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GLADMAN DEVELOPMENTS LIMITED

LAND OFF HEMPSTED LANE, GLOUCESTER

ODOUR ASSESSMENT

JANUARY 2020

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GLADMAN DEVELOPMENTS LIMITED

LAND OFF HEMPSTED LANE, GLOUCESTER

ODOUR ASSESSMENT

JANUARY 2020

PREPARED BY:

[redacted]

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1 INTRODUCTION

1.1 Purpose of the Study

1.1.1 Wardell Armstrong LLP has been commissioned by Gladman Developments Ltd to undertake an odour impact assessment for proposed residential development on Land at Hempsted Lane, Gloucester.

1.1.2 This report details the undertaking of a desk based qualitative meteorological assessment, 'sniff tests' at the proposed development site, and an odour risk assessment in accordance with the Institute of Air Quality Management (IAQM) document "Guidance on the assessment of odour for planning" (July 2018)[1].

1.2 Site Description, Surrounding Area and Odour Source

1.2.1 The proposed development site is located to the south of Hempsted, a village part of the City of Gloucester. To the north of the site are existing residential dwellings, including those along Hempsted Lane. To the south east is the A430, the Gloucester Car Boot and Flea Market and the Gloucester and Sharpness Canal beyond. To the south are wetlands with a sewage treatment works beyond. To the west are open fields and the River Severn beyond. The Netheridge Sewage Treatment Works (STW) is located approximately 540m to the south west of the proposed development site.

1.2.2 It is understood that the operator of the STW, Severn Trent (ST) also own land in closer proximity to the development, approximately 300m south west at the closest point. This additional land is currently unused and does not house any part of the current STW.

1.2.3 The proposed development is for residential dwellings and associated infrastructure.

1.3 Scope

1.3.1 The assessment considers the potential for odour from the Netheridge STW to give rise to an adverse effect on the proposed residential dwellings, and specifically whether unacceptable odour exposure may occur in locations where residents may be exposed during normal day to day situations.

1.3.2 To consider the potential for odour from the STW to give rise to an adverse effect on sensitive receptors, a multi-tool approach has been used, incorporating the following assessment methods:

[1] Institute of Air Quality Management 2018 "Guidance on the assessment of odour for planning"

- A desk based qualitative assessment;
- Sniff tests undertaken at the proposed development site; and
- An odour risk assessment.

1.3.3 The odour risk assessment also takes into consideration meteorological data provided by ADM Ltd. Meteorological data has been sourced from Gloucestershire Meteorological Station, which is considered to be the most representative meteorological station of the proposed development site in terms of altitude and location.

1.3.4 The odour sniff tests were undertaken by experienced Wardell Armstrong odour assessors, with a known level of odour acuity in accordance with BS EN 13725.

2 LEGISLATION AND PLANNING POLICY

2.1 Environment Protection Act 1990

2.1.1 The Environmental Protection Act 1990 (HMSO, 1990), is the legal framework dealing with odour from premises including industrial, trade or business premises. If odour is present in sufficient quantity this may constitute a statutory nuisance. The Local Authority is placed under a duty to inspect, detect any nuisance and to serve abatement notices where necessary.

2.2 Planning Policies

2.2.1 The National Planning Policy Framework (NPPF, 2019) sets out planning policy for England. Paragraph 180 advises planning policies and decisions should ensure that "*development is appropriate for its location*", and that "*the 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*".

2.2.2 In addition, Section 15 of the NPPF advises that "*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"*.

2.3 Gloucester City Council (GCC) Pre-Submission City Plan 2011 – 2031 Regulation 19, Policy C6: Cordon Sanitaire

2.3.1 Policy C6 refers to a defined Cordon Sanitaire surrounding the Netheridge STW, within which no development will be permitted. Policy C6 includes the following points:

2.3.2 "*3.3.31 - Severn Trent Water PLC (Severn Trent) is responsible for sewerage and sewage disposal. They operate Netheridge Sewage Treatment Works (NSTW) south of Hempsted, a facility that processes a significant amount of waste from Gloucester City and beyond. The fields adjoining Netheridge are used for sludge disposal that, in addition to the works itself, create unavoidable smell problems within the area. In order to reasonably prevent development that would be adversely affected by smell, a cordon sanitaire area is shown on the proposals map within which development will not be permitted."*

2.3.3 *"3.3.32 - To support this policy, an assessment of odour nuisance arising from NSTW has been undertaken and has informed the boundary on the policies map. The study is informed by a review of odour complains, odour surveys, a detailed dispersion model assessment and a review of a previous model assessment. Severn Trent were engaged in the review process in order to understand currently and future operations, including plans for any proposed future infrastructure improvements to accommodate additional waste and/or to reduce the impact of odour on the surrounding area. It categorises likely odour nuisance on the basis of odour contours from the sewage works".*

2.3.4 *"3.3.33 - The extent of the cordon sanitaire has been drawn on the basis the area most likely to be affected by odour nuisance, within the 3 – 5 odour contour area. This boundary does not represent the absolute limit of the area where smells can be detected but is drawn so as not unreasonably to constrain development in the existing built-up area".*

3 GUIDELINES AND CRITERIA

3.1 Environment Agency

3.1.1 The Environment Agency produced a horizontal guidance note 'Technical Guidance Note H4 – Odour Management'[2] on odour management, designed for operators of Environment Agency regulated processes. The guidance document provides examples of methods to control and manage the release of odours, but also contains a series of recommended assessment methods that can be used to assess potential odour effects.

3.1.2 The guidance note recognises that not all odours have the same potential to cause annoyance, and odours from, for example, waste water treatment tend to be more "offensive" than, for example, from the brewing or baking industries. This has led to a suggested indicative odour exposure criterion of $1.5ou_E/m^3$ (European odour units per cubic metre of air) for odours associated from waste water treatment compared to $6.0ou_E/m^3$ for brewery and bakery processes.

3.1.3 European odour units per cubic metre of air (ou_E/m^3) is the number of repeated dilutions needed with a fixed amount of odour-free air or nitrogen, until the odour is just detectable to 50% of a panel of trained observers, following strictly the requirements of the European Standard for the technique of olfactometry 'BS EN 13725: 2003, *Air Quality - Determination of Odour Concentration by Dynamic Olfactometry*'.

3.1.4 Odour can be detected at concentrations as low as 1 ou_E/m^3. As a very approximate guide:

- 1-5ou_E/m^3 the odour is recognisable;
- 5ou_E/m^3 is a faint odour;
- 10ou_E/m^3 is a distinct odour.

3.1.5 The values for normal background odours such as from traffic, grass cutting, and plants amount to anything from 5 to 40ou_E/m^3.

3.1.6 Odour is subjective and therefore what one person may find offensive the next person may not. Therefore, all odours have the potential to be a nuisance. A rapidly fluctuating odour is often more noticeable than a steady background odour at a low

[2] Environment Agency 2011: Environmental Permitting: H4 Odour Management [Available at: https://www.gov.uk/government/publications/environmental-permitting-h4-odour-management]

concentration. People can detect and respond to odour exposure that lasts as little as one or two seconds. Factors that are examined when considering the existence of a statutory nuisance are:

- Type of odour;
- Meteorological conditions – temperature, humidity, wind strength and direction;
- Duration of odour;
- Time of day;
- Behaviour of odour – waves, constant; and
- How often it occurs.

3.2 Institute of Air Quality Management (IAQM)

3.2.1 The Institute of Air Quality Management have published Guidance for the assessment of odour entitled 'Guidance on the assessment of odour for planning'[3]. This guidance states what information, monitoring and report information is required for an odour assessment, in support of planning applications. The IAQM Guidance is the only UK odour guidance containing methods for estimating the significance of potential odour effect.

3.2.2 The IAQM guidance endorses the use of multiple assessment tools for odour, stating that, "*best practice is to use a multi-tool approach where practicable".*

3.2.3 In this case, the assessment concerns the potential odour generated from the Netheridge STW on the proposed sensitive receptors. As a result, a qualitative desk-based assessment has been undertaken using the Source-Pathway-Receptor concept (i.e. a 'predictive' tool). Odour observations undertaken by Wardell Armstrong have been utilised to provide verification of the results (i.e. 'observational/empirical' tools).

3.2.4 The IAQM guidance recognises that all year-round site visits are often unfeasible due to the planning applications timetable, deadline and costs. However, the guidance still recommends that three site visits should be undertaken as a minimum, and that these visits should be representative of at least 70% of the Pasquill stability categories experienced at the site over the course of a year.

3.2.5 The Pasquill stability categories are a method for calculating turbulence based on wind speed, solar radiation and cloud cover.

[3] Institute of Air Quality Management (July 2018), Guidance on the Assessment of Odour for Planning

3.3 Information Sources

3.3.1 The following sources have been used in the preparation of this report

- Environment Agency Technical Guidance Note H4 'Odour Management', 2011.
- Institute of Air Quality Management Guidance on the assessment of odour for planning (July 2018).
- Scottish Environmental Protection Agency (SEPA) Odour Guidance (2010)
- Wind rose from ADM Ltd, for the Gloucestershire Meteorological Station, for years 2015 – 2019.

4 ASSESSMENT METHODOLOGY

4.1 Consultations

4.1.1 Consultation was undertaken between 29th June and 24th September 2019 with Ms Yvonne Welsh, Environmental Health Practitioner, and Ms Joann Meneaud at Gloucester City Council (GCC), in order to determine the required scope of works. The following methodology was discussed:

- A qualitative desk based meteorological assessment and an odour risk assessment will be undertaken in accordance with the Institute of Air Quality Management (IAQM) document 'Guidance on the assessment of odour for planning' (July 2018);
- In accordance with the IAQM guidance, four 'sniff test' odour observation site visits will be undertaken at the proposed development site to determine the frequency, intensity, odour unpleasantness and approximate location of any odours that may arise from the STW. This would be undertaken by a Wardell Armstrong employee with a known level of odour acuity, in accordance with BS EN 13725.
- Odour complaint history was asked for to ascertain any previous complaints relating to Netheridge STW; and
- Meteorological data will be obtained from the Gloucester Meteorological Station, which is considered to be the closest and most similar in terms of distance and altitude.

