



Odour Impact Assessment

Land off Longwater Road

Finchampstead, Wokingham

For Catesby Estates Limited



Quality Management

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Executive Summary

This report details the Odour Impact Assessment undertaken to accompany the planning application for the proposed residential development at land off Longwater Road in Finchampstead, Wokingham. The Application Site is some distance from a small sewage treatment works (STW) operated by Thames Water.

The assessment considers the suitability of the proposed development site for its intended use, in the context of odour. The assessment has been undertaken in accordance with the Institute of Air Quality Management (IAQM) *Guidance on the Assessment of Odour for Planning* (May 2014) methodology, drawing on the evidence of multiple best-practice investigative tools to evaluate the suitability of the development site for residential purposes. The IAQM odour guidance states that using different assessment tools in combination can “*minimise individual limitations and increase confidence in the overall conclusion. Best practice is to use a multi-tool approach where practicable.*” As such, a combination of predictive assessment tools (qualitative risk-based assessment and semi-quantitative screening calculations) and observational assessment tools (sniff testing and hydrogen sulphide (H₂S) monitoring, together with complaints analysis) has been used to evaluate the suitability of the site. This choice of assessment tools is considered to be proportionate to the small size of the STW and its distance from the Application Site.

The results of the qualitative risk-based assessment indicate that the odour effect at proposed receptors is likely to be “negligible” at all locations within the Application Site boundary.

A semi-quantitative assessment using the Radius of Effect calculation indicated that no significant adverse odour effect would be expected on the proposed development site.

The above assessments predict the odour impacts over a wide spatial area taking into account all the meteorological conditions for the area. Those predictive assessments were complemented by empirical, observations of the actual prevailing odour, to check the reasonableness of the predictions. A sensory assessment using the IAQM sniff test method was carried out in the field to measure the odour levels prevailing around the STW on the days of the tests. The results of the sniff tests, taking into account the prevailing meteorological conditions, indicated the likely odour effect at the development site would be “negligible”. Hydrogen sulphide concentrations were also measured and all results were below the WHO odour guideline criteria for avoiding annoyance or significant loss of amenity.

At the time of issue of this report, the Environment Agency (EA) had not responded on whether they had received odour complaints; however, the local authority did confirm that it had received no odour complaints concerning the STW. The lack of complaints, and the fact that there are existing receptors in close proximity to the STW, including at predominantly downwind locations, indicates that odour emissions are not causing significant adverse effects at existing residential locations.

It is concluded that the proposed development site is not likely to be subject to significant adverse odour effects that would constrain its suitability for residential use.

Contents

Executive Summary	i
1 Introduction.....	1
2 Policy and Legislative Context	2
National Planning Policy Framework	2
National Planning Practice Guidance	3
Nuisance Provisions	3
Local Planning Policy	4
3 The Development Site and its Environs.....	5
4 Assessment Methodology	7
Assessment Approach	7
Overview of Odour Assessment Tools Used	7
Methodology – Qualitative Predictive Odour Impact Assessment	9
Methodology – Semi-Quantitative Predictive Assessment of Odour Effect Using Radius of Effect Calculation Tool	13
Methodology – Odour Monitoring by Sensory Testing	14
Methodology – Monitoring of Hydrogen Sulphide.....	18
Methodology – Complaints Analysis	19
5 Predictive Assessment of Odour Impacts	21
Qualitative Predictive Odour Impact Assessment.....	21
Semi-Quantitative Predictive Assessment of Odour Effects	22
6 Monitoring Results	24
Results of Sensory Field Assessments	24
Results of Hydrogen Sulphide Monitoring	29
7 Odour Complaints Review	30
8 Summary and Conclusions.....	31

References

Tables and Figures

Tables

Table 4.1 IAQM Examples of Risk Factors for Odour Source, Pathway and Receptor	9
Table 4.2 H4 Offensiveness of Odour Emission Sources	11
Table 4.3 Risk of Odour Exposure (Impact) at the Specific Receptor Location	12
Table 4.4 Likely Magnitude of Odour Effect at the Specific Receptor Location	13
Table 4.5 VDI 3940 [] Odour Intensity Scale	16
Table 4.6 IAQM Matrix to Assess the Odour Exposure (neutral and unpleasant odours) at Time and Place of Sampling	17
Table 4.7 IAQM Matrix to Assess the Odour Effect at Individual Receptors	18
Table 6.1 Sniff Test Locations	24
Table 6.2 Meteorological Conditions	26
Table 6.3 Summary of Sensory Field Assessments	27

Figures

- Figure 3.1 Site Location
- Figure 3.2 Wind Rose – Odiham, Hampshire 2014
- Figure 6.1 Monitoring Survey Locations

1 Introduction

- 1.1 This report details the Odour Impact Assessment undertaken to accompany the planning application for the proposed residential development at land off Longwater Road in Finchampstead, Wokingham. The Application Site is some distance from a small sewage treatment works (STW) operated by Thames Water.
- 1.2 The assessment considers the suitability of the proposed development site for its intended use, in the context of odour. The assessment has been undertaken in accordance with the Institute of Air Quality Management (IAQM) *Guidance on the Assessment of Odour for Planning* (May 2014) methodology, drawing on the evidence of multiple best-practice investigative tools to evaluate the suitability of the development site for residential purposes. The IAQM odour guidance states that using different assessment tools in combination can *“minimise individual limitations and increase confidence in the overall conclusion. Best practice is to use a multi-tool approach where practicable.”* As such, a combination of predictive assessment tools (qualitative risk-based assessment and semi-quantitative screening calculations) and observational assessment tools (sniff testing and hydrogen sulphide (H₂S) monitoring, together with complaints analysis) has been used to evaluate the suitability of the site.
- 1.3 This report begins by setting out the policy and legislative context for the assessment, followed by the details of the methodology and the results. A conclusion has then been drawn on the suitability of the site, in odour terms, for its proposed use.

2 Policy and Legislative Context

National Planning Policy Framework

- 2.1 In March 2012, the National Planning Policy Framework (NPPF) [1] was published. The document provides a framework within which plans will be produced at a local level to reflect the individual needs and priorities of separate communities. The NPPF constitutes guidance and is a material consideration for local planning authorities and decision-takers in determining applications. At the heart of the NPPF is a presumption in favour of sustainable development. For determining planning applications, this means approving development proposals if they accord with the local development plan, unless material considerations indicate otherwise. If the development plan is absent, silent or the policies are out of date, then planning permission should be granted unless any adverse impacts would significantly outweigh the benefits, or specific policies in the NPPF indicate development should be restricted.
- 2.2 The NPPF states that sustainable development has economic, social and environmental dimensions. In the environmental dimension, the planning system contributes to *“protecting and enhancing our natural, built and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy.”* (Paragraph 7)
- 2.3 Within the overarching roles, the NPPF sets out 12 core land-use planning principles. The relevant core principle in the context of this assessment is that planning should *“contribute to conserving and enhancing the natural environment and reducing pollution”* (Paragraph 17), as set out below.
- 2.4 As stated in the NPPF, pollution is *“anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light.”* The term ‘pollution’ can therefore be seen to include odour explicitly.
- 2.5 Under the heading ‘Conserving and Enhancing the Natural Environment’, the NPPF states:

“The planning system should contribute to and enhance the natural and local environment by:

- ...
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability...”* (Paragraph 109)

“To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the

potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.” (Paragraph 120)

“In doing so, local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.” (Paragraph 122)”

