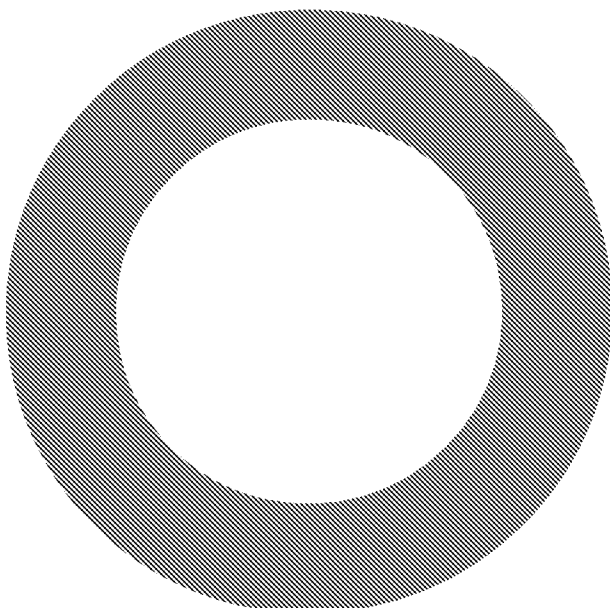


**Land at Ford Airfield.
Ford, West Sussex.
Redrow Homes Southern and
Wates Developments.**

AIR QUALITY
QUANTITATIVE ODOUR ASSESSMENT

REVISION 06 – 21 JULY 2021



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	14/11/2018	First draft	MS/AD	CH	CR
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03	24/10/2019	First Issue	CS	CR	CR
04	19/12/2019	Second issue following update to Site area	CS	CR	CR
05	18/02/2020	Third issue	CS	CH/CR	CR
06	21/07/2021	Reassessment following monitoring	MS	LB	KW

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Executive summary

Barton Wilmore has appointed Hoare Lea to undertake a detailed odour impact assessment of the Ford Wastewater Treatment Works (WwTW) with the aim of predicting the potential odour impact at a Proposed Development on land at Ford Airfield. The Application Site lies within the administrative authority of Arun District Council and West Sussex County Council. The WwTW is operated by Southern Water.

Both Arun District Council and Southern Water (represented by Atkins) have agreed the assessment approach. The details of the WwTW were confirmed through discussions with Southern Water and Atkins during two site visits. Emissions data for sources have been agreed with Atkins on behalf of Southern Water and have been used to input into an atmospheric dispersion model. For this assessment the AERMOD model has been used with due consideration to the relevant guidance. Odour emission rates derived from site sampling at the Ford WwTW have been used.

The odour impact isopleths (contours) for the WwTW are presented in drawings AQ3 and AQ4:

- Drawing AQ3 shows the odour impact isopleths $1.5\text{ouE}/\text{m}^3$, $3.0\text{ouE}/\text{m}^3$ and $5\text{ouE}/\text{m}^3$ based on the 1-hour average 98th percentile ($C_{98,1\text{-hour}}$) values for 5 years of meteorological data;
- Drawing AQ4 shows the odour impact isopleths $1.5\text{ouE}/\text{m}^3$, $3.0\text{ouE}/\text{m}^3$ and $5\text{ouE}/\text{m}^3$ based on the 1-hour maximum 98th percentile ($C_{98,1\text{-hour}}$) value for each grid point from 5 years of meteorological data.

Drawings AQ3 and AQ4 also show a 100m standoff for 'calm conditions' which would not be accounted for in the dispersion model due to the wind having no direction. The use of the $C_{98,1\text{-hour}}$ $3.0\text{ouE}/\text{m}^3$ isopleth has been agreed with the Environmental Health department at Arun District Council as appropriate for the Proposed Development and Drawing AQ4 (maximum 98th percentile value) has been used to inform Masterplan design.

The results of the assessment provide a buffer region where the odour impact associated with the WwTW is greater than the limit of $C_{98,1\text{-hour}}$ $3\text{ouE}/\text{m}^3$ at the Proposed Development under 'typical' operation. Receptors closest to this isopleth (contour) would be likely to experience odours from the works on occasion (i.e. they would not be 'odour free'), however this would be below the $C_{98,1\text{-hour}}$ $3\text{ouE}/\text{m}^3$ limit, where complaints are unlikely to occur as suggested by the Chartered Institution of Water and Environmental Management, based on the modelling inputs applied in this study and agreed with Arun District Council as appropriate for the Proposed Development.

1. Introduction

Barton Wilmore has appointed Hoare Lea to undertake a detailed odour impact assessment of the Ford Wastewater Treatment Works (WwTW) with the aim of predicting the potential odour impact at a Proposed Development on land at Ford Airfield. The Application Site lies within the administrative authority of Arun District Council and West Sussex County Council. The WwTW is operated by Southern Water.

1.1 Development Description

The village of Ford is located to the north east of the Application Site, with the villages of Climping and Yapton located to the immediate south east and west. The town of Littlehampton is located approximately 1.5km to the east of the Application Site while Bognor Regis is located approximately 2km to the south west.

The Application Site extends to approximately 86.63 hectares (ha) and predominantly comprises an area of land formerly used as an airfield. Large areas of the Application Site now comprise agricultural fields, separated by hedgerows and trees. The planning application description is as follows:

Outline planning application (with all matters reserved except for access) for the development of up to 1,500 dwellings (Use Class C3), 60-bed care home (Use Class C2), up to 9,000 sqm of employment floorspace (Use Classes B1), local centre of up to 2,350 sqm including up to 900 sqm retail / commercial (Use Classes A1-A5) and 1,450 sqm community / leisure floorspace (Use Classes D1-D2), land for a two-form entry primary school (Use Class D1), public open space, allotments, new sports pitches and associated facilities, drainage, parking and associated access, infrastructure, landscape, ancillary and site preparation works, including demolition of existing buildings and part removal of existing runway hardstanding.

1.2 Scope

This detailed assessment report relates to odour from the WwTW and does not include assessment of the air quality impacts associated with construction or the traffic during operation of the Proposed Development. Hoare Lea produced a separate report for this which was submitted in February 2020 alongside the Environmental Statement (ref: REP-1010502-5A-20191219-Ford Airfield-AQ-R7).

The sources of odour generation at the WwTW have been identified and the resultant release and impact on the surrounding locality estimated, using on-site monitoring data and dispersion modelling techniques to determine exposure in terms of European Odour Units (ouE/m³).

The assessment does not quantitatively assess the potential for odour impact from other sources adjacent to the Ford Airfield, but a qualitative assessment of the odour impact of other existing sources such as the Grundon Waste Transfer Station, located to the north of the WwTW has been undertaken through field (walkover) odour surveys.

1.3 Objectives

The objectives of this assessment are as follows:

- To predict odour impacts from the Ford WwTW on future receptors sited within the Ford Airfield development; and
- To assess the extent of these predicted impacts to inform the site masterplan.

2. Regulatory Standards and Guidance

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

The numerical guidelines have largely been derived from the findings of a limited number of research studies where modelled odour impacts have been compared to the findings of quality of life surveys to provide a dose-effect relationship. These dose-effect studies have only been undertaken for a limited number of odour sources; however, they have been used as the foundation for the setting of acceptable odour standards in many countries.

For quantitative assessment, odour assessments are undertaken using dispersion modelling to predict impacts in multiples of the European Odour Unit (ou_E), as defined in BS EN 13725. This approach allows impact assessment of any odorous gas as it is independent of chemical constituents and centres instead on multiples of the detection threshold (i.e. the physiological response of a human) of the gas in question. The odour unit is a Standard Unit in the same way as gram or milligram, and the notation used in odour assessment follows the conventions of any pollutant:

- concentration: ou_E/m^3
- emission: ou_E/s
- specific emission (emission per unit area): $\text{ou}_E/\text{m}^2/\text{s}$

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

The acceptable level of impact will be dependent on the nature (offensiveness) of the odour and the broad sensitivity of the population. To account for this, differing numerical guidelines are often set not only depending on the offensiveness of the odour, but also the broad sensitivity of the environment, as described in the sections below.

2.1 The National Planning Policy Framework (NPPF)

The latest guidance published in February 2019, the National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied.