4.1.2 Ms Welsh replied on the 29th June 2019 to confirm a Freedom of Information (FOI) request would need to be submitted to obtain the relevant odour complaint history associated with the STW and advised, that as she does not deal with planning consultations, the odour assessment methodology had been passed to her colleague Ms Joann Meneaud for review.

4.1.3 The FOI odour complaint data was received via email on 31st July 2019 and detailed 12 odour complaints relating to the Netheridge STW since 2012.

4.1.4 Ms Meneaud replied via email on 24th September 2019 and provided a link to a recently released Cordon Sanitaire Evidence Study Netheridge STW report, produced for GCC by Phlorum. This suggests a cordon sanitaire of up to 1km from the boundary of the STW.

4.1.5 A thorough review of the report was undertaken by Wardell Armstrong and externally by BLBB Consulting Ltd. It is understood that the data used in the report is out of date and not representative of current operational practices at Netheridge STW, and the review has cast doubt over the accuracy of the conclusions drawn (**Appendix C**)

4.1.6 It is therefore considered that a qualitative desk based assessment of the STW, as outlined above, is appropriate for the proposed development site based on the relatively large distance between the site and the STW, and the fact there have been upgrades to certain aspects of the works (which will reduce odour levels emitted from the STW) undertaken since the data used in the Phlorum report was collected.

4.2 Assessment Criteria

4.2.1 To consider the potential for odour from the STW to give rise to an adverse effect on the proposed residential dwellings, a qualitative odour risk assessment has been undertaken which takes into consideration meteorological data obtained for the Gloucester Meteorological Station, for years 2015 – 2019, and 'sniff test' data obtained from four site visits at the proposed development site.

4.3 Qualitative Risk Based Assessment

4.3.1 The IAQM guidance discusses the basis of the Source-Pathway-Receptor approach, which focuses on the concept that for an odour impact to occur, there must be a source of odour, a pathway to transport odour and a receptor to be affected by the odour.

4.3.2 The probability of an odour impact occurring and the likely magnitude of the effect resulting from the exposure determine the risk of an odour effect occurring. The risk of an odour effect can therefore be estimated using the following relationship:

Effect ≈ Dose x Response

4.3.3 The dose can be considered to be equivalent to the odour exposure (impact) and can be determined using a number of factors. These factors, referred to as the 'FIDOR' factors in the Environment Agency's H4 guidance and 'FIDOL' in the IAQM odour guidance are defined in Table 2.

4.4

Table 2: Description of the FIDOL Factors

Factor	Description
Frequency	How often an individual is exposed to odour.

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

4.4.1 In accordance with the IAQM guidance, the FIDO of the FIDOL factors is used to determine the dose (impact). The response (i.e. receptor sensitivity) is determined by the location factor (L) of FIDOL.

4.4.2 The IAQM guidance provides a framework for considering the potential for the risk of odour impacts, taking into account the odour-generating potential of relevant site activities (i.e. the Source Odour Potential) and the effectiveness of the pollutant pathway as the transport mechanism through the air to the receptor (i.e. the Pathway Effectiveness).

4.4.3 The Source Odour Potential takes into account the scale (magnitude) of the release from the odour source, how inherently odorous the emission is and the relative pleasantness/unpleasantness of the odour.

4.4.4 The Pathway Effectiveness is determined based on the distance between the receptor and source, whether the receptors are downwind, the effectiveness of the release point in promoting good dispersion and the surrounding topography and terrain.

4.4.5 Table 3 describes the risk-rating criteria (high, medium and low) for source magnitude, pathway effectiveness and receptor sensitivity used within the assessment adopted from the IAQM guidance.

Table 3: Risk Ratings for Source-Pathway- Receptor			
Risk Rating	**Source Magnitude**	**Pathway Effectiveness**	**Receptor Sensitivity**
High/Large	Large scale source Odorous compounds with low odour detection thresholds Hedonic tones (where known) of -2 to -4 Mitigation: Open air operation with no containment	Distance: Receptor is adjacent to source/site boundary Direction: high frequency (%) of winds from source to receptor or receptors downwind of source with respect to prevailing wind direction Effectiveness of dispersion/dilution: open processes with low level releases	Examples: residential dwellings, hospitals, schools, education and tourist/cultural.
Medium/Moderate	Medium scale source Moderately unpleasant odours Hedonic tones (where known) of -2 to 0. Mitigation: Some controls but significant residual odour remains	Distance: Receptor local to source Where mitigation relies on dispersion/dilution: releases are elevated but comprised by building effects	Examples: places of work, commercial/retail premises and playing/recreation fields
Low/Small	Small scale source Mildly odorous compounds with relatively high odour detection thresholds Hedonic tones (where known) 0 to +4 Mitigation: effective mitigation with little or no residual odour	Distance: receptor remote from source and exceeds set back distances where applicable Direction: Low frequency (%) of winds from source to receptor or upwind of source with respect to prevailing wind. Mitigation: high level stacks/vents not compromised by surrounding buildings	Examples: Industrial, farms, footpaths and roads

4.4.6 Hedonic scores are the quantitative values assigned to the unpleasantness of source emission samples, by measurement in the laboratory by a panel of trained assessors following the German method VDI 3882 Part 2. Hedonic tone is scored on a nine-point scale ranging from very pleasant (score of +4, e.g. bakery smell) through neutral to highly unpleasant (score of -4, e.g. rotting flesh).

4.4.7 The risk ratings above are then combined with the matrix in Table 4: Risk of odour impact at receptor location (as taken from the IAQM guidance) to estimate the overall risk of odour impact at the proposed residential development.

Table 4: Risk of odour impact at receptor location

Pathway Effectiveness	Risk Rating based on Source-Pathway-Receptor		
	Small	Medium	Large
Highly effective	Low Risk	Medium Risk	High Risk
Moderately effective	Negligible Risk	Low Risk	Medium Risk
Ineffective pathway	Negligible Risk	Negligible Risk	Low Risk

4.4.8 The next stage of the risk assessment is to estimate the effect of that odour impact on the exposed receptor, taking into account its sensitivity, using Table 5: Likely magnitude of odour effect at the specific receptor location as taken from the IAQM guidance.

Table *5*: Likely magnitude of odour effect at the specific receptor location

Risk of odour exposure (impact)	Receptor Sensitivity		
	Low	Medium	High
Large	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Small	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible	Negligible Effect	Negligible Effect	Negligible Effect

Sniff Test – Odour Intensity Scale

4.4.9 Odour intensity during the sniff tests is assessed in accordance with the IAQM Guidance VDI 3940 Odour Intensity Scale. This scale is a means of providing a numerical value to the odour strength during the sniff test observations. Where odours are rated at an intensity level of 3 or above (distinct), an assessment of offensiveness is made based on descriptors set out in the IAQM odour guidance. Offensiveness is rated either unpleasant, neutral or pleasant.

4.4.10 Table 6 shows the odour intensity scale, as taken from the IAQM Guidance.

Table 6: VDI 3940 Odour Intensity Scale

Odour Strength	Intensity Level	Comments
No odour/not perceptible	0	No odour when compared to the clean site
The Odour Detection Threshold (ODT) of 1 ouE.m-3 is somewhere between 0 and 1		
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
VDI 3940 says that the recognition threshold intensity is generally 3-10 times higher than the ODT (i.e. 3-10 ouE.m-3)		
Strong	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

4.4.11 At the end of the observation period at each monitoring location, the odour unpleasantness was noted by classifying it as unpleasant, neutral (neither pleasant or unpleasant) or pleasant. This assumed that at least some of the odour intensity detected was 3 or more (i.e. the odour is at least 'barely recognisable').

4.4.12 The pervasiveness/extent of the odour at each monitoring location was assessed by calculating the percentage of odour time, $t_{I\geq4}$ where odour is easily recognisable as suggested at Box 4 and in Table 15 of the IAQM guidance. The determined odour

exposure from the calculations above is assessed against the impact outlined within Table 15 of the IAQM guidance.

4.4.13 The average odour intensity (I_{mean}) for the observation period was calculated for each monitoring location and the maximum intensity (I_{max}) observed was also noted. It should be noted that the calculated I_{mean} is rounded to the nearest whole number.

5 SITE VISITS

5.1.1 Four site visits were undertaken on 29th and 30th August and 6th and 12th September 2019. Specific dates, times, meteorology and observations for each site visit are outlined separately below and are also included in Appendix B.

5.1.2 Monitoring locations were selected within the proposed development site at varying downwind, upwind and set back distances from the Netheridge STW.

5.1.3 The IAQM guidance recognises that all round year site visits are often unfeasible due to the planning applications timetable, deadline and costs. Site visits were selected in order to achieve worst case wind conditions conducive for odour generation (downwind of site and lower wind speeds, i.e. <5 m/s,). In accordance with the IAQM guidance, some monitoring locations upwind of the STW were also chosen and the four visits incorporated different Pasquill stability categories.

5.1.4 The Pasquill stability categories are a method for calculating turbulence based on wind speed, solar radiation and cloud cover.

5.1.5 During each of the site visits, sniff tests were undertaken at a total of 21 monitoring locations within the site. Details of these monitoring locations are shown on Drawing GM10710 - 020.

5.1.6 The sniff tests involved normal breathing over a 5-minute period at each monitoring location, with records made of intensity in accordance with the VDI 3940 scale as provided in Table 5.

5.1.7 The results of each site visit are summarised below, and detailed odour observation notes and calculations are provided in Appendix B.