National Planning Practice Guidance

- 2.6 The national Planning Practice Guidance (NPPG) was issued on-line in March 2014 and is updated periodically by government as a live document. The Air Quality section of the NPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment.
- 2.7 Relevant to this assessment it states that *“Odour and dust can also be a planning concern, for example, because of the effect on local amenity.”* The NPPG advise that *“Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific. The scope and content of supporting information is therefore best discussed and agreed between the local planning authority and applicant before it is commissioned.”*

Nuisance Provisions

- 2.8 Part III of the Environmental Protection Act 1990 defines a number of statutory nuisances and includes: *“any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance”*. The Act places a duty on local authorities to investigate the likely occurrence of statutory nuisance and to take reasonable steps to investigate local complaints. Where a local authority is satisfied of the existence or recurrence of statutory nuisance it must generally serve an abatement notice requiring the execution of such works and other steps necessary to rectify the nuisance. If ignored, this can result in proceedings in the Magistrates Court and imposition of an order to prevent the nuisance and a fine. The Act provides a defence for the operator to demonstrate that the Best Practicable Means (BPM) have been used to control potential nuisance. For a nuisance action to succeed the offence also has to be a cause of material harm or to be persistent or likely to recur.
- 2.9 It is important to note that there is no numerical odour concentration limit that can indicate unequivocally whether a statutory (or other) nuisance is being caused and it is ultimately only the Court that can decide at what point it becomes *“prejudicial to health or a nuisance”* and whether a statutory nuisance is occurring.

Local Planning Policy

2.10 In September 2004, the Planning & Compulsory Purchase Act [2] introduced a new development plan system intended to streamline the local planning process. The WBC Local Plan is currently being updated setting out policies up to 2036. It is expected to be completely adopted in May 2019. The WBC Core Strategy document [3] sets out key policies for developments in the borough.

2.11 Key policies relevant to air quality include:

CP1 – Sustainable Development

Planning permission will be granted for development proposals that:

1) Maintain or enhance the high quality of the environment;

2) Minimise the emission of pollutants into the wider environment;

...

8) Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;

....”

2.12 This assessment considers the amenity of future occupiers in relation to odour from the sewage treatment works.

3 The Development Site and its Environs

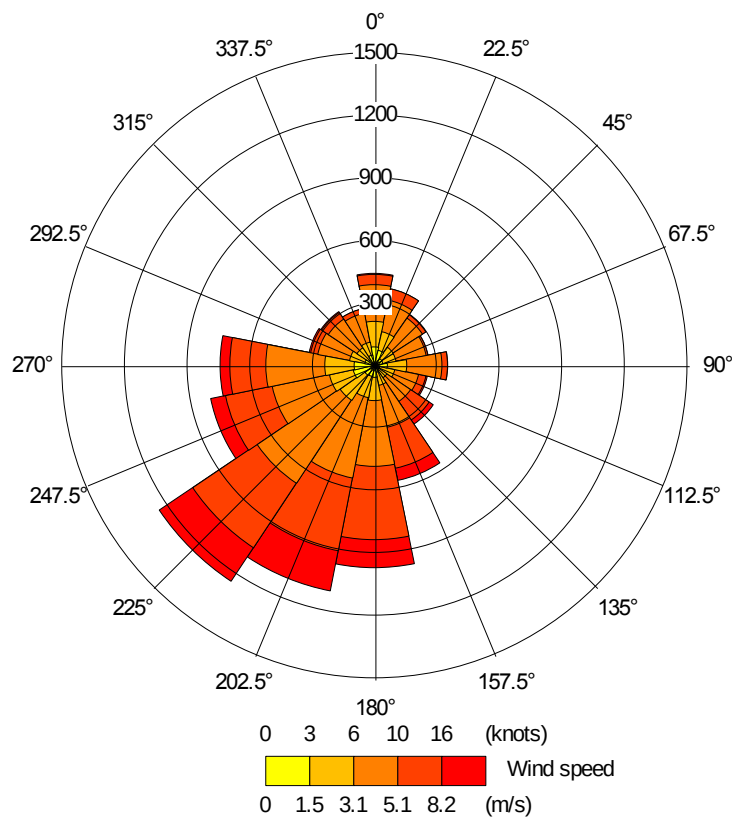
- 3.1 The development site is located on land off Longwater Road, on the east side of the road, in an edge-of-village location with dwellings to the north. The Application Site is bounded by dwellings to the north, lakes to the east and south, and a small wooded area to the west on the opposite side of Longwater Road.
- 3.2 The Eversley Cross sewage treatment works (STW) is located beyond the lakes, approximately 320 m south of the closest boundary of the development site.
- 3.3 Beyond the wooded area to the west, there is a small sewage pumping station (SPS), approximately 100 m from the Application Site. The radius of likely odour effect for a sewage pumping station (SPS) is significantly smaller than for a sewage treatment works. A number of water companies have unilaterally adopted a distance of 15 m as the likely radius of effect. In this case, the Application Site is substantially more than 15 m from the SPS; therefore the odour effects from the SPS can be scoped out as insignificant and have not been considered further in this assessment.
- 3.4 Figure 3.1 below shows the location of the SPS, STW and the Application Site.

Figure 3.1 Site Location



- 3.5 Local meteorological data are collected by the Meteorological Office at Odiham, Hampshire, approximately 12 km south west of the Application Site. Figure 3.2 shows the wind direction and speed measured over the period of a year (2014) at this station. The prevailing wind direction is south-westerly. The Application Site will be downwind of the STW when the wind is from the south; taking this as being between 150° and 210° , such winds tend to occur for 20% of the year.

Figure 3.2 Wind Rose – Odiham, Hampshire 2014



4 Assessment Methodology

Assessment Approach

- 4.1 Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners continue to use guidance provided by Defra and non-governmental organisations, including Environmental Protection UK and the Institute of Air Quality Management (IAQM). However, the NPPG does advise that *“Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific. The scope and content of supporting information is therefore best discussed and agreed between the local planning authority and applicant before it is commissioned.”*
- 4.2 This odour assessment has used a multi-tool approach in accordance with the *IAQM Guidance on the Assessment of Odour for Planning* (2014) and has incorporated multiple predictive and observational assessment tools. The assessment design was considered proportionate. In line with the guidance set out in the NPPG, the scope and method of assessment was agreed with the local authority (Erica Myers, Environmental Health Officer at WBC).
- 4.3 Organisations engaged in assessing the significance of air quality impacts should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members have professional affiliations that include Fellow and Member of the Institute of Air Quality Management, Chartered Chemist, Chartered Scientist, Chartered Environmentalist and Member of the Royal Society of Chemistry and have the required academic qualifications for these professional bodies. In addition, the Director responsible for authorising all deliverables has over 25 years' experience. The work undertaken has been designed and managed by RPS, which has ISO9001 and ISO14001 certifications for its Quality Management System and Environmental Management System, respectively. The sensory tests were carried out by a suitably qualified and trained odour assessor who has been certified as having normal olfactory sensitivity.

Overview of Odour Assessment Tools Used

- 4.4 Most odours are mixtures of many chemicals that interact to produce what we detect as a smell. Odour-free air contains no odorous chemicals, whilst fresh air is usually perceived as being air that contains no chemicals or contaminants that are unpleasant (i.e. air that smells 'clean'). Fresh air may contain odorous chemicals, but these odours will usually be pleasant in character, such as freshly-mown grass or sea spray. Perceptions of an odour - whether we find it acceptable, objectionable or offensive - are partly innate and hard-wired, and partly determined through life experiences and hence can be subjective to the individual.

