential. Using this level, it gives an indication that adverse odour impacts are unlikely. If a lower odour criterion is deemed appropriate there is small disagreement between the models and therefore a risk of a slight adverse impact to the very northern boundary of the site.

As recommended by IAQM guidance, dispersion modelling is to be backed up by analysis of real-world conditions, in this case using complaints analysis. There have been no complaints regarding this site, including from the previous occupants of Dorset Innovation park (Brownsea House), since 2009 (where 2 were registered, with 3 in total). The absence of any complaints from the current users of Dorset Innovation park (Brownsea House), gives weight to complaints being unlikely if used by receptors of a similar sensitivity.

Following post-submission engagement, including the review of this Odour Modelling Report, Wessex Water has confirmed that the development proposed within the Local Development Order would be suitable. Wessex Water recommend that the layout and design of the buildings within Juno, Zebra and Dimple plots ensure there are no access/opening windows that face the Sewage Treatment Works (STW). Furthermore, air conditioning units should be faced so they do not draw from the direction of the STW.

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9. CONCLUSION

This assessment has been undertaken to assess the odour impact from Wool STW on the nearby Dorset Innovation Park. As agreed with Wessex Water a desktop modelling exercise has been undertaken with the conclusions summarised below:

- The assets at Wool STW include: inlet works, two circular activated sludge plants, two final settlement tanks, a drum thickener and two sludge tanks. An additional odour source comes from exporting of sludge offsite.
- Wool STW is predicted to have an overall odour emission rate of approximately 14,000 ou_E/s, with the majority coming from the sludge assets (46%) and the remainder coming from the secondary (30%), preliminary (21%) and final treatment (3%).
- Dispersion modelling indicates the maximum 98^{th} percentile concentration over the proposed development site is to be less than the chosen 5 ou_E/m^3 odour criteria.

In this case the extent of the risk is dependent on the odour criteria chosen i.e. the risk appetite of the parties involved. Based on guidance, 5 ou_E/m^3 is deemed suitable for a small sewage works near receptors that will not be expecting as high a level of amenity as residential. Using this level there is unlikely to be adverse odour impacts. If a lower odour criterion is deemed appropriate, there is small disagreement between the models and therefore a risk of a slight adverse impact to the very northern boundary of the site.

The absence of any complaints from the current users of Dorset Innovation park (Brownsea House), gives weight to complaints being unlikely if used by receptors of a similar sensitivity.

In accordance with Wessex Water recommendations (see section 8.2) an environmental protection (compliance) component has been incorporated within the Pre-Development Notice. This requires future detailed development projects to demonstrate a suitable approach to control the internal air quality within buildings in plots Juno, Zebra and Dimple.

Appendix A – Modelling parameters

Table 5 – Modelling parameters for all odour sources.

Source	Source type	Source height (m)	Temperature release (°C)	exit velocity (m/s)	L2 (m)
Below reception pipe	Area	1.0	ambient	0.01	n/a
Inlet Chamber	Area	1.0	ambient	0.01	n/a
Screen	Area	1.0	ambient	0.01	n/a
Detritor	Area	1.0	ambient	0.01	n/a
Detritor outlet	Area	1.0	ambient	0.01	n/a
Grit skip	Area	1.0	ambient	0.01	n/a
Screening skip	Area	1.0	ambient	0.01	n/a
Anoxic zone inlet x 2	Area	6.0	ambient	0.01	n/a
Anoxic zone x 2	Area	6.0	ambient	0.01	n/a
Aerobic Zone x 2	Area	6.0	ambient	0.01	n/a
FST x 2	Area	6.0	ambient	0.01	n/a
Raw sludge tank	Area	4.0	ambient	0.01	n/a
Dewatering chamber	Area	0.2	ambient	0.01	n/a
Drum thickener fugitive	Volume	2.5	ambient	n/a	5.0
Thickened sludge tank	Area	4.0	ambient	0.01	n/a
Sludge export	Volume	1.0	ambient	n/a	2.0