5.2 Site Visit 1 (29th August 2019)

5.2.1 Site Visit 1 was undertaken on 29th August 2019 from approximately 13:45 to 16:05 hours during a Thursday afternoon.

5.2.1 Meteorological conditions at the time of the visit were as follows:

- Temperature: 21-22°c;
- Atmosphere: Dry/Partly Cloudy;
- Wind direction: SW/SSW
- Wind strength: Moderate.

5.2.2 Twenty-one monitoring locations were selected within the development site. These are shown on Drawing GM10710-020. The weather conditions experienced during the sniff tests were conducive to odour generation and propagation with no strong air movement to dilute and disperse odour.

5.3 Site Visit 2 (30th August 2019)

5.3.1 Site Visit 2 was undertaken on 30th August 2019 from approximately 08:15 to 10:35 hours during a Friday morning.

5.3.2 Meteorological conditions at the time of the visits were as follows:

- Temperature: 18°c;
- Atmosphere: Dry/Partly Cloudy;
- Wind direction: SW;
- Wind strength: Moderate

5.3.3 Twenty-one monitoring locations were selected within the development site. These are shown on Drawing GM10710-020. The weather conditions experienced during the sniff tests were conducive to odour generation and propagation with no strong air movement to dilute and disperse odour.

5.4 Site Visit 3 (6th September 2019)

5.4.1 Site Visit 3 was undertaken on 6th September 2019 from approximately 08:00 to 09:50 hours during a Friday morning.

5.4.2 Meteorological conditions at the time of the visits were as follows:

- Temperature: 15°c;
- Atmosphere: Dry/Cloudy;
- Wind direction: SW;
- Wind strength: Moderate

5.4.3 Twenty-one monitoring locations were selected within the development site. These are shown on Drawing GM10710-020. The weather conditions experienced during the sniff tests were conducive to odour generation and propagation with no strong air movement to dilute and disperse odour.

5.5 Site Visit 4 (12th September 2019)

5.5.1 Site Visit 4 was undertaken on 12th September 2019 from approximately 19:00 to 21:30 hours during a Thursday evening.

5.5.2 Meteorological conditions at the time of the visits were as follows:

- Temperature: 11°c;
- Atmosphere: Dry/Cloudy;
- Wind direction: SW;
- Wind strength: Moderate

5.5.3 Twenty-one monitoring locations were selected within the development site. These are shown on Drawing GM10710-020. The weather conditions experienced during the sniff tests were conducive to odour generation and propagation with no strong air movement to dilute and disperse odour.

5.6 Summary of Site Visits

5.6.1 Four site visits were undertaken on two separate consecutive day visits on the 29th and 30th August and 6th and 12th September 2019. All site visits were undertaken at various downwind and upwind locations in relation to the STW with varying wind speeds and Pasquill Stability categories.

5.6.2 During site visit 1, odour was detected at 7 of the 21 observation periods (33.33%). Five of these occurrences originated from Netheridge STW (23.81%), with two locations detecting odour from the surrounding agricultural fields and the adjacent road (locations 1 and 8, respectively).

5.6.3 Slight adverse odour effects were calculated at monitoring locations 8 and 13, with negligible impacts calculated at all remaining locations.

5.6.4 During site visit 2, odour was detected at 8 of the 21 observation periods (38.10%). Five of these occurrences originated from Netheridge STW (23.81%), with three locations detecting odour from the surrounding agricultural fields (locations 1 - 3).

5.6.5 Slight adverse odour effects were calculated at monitoring locations 12 and 13, with negligible impacts calculated at all remaining locations.

5.6.6 During site visit 3, odour was detected at 7 of the 21 observation periods (33.33%). All odour detected originated from Netheridge STW. Odour effects were calculated as negligible at all 21 monitoring locations.

5.6.7 During site visit 4, odour was detected at 9 of the 21 observation periods (42.86%). All odour detected originated from Netheridge STW. Odour effects were calculated as negligible at all 21 monitoring locations.

5.6.8 Combining all four site visits, maximum odour intensities recorded across the monitoring locations ranged from 0 'no odour' to 4 'strong' with a corresponding average odour intensity ranging from 0 'not perceptible' to 2 'slight/weak'.

5.6.9 A total of 84 observation periods were conducted over the four site visits. Observation periods conducted during the site visits had variable wind directions with low wind speeds less than 5m/s and therefore, any odour present would not have been diluted or dispersed effectively, presenting a robust approach.

5.6.10 Combining all four site visits, no odour was detected at 53 of the 84 observation periods, which accounts for 63.10% of all observation periods. However, odour from sources other than Netheridge STW was detected at 5 of the 84 monitoring locations. Therefore, odour originating from the STW was not detected at 58 of the 84 locations (69.05%).

5.6.11 Overall, odour effects were calculated as 'negligible' at 80 of the 84 observation periods (95.24%) undertaken during all four site visits. Slight adverse effects were calculated at 4 observation periods, across three monitoring locations (locations 8, 12 and 13). One of these resulted from odour originating from a source other than the Netheridge STW (location 8) and monitoring locations 12 and 13 are both located adjacent to the southern boundary of the site. It is understood that no residential dwellings are proposed within or in close proximity to these locations.

5.6.12 In accordance with IAQM guidance, all of the observation periods undertaken during all four site visits correspond to a 'not significant' odour impact.

6 ODOUR RISK ASSESSMENT

6.1 Existing Odour Sources

6.1.1 The proposed development is located approximately 540m north of the Netheridge STW with a large amount of open agricultural land surrounding the west of the site. Hempsted Recycling Centre is located approximately 920m to the north west of the proposed development site. Given the proposed development location, and the very large scale of the STW, the main potential sources of odour at the site are likely to arise from activities undertaken at the STW as well as agricultural odours from the surrounding area.

6.2 Existing Sensitive Receptors

6.2.1 The assessment has considered the highest sensitivity receptors (i.e. the proposed residential dwellings), as occupants are expected to be present continuously or at least for extended periods of time and therefore are at a greater risk of impact from odour exposure.

6.3 FIDOL Assessment

6.3.1 The source-odour-potential has been considered with respect to FIDOL as per the IAQM guidance. This is summarised in Table 7.

Table 7: Description of the FIDOL Factors

Factor	Description
Frequency	The regional prevailing wind is from the south south west/south west. During calm conditions, higher odour concentrations may linger in the local area due to the absence of wind to dilute and disperse the odours. The wind rose in Appendix A shows that this is likely to be, at worst 6.89 % of the time. Due to the nature of the STW, the facility is likely to be operating continuously throughout the year.
Intensity	Average odour intensities across the three site visits ranged from 0 'not perceptible' to 4 'strong'.
Duration	The source emissions are likely to be large and constant throughout the year, due to the nature of the work undertaken at the STW. However, given the distance between the works and the proposed development site, odours are expected to dilute and disperse considerably before reaching the site. Sniff tests undertaken within the proposed development site by Wardell Armstrong indicate that odour is detected infrequently on site at relatively low intensities.

Table 7: Description of the FIDOL Factors	
Factor	**Description**
Odour unpleasantness	Hedonic tone scores detected within the proposed development site during the site visits ranged between 0 and -3. SEPA guidance states that hedonic tones are likely to be between -1.94 (Musty) and -3.68 (Sewer odour).
Location	The proposed residential receptors will be located in a mainly rural area. The southern boundary of the proposed development site is located approximately 540m north of the Netheridge STW with open land in between. It is understood that no proposed residential dwellings are to be built in the southern half of the development site.

6.3.2 In accordance with Table 3 and 7 and giving consideration to the large size of the STW, the magnitude of odour release from the STW is considered to be High/Large**.**

Pathway Effectiveness

6.3.3 It is important to consider the existing receptors in terms of proximity to the odour source and the prevailing wind direction to determine the pathway effectiveness.

6.3.4 To provide information on how odour may disperse, wind speed and wind direction data has been obtained from the Gloucester Meteorological Station (with 50% missing data from Pershore Meteorological Station), which is located approximately 9km from the proposed development site and is considered to be most representative of conditions on site. The Gloucester annual wind rose for 2015 to 2019 is available in Appendix A.

6.3.5 The wind rose is displayed as 16 compass directions. The prevailing wind direction is from south-south west/south west. The Netheridge STW lies to the south west of the proposed development and is therefore located downwind with respect to the prevailing wind direction.

6.3.6 Low wind speeds are most effective at carrying odour (i.e. less than $3ms^{-1}$) as the wind fails to dilute and disperse the odour effectively. Higher wind speeds become increasingly effective at diluting and dispersing odour.

6.3.7 The meteorological data shows that, when taking into account all wind speeds, the proposed development site is predicted to be downwind of the Netheridge STW for 33.5% of the time. However, worst case conditions when the receptors are downwind of the STW and wind speeds are less than $3ms^{-1}$ occur for approximately 11.9% of the time. Calm conditions, when higher odour concentrations may linger in the local area

due to the absence of wind to dilute and disperse the odours**,** are predicted to occur approximately 6.89% of the time.

6.3.8 The effectiveness of the odour pathway is presented in Table 8.

Table 8: Effectiveness of odour pathway

Receptor	Distance from Source	Direction from Source	Downwind	Pathway Effectiveness
Proposed development site	540m at closest point	North east	Yes	Moderately effective

6.3.9 It is concluded that the pathway effectiveness is Moderately effective, in accordance with the IAQM Guidance criteria.

Receptor Sensitivity

6.3.10 The existing receptor locations are residential and are therefore judged to be of High sensitivity.

Potential Odour Effects

6.3.11 The SEPA odour guidance, and the categories included within the EA H4 guidance, states the hedonic score is likely to be between -1.94 (Musty) and -3.68 (Sewer odour).