At the heart of the NPPF is a presumption in favour of sustainable development. It is described as providing a framework within which locally-prepared plans for housing and other development can be produced. It requires Local Plans to be consistent with the principles and policies set out in the Framework with the objective of contributing to the achievement of sustainable development. The following Policies are of relevance.

Under paragraph 170(e), it states that:

'127. Planning policies and decisions should ensure that developments:

.....

f) create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience.'

Under paragraph 180, it states that:

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

Under paragraph 182, it states that:

'182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.'

2.2 IAQM Odour Guidance

In October 2018 the Institute of Air Quality Management (IAQM) released the latest version of its Guidance on The Assessment of Odour for Planning¹ (hereafter referred to as the 'IAQM Guidance'). The IAQM guidance is for assessing odour impacts for planning purposes. It provides background information relating to requirements for odour impact assessments and suitable impact criteria and draws from other sources of information such as that described in Environmental Permitting Regulations H4 horizontal odour guidance².

The IAQM guidance identifies a range of odour impact criteria depending primarily on the nature of the odour (i.e. its pleasantness/unpleasantness) and the likelihood of causing unacceptable impacts based on a percentile of predicted hourly average concentrations over a year. Such criteria apply only to locations where an individual's exposure is likely to occur for prolonged periods of time i.e. residential properties. Where exposure is more transient (i.e. roads, footpaths etc.) the direct application of such criteria should be treated with caution and further consideration should be given to how the duration and frequency of exposure of the individual will influence the acceptability of the predicted impact

The IAQM Guidance describes the concept of the FIDOL factors:

- Frequency;
- Intensity;
- Duration;
- Offensiveness; and
- Location.

The probability of disamenity will be dependent upon the inter-relationship between each of these factors. For example, a less frequent but higher offensiveness odour may (or may not) be more problematic than a more frequent but less offensive odour dependent upon the duration of exposure.

The IAQM Guidance suggest that, where possible, 'multi-tool odour assessment' of site suitability should be applied:

- *Monitoring (e.g. sniff tests) can give a measure of odour at specific locations under the conditions prevailing at the times and days of the sampling, but cannot cover all receptor locations under every meteorological condition over a typical year;*
- *Complementing monitoring with dispersion modelling provides greater spatial and temporal coverage and the reasonableness of the estimates from the model can be compared with the observed (i.e. monitored) levels; and*
- *Modelling (and probably monitoring) is only likely to characterise normal operations of the odour source, whereas it is known that unexpected events (e.g. breakdowns) and abnormal operations at some facilities can account for a significant proportion of high odour episodes. If there are already receptors in the*

¹ Bull et al (2018). IAQM Guidance on the assessment of odour for planning – version 1.1. Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/odour-guidance-2018

² Environment Agency (March 2011) Additional guidance for H4 Odour Management. How to comply with your environmental permit. GEHO0411BTQM-E-E

locality, analysis of historical complaints data can provide an alternative perspective on the impact that is inclusive of such unexpected events and abnormal operations.

2.2.1 Quantitative Assessment

Where detailed dispersion modelling has been undertaken, the IAQM guidance provides odour effect descriptors for quantitative impacts. These are typically expressed as a 1-hour average of the 98th percentile (i.e. 175 hours of the year) and are dependent on the odour exposure level, the offensiveness and the receptor sensitivity. For residences, the receptor sensitivity will almost always be regarded as 'high'.

For sites releasing the "Most Offensive" odours, the impact criteria are as shown below.

Odour Exposure Level C_{98} ouE/m ³	Receptor Sensitivity		
	Low	Medium	High
>30	Moderate	Substantial	Substantial
5-30	Moderate	Moderate	Substantial
3-5	Slight	Moderate	Moderate
1.5-3	Negligible	Slight	Moderate
0.5-1.5	Negligible	Negligible	Slight
<0.5	Negligible	Negligible	Negligible

It should be noted that the Table applies equally to cases where there are increases and decreases in odour exposure as a result of this development, in which case the appropriate terms "adverse" or "beneficial" should be added to the descriptors.

- IAQM 2018

It can be seen that, for a high sensitivity receptor such as a new residence, any more than 1.5ouE/m³ would constitute of 'moderate' and therefore 'significant' adverse odour impact when the most offensive odours are experienced.

Similarly, the IAQM guidance also provides odour effect descriptors for impacts predicted by modelling – "Moderately Offensive" odours, as shown below.

Odour Exposure Level C_{98} ouE/m ³	Receptor Sensitivity		
	Low	Medium	High
>30	Moderate	Substantial	Substantial
5-30	Slight	Moderate	Moderate
3-5	Negligible	Slight	Moderate
1.5-3	Negligible	Negligible	Slight
0.5-1.5	Negligible	Negligible	Negligible
<0.5	Negligible	Negligible	Negligible

It should be noted that the Table applies equally to cases where there are increases and decreases in odour exposure as a result of this development, in which case the appropriate terms "adverse" or "beneficial" should be added to the descriptors.

- IAQM 2018

It can be seen that, for a high sensitivity receptor such as a new residence, any more than 3.0ouE/m³ would constitute of 'moderate' and therefore 'significant' adverse odour impact when odours of moderate offensiveness are experienced.

The IAQM guidance also states in relation to relative offensiveness that:

'For odours that are less unpleasant, the level of odour exposure required to elicit the same effect may be somewhat higher, requiring professional judgement to be applied. For example, odours from sewage treatment works plant operating normally, i.e. non-septic conditions, would not be expected to be at the 'most offensive' end of the spectrum ... and can be considered on par with 'moderately offensive' odours such as intensive livestock rearing'.

2.2.2 Walkover Odour Surveys

Appendix 2 ('Sniff Testing') of the IAQM guidance provides a standardised method for offsite odour audits (also known as walkover surveys or sniff tests). The method relies on person(s) with a defined acuity to odours walking in areas downwind of the site to detect the extent of the odour plume. By noting the following, a measure of the odour effect may be determined:

- Offensiveness;
- Odour Intensity; and
- Percentage of time that an odour may be detected.

2.3 CIWEM Criteria

The Chartered Institution of Water and Environmental Management (CIWEM) has published a Policy Position Statement relating to the control of odour³. The PPS states the following in relation to odour impact criteria:

'Given the differing odour impact criteria available, the selection of the most appropriate criterion should be determined by the objective of the assessment (whether this be against a standard of avoidance of nuisance or 'significant pollution') and the nature of the odour under assessment.

It is, therefore, the view of CIWEM that these and other odour impact criteria should be regarded as indicative guidelines and cannot be applied as over-arching statutory numerical standards. CIWEM considers 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:

- $C_{98, 1-hour} 100\mu E/m^3$ - complaints are highly likely and odour exposure at these levels represents an actionable nuisance;
- $C_{98, 1-hour} 50\mu E/m^3$ - complaints may occur and depending on the sensitivity of the locality and nature of the odour this level may constitute a nuisance
- $C_{98, 1-hour} < 30\mu E/m^3$ - 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.'

As such, the CIWEM PPS is in agreement with the IAQM Guidance in that the use of a $C_{98, 1-hour} < 30\mu E/m^3$ criterion is likely to be sufficient for protection unless the odour from the source is considered to be of the 'most offensive' category.

2.4 UK Planning Appeals

There have been a number of planning judgments specifically in relation to the acceptability of odour from wastewater treatment on residential development; both in terms of encroachment of new housing in proximity to an existing WwTW and for new WwTW in proximity to existing housing. Judgements in a number of planning appeals, such as The Fitz Cockermouth, Haverill Snooker Club and Bloor Homes Leighton Linslade, have accepted the use of an assessment criterion of the 98th percentile of 1-hour average ($C_{98, 1-hour}$) of $30\mu E/m^3$ and a $C_{98, 1-hour} 50\mu E/m^3$ as being sufficient to safeguard residential amenity.

On 1st March 2016 the ' report for the appeal relating to 'Land South of Le Neubourg Way, Gillingham, Dorset' (Appeal Ref: APP/N1215/W/15/3005513) was released. This appeal centred on a development north of the Wessex Water's Gillingham WwTW and included a significant and detailed discussion between two odour expert

³ <https://www.ciwem.org/assets/pdf/Policy/Policy%20Position%20Statement/Control-of-odour.pdf>

witnesses. The issues are described in some detail in the Inspector's report. In relation to odour criteria, the Inspector concluded the following:

'19. Taking all the above into account, I conclude that the appropriate parameter to apply in this case is the 3 OU_E/m³ contour line; a more restrictive approach would preclude from development areas which are comparable in odour terms with extensive areas of existing housing in Gillingham. A less restrictive approach would permit development of areas which, in odour terms, clearly ought not to be developed.'