Appendix B – Wind rose

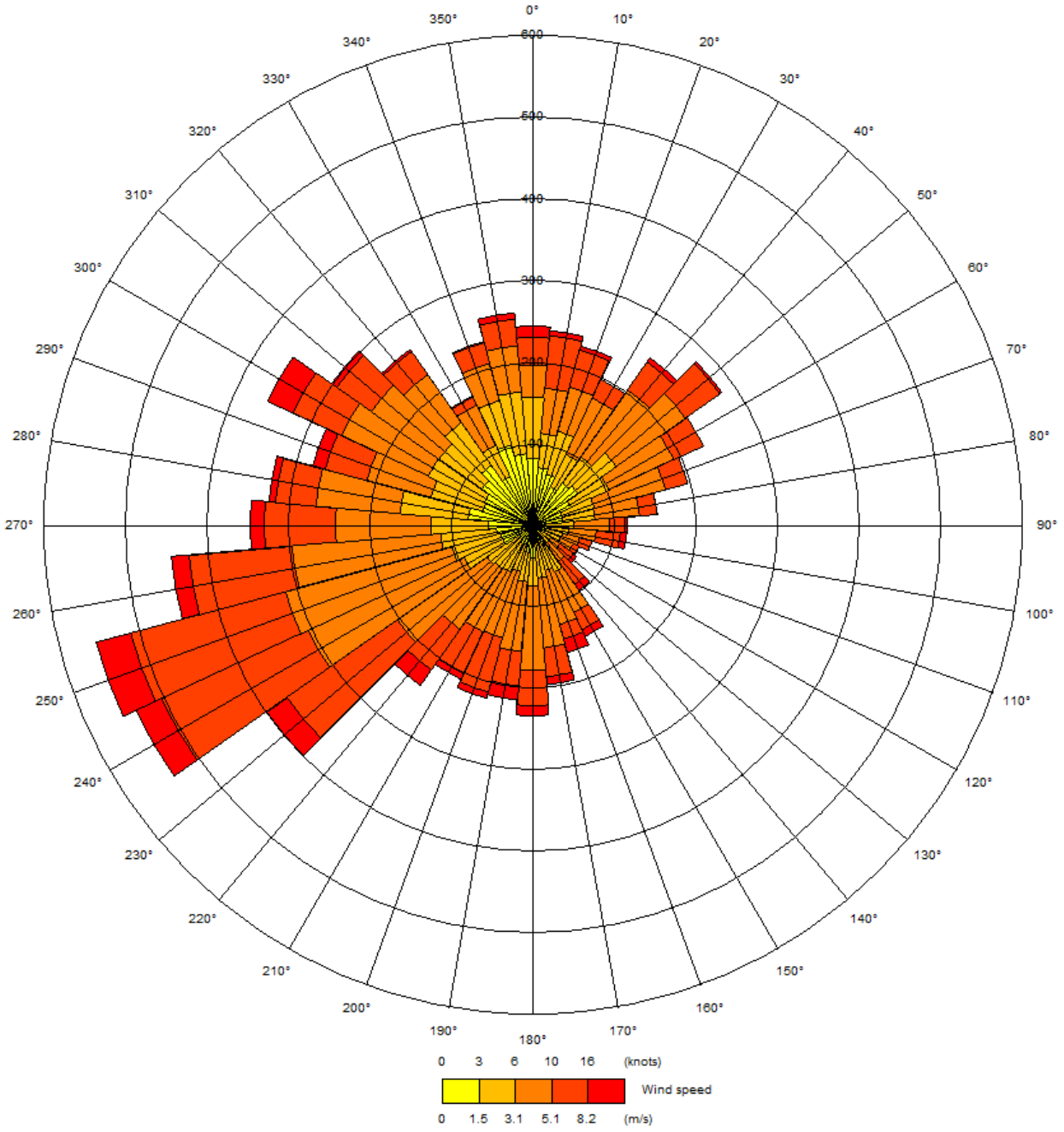

Figure 5 – Windrose for the 2016 weather data from Bournemouth Airport

Appendix C – Meteorological sensitivity

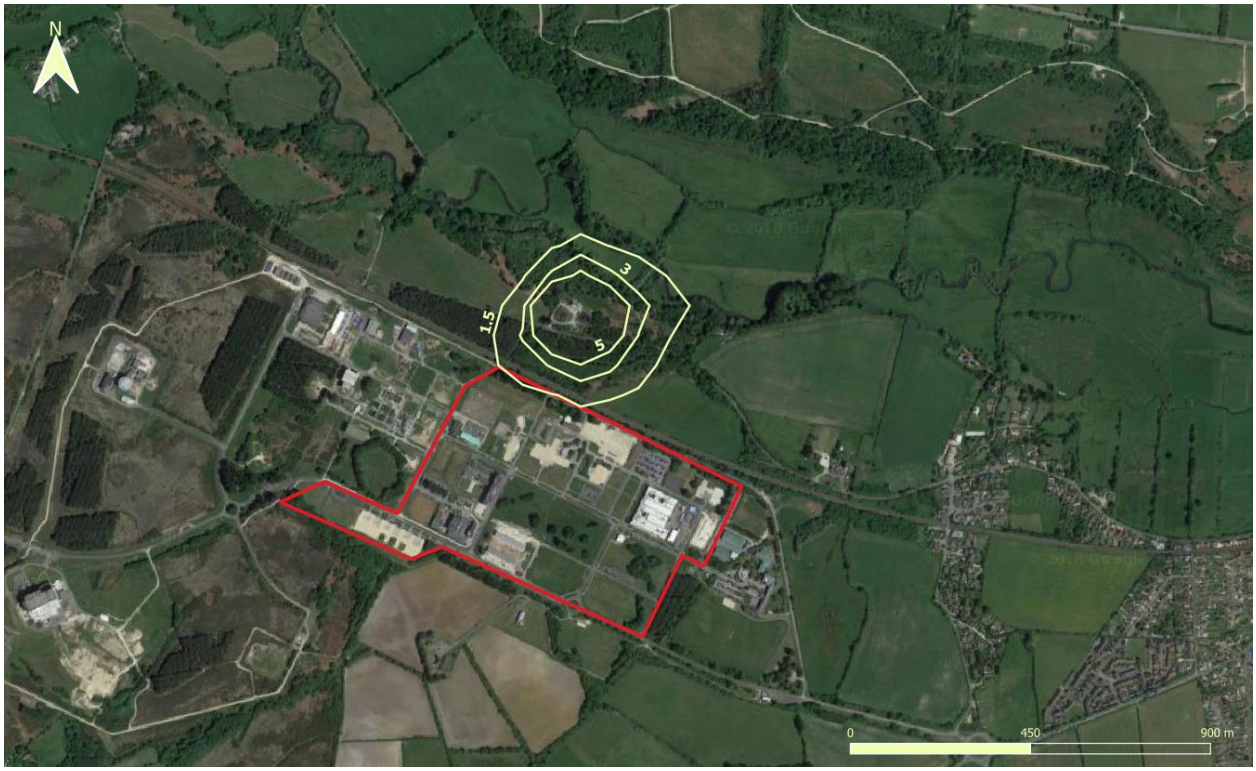

Figure 6 – ADMS modelling plot using 2013 meteorological data