6.3.12 A summary of the risk factors for the Source Odour Potential are detailed in Table 9.

Table 9: Source Odour Potential

Factors affecting Source Magnitude	Risk Factors
Magnitude of Odour Release	Large scale
Inherent Odorous Nature of Compounds	Odorous compounds with low odour detection thresholds
Odour Unpleasantness	Hedonic tones recorded between 0 and -3 during odour observations site visits.

6.3.13 In accordance to the criteria detailed in Tables 2 and 7, the Odour Source Potential for the Netheridge STW is judged to be High/Large.

6.3.14 The potential for the source to cause odour, the pathway effectiveness and the receptor sensitivity are combined to determine the overall likely odour effect, in accordance with the IAQM guidance and tables 2 to 4 of this report.

6.3.15 The potential odour effect at the existing residential receptors presented in Table 10.

Table 10: Potential Odour Effects

Receptor	Distance from Source	Activity Source Odour Potential	Effectiveness of Pathway	Receptor Sensitivity	Risk of Odour Impact	Likely Odour Effect
Proposed residential development	Approximately 540m at closest point (southern boundary of site)	Large	Moderately effective	High	Medium risk	Moderate Adverse Effect
Proposed residential development	Approximately 660m at closest point (middle of site)	Large	Ineffective	High	Low risk	Slight Adverse Effect

6.3.16 Focusing on the southern boundary of the proposed development (the closest distance from the STW), based on a large source odour potential, where the pathway is deemed to be moderately effective, the risk of odour impact (dose) is deemed to be medium with an overall moderate adverse effect, in accordance with IAQM guidance for the proposed residential development with regard to odour from the Netheridge STW.

6.3.17 In order to consider the likely odour effect of the Netheridge STW on the site as a whole, odour effects have also been calculated to predict impacts further in to the proposed development site.

6.3.18 Focusing on the middle of the proposed development, based on a large source odour potential, where the pathway is deemed to be ineffective due to increased distance from the STW, the risk of odour impact (dose) is deemed to be low with an overall slight adverse effect, in accordance with IAQM guidance for the proposed residential development with regard to odour from the Netheridge STW.

6.3.19 It is likely that as the distance between the STW and the proposed development site increases, the potential for odour effects is reduced, due to increased dilution and dispersions of any odours from the STW.

6.3.20 The final stage of the assessment is to draw an overall conclusion on the potential significance, based on professional judgement. This is considered within Section 7 of this report.

7 ASSESSMENT OF SIGNIFICANCE

7.1.1 A qualitative risk-based assessment has been undertaken to consider the potential for odour from the Netheridge STW to give rise to an adverse odour effect at proposed residential development off Hempsted Lane, Gloucester.

7.1.2 With regard to reaching a conclusion on the overall significance of likely odour effects, the IAQM guidance states that the findings of the different odour assessment tools should be drawn together. This includes community-based tools, such as odour complaint histories, and empirical tools, such as sniff tests. The guidance states that both of these should normally be given *"considerable weight"* when drawing conclusions in an assessment.

7.1.3 The significance of the overall odour effects arising from the STW has been assessed, taking into account the following points:

- The results of the risk based qualitative assessment which represent a worst-case scenario for the STW and its effect on the proposed residential dwellings;
- The odour potential of the STW is considered to be large, in accordance with EA H4 odour guidance;
- The odour complaint history relating to the STW. It has been confirmed by GCC that the council have record of 12 odour complaints relating to the STW in the last five years. Eleven of these are located to the south of the STW, with the remaining one complaint, logged in 2016, located to the north east of the proposed development site. The proposed development site is located towards the north east of the STW, and so this shows there is potential for greater odour impact to the south of the STW;
- The proposed development site is located approximately 540m to the north east of the STW northern boundary. Increased distance from an odour source is likely to increase the dilution and dispersion of odours before reaching any sensitive receptors i.e. the proposed development site;
- The wind rose indicates that for an average year, the majority of the wind originates from a south-south westerly/south westerly direction. Considering all wind speeds, the existing residential receptors are predicted to be downwind of the STW for 33.5% of an average year. Taking in to account low wind speeds of less than 3m/s, when the potential for odour propagation is at its highest, this falls to 11.9%. Calm conditions are estimated for 6.89% of an average year.

Higher wind speeds become increasingly effective at diluting and dispersing odour;

- When considering that the potential for odour effects is likely to be highest when both the proposed development is located downwind of the STW and wind speeds are less than 3m/s, this further reduces the proportion of time when odour effects may be experienced;
- Information obtained from BLBB Consulting Limited (Appendix C) indicates that there have been recent upgrade works to Netheridge STW to improve sludge handling and storage at the works. There have also been upgrades to the operation of other assets at the STW such as increased desludging of the primary sedimentation tanks. It is considered that these measures are likely to decrease odour levels emitted from the Netheridge STW. BLBB considers the Phlorum report is a poor summary of the odour position at Netheridge STW and that "*the current Cordon Sanitaire begin recommended within the Phlorum report will needlessly prevent development of certain areas to the north of the works where nuisance is less likely but will allow development of other areas to the south where nuisance is already being suffered by existing residents*";
- Sniff test site observations have been undertaken at the proposed development site during various meteorological conditions, in accordance with IAQM guidance, to survey the site during 'worst case' and more 'typical' conditions;
- Data obtained from sniff tests undertaken at various locations within the proposed development show that whilst odour was detected at various locations across the site, it was detected infrequently and at low intensities. Higher odour intensities were detected along the southern boundary of the site;
- Combining all four site visits, no odour was detected at 53 of the 84 observation periods, which accounts for 63.10% of all observation periods. However, odour from sources other than Netheridge STW was detected at 5 of the 84 monitoring locations. Therefore, odour originating from the STW was not detected at 58 of the 84 locations (69.05%).
- Overall, odour effects were calculated as 'negligible' at 80 of the 84 observation periods (95.24%) undertaken during all four site visits. Slight adverse effects were calculated at 4 observation periods, across three monitoring locations (locations 8, 12 and 13). One of these resulted from odour originating from a source other than the Netheridge STW (location 8). Monitoring locations 12 and 13 are both located adjacent to the southern boundary of the site, in closest

proximity to the STW. It is understood that no residential dwellings are proposed in close proximity to these locations.

7.1.4 The qualitative assessment has shown that odour from the Netheridge STW has the potential to cause a moderate adverse impact in the south of the proposed residential development. Empirical observations undertaken along the southern boundary of the proposed development site calculated a slight adverse impact three times at two of these locations during site visit 1 and 2.

7.1.5 The qualitative assessment predicts that further in to the proposed development site, as the distance from the STW increases dilution and dispersion of any odours, the risk of odour falls and the overall odour impact decreases to slight adverse impacts. It should be noted that in accordance with IAQM guidance, odour impacts of slight adverse or less correlate to a not significant odour impact overall.

7.1.6 The results of the empirical sniff test observations show that the southern boundary of the site is most likely to experience worst case odour impacts, as predicted by the qualitative assessment undertaken. However, where the qualitative assessment predicted a moderate adverse impact, the empirical sniff test observations calculated slight adverse odour impacts in this area. This also correlates well with the odour complaint history received from GCC, where all but one of complaints received in the last five years are located to the south of the STW i.e. not in the vicinity of the proposed development.

7.1.7 It is considered that the moderate adverse likely odour effect predicted within the qualitative assessment is a worst-case effect for the areas of the proposed development situated closest to the STW i.e. the southernmost areas of the site. It is considered likely that those areas of the proposed site situated further away from the STW are likely to experience a lesser odour effect. This assumption correlates well with the results of the empirical observations where odour was detected less frequently and at lower intensities across the middle and northern sections of the proposed development site (when compared with those locations along the southern boundary).

7.1.8 Overall, taking in to account the results of the qualitative risk based assessment, the results of the sniff tests undertaken within the proposed development site, the local meteorological data and information provided by BLBB Consulting Limited, which doubts the reliability of the Cordon Sanitaire recommended in the Phlorum report, the most likely impact from odour from the Netheridge STW on the proposed

development site as a whole is judged to be **'not significant'**, in accordance with IAQM guidance.

8 SUMMARY AND CONCLUSION

8.1.1 A qualitative risk-based assessment has been undertaken to consider the potential for odour from the Netheridge STW to give rise to an adverse odour effect at proposed residential receptors at land off Hempsted Lane, Gloucester.

8.1.2 The desk-based assessment demonstrates that the risk of odour impact at the southern boundary of the site is '**medium'**. However, as distance northwards from the boundary in to the site increases, the risk falls to '**low'**.

8.1.3 Empirical odour observation site visits demonstrate that whilst odour was detected at various locations across the site, it was detected infrequently and at low intensities. Higher odour intensities were detected along the southern boundary of the site. Odour originating from the STW was not detected at 58 of the 84 locations (69.05%), and odour effects were calculated as 'negligible' at 80 of the 84 observation periods (95.24%) undertaken during all four site visits.

8.1.4 Odour complaint history from GCC indicate a very low frequency of odour complaints to the north east of the STW in the last five years, with only one complaint recorded in this area in 2016. Eleven other complaints were recorded during the same five year period to the south of the STW.

8.1.5 Considering all wind speeds experienced at the site across a typical year, the existing residential receptors are predicted to be downwind of the STW for 33.5% of an average year. Taking in to account low wind speeds of less than 3m/s, when the potential for odour propagation is at its highest, this falls to 11.9%.

8.1.6 Overall, taking into account the results of the odour assessment and the empirical observations (sniff tests and odour complaint history), the local meteorological data and information provided by BLBB Consulting Limited, the potential for odour impact from the Netheridge STW at the proposed development site is **'not significant'** based on the points raised in Section 7 of this report and in accordance with IAQM guidance.