As such, the planning Inspector was in agreement with the IAQM Guidance in that the use of a C_{98, 1-hour} < 3 OU_E/m³ criterion is likely to be sufficient for protection unless the odour from the source is considered to be of the 'most offensive' category.

2.5 Southern Water Guidance

Southern Water does not have any published guidelines relating to development near WwTW. Southern Water has previously applied an impact criterion of between C_{98, 1-hour} 1.5 OU_E/m³ and C_{98, 1-hour} 3 OU_E/m³ as being sufficient enough to safeguard residential amenity. However, their current position, is that C_{98, 1-hour} 1.5 OU_E/m³ is appropriate. This is lower than that adopted by other water companies and also that suggested as appropriate by the IAQM and CIWEM for a 'typical' site (i.e. not of the 'most offensive' type).

3. Assessment Methodology

3.1 Consultation

3.1.1 Arun District Council Consultation

Dr Claire Holman of Hoare Lea contacted Arun District Council in May 2018 to agree the assessment approach for the initial (desktop) report provided at that time. Mr Colin Giddings, Senior Environmental Health Officer at Arun District Council was in agreement that the assessment methodology be based on the IAQM odour guidance and agreed with Southern Water. Mr Giddings also agreed with the use of meteorological data from Shoreham Airport for use in the odour assessment.

Arun District Council was contacted again prior to the 2021 reassessment work (site sampling). Ms Fiona Fitzgerald, Senior Environmental Health Officer at Arun District Council remained in agreement that the assessment methodology be based on the IAQM odour guidance. It was also agreed that the use of the $30\mu\text{E}/\text{m}^3$ impact criteria for residences is appropriate for the Proposed Development.

3.1.2 Southern Water Consultation

The dispersion modelling inputs were discussed during the site visit on 14th June 2018 and subsequently sent for agreement with Mr Craig Radoki-Smith and Mr Gong Yang Lead Technical Expert, Odour Control Engineering Solutions at Southern Water.

Southern Water confirmed that:

- The WwTW is largely covered, with odorous air extracted to odour control;
- The site undertakes continuous H_2S monitoring at the odour control stacks; and
- That detailed dispersion modelling is a suitable assessment method.

Southern water confirmed in late 2020 that Atkins had been instructed to take over from them as the main point of contact for odour assessments on their sites. Atkins have therefore been retained to provide comments and also agree sampling strategy and model inputs for the 2021 assessment.

3.2 Site Visits

3.2.1 2018 Visit

Mr Matthew Stooling of Isopleth Ltd visited the Ford WwTW on behalf of Hoare Lea, on the 14th June 2018. The weather on the day was warm ($>20^\circ\text{C}$) with a south westerly breeze of approximately 5-10 m/s. The site visit was conducted by Mr Craig Radoki-Smith Field Performance Manager (Site Manager) East Worthing and Ford WR&EP (Central). Mr Radoki-Smith explained the operation of the site and subsequently provided additional information relating to the hydrogen sulphide (H_2S) monitoring undertaken at the odour control stacks.

The IAQM suggests the use of a 'multi-tool' approach, where possible. At the time of assessment, the Ford WwTW was the subject of refurbishment works. For this reason, it was not appropriate to undertake formal 'sniff testing' in the area surrounding the WwTW during these works as this would not represent the odour for any future resident.

3.2.2 2021 Visits

By late 2020 the upgrading of the Ford WwTW was complete, and it was therefore possible to undertake both monitoring of odour from the sources at the site in addition to undertaking formal 'sniff testing' in the area. The first offsite walkover survey was completed on the day of sampling, with the assessors accompanied by a representative of Atkins (acting on behalf of Southern water). Five further offsite walkover surveys were subsequently completed with the agreement of Atkins.

3.3 Odour Sampling and Analysis

Odour sampling was undertaken by Olfasense following the methods as described in their sampling and analysis report (Report Number: REWA21A_06) included as Appendix A to this odour assessment.

3.4 Detailed Dispersion Modelling

Emissions data for sources agreed with Southern Water has been used as input to an atmospheric dispersion model. For this assessment the AERMOD model has been used with due consideration to relevant guidance. This model is widely used and accepted by the EA and UK planning authorities for undertaking such assessments and its predictions have been validated against real-time monitoring data by the United States Environmental Protection Agency. Southern Water consider AERMOD to be a suitable model for this assessment.

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

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

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

One dispersion modelling scenario has been prepared, with results presented for both the 5 year average and maximum (all 5 years combined) isopleths.

3.5 Walkover Surveys (Odour Audits)

A total of 6 No. walkover surveys have been completed in accordance with the requirements of IAQM guidance Appendix 2 ('Sniff Testing'), which provides a standardised method for offsite odour audits.

The receptor points at which sniff testing has been completed were dependent upon the wind conditions on that day, following a 'dynamic' plume approach as described in the IAQM Guidance and these are shown in Appendix B.

3.5.1 Odour Intensity Scale

The IAQM (2018) Guidance uses an intensity scale derived from the German Standard VDI 3940, with additional comments as follows. This is summarised below:

Table 3.1 Odour Intensity Scale

Odour Strength	Intensity Level	Comments
No odour/not perceptible	0	No odour when compared to the clean site
Slight/very weak	1	There is probably some doubt as to whether the odour is actually present
Slight/weak	2	The odour is present but cannot be described using precise words or terms
(barely) Recognisable	3	The odour character is barely recognisable
(easily) Recognisable	4	The odour character is easily recognisable
Very strong	5	The odour is offensive. Exposure to this level would be considered undesirable
Extremely strong	6	The odour is offensive. An instinctive reaction would be to mitigate against further exposure

3.5.2 Odour Exposure

The results are then interpreted to assess the odour impact at the time and place of sampling. The Odour Exposure experienced at each location will be dependent on the frequency, intensity, duration and unpleasantness of the odour and different combinations of the FIDOL factors can result in different exposures: for example, odours may occur frequently in short bursts ('acute' exposures), or for longer periods ('chronic' exposures).

A matrix to assess the odour exposure (neutral and unpleasant odours) at time and place of sampling is shown below.

Table 3.2 Odour Exposure

Average Intensity (Imean)	Percentage odour time (tlz4) during the test				
	10%	11-20%	21-30%	31-40%	>40%
6	Large	Very Large	Very Large	Very Large	Very Large
5	Medium	Large	Large	Very Large	Very Large
4	Small	Medium	Medium	Large	Large
3	Small	Medium	Medium	Medium	Medium
2	Small	Small	Medium	Medium	Medium
1	Small	Small	Small	n/a	n/a

3.5.3 Effect

The odour effect is derived from the exposure derived from Table 3-2 and the sensitivity shown in Table 3-3:

Table 3.3 Odour Effect

Odour Exposure	Receptor Sensitivity		
	Low	Medium	High
Very Large	Substantial	Substantial	Substantial
Large	Moderate	Moderate	Substantial
Medium	Slight	Slight	Moderate
Small	Negligible	Negligible	Slight

3.6 Suitability of Assessor

According to guidance issued by the IAQM, odour assessments and surveys must only be completed by a qualified assessor if they are to be considered robust. This includes both experience in the field of odour assessment as well as a defined odour acuity.

This assessment has been completed by Matt Stoaling of Isopleth Ltd and Fellow of the IAQM. Matt has been involved in the field of odour assessment for over 20 years. During this time, Matt has also provided air quality and odour advice and services to a range of industry sectors and clients, including solid waste, wastewater and agriculture. Matt has worked on behalf of local authority and government agencies advising on odour issues, including documents relating to odour assessment published by the Environment Agency, Sniffer and the IAQM.

3.7 Assessment Limitations

The most robust assessment method available has been used in preparation of this odour impact assessment. Inputs have been agreed with Southern Water representatives (Atkins) and Arun District Council. The assessment relies on detailed dispersion modelling, site sampling and offsite surveys for the existing works.