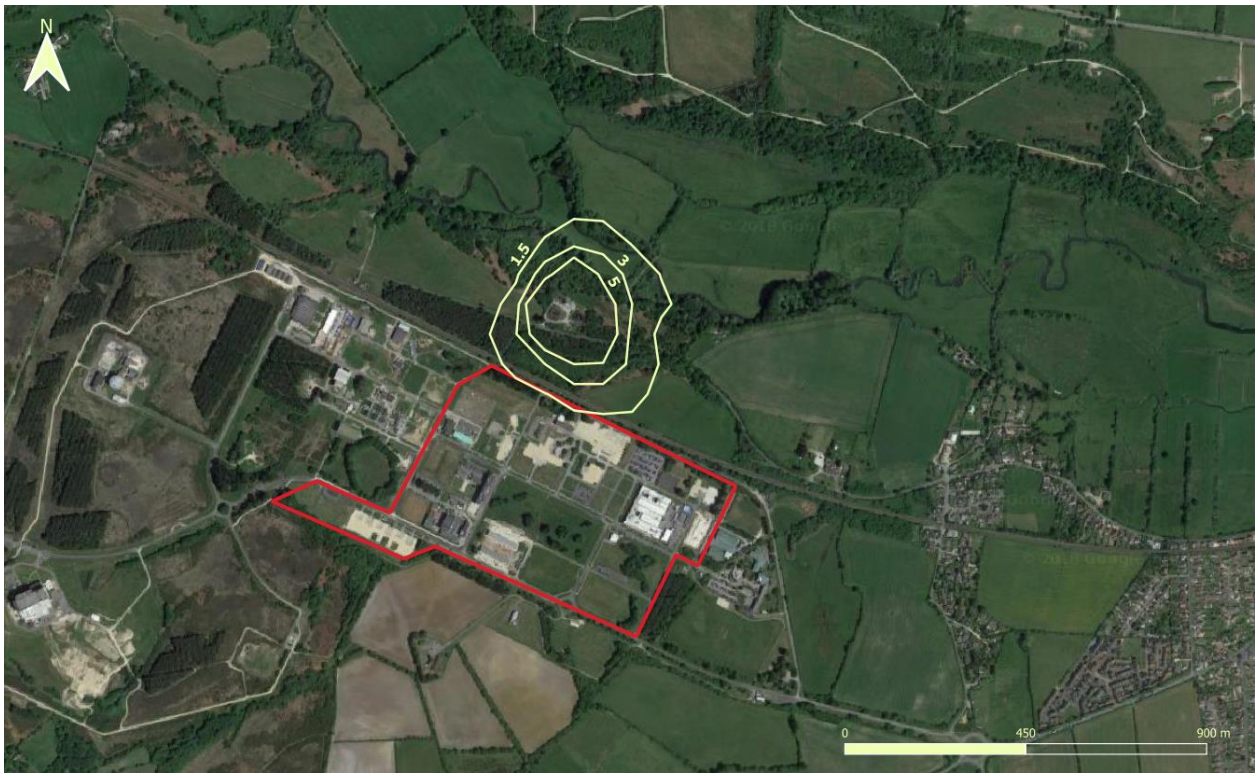

Figure 7 – ADMS modelling plot using 2014 meteorological data

Figure 8 – ADMS modelling plot using 2015 meteorological data

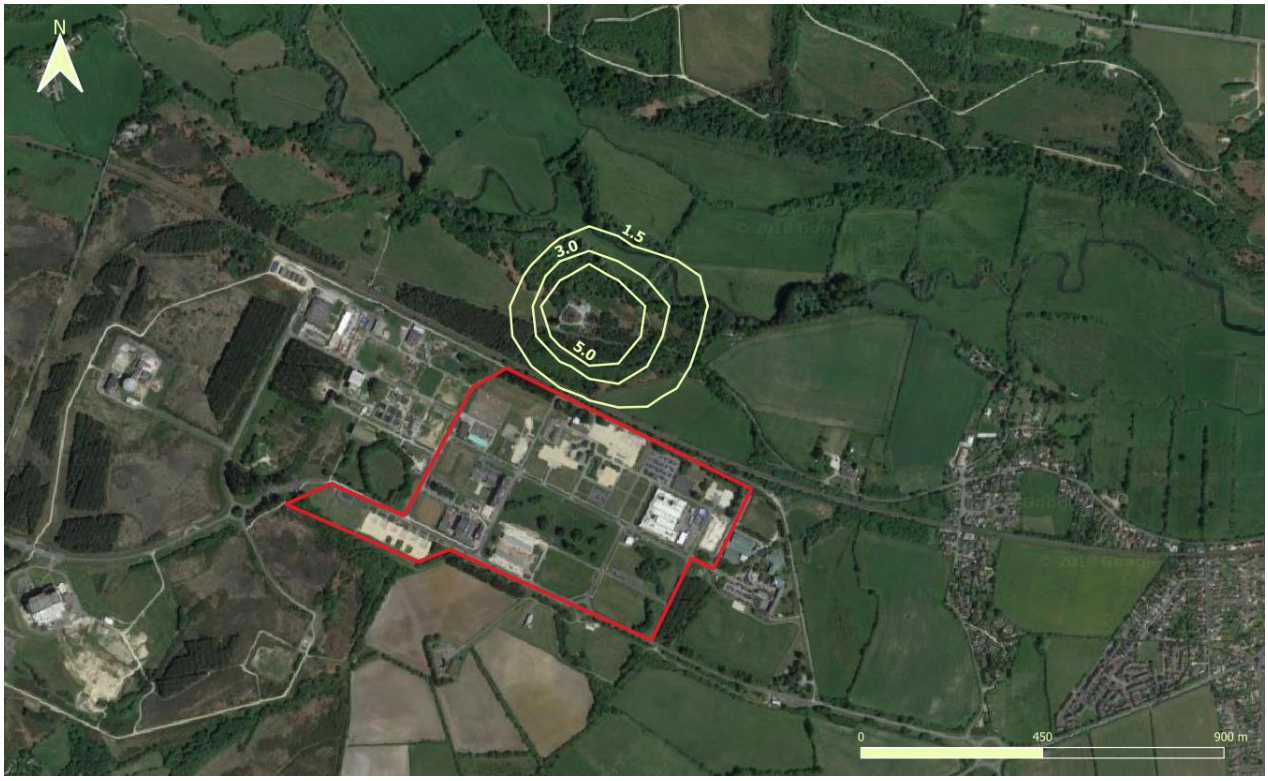

Figure 9 – ADMS modelling plot using 2017 meteorological data

Appendix D – AERMET parameters

Table 6 – AERMET parameters by sector

Section	Bowen Ratio	Albedo	Surface roughness
340-75	0.9625	0.246	0.2
75-200	0.9625	0.246	0.7
200-280	0.9625	0.246	0.1
280-340	0.9625	0.246	0.3

Appendix E – Boundary information

Figure 10 – Plans for the northern boundary of the site