APPENDICES

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Appendix A
Wind Rose for Gloucestershire Meteorological Station 2015 - 2019

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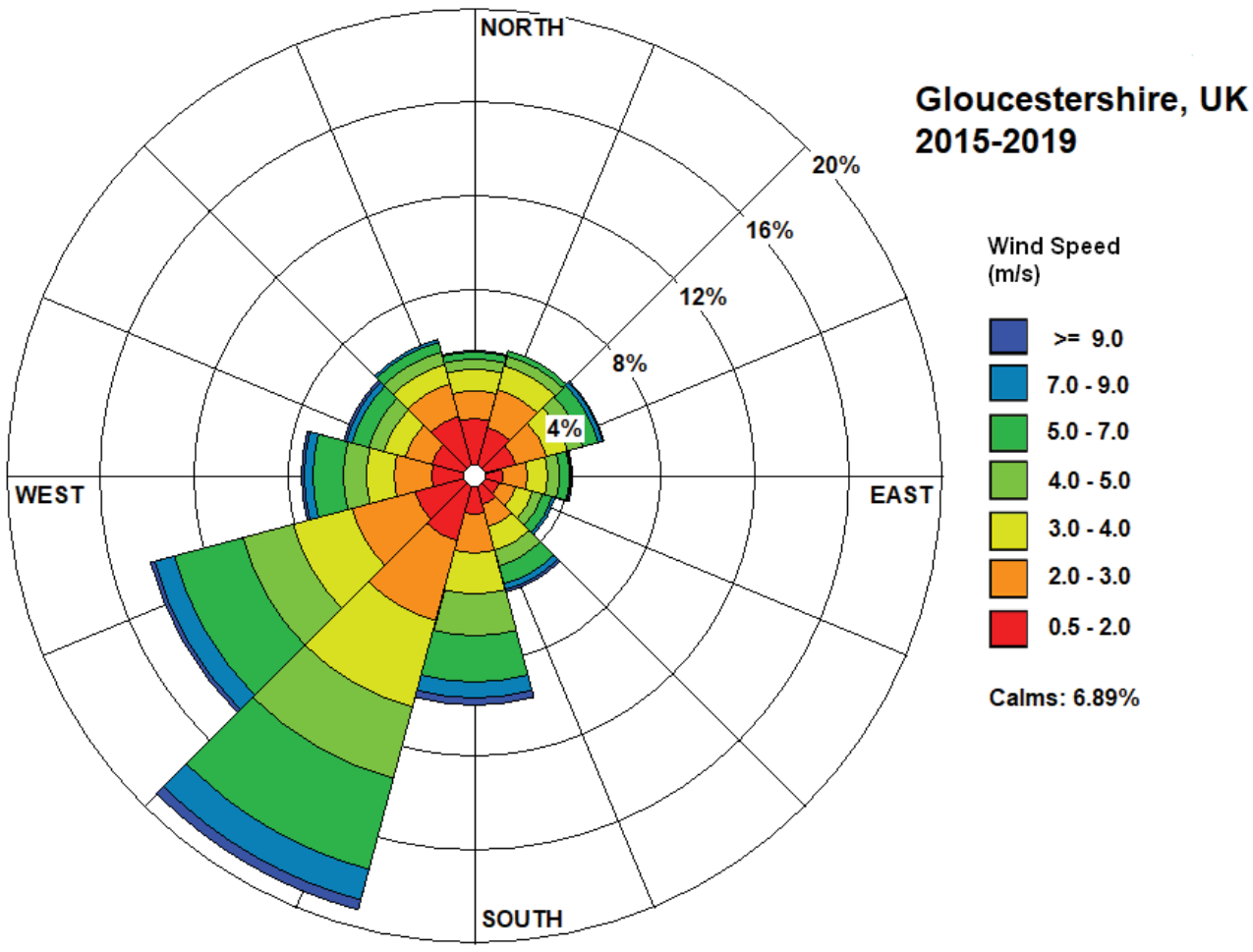
NORTH
EAST
SOUTH
WEST
4%
8%
12%
16%
20%
Gloucestershire, UK
2015-2019
Wind Speed
(m/s)
>= 9.0
7.0 - 9.0
5.0 - 7.0
4.0 - 5.0
3.0 - 4.0
2.0 - 3.0
0.5 - 2.0
Calms: 6.89%

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Appendix B
Site Visit Odour Observations

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Job Number:	GM10710	**Site:**	Hempsted Lane, Gloucester	**Date:**	29/8/19
Start time:	13:45	**Finish Time:**	16:05	**Surveyor:**	Paul Threlfall
General Weather Conditions:	**Temperature:** 21-22°C **Cloud Cover:** 8/8 falling to 4/8		**Wind Direction: SW/SSW** **Wind Strength: Moderate**		
Comments (e.g. site operations, weather changes, general info etc): clouds broke during observations and became sunnier and warmer. Wind speeds dropped slightly. Site slopes downwards towards STW and so those locations further away are higher up and tended to experience higher wind speeds.					

Local Ref. & Description	If first visit – it is useful to stop at site boundary/site entrance to determine the potential odour present. The assessment begins at an upwind location, moving closer to the source and into the downwind location. Record location numbers, mark on map and description of location.
Weather conditions	General description – dry, wet, humid, fog etc.
Temperature	Degrees C (estimate from Met Office or similar) otherwise, very warm, warm, cold, mild etc. Be wary of anemometer readings as they often record the surface temperature on the monitor which, if left in warm car or bag, can give misreading's.
Cloud Cover	Use a scale of 8 where 0 is clear sky and 8 is complete cloud cover. Can convert this number to a percentage.
Wind Strength	Use anemometer as priority, otherwise: Beaufort Scale: 0. Calm (smoke rises vertically) 1. Light Air (direction of wind shown by a smoke drift) 2. Light Breeze (Wind felt on face, leaves rustle) 3. Gentle Breeze (leaves and small twigs in constant movement 4. Moderate Breeze (approx. 5m/s, raises dust and loose paper, small branches move) 5. Fresh Breeze (small tree in leaf begin to sway, small branches move) 6. Strong Breeze (large branches in motion, umbrella used with difficulty) 7. Near Gale (whole trees in motion, inconvenience felt when walking against wind)
Wind Direction	N, NE, NEE etc.
Duration of Test	5 mins minimum. Record any odour detected walking between locations. Note this is standard so does not need to be written in notes.
Intensity	IAQM Guidance 0 to 6. 0. No odour 1. Slight/Very Weak – Potentially odour, may be doubt to whether odour is present 2. Slight/Weak – Odour is present but source/words to describe it are unknown 3. Distinct – Odour character/nature is barely recognisable 4. Strong – Odour character/nature easily recognisable 5. Very Strong – Odour is offensive. Exposure to this level is undesirable 6. Extremely Strong – Odour is offensive. Difficulty staying in locality and instinctive reaction to mitigate against further exposure.
Offensiveness	Use Hedonic Tone score: 1. -4 =extremely unpleasant, 0 = neither unpleasant or pleasant, +4 = extremely pleasant
Nature of Smell	What does it smell like. Use odour wheel where appropriate.

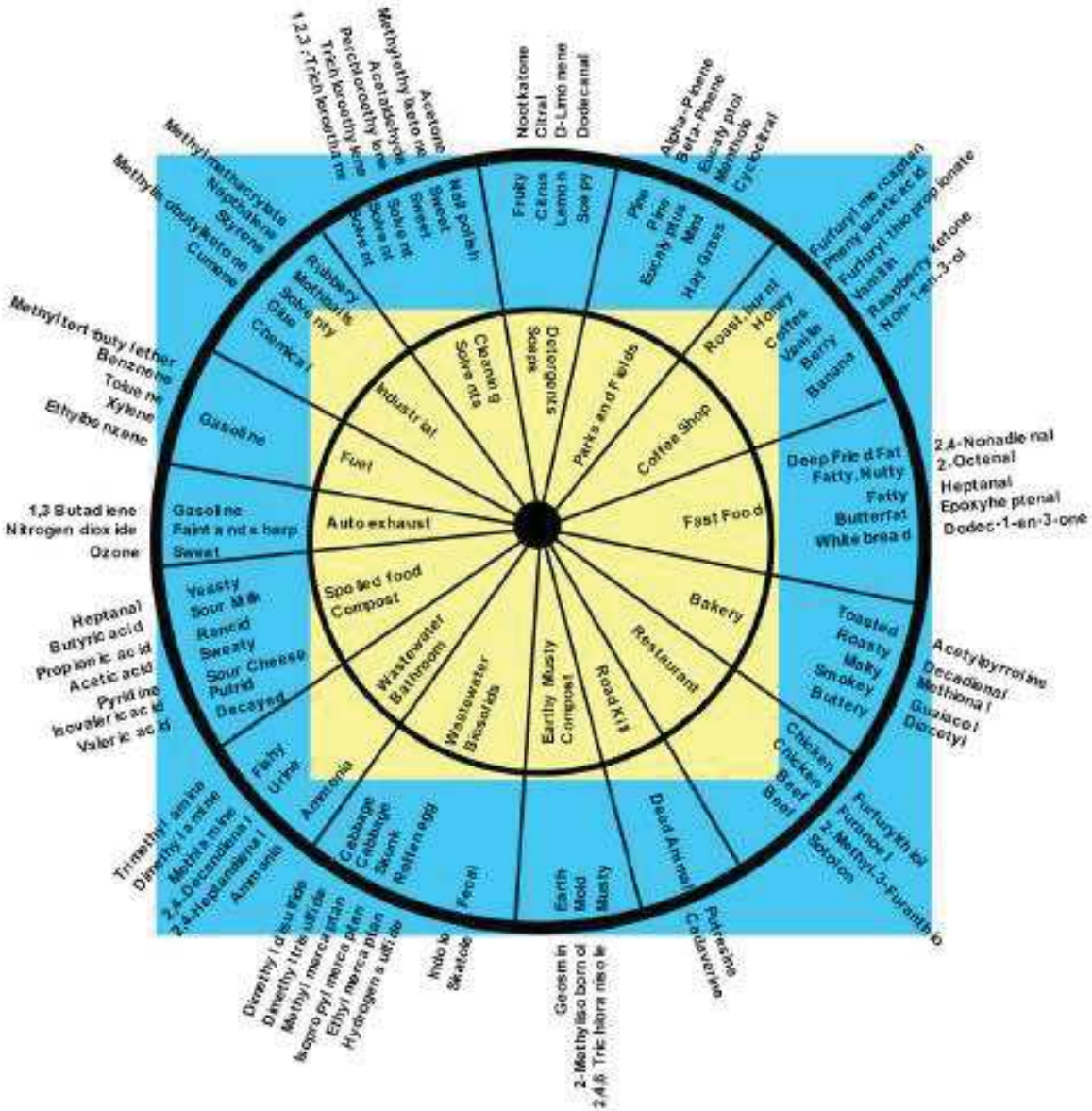
Potential Source	Odour is distinct enough to state a likely source e.g. landfill, sewage treatment works. To be stated when certain of the source (note Intensity 3 is distinct)
Odour Duration	Time 'sniffed' odour for e.g. 30 second 'wave' at intensity 4, 30 Sec @I.4