The primary limitation to the assessment is that it relies on the emissions from the WwTW as monitored and observed. Southern Water representatives (Atkins) have confirmed that there are no proposed changes planned

for the works which would significantly change the odour emissions. Similarly, it was confirmed by Southern Water that the Ford WwTW has sufficient capacity for its current needs and for the foreseeable future.

4. Site Setting and Source Description

4.1 Development Area and Complaint History

The location of the WwTW in proximity to the Ford Airfield is shown in Figure 4-1, below.

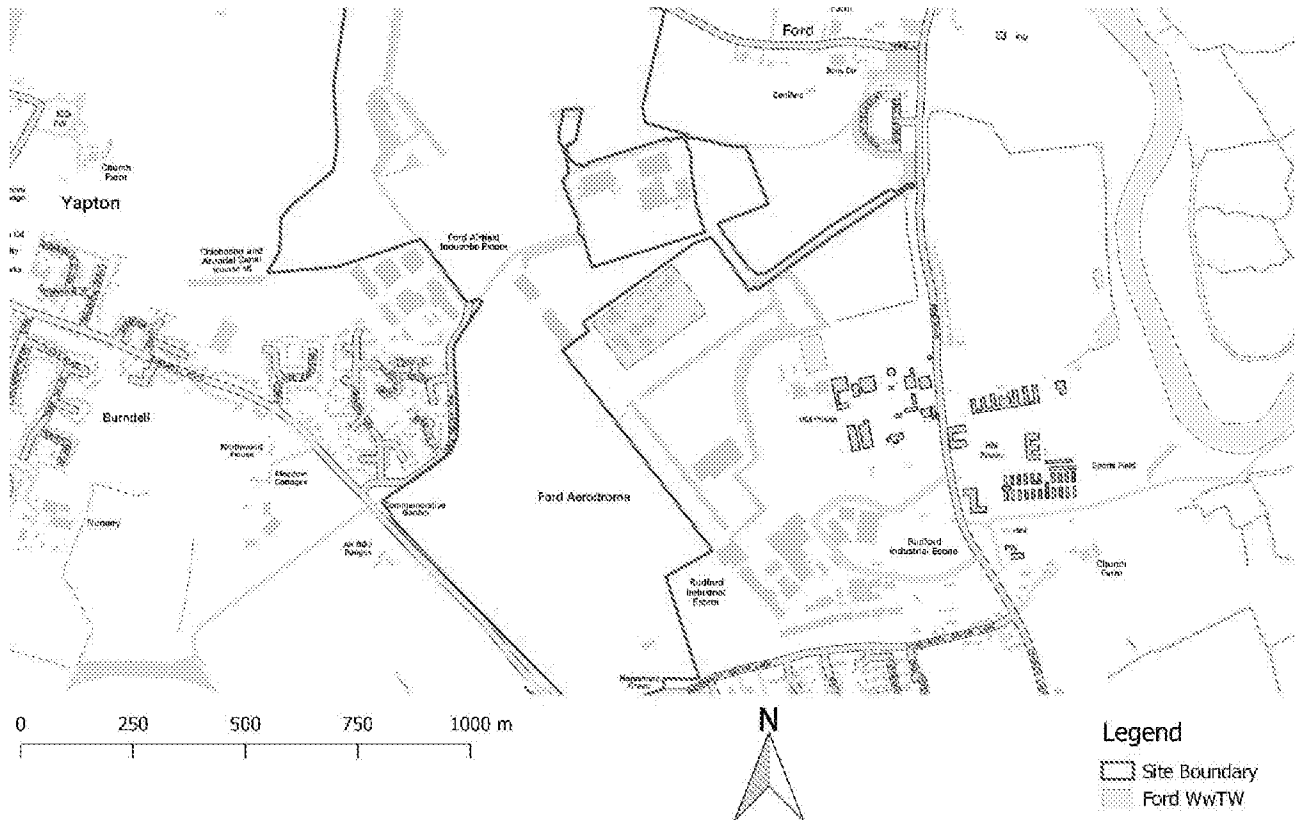


Figure 4-1 -WwTW Location

Although there are existing residences in the settlements of Yapton, Ford and Climping, none are as close to the works as those associated with the proposed development. Arun District Council and Southern Water have supplied complaint data as follows:

- 2020: none;
- 2019: none;
- 2018: 3;
- 2017: 4;
- 2016: 2 (received August and October);
- 2015: 5 (all during a period 23rd June until 7th July);
- 2014: none;
- 2013: 1; and
- 2012: none.

None of these complaints were verified by Arun District Council and Southern Water largely attributed any issues to other sources and (very) occasional process failures such as the flare stack not lighting in May 2018.

4.2 Topography

The presence of elevated terrain can significantly affect the dispersion of pollutants and the resulting ground level concentration in a number of ways. Elevated terrain reduces the distance between the plume centre line and the ground level, thereby increasing ground level concentrations. Elevated terrain can also increase turbulence and hence, plume mixing with the effect of increasing concentrations near to a source and reducing concentrations further away. The WwTW facility lies on a flat plain, with a basal elevation of around 4-5m AoD.

4.3 Site Surroundings and Potentially Sensitive Receptors

The results of the odour modelling have been used for the development of the masterplan for the Application Site. There are no existing residential receptors at the Application Site and impacts have been assessed by use of a receptor grid.

4.4 Odour Baseline Conditions

Ambient odour is not a pollutant that is measured in the UK as it is not possible to accurately obtain a background concentration using standard monitoring techniques. As noted above, the IAQM Guidance (2018) recommends that odour 'sniff' tests are undertaken and a total of 6 surveys have been completed as reported in this assessment.

Part of the eastern boundary, in the northern extent of the Application Site is located adjacent to the Grundon Waste Management Waste Transfer Station (WTS). This facility has an environmental permit (permit number: EPR/DB3304HB) and operations should ensure any odour released beyond the site boundary is at levels below those that would be considered likely to cause pollution. The relevant extracts from their environmental permit is provided below:

"3.2.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable, to minimise, the odour.

3.2.2 The operator shall:

(a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, submit to the Environment Agency for approval within the period specified, an odour management plan;

(b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency."

It has been assumed that the Grundon Waste Management WTS is operating in line with its environmental permit and that odour from the site is controlled. Furthermore, the Application Site is located downwind of the WTS and therefore, for the majority of the year, any odour arising from the WTS would be blown away from the Application Site. Odour impacts from the Grundon Waste Management WTS have therefore not been considered further within this assessment.

There are proposals for the replacement of the Grundon Waste Management WTS with an energy from waste facility, to be known as the Ford Circular Technology Park. The application is to West Sussex as the waste and minerals planning authority (Application Number WSCC/011/21). Arun District Council Planning Application Reference F/6/21/WS describes the scheme as follows:

"Demolition of existing buildings and structures and construction and operation of an energy recovery facility and a waste sorting and transfer facility for treatment of municipal, commercial and industrial waste, including ancillary buildings, structures, parking, hardstanding and landscape works."

Arun District Council has confirmed that any odour from the Grundon WTS would be controlled by its Environmental Permit and, in accordance of the requirements of the NPPF, that no further assessment is required other than that submitted with the application for that scheme.

Two further industrial sources have been identified as having the potential to generate odours:

- Besmoke: Use smoking to produce smoke flavours for the food and drink industry;
- Biogas digester: Which utilises biogas to generate electricity.

The walkover surveys did not pick up any odours from these sources within the vicinity of the Proposed Development on any of the 6 survey days.

4.5 Description of WwTW

The Ford WwTW is part of Southern Water's Bognor Regis and Littlehampton wastewater scheme and opened in 1999. The inlet flows are pumped to screens, primary tanks, activated sludge (aeration lanes) and then final settlement tanks. The sludge is digested on site before being centrifuged and removed from site via HGV. There are no storm tanks, the flows instead being balanced at the source works in each case.

The full flow to treatment (FFT) for the site is 715 l/s coming from 2 large mains (Bognor and Littlehampton) and 4 smaller mains from local sites. The influent is dosed with ferric for odour control/influent quality. The population equivalent (p.e.) currently served by the works is 136,344. Southern Water does not monitor the variation in the impact associated with tourism, however it is estimated by them to be equivalent to approximately 1,780 p.e. The plant treats a maximum 37,764 cubic meters of waste water per day.