4.5 Before annoyance or nuisance can occur, there must be odour exposure. For odour exposure to occur all three links in the source-pathway-receptor chain must be present.

- an emission **source** - a means for the odour to get into the atmosphere.
- a **pathway** - for the odour to travel through the air to locations off site, noting that:
 - anything that increases dilution and dispersion of an odorous pollutant plume as it travels from source to receptor will reduce the concentration at the receptor, and hence reduce exposure.
 - dilution and dispersion increase as the length of the pathway increases.
 - increasing the length of the pathway (e.g. by releasing the emissions from a high stack) will – all other things being equal – increase the dilution and dispersion.
- The presence of **receptors** (people) that could experience an adverse effect, noting that different people vary in their sensitivities to odour.

4.6 By convention, we restrict the term odour impact to the negative appraisal by a human receptor of the odour exposure. This appraisal, occurring over a matter of seconds or minutes, involves many complex psychological and socio-economic factors. Once exposure to odour has occurred, the process can lead to annoyance, nuisance and possibly complaints.

4.7 Both, or either, annoyance and nuisance can lead to complaint action. However, a lack of complaints does not necessarily prove there is no annoyance or nuisance. On the other hand, there needs to be an underlying level of annoyance before complaints are generated. The responses of annoyance and nuisance can change over time.

4.8 Several methods have been used together as part of the assessment of the odour impact at the proposed development.

I. Predictive assessment of impact:

- a) The first tool used was a qualitative predictive assessment of the potential for odour impact, carried out using the source-pathway-receptor concept and following the method in the 2014 IAQM odour guidance. This assessment tool considers: the emission source; the presence of odour controls (both engineering controls and odour management procedures and with the assumption that regulators will properly and effectively enforce these); the prevailing wind direction relative to the locations and distances of the proposed receptors; and their sensitivity to the type of odour in question.
- b) The second predictive tool was a semi-quantitative assessment of the potential for odour effect using the widely-used Radius of Effect calculation method, developed by the Government's former Warren Spring Laboratory [4].

II. Monitoring surveys:

- c) The actual odour levels prevailing at the proposed development site were monitored by sniff testing to obtain snapshots of the odour levels on the day(s) of the monitoring surveys. The Frequency, Duration, Offensiveness and Location (the so-called FIDOL factors) were considered together to enable the impact of the odour to be assessed at specific locations. This sensory assessment follows the method in the 2014 IAQM odour guidance.
- d) Additional monitoring was carried out using a Jerome gold-film analyser to measure hydrogen sulphide (H₂S) concentrations in air, a typical marker for odour for sewage treatment works.

III. Community Assessment:

- e) The final assessment tool used was complaints analysis. Complaints data were requested from the Environment Agency (EA) and the local authority and the data reviewed in order to understand the odour effects that have to date been experienced at existing receptors around the STW and in the vicinity of the proposed development site.

Methodology – Qualitative Predictive Odour Impact Assessment

4.9 A qualitative prediction of the odour impact of emissions from Eversley Cross STW on the proposed development site was carried out using the risk-based assessment method in the IAQM Guidance Appendix 1, which provides examples of risk factors for odour source potential, pathway effectiveness and receptor sensitivity (set out in Table 4.1).

Table 4.1 IAQM Examples of Risk Factors for Odour Source, Pathway and Receptor

Source Odour Potential	Pathway Effectiveness	Receptor
Factors affecting the source odour potential include: - the magnitude of the odour release (taking into account odour-control measures) - how inherently odorous the compounds are - the unpleasantness of the odour	Factors affecting the odour flux to the receptor are: - distance from source to receptor the frequency (%) of winds from the source to receptor (or, qualitatively, the direction of receptors from source with respect to prevailing wind) - the effectiveness of any mitigation/control in reducing flux to the receptor - the effectiveness of dispersion/ dilution in reducing the odour flux to the receptor - topography and terrain	For the sensitivity of people to odour, the IAQM recommends that the air quality practitioner uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the following general principles:

Source Odour Potential	Pathway Effectiveness	Receptor
Large Source Odour Potential Magnitude - Larger Permitted processes of odorous nature or large STWs; materials usage hundreds of thousands of tonnes/m³ per year; area sources of thousands of m². The compounds involved are very odorous (e.g. mercaptans), having very low Odour Detection Thresholds (ODTs) where known. Unpleasantness - processes classed as "Most offensive" in H4; or (where known) compounds/odours having unpleasant (-2) to very unpleasant (-4) hedonic score. Mitigation/control - open air operation with no containment, reliance solely on good management techniques and best practice.	Highly Effective Pathway for Odour Flux to Receptor Distance - receptor is adjacent to the source/site; distance well below any official set-back distances^a. Direction - high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind). Effectiveness of dispersion/dilution - open processes with low-level releases, e.g. lagoons, uncovered effluent treatment plant, landfilling of putrescible wastes.	High Sensitivity Receptor - surrounding land where: - users` can reasonably expect enjoyment of a high level of amenity; and - the people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium Source Odour Potential Magnitude - smaller Permitted processes or small Sewage Treatment Works (STWs); materials usage thousands of tonnes/m³ per year; area sources of hundreds of m². The compounds involved are moderately odorous. Unpleasantness - processes classed in H4 as "Moderately offensive"; or (where known) odours having neutral (0) to unpleasant (-2) hedonic score. Mitigation/control - some mitigation measures in place, but significant residual odour remains.	Moderately Effective Pathway for Odour Flux to Receptor Distance - receptor is local to the source. Where mitigation relies on dispersion/dilution - releases are elevated, but compromised by building effects.	Medium Sensitivity Receptor - surrounding land where: - users' would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or - people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Small Source Odour Potential Magnitude - falls below Part B threshold; materials usage hundreds of tonnes/m³ per year; area sources of tens m². The compounds involved are only mildly odorous, having relatively high ODTs where known. Unpleasantness - processes classed as "Less offensive" in H4; or (where known) compounds/odours having neutral (0) to very pleasant (+4) hedonic score. Mitigation/control - effective, tangible mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.	Ineffective Pathway for Odour Flux to Receptor Distance - receptor is remote from the source; distance exceeds any official set-back distances. Direction - low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind). Where mitigation relies on dispersion/ dilution - releases are from high level (e.g. stacks, or roof vents > 3 m above ridge height) and are not compromised by surrounding buildings	Low Sensitivity Receptor - surrounding land where: - the enjoyment of amenity would not reasonably be expected; or - there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial, farms, footpaths and roads.

Notes: ^a Minimum setback distances may be defined for some odorous activities

4.10 The first step of this qualitative assessment is to estimate the odour-generating potential of the site activities, termed the “Source Odour Potential”. This takes into account three factors:

- i. The scale (magnitude) of the release from the odour source, taking into account the effectiveness of any odour control or mitigation measures that are already in place. This involves judging the relative size of the release rate after mitigation and taking account of any pattern of release (e.g. intermittency). The assumption has been made, as required by the NPPF, that any pollution-control regimes applying to potentially-odorous sites will operate effectively and that the appropriate BAT standards of odour control will be enforced.
- ii. How inherently odorous the emission is. In some cases it may be known whether the release has a low, medium or high odour detection threshold (ODT); this is the concentration at which an odour becomes detectable to the human nose. In most instances the odours released by a source will be a complex mixture of compounds and the detectability will not be known. However, for some industrial processes the odour will be due to one or a small number of known compounds and the detection thresholds will be a good indication of whether the release is highly odorous or mildly odorous.
- iii. The relative pleasantness/unpleasantness* of the odour. Lists of relative pleasantness of different substances are given in the Environment Agency guidance H4 Odour Management [5].