General Information

Hedonic Score Rating

Very Pleasant	+4
Pleasant	+3
Moderately Pleasant	+2
Mildly Pleasant	+1
Neutral Odour / No Odour	0
Mildly Unpleasant	-1
Moderately Unpleasant	-2
Unpleasant	-3
Very Unpleasant	-4

Odour Wheel



Location Number/ Description	**1**	**2**	**3**	**4**	**5**
Time of 'Sniff Test'	1345	1350	1355	1400	1405
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	4.1, SW	2.9, SW	3.1, SW	3.5, SW	3.3, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Downwind
Intensity (0 – 6)	1	1	No Odour	No Odour	No Odour
Offensiveness (-4 to +4)	-1	-1	-	-	-
Nature of odour	Agricultural/Animal	Faecal	-	-	-
Potential Source	Surrounding fields	Gloucester STW	-	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	1 – 200 seconds	1 – 30 seconds	-	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)	Just slightly stronger than a background odour. Very faint. Not an STW odour.	-	-	-	-

Location Number/ Description	**6**	**7**	**8**	**9**	**10**
Time of 'Sniff Test'	1410	1420	1430	1440	1445
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	2.3, SSW	2.7, SW	1.7, SW	3.9, SW	4.1, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Downwind
Intensity (0 – 6)	No Odour	2/3	2/3	No Odour	No Odour
Offensiveness (-4 to +4)	-	-3	-2	-	-
Nature of odour	-	Aeration (sweet)/Sewage (faecal)	Dusty/Petrol/Car exhausts	-	-
Potential Source	-	Gloucester STW	Adjacent Road (A430)	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	-	2 – 90 seconds 3 – 60 seconds	2 – 100 seconds 3 – 100 seconds	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)	-	Odour faded around halfway between location 7 and 4	Generally sheltered location due to existing hedgerows	-	-

Location Number/ Description	**11**	**12**	**13**	**14**	**15**
Time of 'Sniff Test'	1450	1455	1500	1510	1515
Weather conditions	Dry/Partly sunny	Dry/Partly sunny	Dry/Partly sunny	Dry/Partly sunny	Dry/Partly sunny
Wind Speed (m/s)/Direction	3.7, SW	28., SW	2.5, SW	4.1, SW	3.2, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Upwind
Intensity (0 – 6)	1/2	1/2/3	1/2/3	No Odour	No Odour
Offensiveness (-4 to +4)	-2	-2	-2	-	-
Nature of odour	Faecal	Aeration (sweet)/Sewage	Aeration (sweet)/Sewage	-	-
Potential Source	Gloucester STW	Gloucester STW	Gloucester STW	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	1 – 60 seconds 2 – 100 seconds	1 – 10 seconds 2 – 60 seconds 3 – 60 seconds	1 – 60 seconds 2 – 90 seconds 3 – 80 seconds	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)		Calm conditions during test.		-	-

Location Number/ Description	**16**	**17**	**18**	**19**	**20**
Time of 'Sniff Test'	1525	1530	1540	1550	1555
Weather conditions	Dry/Partly sunny	Dry/Partly sunny	Dry/Partly sunny	Dry/Partly sunny	Dry/Partly sunny
Wind Speed (m/s)/Direction	2.6, SW	3.6, SW	2.2, SW	3.2, SW	2.5, SW
Upwind/Downwind Location	Upwind	Downwind	Upwind	Downwind	Downwind
Intensity (0 – 6)	No Odour	No Odour	No Odour	No Odour	No Odour
Offensiveness (-4 to +4)	-	-	-	-	-
Nature of odour	-	-	-	-	-
Potential Source	-	-	-	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	-	-	-	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)	-	-	Some calm conditions	Some calm conditions	Some calm conditions

Location Number/ Description	**21**				
Time of 'Sniff Test'	1600				
Weather conditions	Dry/Partly sunny				
Wind Speed (m/s)/Direction	1.7, SW				
Upwind/Downwind Location	Upwind				
Intensity (0 – 6)	No Odour				
Offensiveness (-4 to +4)	-				
Nature of odour	-				
Potential Source	-				
Odour Duration (seconds) (5 mins = 300 seconds)	-				
Other comments/Rationale (record as much info as you can to aid write up in office)	Some calm conditions				

Job Number:	GM10710	**Site:**	Hempsted Lane, Gloucester	**Date:**	30/8/19
Start time:	08:15	**Finish Time:**	10:35	**Surveyor:**	Paul Threlfall
General Weather Conditions:	**Temperature: 18**°C **Cloud Cover:** 7/8		**Wind Direction: SW** **Wind Strength: Moderate**		

Comments (e.g. site operations, weather changes, general info etc): general pockets of agricultural background odour across majority of 1st field.

Local Ref. & Description	If first visit – it is useful to stop at site boundary/site entrance to determine the potential odour present. The assessment begins at an upwind location, moving closer to the source and into the downwind location. Record location numbers, mark on map and description of location.
Weather conditions	General description – dry, wet, humid, fog etc.
Temperature	Degrees C (estimate from Met Office or similar) otherwise, very warm, warm, cold, mild etc. Be wary of anemometer readings as they often record the surface temperature on the monitor which, if left in warm car or bag, can give misreading's.
Cloud Cover	Use a scale of 8 where 0 is clear sky and 8 is complete cloud cover. Can convert this number to a percentage.
Wind Strength	Use anemometer as priority, otherwise: Beaufort Scale: 8. Calm (smoke rises vertically) 9. Light Air (direction of wind shown by a smoke drift) 10. Light Breeze (Wind felt on face, leaves rustle) 11. Gentle Breeze (leaves and small twigs in constant movement 12. Moderate Breeze (approx. 5m/s, raises dust and loose paper, small branches move) 13. Fresh Breeze (small tree in leaf begin to sway, small branches move) 14. Strong Breeze (large branches in motion, umbrella used with difficulty) 15. Near Gale (whole trees in motion, inconvenience felt when walking against wind)
Wind Direction	N, NE, NEE etc.
Duration of Test	5 mins minimum. Record any odour detected walking between locations. Note this is standard so does not need to be written in notes.
Intensity	IAQM Guidance 0 to 6. 7. No odour 8. Slight/Very Weak – Potentially odour, may be doubt to whether odour is present 9. Slight/Weak – Odour is present but source/words to describe it are unknown 10. Distinct – Odour character/nature is barely recognisable 11. Strong – Odour character/nature easily recognisable 12. Very Strong – Odour is offensive. Exposure to this level is undesirable 13. Extremely Strong – Odour is offensive. Difficulty staying in locality and instinctive reaction to mitigate against further exposure.
Offensiveness	Use Hedonic Tone score: 2. -4 =extremely unpleasant, 0 = neither unpleasant or pleasant, +4 = extremely pleasant
Nature of Smell	What does it smell like. Use odour wheel where appropriate.