The site also receives sludges imported by tanker from other WwTW in the area and these are also digested with biogas fed to a Combined Heat and Power Plant (CHP).

Southern Water and Arun District Council is aware of a large number of historic odour complaints (approximately 20 years ago) due to emission from the WwTW and as a result the majority of the works has been covered with the air extracted to two odour control units (OCU):

- Main OCU: flow 4.272m³/s; and
- Imported sludge OCU: 1.667m³/s.

The two OC units can be seen in the image below. The only remaining process units not covered are the aeration lanes and final tanks.

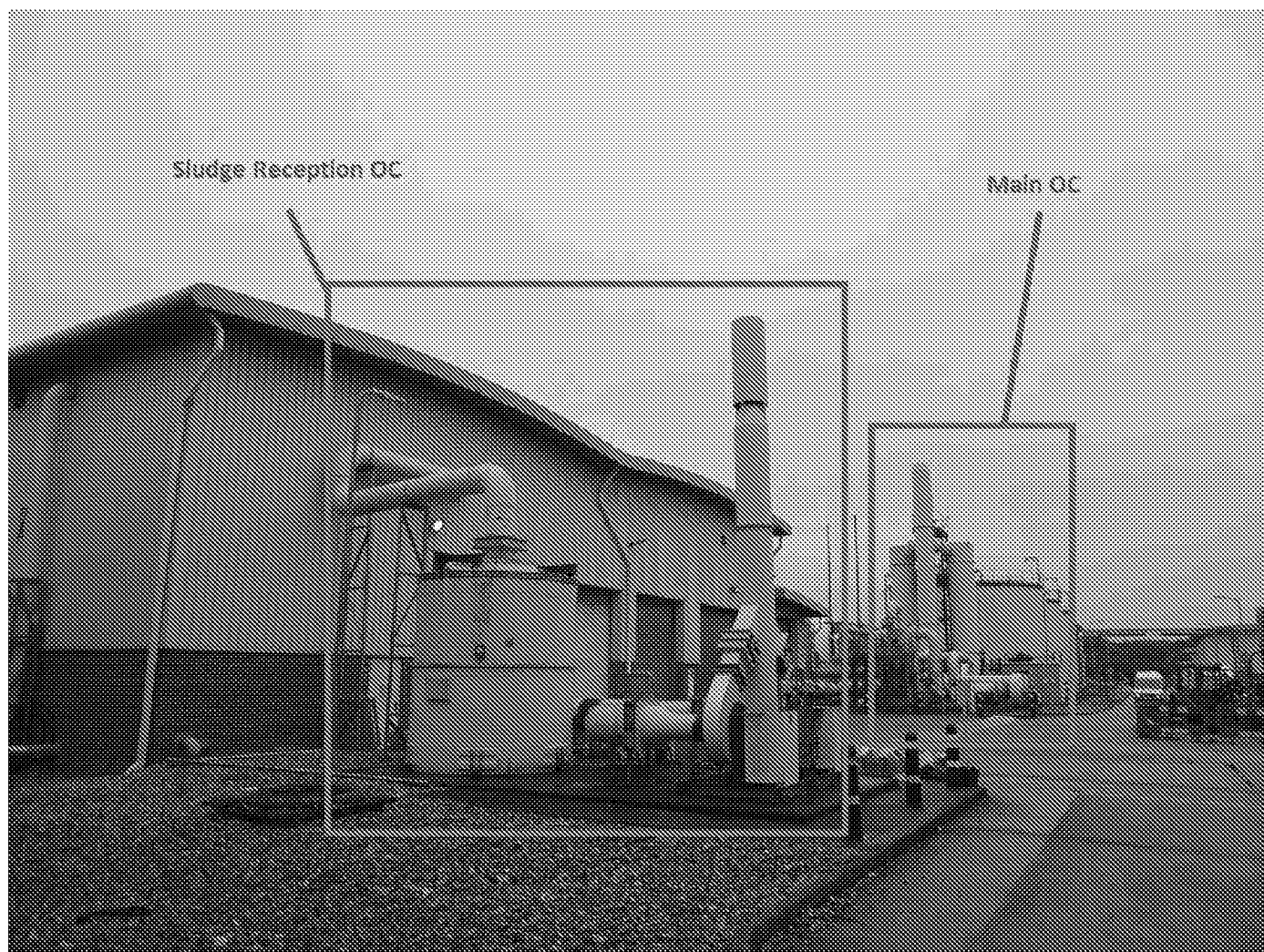


Figure 4-2 Ford WwTW Odour Control.

5. Dispersion Modelling

5.1 Quantification of Odour Emissions

The WwTW includes the following potentially odorous sources, as agreed with Atkins acting on behalf of Southern Water:

- Main odour control;
- Sludge reception odour control;
- Aeration lanes; and
- final settlement tanks.

No seasonal variability has been applied to the specific emission rates, although in reality emissions are likely to be lower during the winter months and higher in the summer when volatilisation will be higher and the development of septicity more rapid. All storm water provision is offsite (i.e. pumping of storm water to the Ford WwTW will only occur to the maximum levels (i.e. FFT) and anything above that will not reach the works until the flows return to normal. Southern Water monitors levels of hydrogen sulphide (H₂S) in the stacks of the OCUs in order to demonstrate (in line with their obligations under the planning permission for the works) that they are operating optimally.

A summary of Olfasense odour monitoring is provided below. Full results are presented in the Olfasense monitoring report.

Table 5.1 Point Sources – Analysis Results

	Geometric Mean Concentration (ouE/m ³)	Flow Rate (m ³ /s)	Calculated Odour Emission (ouE/s)
Main odour control	4398.0	4.3	18786.8
Sludge reception odour control	402.0	1.7	667.3

The Olfasense monitoring also included analysis of the character and hedonic tone of the odours from the sources at the Ford WwTW site. The results confirm that the primary odour from the main odour control unit is chlorine-type odour from the odour control dosing chemicals (hypochlorite). This odour dominated the emission, indicating that the unit is being significantly over-dosed at the present time.

Table 5.2 Area Sources – Analysis Results

	Specific Emission Rate (ouE/m ² /s)	Area (m ²)	Calculated Odour Emission (ouE/s)
Aeration lanes (Start)	17.4	403.7*	7024.8
Aeration lanes (2/3 of lane)	0.6	1614.9*	968.9
Final settlement tanks	0.6	2642.1	1585.2

[Assuming that 20% is the anoxic zone and 80% is at the lower specific emission rate.]

The monitored emission rates shown above were discussed with Atkins on behalf of Southern Water and the following emission rates have been used in the detailed modelling. Full inputs are included as Appendix C.

Table 5.3 Point Sources – Model Inputs

	Geometric Mean Concentration (ouE/m ³)	Flow Rate (m ³ /s)	Calculated Odour Emission (ouE/s)
Main odour control	4398.0	4.3	18786.8

	Geometric Mean Concentration (ouE/m ³)	Flow Rate (m ³ /s)	Calculated Odour Emission (ouE/s)
Sludge reception odour control	2000.0	1.7	3320.0

Table 5.4 Area Sources – Model Inputs

	Specific Emission Rate (ouE/m ² /s)	Area (m ²)	Calculated Odour Emission (ouE/s)
Aeration lanes (average)	4.0	2018.6	8074.4
Final settlement tanks	0.6	2642.1	1585.2

The overall site odour emissions and the relative contribution of each source group based on the calculations described above, is presented in Table 5.5 below.

Table 5.5 Relative Source Contribution

Source	Emission (ouE/s)	% of Total
Sludge Import OC	18786.8	59%
Main Works OC	3320.0	10%
Aeration Lanes	8074.4	25%
Final settlement tanks	1585.2	5%
Total	31766.5	100%

5.2 Building Downwash

Building downwash occurs when turbulence, induced by nearby structures, causes pollutants emitted from an elevated point source to be displaced and dispersed rapidly towards the ground, resulting in higher ground level concentrations. Building downwash should always be considered for buildings that have a maximum height equivalent to at least 40% of the emission height and which are within a distance defined as five times the lesser of the height or maximum projected width of the building. Building heights have been included in the model.