Using the example risk ranking in Table 4.1, the Source Odour Potential can be categorised as small, medium or large.

Table 4.2 H4 Offensiveness of Odour Emission Sources

Offensiveness	Odour Emission Sources
Most Offensive	Processes involving decaying animal or fish remains Processes involving septic effluent or sludge Biological landfill odours
Moderately Offensive	Intensive livestock rearing Fat frying (food processing) Sugar beet processing Well aerated green waste composting
Less Offensive	Brewery Confectionary Coffee

* This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score.

4.11 Next, the effectiveness of the pollutant pathway as the transport mechanism for odour through the air to the receptor, versus the dilution/dispersion in the atmosphere, needs to be estimated. Anything that increases dilution and dispersion of the odorous pollutant plume as it travels from source (e.g. processes and plant) to receptor will reduce the concentration at the receptor, and hence reduce exposure. Important factors to consider here are:

- i. The distance of sensitive receptors from the odour source.
- ii. Whether these receptors are downwind (with respect to the predominant prevailing wind direction). Odour episodes often tend to occur during stable atmospheric conditions with low wind speed, which gives poor dispersion and dilution; receptors close to the source in all directions around it can be affected under these conditions. When conditions are not calm, it will be the downwind receptors that are affected. Overall therefore, receptors that are downwind with respect to the prevailing wind direction tend to be at higher risk of odour impact.
- iii. The effectiveness of the point of release in promoting good dispersion, e.g. releasing the emissions from a high stack will - all other things being equal - increase the pathway, dilution and dispersion.
- iv. The topography and terrain between the source and the receptor. The presence of topographical features such as hills and valleys, or urban terrain features such as buildings can affect air flow and therefore increase, or inhibit dispersion and dilution.

Using the example risk ranking in Table 4.1, the pollutant pathway from source to receptor can be categorised as ineffective, moderately effective, or highly effective.

4.12 In the third step, the estimates of Source Odour Potential and the Pathway Effectiveness are considered together to predict the risk of odour exposure (impact) at the receptor location, as shown by the example matrix in Table 4.3.

Table 4.3 Risk of Odour Exposure (Impact) at the Specific Receptor Location

		Source Odour Potential		
		Small	Medium	Large
Pathway Effectiveness	Highly effective	Low Risk	Medium Risk	High Risk
	Moderately effective	Negligible Risk	Low Risk	Medium Risk
	Ineffective	Negligible Risk	Negligible Risk	Low Risk

4.13 The next step is to estimate the effect of that odour impact on the exposed receptor, taking into account its sensitivity, as shown by the example matrix in Table 4.4. The odour effects may range from negligible, through slight adverse and moderate adverse, up to substantial adverse.

Table 4.4 Likely Magnitude of Odour Effect at the Specific Receptor Location

Risk of Odour Exposure	Receptor Sensitivity		
	Low	Medium	High
High	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible	Negligible Effect	Negligible Effect	Negligible Effect

- 4.14 This procedure results in a prediction of the likely odour effect at each sensitive receptor. The next step is to estimate the overall odour effect on the surrounding area, taking into account the different magnitude of effects at different receptors, and the number of receptors that experience these different effects*. This requires the competent and suitably experienced Air Quality Practitioner to apply professional judgement.

Methodology – Semi-Quantitative Predictive Assessment of Odour Effect Using Radius of Effect Calculation Tool

- 4.15 The semi-quantitative assessment of the potential odour effect of emissions from Eversley Cross STW was carried out using the Radius of Effect calculation, developed by Warren Spring Laboratory. A formula (known as the “d max equation”) was used to give an estimate of the distance (radius) from an odour source beyond which the local population must reside so as not to experience odour annoyance. The “d max equation” is expressed as:

$$d_{max} = (2.2E)^{0.6}$$

Where d_{max} is the predicted radius (in metres) from a low-level odour source, beyond which complaints would not be expected; E is the odour emission rate of the source (measured in $\text{ou}_E \cdot \text{s}^{-1}$); the constant 2.2 is a best estimate value, but it can range from 0.7 to 7.

- 4.16 The UK Water Industry Research (UKWIR) Technical Reference Document [6] reports that the complaints radius from STWs in rural areas is better estimated from the expression:

$$d_{max} = 0.5(2.2E)^{0.6}$$

This is supported by Defra research [7] on odour at STWs, which also reported that the d_{max} formula often gave an over-prediction for STWs and that $d_{max}/2$ might be more appropriate. It was suggested that one reason for this is that most emissions from sewage treatment works are from area sources, not point sources as assumed in the original d_{max} formula.

* Unless there is only a small number of local receptors, then a representative selection of receptors will have been used in the assessment. This final stage of considering the overall effect needs to take into account how many receptors these selected ones represent.

- 4.17 The Radius of Effect predictions require some information on the odour source emissions, either measured data or estimates. Alternatively, the distance to the nearest sensitive receptor can be input as $d_{\max}$ so as to enable the back-calculation of the maximum odour emission rate, E , to avoid complaints.

Methodology – Odour Monitoring by Sensory Testing

- 4.18 Odour assessment in the field using subjective, sensory testing is a tool whereby a trained odour assessor records the attributes of the odour that determine its impact, namely the Frequency, Intensity, Duration, Offensiveness and Location (the so-called FIDOL factors). The following procedure, using the method in Appendix 2 of the 2014 IAQM odour guidance, describes how these attributes of the odour were measured in ambient air to enable the impact of the odour to be assessed for a given location.
- 4.19 The assessment is “sensory” in that the human nose is used as the detector – a sound approach considering that (currently at least) no analytical instrument can give a unified measure of a complex mixture of compounds that quantifies it as a whole in the same way that a human experiences odour. The sniff tests allow the character of the odour to be assessed, which is essential where there may be a number of alternative odour sources.
- 4.20 In order to provide confidence in the quality of the results, the sensory tests were carried out by a suitably qualified and trained odour assessor who has been certified as having normal olfactory sensitivity.

Measurement Method

- 4.21 The main principles of the sensory assessment are:
- Step 1 – The ‘sniff-test’ technique was used to gather information on odour intensity (refer to Table 4.5), character, unpleasantness, frequency and duration at different test locations upwind and downwind of the odour source. Box 1 summarises the procedure.
 - Step 2 – The Odour Exposure at each test location at the time of sampling was estimated, taking into account the average odour intensity over the sniff testing period (I_{mean}) and the percentage of the time where the odour intensity level was greater than or equal to 4 ($t_{\geq 4}$) (refer to Table 4.6). 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).
 - Step 3 – The results of repeated tests were brought together with the receptor sensitivity to judge the Odour Effect. The sniff testing technique can measure odour exposure at a particular place and time, but the frequency of odour occurrence at that place is also important. If many sniff testing samples are taken that represent a wide range of weather conditions and source variations, the results of the sniff testing can be considered to

represent the overall odour exposure at a particular receptor location. However, if fewer tests are carried out, professional judgement is required to conclude how the snapshot(s) relate to the overall odour exposure at a receptor location. The Overall Odour Exposure and Receptor Sensitivity determine the overall Odour Effect (Table 4.7).