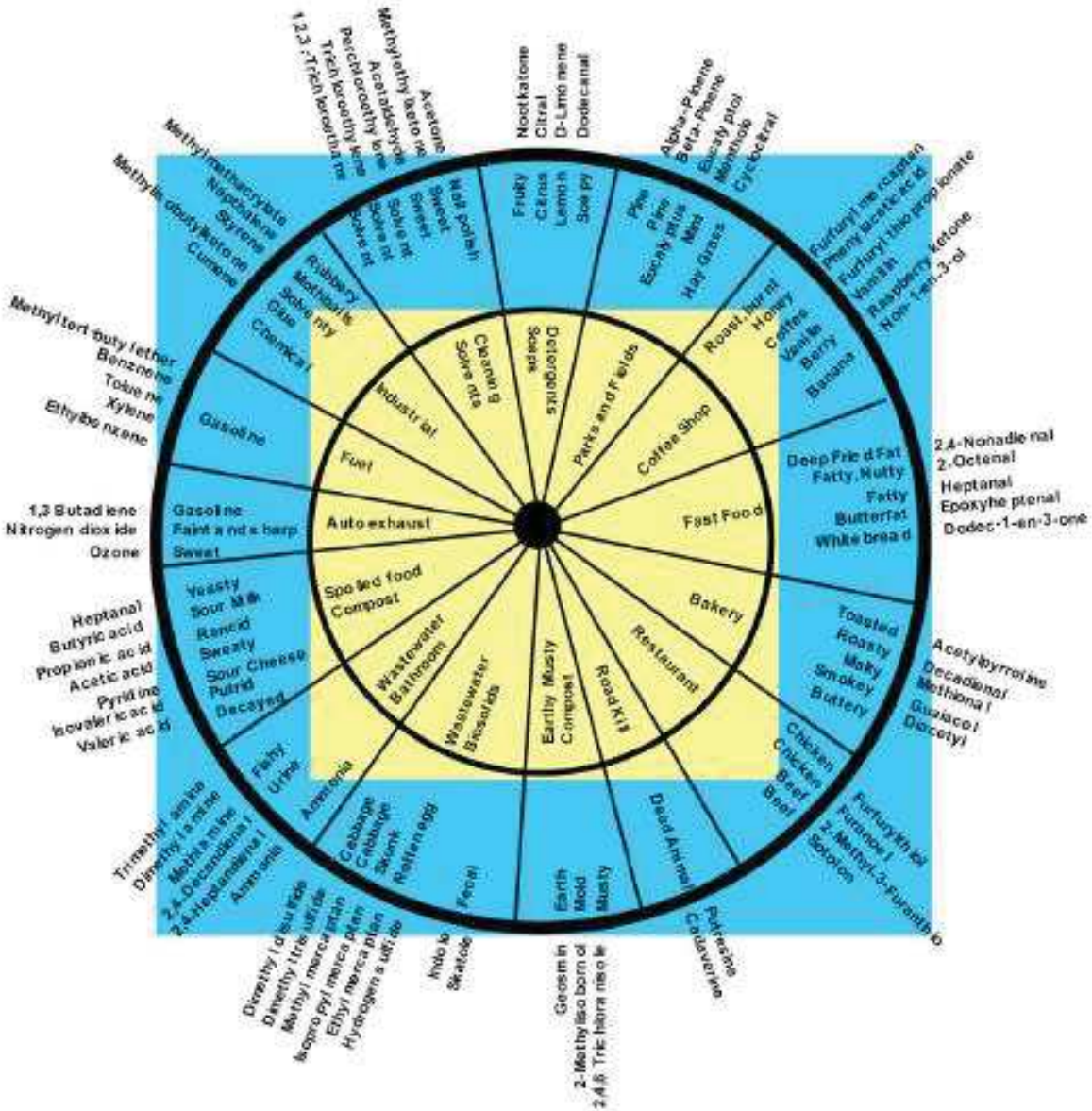
Potential Source	Odour is distinct enough to state a likely source e.g. landfill, sewage treatment works. To be stated when certain of the source (note Intensity 3 is distinct)
Odour Duration	Time 'sniffed' odour for e.g. 30 second 'wave' at intensity 4, 30 Sec @I.4

General Information

Hedonic Score Rating

Very Pleasant	+4
Pleasant	+3
Moderately Pleasant	+2
Mildly Pleasant	+1
Neutral Odour / No Odour	0
Mildly Unpleasant	-1
Moderately Unpleasant	-2
Unpleasant	-3
Very Unpleasant	-4

Odour Wheel



Location Number/ Description	**1**	**2**	**3**	**4**	**5**
Time of 'Sniff Test'	0815	0820	0825	0830	0840
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	1.7, SW	2.4, SW	2.0, SW	3.5, SW	3.1, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Downwind
Intensity (0 – 6)	1/2	1/2	1	No Odour	No Odour
Offensiveness (-4 to +4)	-1	-1	-1	-	-
Nature of odour	Agricultural/Animal	Agricultural/Animal	Agricultural/Animal	-	-
Potential Source	Surrounding fields	Surrounding fields	Surrounding fields	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	1 – 40 seconds 2 – 90 seconds	1 – 150 seconds 2 – 30 seconds	1 – 30 seconds	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)	1 intensity only slightly stronger than background odour. Not an STW odour.	1 intensity only slightly stronger than background odour.	1 intensity only slightly stronger than background odour.	-	-

Location Number/ Description	**6**	**7**	**8**	**9**	**10**
Time of 'Sniff Test'	0845	0900	0850	0910	0915
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	2.7, SW	3.2, SW	<1m/s, SW	4.2, SW	4.1, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Downwind
Intensity (0 – 6)	No Odour	1/3	No Odour	No Odour	No Odour
Offensiveness (-4 to +4)	-	-3	-	-	-
Nature of odour	-	Sludge/Sewage	-	-	-
Potential Source	-	Gloucester STW	-	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	-	1 – 90 seconds 3 – 30 seconds	-	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)	-	Came in short bursts. No odour during calmer conditions.	Often calm conditions	-	-

Location Number/ Description	**11**	**12**	**13**	**14**	**15**
Time of 'Sniff Test'	0920	0925	0930	0950	0955
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	2.9, SW	1.5, SW	2.2, SW	3.9, SW	4.0, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Upwind
Intensity (0 – 6)	1/2/3	2/3/4	1/2/3	No Odour	No Odour
Offensiveness (-4 to +4)	-2	-3	-2	-	-
Nature of odour	Aeration (sweet)/Sludge	Sludge/Aeration (sweet)	Aeration (sweet)/Sewage	-	-
Potential Source	Gloucester STW	Gloucester STW	Gloucester STW	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	1 – 90 seconds 2 – 60 seconds 3 – 30 seconds	2 – 70 seconds 3 – 90 seconds 4 – 10 seconds	1 – 90 seconds 2 – 90 seconds 3 – 60 seconds	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)	-	2 intensity more constant, 3 intensity came in waves. Could detect odour leading up to 12 from 11.	1 intensity tended to be more constant, 2 and 3 came in waves.	-	-

Location Number/ Description	**16**	**17**	**18**	**19**	**20**
Time of 'Sniff Test'	1000	1005	1010	1015	1025
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	3.2, SW	3.5, SW	2.8, SW	3.1, SW	1.3, SW
Upwind/Downwind Location	Upwind	Downwind	Upwind	Downwind	Downwind
Intensity (0 – 6)	No Odour	No Odour	No Odour	No Odour	1
Offensiveness (-4 to +4)	-	-	-	-	-2
Nature of odour	-	-	-	-	Aeration (sweet)/Sludge
Potential Source	-	-	-	-	Gloucester STW
Odour Duration (seconds) (5 mins = 300 seconds)	-	-	-	-	1 – 60 seconds
Other comments/Rationale (record as much info as you can to aid write up in office)	-	-	-	-	-

Location Number/ Description	**21**				
Time of 'Sniff Test'	1030				
Weather conditions	Dry/Cloudy				
Wind Speed (m/s)/Direction	1.7, SW				
Upwind/Downwind Location	Upwind				
Intensity (0 – 6)	No Odour				
Offensiveness (-4 to +4)	-				
Nature of odour	-				
Potential Source	-				
Odour Duration (seconds) (5 mins = 300 seconds)	-				
Other comments/Rationale (record as much info as you can to aid write up in office)	-				

Job Number:	GM10710	**Site:**	Hempsted Lane, Gloucester	**Date:**	06/09/19
Start time:	08:00	**Finish Time:**	10:15	**Surveyor:**	Rosie Pitt
General Weather Conditions:	**Temperature: 15**°C **Cloud Cover:** 8/8		**Wind Direction: SW** **Wind Strength: Moderate**		
Comments (e.g. site operations, weather changes, general info etc): general pockets of agricultural background odour across majority of 1st field.					

Local Ref. & Description	If first visit – it is useful to stop at site boundary/site entrance to determine the potential odour present. The assessment begins at an upwind location, moving closer to the source and into the downwind location. Record location numbers, mark on map and description of location.
Weather conditions	General description – dry, wet, humid, fog etc.
Temperature	Degrees C (estimate from Met Office or similar) otherwise, very warm, warm, cold, mild etc. Be wary of anemometer readings as they often record the surface temperature on the monitor which, if left in warm car or bag, can give misreading's.
Cloud Cover	Use a scale of 8 where 0 is clear sky and 8 is complete cloud cover. Can convert this number to a percentage.
Wind Strength	Use anemometer as priority, otherwise: Beaufort Scale: 16. Calm (smoke rises vertically) 17. Light Air (direction of wind shown by a smoke drift) 18. Light Breeze (Wind felt on face, leaves rustle) 19. Gentle Breeze (leaves and small twigs in constant movement 20. Moderate Breeze (approx. 5m/s, raises dust and loose paper, small branches move) 21. Fresh Breeze (small tree in leaf begin to sway, small branches move) 22. Strong Breeze (large branches in motion, umbrella used with difficulty) 23. Near Gale (whole trees in motion, inconvenience felt when walking against wind)
Wind Direction	N, NE, NEE etc.
Duration of Test	5 mins minimum. Record any odour detected walking between locations. Note this is standard so does not need to be written in notes.
Intensity	IAQM Guidance 0 to 6. 14. No odour 15. Slight/Very Weak – Potentially odour, may be doubt to whether odour is present 16. Slight/Weak – Odour is present but source/words to describe it are unknown 17. Distinct – Odour character/nature is barely recognisable 18. Strong – Odour character/nature easily recognisable 19. Very Strong – Odour is offensive. Exposure to this level is undesirable 20. Extremely Strong – Odour is offensive. Difficulty staying in locality and instinctive reaction to mitigate against further exposure.
Offensiveness	Use Hedonic Tone score: 3. -4 =extremely unpleasant, 0 = neither unpleasant or pleasant, +4 = extremely pleasant
Nature of Smell	What does it smell like. Use odour wheel where appropriate.