5.3 Potentially Sensitive Receptors

This odour assessment has been used for purposes of Masterplanning and constraints review, and the approach has therefore been iterative. There are no existing residential receptors at the Application Site. Impacts have been assessed over a 1.225km x 1.255km grid at 25m resolution. These results have been presented as odour impact isopleths.

5.4 Topography

The WWTW facility lies on a flat plain, with a basal elevation of around 4-5m AoD. Topography is therefore unlikely to have a significant influence on dispersion, it has, however, been incorporated within the dispersion model.

5.5 Meteorological Conditions

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

The closest Met Office site to Ford is located at Shoreham. ADC was consulted regarding the suitability of using the Shoreham data set and has confirmed that this is their preferred meteorological data set due to proximity and height of ground level (mAoD).

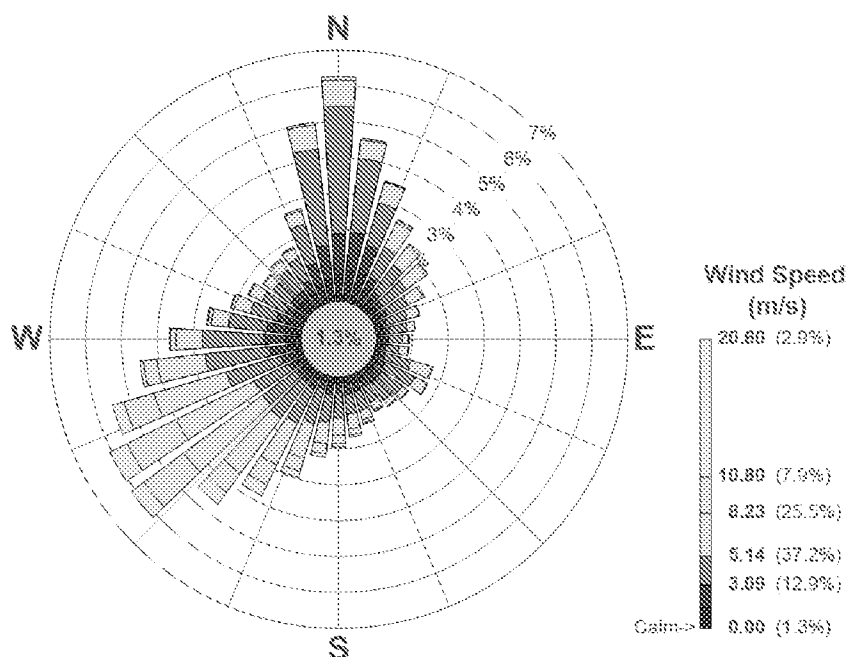


Figure 5-1 Shoreham Data: Windrose 2013-2017

It is apparent from this data that the predominant wind direction is from the south west with a strong northerly component attributable to coastal effects. This is as would be expected given the lack of topographical influence in this area. The use of this data set has been agreed with Aru District Council and Atkins.

The AERMOD dispersion model requires the selection of a suitable data set (in this case Shoreham) and then 'preparation' of this data set using the AERMET software to account for site characteristics such as surface roughness, and albedo. The WWTW is currently surrounded by open fields (i.e. grassland), however these would be developed should the proposed development proceed. By selecting a surface roughness equivalent to grassland the area of odour impact will represent a worst case (i.e. the extent of the isopleth will be largest) however at the request of Atkins a surface roughness of 0.5m has been used.

The albedo / bowen preparation is based on:

- 30% fresh water and sea;
- 10% deciduous forest
- 20% cultivated land
- 20% grassland; and
- 20% urban.

5.6 Low Wind Speeds (Calm Conditions)

Detailed dispersion models are limited by the meteorological data used, in particular the lower wind speed limit of the anemometer and the direction of wind in calm conditions (when it will essentially have none). Dispersion models are therefore unable to represent the impact under these calm conditions despite the fact that, for some sites, these may be the occasions where the risk of odour impact is highest. For this reason, an additional development buffer has been incorporated into the masterplan for the Application Site which is also consistent with the findings of the walkover surveys.

5.7 Assessment Criteria

As described above, the IAQM Guidance states that:

“odours from sewage treatment works plant operating normally, i.e. non-septic conditions, would not be expected to be at the ‘most offensive’ end of the spectrum and can be considered on par with ‘moderately offensive’ odours such as intensive livestock rearing.”

The selection of a $3\text{ouE}/\text{m}^3$ criteria for residences (i.e. houses should not be within this isopleth) therefore ensures that the impact will be, at worst, ‘slight’ which the IAQM Guidance states is ‘not significant’ for a wastewater treatment works which is not dominated by septic sources.

The Ford WwTW has been subject to extensive odour control measures, with the inlet works, sludge import and primary settlement tanks (i.e. the most offensive sources) all covered and extracted to odour control systems. This leaves the sources at the works to be non-septic areas such as the secondary treatment (aeration lanes), final tanks and the odour control outlets themselves. Any sludge cake destined for export from the site would also be non-septic due to the treatment process which ensures that it has been ‘activated’ in the aeration lanes before thickening.

The Olfasense monitoring also included analysis of the character and hedonic tone of the odours from the sources at the Ford WwTW site. The results confirm that the site is not dominated by septic sludge odours, with the primary odour from the site being those from the activated sludge plant and chlorine-type odours from the odour control dosing chemicals.

For these reasons the odour from the Ford WwTW must be considered to be (at worst) “moderately offensive” the IAQM Guidance should be applied.

For the reasons given above, the $\text{C}_{98, 1\text{-hour}} 3\text{ouE}/\text{m}^3$ has been used as the odour criterion for new residential receptors for the purposes of this assessment. At these levels it is likely that odour will be detected occasionally, however the IAQM Guidance states that at this level it is unlikely that disamenity will be caused. On 20th July 2021 Ms Fiona Fitzgerald, Senior Environmental Health Officer at Arun District Council, agreed that “Environmental Health is in agreement that the $3\text{ouE}/\text{m}^3$ contour is appropriate for the Ford Airfield development”

5.8 Predicted Impacts

The odour impact isopleths for the WwTW, based on the model inputs described above, are presented in drawings AQ3 and AQ4, Appendix D.

- Drawing AQ3 shows the odour impact isopleths $1.5\text{ouE}/\text{m}^3$, $3.0\text{ouE}/\text{m}^3$ and $5\text{ouE}/\text{m}^3$ based on the 1-hour average 98th percentile values for 5 years of meteorological data;
- Drawing AQ4 shows the odour impact isopleths $1.5\text{ouE}/\text{m}^3$, $3.0\text{ouE}/\text{m}^3$ and $5\text{ouE}/\text{m}^3$ based on the 1-hour maximum 98th percentile value for each grid point from 5 years of meteorological data.

The drawings also show a 100m buffer for ‘calm conditions’ which would not be accounted for in the dispersion model due to the wind having no direction.

The results of the assessment provide the area where the odour impact associated with the WwTW is greater than the $\text{C}_{98, 1\text{-hour}} 3\text{ouE}/\text{m}^3$ within the proposed development under ‘typical’ operation. Receptors closest to this isopleth would be likely to experience odours from the works on occasion (i.e. they would not be ‘odour free’) however this would be below the $\text{C}_{98, 1\text{-hour}} 3\text{ouE}/\text{m}^3$ limit based on the conservative modelling inputs applied in this study.

5.9 Model Sensitivity

It is standard practice to consider model sensitivity, with a view to determining the potential for any errors or assumptions which could lead to results significantly different from those experienced in reality.

5.9.1 Odour Sources

As described in Section 5.1 above, the odour sources were identified during a site visit and subsequently confirmed with Southern Water. No further sensitivity assessment is considered to be required for odour sources.

5.9.2 Emission Rates

Section 5.1 describes the odour emission rates used in the assessment and their derivation. These emission rates are based on site specific odour sampling during a period of typical operation during the summer in warm ambient conditions. The final settlement tanks, for example, were observed to have no detectable odour and this is as would be expected for a well-managed works, which Ford WwTW was observed to be.

No further assessment is considered to be required for the odour emission rates.

5.9.3 Meteorological Data

Section 5.5 describes that Shoreham Airport meteorological data was used in this assessment. This is the closest Met Office site to Ford Airfield. ADC was consulted regarding the suitability of the Shoreham data set and has confirmed that this is their preferred meteorological data set for this site due to proximity and height of ground level (mAoD).