Box 1 Sniff Test Sampling Procedure

The sensory test is carried out at each test location over a standard observation time, typically 5 minutes. Testing should start from locations affected by the least-intense odours, to avoid olfactory fatigue. For each test location, the start time of the observation period and the attributes of the odour over the observation period are recorded as follows:

- i) The assessor breathes normally, inhaling ambient air samples through the nose at regular intervals (say, every 10 seconds, to give 30 samples over typically a 5 minute observation period). However, where the odour levels are either constant or intense then the odour assessor should avoid olfactory fatigue/desensitisation by alternating each sample sniff of ambient air with a sniff of odour-free air from an ori-nasal face mask fitted with carbon filters.
- ii) For each sample, the odour intensity (VDI scale, 0-6) is recorded.
- iii) At the end of the observation period at the test location, the odour unpleasantness is noted down by classifying it as unpleasant, neutral (neither pleasant nor unpleasant) or pleasant. This assumes that at least some of the 30 samples were of intensity 3 or more (i.e. the odour is at least "barely recognisable").
- iv) The odour descriptor should also be noted: odours can be objectively described using standardised categories and reference vocabulary. It is useful to provide odour assessors with standard descriptor terms, which are organised with similar terms in categories and groups either as a list or as an "odour wheel".
- v) Next the pervasiveness/extent of the odour at this test location is assessed. This can be calculated as the percentage odour time, $t_{i \geq 4}$, which is the number of samples where odour was recognisable divided by the total number of samples (i.e. 30). Note that "recognisable odour" is where the odour strength exceeds the recognition threshold and is definitely recognisable by the assessor, i.e. the assessor is capable of definitely identifying its quality/character, which corresponds to VDI intensity of 4 or more.
- vi) The average odour intensity, I_{mean} , over the test period is calculated and the maximum intensity observed is noted.

The above procedure is then repeated at the next test location, remembering that the character of an odour mixture can change over distance, as the particular components may become diluted below their individual detection thresholds at different distances.

A record should be kept of the meteorological conditions at the time of testing (including wind strength and direction, atmospheric stability category, barometric pressure, rainfall, temperature and humidity), together with information relating to the operations and activities being undertaken on site and in the surrounding area.

Table 4.5 VDI 3940 [8] Odour Intensity Scale

Odour Strength	Intensity Level	Comments
No odour/not perceptible	0	No odour when compared to the clean site
<i>The Odour Detection Threshold (ODT) of $1 \text{ ou}_E \cdot \text{m}^{-3}$ is somewhere between 0 and 1</i>		
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
Distinct	3	The odour character is barely recognisable
<i>VDI 3940 says that the recognition threshold intensity is generally 3-10 times higher than the ODT (i.e. $3\text{-}10 \text{ ou}_E \cdot \text{m}^{-3}$)</i>		
Strong	4	The odour character is easily recognisable

Odour Strength	Intensity Level	Comments
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

Table 4.6 IAQM Matrix to Assess the Odour Exposure (neutral and unpleasant odours) at Time and Place of Sampling

		Percentage odour time ($t_{\geq 4}$) during the test				
		$\leq 10\%$	11 to 20 %	21 to 30 %	31 to 40 %	$\geq 41\%$
Average Intensity (I_{mean})	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

Notes: I_{mean} should be rounded to the nearest whole number.

The following overriding considerations affect the scoring:

if $I_{\text{mean}} = 0$, then the odour effect can for practical purposes be considered negligible; and

if $I_{\text{mean}} = 1$ but $t_{\geq 4} = 0\%$, then the odour effect can for practical purposes be considered negligible.

Table 4.7 IAQM Matrix to Assess the Odour Effect at Individual Receptors

		Receptor Sensitivity		
		Low	Medium	High
Overall Odour Exposure	Very Large	<i>Substantial adverse</i>	<i>Substantial adverse</i>	<i>Very substantial adverse</i>
	Large	<i>Moderate adverse</i>	<i>Moderate adverse</i>	<i>Substantial adverse</i>
	Medium	<i>Slight adverse</i>	<i>Slight adverse</i>	<i>Moderate adverse</i>
	Small	<i>Negligible</i>	<i>Negligible</i>	<i>Slight adverse</i>

Methodology – Monitoring of Hydrogen Sulphide

4.22 Although odour concentration can be measured quantitatively at source (e.g. in stacks and vents) in European odour units per cubic metre ($\text{OU}_E\cdot\text{m}^{-3}$) using dynamic dilution olfactometry (DDO), that technique cannot be used to measure ambient concentrations of odours at the receptors themselves. For quantitative ambient monitoring, it is necessary to measure a surrogate parameter (a specific chemical species considered to contribute to all or most of the odour). Whether this will be suitable in a given case depends on:

- whether the specific compound(s) are responsible for the vast majority of the odour in the emissions, or at least can be considered as an empirical surrogate for the odour; and
- whether there is a monitoring technique available that has sufficient sensitivity (concentrations will be very low) and fast enough response time (odours may be perceived over a few seconds).

4.23 This restricts the monitoring technique to either a direct-reading continuous analyser or a grab sample of air followed by later analysis. Monitoring over averaging times of several days or weeks using, e.g., diffusion tube samplers, can be ruled out.

4.24 Hydrogen sulphide (H_2S) is a major component of many odours from STWs and, because it is relatively easy to measure, it is often used as a surrogate for odour concentrations. Whilst there are other odorous compounds that may contribute to the odour impact, studies [9] have shown that H_2S is a good surrogate indicator for some aspects of the sewage treatment process, namely, preliminary treatment before odour control and sludge storage and handling, where it is the dominant odorant. Poorer correlation is found when lime dosing is employed, after odour control (which may remove H_2S preferentially to other odorants), for secondary treatment odours/aeration tank odours (which should not generate H_2S unless overloaded) industrial effluents, and for dryers/incinerations. H_2S is proportionally less important as an odorous component in these sources.

4.25 H_2S monitoring was carried out using the Jerome 631-X Hydrogen Sulphide Analyser (Arizona Instruments) as recommended by UK Water Industry Research (UKWIR) [10]. The analyser has a response time of 30 seconds and measures H_2S within the range of 0.001 to 50 ppm (1 ppb to 50,000 ppb), making it suitable for monitoring ambient air concentrations in sewage treatment applications. This technique is acknowledged in the Defra guidance [11] on odour from STWs, in

the IAQM odour guidance [12], in the Environment Agency's Technical Guidance Note M9 [13] and the Environment Agency's H4 Technical Guidance Note [14]. H₂S was monitored at varying distances from the STW and at the Application Site during the site survey visit on 19th March 2015.

- 4.26 The odour detection threshold (ODT) for H₂S is given as 0.5 ppb (0.76 µg.m⁻³) [15]. Guideline values [16] for limiting odours impacts for a small number of single compounds (rather than compounds in mixtures) have been published by the World Health Organisation (WHO). The WHO notes that the malodorous property of H₂S is a source of annoyance for a large proportion of the general population at concentrations below 1.5 mg.m⁻³ (equivalent to 2.1 ppm or 2100 ppb). To avoid substantial complaints among the exposed population, concentrations should not be allowed to exceed a much lower guideline limit of 7 µg.m⁻³ (approximately 5 ppb) as a 30-minute mean concentration. Substantial annoyance is not defined but this standard is generally assumed to apply to H₂S in isolation, not to H₂S when used as a marker for STW odour. It should be noted that background concentrations of H₂S in the UK frequently lie in the range 1 - 3 ppb. This is believed to be mostly derived from road traffic and does not lead to any form of complaint or annoyance. Yet a rise in the background of 1 ppb, if unequivocally associated with a STW, will generally be associated with a faint but distinct sewage smell [17].
- 4.27 In this assessment, the 7 µg.m⁻³ (5 ppb) guideline recommended by WHO has been taken as the guideline criteria for avoiding annoyance or significant loss of amenity due to hydrogen sulphide.