Shoreham is located approximately 20km to the east of Ford, approximately 1.6km from the coast. The Ford WwTW is located approximately 2.5km from the coast. The only other site of relevance to the Ford WwTW is Thorney Island, approximately 23km to the west near Hayling Island (near Portsmouth and Havant). In order to test model sensitivity, the dispersion model was run with 5 years of meteorological data from Thorney Island, prepared using the same AERMET input files as the Shoreham data.

The results of the sensitivity modelling using Thorney Island data was that the impact isopleth produced was no larger in any direction relevant to the Proposed Development than for the Shoreham data set preferred by ADC. As such, the results produced for the Shoreham data set represent the 'worst case' in terms of potential impact.

5.9.4 Topography

As described in Section 5.4, the WwTW facility lies on a flat plain, with a basal elevation of around 4-5m AoD. Due to the absence of any terrain complexities, no further sensitivity is considered to be required for topography.

6. Walkover Surveys

Walkover sampling locations are shown in Appendix B and the full results are included as Appendix E.

6.1 Odour Survey 1

The first survey was completed on Tuesday 18th May when the odour sampling was being undertaken by Olfasense. The survey was completed by Matt Stoaling of Isopleth and Charlotte Smith of Hoare Lee. Matt Edwards of Atkins accompanied the walkover to ensure that he (acting on behalf of Southern Water) was satisfied with the approach taken.

6.1.1 Details

Date	18 th May 2021
Time Started	11 am (approx.)
Time Finished	2 pm (approx.)
Temperature Range	15°C - 18°C (sunny)
Average Wind Speed (mph)	5-10 mph

This site visit was undertaken on a Tuesday during fine conditions and typical temperatures for the time of year. The wind was from the south west and the WwTW site was operational throughout the period of the survey with sludge tankers seen importing throughout the survey. Results at a total of 36 sample locations were collected as shown in Appendix B.

6.1.2 Results

The results of the survey are detailed in Appendix E.

6.1.3 Summary

The odour from the WwTW was perceived, but scored as $tl \geq 4$ only at the 3 closest locations to the Application Site boundary. There were a number of locations where the odour was scored at intensity level 3 (*i.e. 'Distinct - The odour character is barely recognisable'*) as shown in Appendix E.

Table 6-1 Survey 1: Locations ($tl \geq 4$)

Location	OS Xm	OS Ym	% Odour Time ($tl \geq 4$)	lmean	lmax	Notes
Location 21	499716	103359	43	2	4	Chlorine
Location 22	499699	103349	60	2	4	Chlorine
Location 24	499668	103332	60	2	4	ASP

The highest maximum intensity was 4 and the odour exposure was 60% at these locations. This is classed as a 'Large' exposure which would be regarded as 'substantial adverse' for a residential receptor and 'moderate adverse' at a commercial receptor. The masterplan must ensure that no residences are proposed within this area, which is within the 100m buffer from the WwTW as shown on Drawing AQ3 and AQ4. The impact is at worst 'medium' and at worst 'moderate adverse' at the other receptors where odour was perceived. At all other locations the maximum intensity was less than 4.

6.2 Odour Survey 2

This survey was completed by Matt Stoaling of Isopleth.

6.2.1 Details

Date	26 th May 2021
Time Started	12:30 pm (approx.)
Time Finished	4:30 pm (approx.)
Temperature Range	17°C - 19°C (sunny)
Average Wind Speed (mph)	6-11 mph

This site visit was undertaken on a Wednesday during fine conditions and typical temperatures for the time of year. The wind was from the south west and the WwTW site was operational throughout the period of the survey with sludge tankers seen importing throughout the survey. Results at a total of 26 sample locations were collected as shown in Appendix B.

6.2.2 Results

The results of the survey are detailed in Appendix E.

6.2.3 Summary

The odour from the WwTW was perceived, but scored as ≥ 4 at the 7 closest locations to the Application Site boundary. There were a number of locations where the odour was scored at intensity level 4 (*i.e. 'Strong - The odour character is easily recognisable'*) as shown in Appendix E.

Table 6-2 Survey 2: Locations (≥ 4)

Location	OS Xm	OS Ym	% Odour Time (≥ 4)	I _{mean}	I _{max}	Notes
Location 5	499715	103239	40%	3	4	ASP
Location 9	499711	103277	20%	2	4	ASP
Location 10	499693	103267	60%	3	4	ASP
Location 22	499677	103312	7%	1	4	sludge cake?
Location 24	499699	103256	67%	3	4	ASP
Location 25	499724	103220	47%	3	4	ASP
Location 26	499729	103194	40%	3	4	ASP

The highest maximum intensity was 4 and the odour exposure was 67% at this location. There were also 4 other locations where the maximum intensity is 4. This is classed as a 'Large' exposure which would be regarded as 'substantial adverse' for a residential receptor and 'moderate adverse' at a commercial receptor. The masterplan must ensure that no residences are proposed within this area, which is within the 100m buffer from the WwTW as shown on Drawing AQ3 and AQ4. The impact is at worst 'medium' and at worst 'moderate adverse' at the other receptors where odour was perceived. At all other locations the maximum intensity was less than 4.

6.3 Odour Survey 3

This survey was completed by Matt Stoaling of Isopleth.

6.3.1 Details

Date	27 th May 2021
Time Started	9 am (approx.)
Time Finished	2 pm (approx.)
Temperature Range	15°C - 19°C (sunny)
Average Wind Speed (mph)	5-10 mph

This site visit was undertaken on a Thursday during fine conditions and typical temperatures for the time of year. The wind was from the north north west and the WwTW site was operational throughout the period of the survey with sludge tankers seen importing throughout the survey. The Ford Airfield market was open, and it therefore gave the opportunity to survey the site when the wind was in a different direction when compared with the other site surveys. Results at a total of 40 sample locations were collected as shown in Appendix B.

6.3.2 Results

The results of the survey are detailed in Appendix E.

6.3.3 Summary

The odour from the WwTW was perceived, but scored as ≥ 4 only at the 3 closest locations to the Application Site boundary. There were a number of locations where the odour was scored at intensity level 4 (*i.e.* 'Strong - The odour character is easily recognisable') as shown in Appendix E.

Table 6-3 Survey 3: Locations (≥ 4)

Location	OS Xm	OS Ym	% Odour Time (≥ 4)	I _{mean}	I _{max}	Notes
Location 5	499627	103082	10%	3	4	ASP
Location 6	499607	103069	73%	4	4	ASP
Location 7	499591	103057	87%	4	4	ASP
Location 8	499581	103049	90%	4	4	ASP
Location 9	499570	103041	90%	4	4	ASP
Location 10	499557	103033	87%	4	4	ASP
Location 11	499545	103024	87%	4	4	ASP
Location 12	499528	103013	70%	4	4	ASP
Location 13	499510	102999	7%	3	4	ASP
Location 14	499490	102985	10%	3	4	ASP

The highest maximum intensity was 4 and the odour exposure was 90% at these locations. There were also 5 other locations where the maximum intensity is 4 and 7 locations where the average intensity is 4. In all cases the odour was from the ASP, which is not classified as a source of high offensiveness.

The surveyed impact is classed as a 'Large' exposure which would be regarded as 'substantial adverse' for a residential receptor and 'moderate adverse' at a commercial receptor. The masterplan must ensure that no residences are proposed within this area, which is within the 100m buffer from the WwTW as shown on Drawing

AQ3 and AQ4. The impact is at worst ‘medium’ and at worst ‘moderate adverse’ at the other receptors where odour was perceived. At all other locations the maximum intensity was less than 4.

6.4 Odour Survey 4

This survey was completed by Matt Stoaling of Isopleth.

6.4.1 Details

Date	7 th June 2021
Time Started	11 am (approx.)
Time Finished	2:30 pm (approx.)
Temperature Range	16°C - 20°C (sunny)
Average Wind Speed (mph)	4-9 mph

This site visit was undertaken on a Monday during hot and sunny conditions. The wind was light and from the south west and the WwTW site was operational throughout the period of the survey with sludge tankers seen importing throughout the survey. Results at a total of 44 sample locations were collected as shown in Appendix B.