Methodology – Complaints Analysis

- 4.28 Complaints analysis is a methodical way of harnessing the response of the community. Complaints (and absence of them) are considered as a form of monitoring data – continuous monitoring at that. Complaints analysis is therefore good at identifying unexpected odour events that occur only occasionally, but that can nevertheless in some circumstances be the dominant adverse odour effect at receptors. The best datasets are from dense urban/semi-urban populations.
- 4.29 There is currently no CEN, ISO or BS standard method covering this technique, although, a New Zealand Ministry for the Environment protocol exists [18]. The first step is to harvest the complaints data (or absence of complaints) from the local authority, the Environment Agency and if possible the site/process operator. The approach relies on these bodies having effective systems for collecting complaints. Ideally, the data will contain information on:
- the location and time where the odour annoyance leading to the complaint was observed;
 - a description of the character and strength of the odour;
 - any other information the complainant provided on activities at the alleged odour source.
 - wind direction and strength at the time; and
 - any process incidents at the time of complaint.

- 4.30 In accordance with the above, odour complaints were requested from both the local authority and the Environment Agency.

5 Predictive Assessment of Odour Impacts

Qualitative Predictive Odour Impact Assessment

Source Odour Potential

- 5.1 The first step in the qualitative assessment of odour impact is to estimate the odour source potential which has been determined based on the guidance set out in Table 4.1.
- 5.2 A joint water cycle study [19] was undertaken by Hart District Council, Rushmoor Borough Council and Surrey Heath Borough Council to inform preparation of each local authority's Local Plan to ensure that future development does not have a damaging effect on the water environment. The Eversley Cross STW is required to provide capacity for an additional 250 dwellings by 2032. The data in the water cycle study report indicates that the total number of dwellings served by the STW in 2032 would be 794. This indicates that it currently provides for 544 homes. Assuming a ratio of 2.4 people per dwelling, the STW is providing for approximately 1,300 users. To place this in context, the size of STW requiring EIA under Schedule 1 is 150,000 population equivalent. Using Table 4.1, the Source Odour Potential has been conservatively categorised as 'medium'.
- 5.3 The odours are considered to fall into the 'moderately offensive' category listed in Environment Agency odour guidance H4.
- 5.4 Based on the above, RPS has conservatively categorised the Source Odour Potential as 'medium'.

Pathway Effectiveness

- 5.5 The odour flux from the odour sources is dependent on the effectiveness of odour transport to the receptors, versus the mitigating effect of dilution/dispersion in the atmosphere.
- 5.6 No official set-back distances exist in the UK for development around STWs; however, the South Australian Environmental Protection Agency [20] sets separation distances (as measured from the sources rather than the STW boundary) of 100 m for STWs of population equivalent up to 1000, 200 m for population equivalent between 1,000 and 5,000, and 300 m for population equivalent between 5,000 and 20,000. For a population equivalent of 1300, the separation distance would therefore be 200 m.
- 5.7 The locations of the proposed development site and Eversley Cross STW are depicted in Figure 3.1. The nearest proposed property in the development scheme could be approximately 320 m from the STW. The furthest proposed residential properties could be approximately 470 m from the STW. Therefore all properties within the Application Site would be located more than 200 m from the STW.
- 5.8 The wind rose illustrated in Figure 3.2 shows the wind direction and speed measured over the period of a year (2014) at Odiham. The proposed development is located to the north of the

Eversley Cross STW and would therefore be downwind of the STW when the wind is from the south, which was during 20% of the hours of the year analysed.

- 5.9 Taking into account the distances compared to public set-back distances, the 20% frequency of winds towards the development, and the guidance examples in Table 4.1, the pathway effectiveness is considered to be “ineffective”.

Receptor Sensitivity

- 5.10 The proposed receptors are residential and are deemed to be “high sensitivity”.

Risk of Odour Exposure (Impact)

- 5.11 When the medium source odour potential (ignoring mitigation) is considered in the context of the pathway effectiveness (Table 4.3), the risk of odour exposure (impact) is “negligible” for all areas within the Application Site.

Likely Magnitude of Odour Effect

- 5.12 When the above risk of odour exposure impact is considered in the context of the sensitivity of the receptors using the matrix in Table 4.4, the likely resulting odour effect is predicted to be “negligible”.

Semi-Quantitative Predictive Assessment of Odour Effects

Radius of Effect Assessment

- 5.13 Calculation of the likely Radius of Effect using the UKWIR and Defra variant of the “d max equation” was used to give an estimate of the distance (radius) from the STW odour sources beyond which future residents should not to experience odour annoyance. The “d max equation” is expressed as:

$$d_{max} = 0.5(2.2E)^{0.6}$$

where E is the odour emission rate of the source in units of $\text{OU}_E \cdot \text{s}^{-1}$.

- 5.14 For works employing conventional, mostly uncovered treatment processes, an emission factor of $1 \text{ OU}_E \cdot \text{s}^{-1}$ per PE has been proposed by UKWIR [6]. However, this figure originates from surveys around works with some problems or where there were worries about odour and the document suggests that an emissions factor of $0.5 \text{ OU}_E \cdot \text{s}^{-1}$ per PE may be more representative of the average or the majority of works (excluding works treating septic sewage in open processes or using unabated sludge treatment processes, which will have emissions rates greater than $1 \text{ OU}_E \cdot \text{s}^{-1}$ per PE).
- 5.15 RPS has searched freely publically-available sources for information on Eversley Cross STW; however, no documents were found providing any detail. This is not entirely surprising, as Eversley Cross STW is a small works.

- 5.16 Assuming a PE for the STW of 1300, then the radius of effect beyond which no complaints would be expected would be 40 m based on an emission factor of $0.5 \text{ OU}_E \cdot \text{s}^{-1}$ per PE, or 59 m based on the more conservative emission factor of $1 \text{ OU}_E \cdot \text{s}^{-1}$ per PE. Either way, this radius of effect is considerably less than the distance to the nearest dwellings (at 320 m) on the proposed development site.
- 5.17 The $d_{\text{max}}/2$ equation can also be used to back-calculate the maximum odour emission rate that can be accommodated without causing odour annoyance at the nearest sensitive receptors at 320 m. The maximum odour emission rate so obtained is $21,604 \text{ OU}_E \cdot \text{s}^{-1}$. Using the UKWIR emissions factor of $0.5 \text{ OU}_E \cdot \text{s}^{-1}$ per PE, this equates to a STW of capacity 43,208 PE, substantially more than currently provided for by the STW.