6.4.2 Results

The results of the survey are detailed in Appendix E.

6.4.3 Summary

The odour from the WwTW was perceived, but scored as $tl \geq 4$ at 13 locations. There were a number of locations where the odour was scored at intensity level 5 (*i.e. ‘Very strong - The odour is offensive. Exposure to this level would be considered undesirable’*) as shown in Appendix E.

Table 6-4 Survey 4: Locations ($tl \geq 4$)

Location	OS Xm	OS Ym	% Odour Time ($tl \geq 4$)	I _{mean}	I _{max}	Notes
Location 3	499670	103245	87%	4	5	ASP
Location 4	499644	103284	83%	4	5	sludge
Location 5	499606	103309	47%	3	4	sludge
Location 7	499683	103255	87%	4	4	ASP
Location 8	499658	103294	83%	4	4	ASP
Location 9	499620	103322	43%	3	4	sludge
Location 10	499610	103367	3%	2	4	chlorine
Location 22	499729	103407	3%	1	4	chlorine
Location 23	499690	103385	33%	2	4	chlorine
Location 24	499651	103362	30%	3	4	sludge
Location 25	499639	103311	13%	2	4	chlorine
Location 28	499759	103379	27%	3	4	ASP
Location 29	499672	103286	30%	3	4	ASP / chlorine

The highest average intensity was 4 and the odour exposure was 87% at this location. This is classed as a ‘Large’ exposure which would be regarded as ‘substantial adverse’ for a residential receptor and ‘moderate adverse’ at a

commercial receptor. The highest maximum intensity was 5 and this was perceived when a large slurry import tanker was seen to be unloading in the septic sludge import area with the doors open. There was a notable odour of chlorine at several locations, attributed to the main odour control stack scrubbing chemicals.

The masterplan must ensure that no residences are proposed within this area, which is within the 100m buffer from the WwTW as shown on Drawing AQ3 and AQ4. At all other locations the maximum intensity was less than 4.

6.5 Odour Survey 5

This survey was completed by Matt Stoaling of Isopleth.

6.5.1 Details

Date	8 th June 2021
Time Started	8:30 am (approx.)
Time Finished	12:30 pm (approx.)
Temperature Range	16°C - 21°C (sunny)
Average Wind Speed (mph)	2-7 mph

This site visit was undertaken on a Wednesday during fine conditions and typical temperatures for the time of year. The wind was from the south west and the WwTW site was operational throughout the period of the survey with sludge tankers seen importing throughout the survey. Results at a total of 28 sample locations were collected as shown in Appendix B.

6.5.2 Results

The results of the survey are detailed in Appendix E.

6.5.3 Summary

The odour from the WwTW was perceived, but scored as ≥ 4 only at the 3 closest locations to the Application Site boundary. There were a number of locations where the odour was scored at intensity level 4 (*i.e. 'Strong - The odour character is easily recognisable'*) as shown in Appendix E.

Table 6-5 Survey 5: Locations (≥ 4)

Location	OS Xm	OS Ym	% Odour Time (≥ 4)	I _{mean}	I _{max}	Notes
Location 1	499723	103184	37%	2	4	ASP
Location 2	499687	103215	50%	3	4	ASP
Location 3	499662	103254	33%	2	4	ASP
Location 4	499634	103291	23%	2	4	sludge / ASP
Location 5	499727	103182	40%	2	4	ASP
Location 6	499703	103225	57%	3	4	ASP
Location 7	499677	103266	37%	3	4	sludge / ASP
Location 8	499648	103302	30%	2	4	chlorine
Location 16	499682	103292	7%	1	4	chlorine
Location 20	499709	103268	17%	1	4	ASP
Location 23	499732	103240	7%	2	4	ASP
Location 26	499760	103213	13%	2	4	ASP

The highest average intensity was 3 and the odour exposure was 57%. This is classed as a 'Large' exposure which would be regarded as 'substantial adverse' for a residential receptor and 'moderate adverse' at a commercial receptor. The masterplan must ensure that no residences are proposed within this area, which is within the 100m buffer from the WwTW as shown on Drawing AQ3 and AQ4. The impact is at worst 'medium' and at worst 'moderate adverse' at the other receptors where odour was perceived. At all other locations the maximum intensity was less than 4.

6.6 Odour Survey 6

This survey was completed by Matt Stoaling of Isopleth.

6.6.1 Details

Date	9 th June 2021
Time Started	9:00 am (approx.)
Time Finished	2:30 pm (approx.)
Temperature Range	16°C - 22°C (sunny)
Average Wind Speed (mph)	2-6 mph

This site visit was undertaken on a Wednesday during hot and sunny conditions. The wind was from the south west and the WwTW site was operational throughout the period of the survey with sludge tankers seen importing throughout the survey. Results at a total of 44 sample locations were collected as shown in Appendix B.

6.6.2 Results

The results of the survey are detailed in Appendix E.

6.6.3 Summary

The odour from the WwTW was perceived, but scored as ≥ 4 only at the 3 closest locations to the Application Site boundary. There were a number of locations where the odour was scored at intensity level 4 (*i.e.* 'Strong - The odour character is easily recognisable') as shown in Appendix E.

Table 6-6 Survey 6: Locations (≥ 4)

Location	OS Xm	OS Ym	% Odour Time (≥ 4)	I _{mean}	I _{max}	Notes
Location 1	499711	103189	17%	1	4	ASP
Location 2	499681	103225	60%	3	4	ASP
Location 3	499623	103297	33%	2	4	ASP
Location 4	499722	103193	13%	1	4	ASP
Location 5	499696	103235	43%	3	4	ASP
Location 6	499671	103276	43%	3	4	ASP /sludge
Location 7	499638	103308	3%	1	4	ASP /sludge
Location 14	499718	103273	27%	2	4	ASP
Location 17	499742	103245	13%	2	4	ASP
Location 30	499670	103326	10%	1	4	chlorine
Location 32	499694	103299	23%	2	4	ASP
Location 35	499689	103258	37%	2	4	ASP

Location	OS Xm	OS Ym	% Odour Time (t _i ≥4)	I _{mean}	I _{max}	Notes
Location 36	499733	103283	13%	2	4	ASP
Location 37	499714	103228	37%	2	4	ASP
Location 38	499757	103256	23%	2	4	ASP

The highest average intensity was 3 and the highest odour exposure was 60%. This is classed as a 'Large' exposure which would be regarded as 'substantial adverse' for a residential receptor and 'moderate adverse' at a commercial receptor. The masterplan must ensure that no residences are proposed within this area, which is within the 100m buffer from the WwTW as shown on Drawing AQ3 and AQ4. The impact is at worst 'medium' and at worst 'moderate adverse' at the other receptors where odour was perceived. At all other locations the maximum intensity was less than 4.

7. Conclusions

This report presents a detailed odour impact assessment of the Ford Wastewater Treatment Works (WwTW), in relation to the potential for impact at occupiers (and amenity users) of a Proposed Development on the adjacent Ford Airfield.

The assessment has been completed using information provided by Southern Water and obtained through odour sampling at the WwTW undertaken by Olfasense in May 2021. The dispersion modelling inputs have been discussed and agreed with Atkins on behalf of Southern Water.

The modelled odour impact isopleths show the extent of the odour constraints associated with the WwTW ('average' and 'maximum'). It is recommended that receptors should be sited outside the $C_{98,1\text{-hour}} 3.0 \text{ ouE/m}^3$ limit shown on the attached drawings AQ3 and AQ4. This is considered to be a reasonable criterion given the nature of the odour from the sources at the Ford WwTW which are not odour controlled (i.e. the aeration lanes and final tanks). This does not mean that residents would never experience odours from the works, rather that this criterion is considered appropriate for a site such as the Ford WwTW and in line with CIWEM Position Statement odour complaints would be 'unlikely'. The use of the $C_{98,1\text{-hour}} 3.0 \text{ ouE/m}^3$ isopleth has been agreed with the Environmental Health department at Arun District Council as appropriate for the Proposed Development and Drawing AQ4 (maximum 98th percentile value) has been used to inform Masterplan design.

The odour modelling is based on the assumption that the odour control units at the Ford WwTW will remain in good order and will prevent the most odorous emissions from being released untreated from the site, which is consistent with the findings during the site visits and offsite walkover surveys.

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