6 Monitoring Results

Results of Sensory Field Assessments

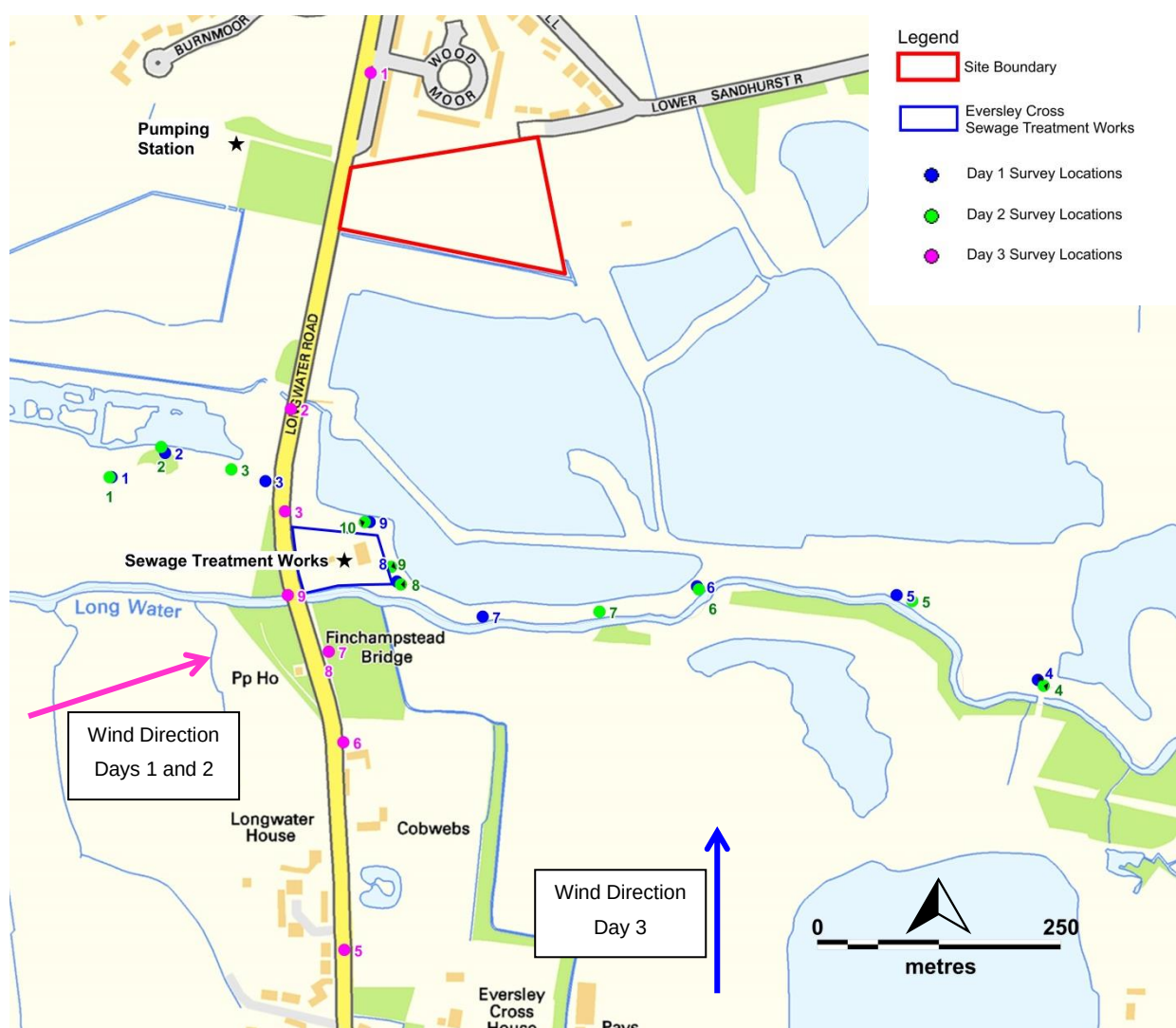
- 6.1 Monitoring surveys were carried out on the 24th, 25th and 26th of June 2017. During these visits, sensory field assessments (sniff tests) were conducted downwind of Eversley Cross STW, and at control locations upwind of the STW. The locations of the sensory tests are listed in Table 6.1 and depicted in Figure 6.1.

Table 6.1 Sniff Test Locations

Sniff Test Location			Grid Reference	
ID	Location relative to Eversley Cross STW	Approx. distance from centre of source (m)	X	Y
Sniff Test Survey 24/06/2017				
1	Upwind	250	479287	162414
2	Upwind	210	479342	162439
3	Upwind	120	479445	162410
4	Downwind	720	480238	162206
5	Downwind	570	480093	162293
6	Downwind	360	479888	162302
7	Downwind	150	479668	162271
8	Downwind	60	479580	162307
9	Downwind	50	479552	162368
Sniff Test Survey 25/06/2017				
1	Upwind	250	479285	162414
2	Upwind	220	479338	162445
3	Upwind	150	479410	162422
4	Downwind	730	480244	162200
5	Downwind	580	480109	162287
6	Downwind	370	479890	162299
7	Downwind	270	479788	162276
8	Downwind	70	479584	162304
9	Downwind	50	479574	162322
10	Downwind	40	479547	162368
Sniff Test Survey 26/06/2017				
1	Upwind	500	479553	162829
2	Upwind	160	479471	162484
3	Upwind	80	479465	162379

Sniff Test Location			Grid Reference	
ID	Location relative to Eversley Cross STW	Approx. distance from centre of source (m)	X	Y
4	Downwind	600	479549	161729
5	Downwind	400	479526	161929
6	Downwind	190	479525	162142
7	Downwind	100	479510	162235
8	Downwind	100	479510	162235
9	Downwind	70	479468	162293

Figure 6.1 Monitoring Survey Locations



- 6.2 The meteorological conditions on the day of the site survey were recorded and are summarised in Table 6.2. On the first day, conditions were generally breezy, mostly cloudy and dry. On the second day, conditions were generally breezy, overcast and dry. On the third day, conditions were generally calm, partly cloudy and dry. The wind was west-south-westerly on the first and second day and northerly on the third day.

Table 6.2 Meteorological Conditions

Meteorological Parameter	Sniff Test Survey 24/06/2017	Sniff Test Survey 25/06/2017	Sniff Test Survey 26/06/2017
Temperature (°C)	22	21	20
Bar. Pressure (mbar)	1012	1012	1015
Precipitation	None	None	None
Ground Condition	Damp	Damp	Damp
Relative Humidity (%)	68	70	61
Cloud Cover	Mostly Cloudy	Overcast	Partly Cloudy
General Air Stability Category	D	D	C
Average Wind speed and direction	2.0 km/h WSW	0.9 km/h WSW	0.7 km/h S

- 6.3 The results of the sniff tests at the sampling locations are summarised in Table 6.3.

Table 6.3 Summary of Sensory Field Assessments

Location	Average Intensity (VDI Scale 0-6)	Maximum Intensity (VDI Scale 0-6)	% Time Odour Intensity Level ≥ 4 ($t_{\geq 4}$) during test	Odour Descriptor*	Unpleasant-ness*	Odour Exposure
Sniff Test Survey 24/06/2017						
1 (Upwind)	1	3	0	Plants	Pleasant	Negligible
2 (Upwind)	1	2	0	-	-	Negligible
3 (Upwind)	2	3	0	Manure	Unpleasant	Small
4 (Downwind)	1	3	0	Plants	Pleasant	Negligible
5 (Downwind)	1	3	0	Plants	Pleasant	Negligible
6 (Downwind)	2	3	0	Manure	Unpleasant	Negligible
7 (Downwind)	1	2	0	-	-	Negligible
8 (Downwind)	2	5	10	Sewage/Chemicals	Unpleasant	Small
9 (Downwind)	4	6	87	Sewage/Chemicals	Unpleasant	Large
Sniff Test Survey 25/06/2017						
1 (Upwind)	1	3	0	Plants	Pleasant	Negligible
2 (Upwind)	1	2	0	-	-	Negligible
3 (Upwind)	2	2	0	-	-	Small
4 (Downwind)	1	2	0	-	-	Negligible
5 (Downwind)	1	2	0	-	-	Negligible
6 (Downwind)	3	4	23	Manure	Unpleasant	Medium
7 (Downwind)	1	2	0	-	-	Negligible
8 (Downwind)	2	3	0	Sewage/Chemicals	Unpleasant	Small
9 (Downwind)	2	4	10	Sewage/Chemicals	Unpleasant	Small
10 (Downwind)	2	2	0	-	-	Small

Location	Average Intensity (VDI Scale 0-6)	Maximum Intensity (VDI Scale 0-6)	% Time Odour Intensity Level ≥ 4 ($t_{\geq 4}$) during test	Odour Descriptor*	Unpleasant-ness*	Odour Exposure
Sniff Test Survey 26/06/2017						
1 (Upwind)	1	2	0	-	-	Negligible
2 (Upwind)	0	1	0	-	-	Negligible
3 (Upwind)	1	3	0	Plants	Pleasant	Negligible
4 (Downwind)	1	2	0	-	-	Negligible
5 (Downwind)	1	1	0	-	-	Negligible
6 (Downwind)	1	3	0	Plants	Pleasant	Negligible
7 (Downwind)	1	3	0	Plants	Pleasant	Negligible
8 (Downwind)	2	3	0	Sewage/Chemicals	Unpleasant	Small
9 (Downwind)	3	4	13	Sewage/Chemicals	Unpleasant	Medium

* The odour descriptor and relative unpleasantness can only be reported when at least some of the sniff test samples in the run were of intensity 3 or more.

- 6.4 The odour exposure on the second and third day of the surveys ranges from “negligible” to “medium”. On the first day the odour exposure ranges from “negligible” to “large”. At the majority of the locations across the three days, the odour exposure was “negligible”. At the ten locations where the exposure was not negligible, the odour descriptors were either manure or sewage/chemicals. The six locations where the odour descriptor was sewage/chemicals were all within 100 m of the STW and the STW was clearly visible from the sniff test locations. The proposed development is over 300 m from the STW. At all locations greater than 100 m from the STW the odour exposure is “negligible”, “small” or “medium”. Where the odour exposure was “small” or “medium” the odour descriptor was manure and therefore the source of the odour was not the STW.
- 6.5 The IAQM guidance requires as the next step that the odour practitioner considers carefully how these snapshots of exposure can be used to come to a conclusion on the overall odour impact/exposure and then onwards to estimate the effects. The IAQM guidance states this would be likely to require consideration of the meteorological conditions at the time of the tests and how frequently these occur over the long term.
- 6.6 The meteorological conditions of most importance for odour impact at the development site are Atmospheric Stability Category and wind direction. The conditions during the sniff test surveys correlated most closely with Atmospheric Stability Category D (Neutral) and C (Slightly Unstable). These are the most and second-most prevalent category (45-60% and 20% of the time in a year respectively) and lead to moderate dispersion of contaminants, so the exposures measured during the site survey can be considered reasonably representative.
- 6.7 Although the wind direction during the surveys was different to the usual prevailing direction, this is not an impediment to the assessment as sniff tests were taken at a full range of downwind locations at varying distances from the STW and the impacts at these distances can be correlated with the distance of proposed receptors on the development site.
- 6.8 Overall, the odour effect is considered to be “negligible” for the proposed receptors.

Results of Hydrogen Sulphide Monitoring

- 6.9 Hydrogen sulphide (H₂S) was monitored during each of the site visits. Three H₂S concentrations were recorded per sniff test, at each sniff testing location. H₂S concentrations were found to be below the detection limit (< 3 ppb) at all sampling locations on all three site visits.

7 Odour Complaints Review

- 7.1 The proposed development site lies on the southern boundary of the village of Finchampstead. The nearest existing receptors to the Eversley Cross STW are Longwater House and properties aligning Longwater Road and Bannister Gardens, located approximately 200 m to the south. At a greater distance there are several residential receptors along Wood Moor, located approximately 350 m north of the STW. These residential properties align the northern boundary of the Application Site.
- 7.2 At the time of issue of this report, the Environment Agency (EA) had not responded on whether they had received odour complaints; however, the local authority did confirm that it had received no odour complaints concerning the STW [21]. The lack of complaints, and the fact that there are existing receptors in close proximity to the STW, including at predominantly downwind locations, indicates that odour emissions are not causing significant adverse effects at existing residential locations.

8 Summary and Conclusions

- 8.1 RPS was commissioned by Catesby Estates Limited to undertake an odour assessment for a proposed residential development site on land off Longwater Road in Finchampstead, Wokingham. The Application Site is some distance from a small sewage treatment works (STW) operated by Thames Water.
- 8.2 The assessment considers the suitability of the proposed development, for its intended use, in the context of odour. The assessment has been undertaken in accordance with the Institute of Air Quality Management (IAQM) *Guidance on the Assessment of Odour for Planning* (May 2014) methodology, drawing on the evidence of multiple best-practice investigative tools to evaluate the suitability of the development site for residential purposes. The IAQM odour guidance states that using different assessment tools in combination can “*minimise individual limitations and increase confidence in the overall conclusion. Best practice is to use a multi-tool approach where practicable.*” As such, a combination of predictive assessment tools (qualitative risk-based assessment and semi-quantitative screening calculations) and observational assessment tools (sniff testing and hydrogen sulphide (H₂S) monitoring, together with complaints analysis) has been used to evaluate the suitability of the site. This choice of assessment tools is considered to be proportionate to the small size of the STW and its distance from the Application Site.
- 8.3 The results of the qualitative risk-based assessment indicate that the odour effect at proposed receptors is likely to be “negligible” at all locations within the site boundary.
- 8.4 A semi-quantitative assessment using the Radius of Effect calculation indicated that no significant adverse odour effect would be expected on the proposed development site.
- 8.5 The above assessments predict the odour impacts over a wide spatial area taking into account all the meteorological conditions for the area. Those predictive assessments were complemented by empirical, observations of the actual prevailing odour, to check the reasonableness of the predictions:
- A sensory assessment using the IAQM sniff test method was carried out in the field to measure the odour levels prevailing around the STW on the days of the test. The sniff tests were conducted at locations downwind of Eversley Cross STW, and at control locations upwind of the STW. The results of the sniff tests, taking into account the meteorological conditions, indicated the likely odour effect at the development site would be “negligible”.
 - The hydrogen sulphide concentrations measured downwind of the STW were all below the WHO odour guideline criteria for avoiding annoyance or significant loss of amenity.
 - At the time of issue of this report, the Environment Agency (EA) had not responded on whether they had received odour complaints; however, the local authority did confirm that it had received no odour complaints concerning the STW. The lack of complaints, and the fact that there are existing receptors in close proximity to the STW, including at downwind

locations, indicates that odour emissions are not generating significant impacts at existing residential locations.

- 8.6 Taking into account all the findings of the multi-tool assessment, the overall odour impact at the proposed development site is not likely to be subject to significant odour effects that would constrain its suitability for residential use.
- 8.7 The Proposed Development does not, in air quality terms, conflict with national or local policies.

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