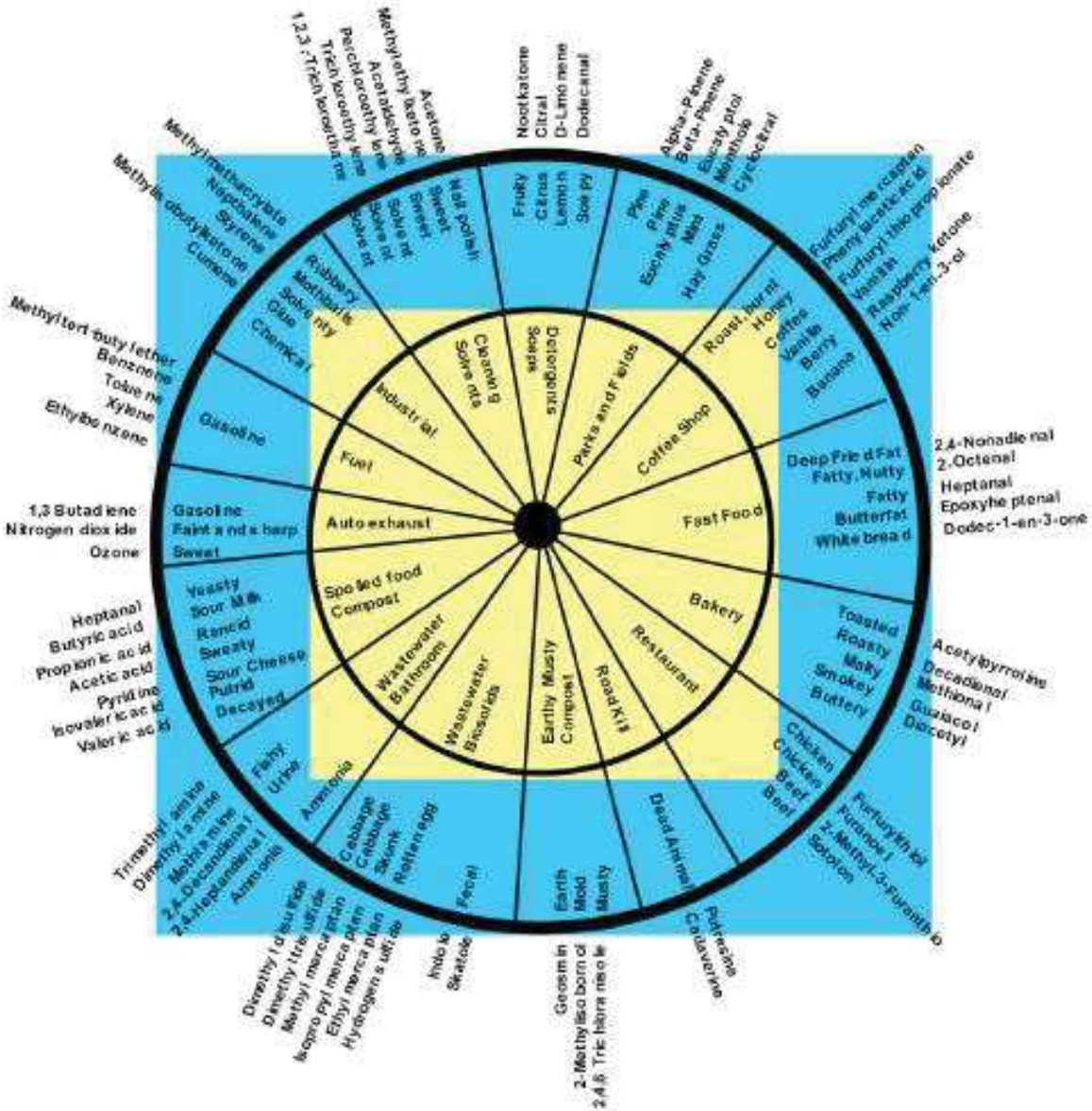
Potential Source	Odour is distinct enough to state a likely source e.g. landfill, sewage treatment works. To be stated when certain of the source (note Intensity 3 is distinct)
Odour Duration	Time 'sniffed' odour for e.g. 30 second 'wave' at intensity 4, 30 Sec @I.4

General Information

Hedonic Score Rating

Very Pleasant	+4
Pleasant	+3
Moderately Pleasant	+2
Mildly Pleasant	+1
Neutral Odour / No Odour	0
Mildly Unpleasant	-1
Moderately Unpleasant	-2
Unpleasant	-3
Very Unpleasant	-4

Odour Wheel



Location Number/ Description	**1**	**2**	**3**	**4**	**5**
Time of 'Sniff Test'	0800	0806	0811	0816	0822
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	2.0, SW	3.8, SW	4.1, SW	3.5, SW	4.0, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Downwind
Intensity (0 – 6)	No odour	1/2	1/2	1	1/2
Offensiveness (-4 to +4)	-	-1	-1	-1	-1
Nature of odour	-	Sewage	Sewage	Sewage	Sewage
Potential Source	-	Gloucester STW	Gloucester STW	Gloucester STW	Gloucester STW
Odour Duration (seconds) (5 mins = 300 seconds)	-	1 – 120 seconds 2 – 30 seconds	1 – 30 seconds 2 – 60 seconds	1 – 30 seconds	1 – 30 seconds 2 – 30 seconds
Other comments/Rationale (record as much info as you can to aid write up in office)	-	-	-	-	-

Location Number/ Description	**6**	**7**	**8**	**9**	**10**
Time of 'Sniff Test'	0827	0832	0837	0845	0850
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	2.1, SW	3.2, SW	3.5, SW	4.2, SW	4.1, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Downwind
Intensity (0 – 6)	No Odour	No odour	No Odour	No Odour	1
Offensiveness (-4 to +4)	-	-	-	-	-1
Nature of odour	-	-	-	-	Sewage
Potential Source	-	-	-	-	Gloucester STW
Odour Duration (seconds) (5 mins = 300 seconds)	-	-	-	-	1 – 45 seconds
Other comments/Rationale (record as much info as you can to aid write up in office)	-	-	-	-	-

Location Number/ Description	**11**	**12**	**13**	**14**	**15**
Time of 'Sniff Test'	0855	0900	0905	0915	0920
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	3.0, SW	2.5, SW	3.1, SW	3.7, SW	4.1, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Upwind
Intensity (0 – 6)	1/2/3	1/2/3	No odour	No Odour	No Odour
Offensiveness (-4 to +4)	-2	-3	-	-	-
Nature of odour	Sewage	Sludge/Aeration (sweet)	-	-	-
Potential Source	Gloucester STW	Gloucester STW	-	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	1 – 80 seconds 2 – 40 seconds 3 – 15 seconds	1 – 45 seconds 2 – 80 seconds 3 – 60 seconds	-	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)	-	Could detect odour leading up to 12 from 11.	-	-	-

Location Number/ Description	**16**	**17**	**18**	**19**	**20**
Time of 'Sniff Test'	0925	0930	0935	0940	0945
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	3.6, SW	3.4, SW	3.2, SW	3.3, SW	2.9, SW
Upwind/Downwind Location	Upwind	Downwind	Upwind	Downwind	Downwind
Intensity (0 – 6)	No Odour	No Odour	No Odour	No Odour	No odour
Offensiveness (-4 to +4)	-	-	-	-	-
Nature of odour	-	-	-	-	-
Potential Source	-	-	-	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	-	-	-	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)	-	-	-	-	-

Location Number/ Description	**21**				
Time of 'Sniff Test'	0950				
Weather conditions	Dry/Cloudy				
Wind Speed (m/s)/Direction	3.1, SW				
Upwind/Downwind Location	Upwind				
Intensity (0 – 6)	No Odour				
Offensiveness (-4 to +4)	-				
Nature of odour	-				
Potential Source	-				
Odour Duration (seconds) (5 mins = 300 seconds)	-				
Other comments/Rationale (record as much info as you can to aid write up in office)	-				

Job Number:	GM10710	**Site:**	Hempsted Lane, Gloucester	**Date:**	12/09/19
Start time:	1900	**Finish Time:**	2130	**Surveyor:**	Rosie Pitt
General Weather Conditions:	**Temperature: 11**°C **Cloud Cover:** 8/8		**Wind Direction: SW** **Wind Strength: Moderate**		

Comments (e.g. site operations, weather changes, general info etc):

Local Ref. & Description	If first visit – it is useful to stop at site boundary/site entrance to determine the potential odour present. The assessment begins at an upwind location, moving closer to the source and into the downwind location. Record location numbers, mark on map and description of location.
Weather conditions	General description – dry, wet, humid, fog etc.
Temperature	Degrees C (estimate from Met Office or similar) otherwise, very warm, warm, cold, mild etc. Be wary of anemometer readings as they often record the surface temperature on the monitor which, if left in warm car or bag, can give misreading's.
Cloud Cover	Use a scale of 8 where 0 is clear sky and 8 is complete cloud cover. Can convert this number to a percentage.
Wind Strength	Use anemometer as priority, otherwise: Beaufort Scale: 24. Calm (smoke rises vertically) 25. Light Air (direction of wind shown by a smoke drift) 26. Light Breeze (Wind felt on face, leaves rustle) 27. Gentle Breeze (leaves and small twigs in constant movement 28. Moderate Breeze (approx. 5m/s, raises dust and loose paper, small branches move) 29. Fresh Breeze (small tree in leaf begin to sway, small branches move) 30. Strong Breeze (large branches in motion, umbrella used with difficulty) 31. Near Gale (whole trees in motion, inconvenience felt when walking against wind)
Wind Direction	N, NE, NEE etc.
Duration of Test	5 mins minimum. Record any odour detected walking between locations. Note this is standard so does not need to be written in notes.
Intensity	IAQM Guidance 0 to 6. 21. No odour 22. Slight/Very Weak – Potentially odour, may be doubt to whether odour is present 23. Slight/Weak – Odour is present but source/words to describe it are unknown 24. Distinct – Odour character/nature is barely recognisable 25. Strong – Odour character/nature easily recognisable 26. Very Strong – Odour is offensive. Exposure to this level is undesirable 27. Extremely Strong – Odour is offensive. Difficulty staying in locality and instinctive reaction to mitigate against further exposure.
Offensiveness	Use Hedonic Tone score: 4. -4 =extremely unpleasant, 0 = neither unpleasant or pleasant, +4 = extremely pleasant
Nature of Smell	What does it smell like. Use odour wheel where appropriate.

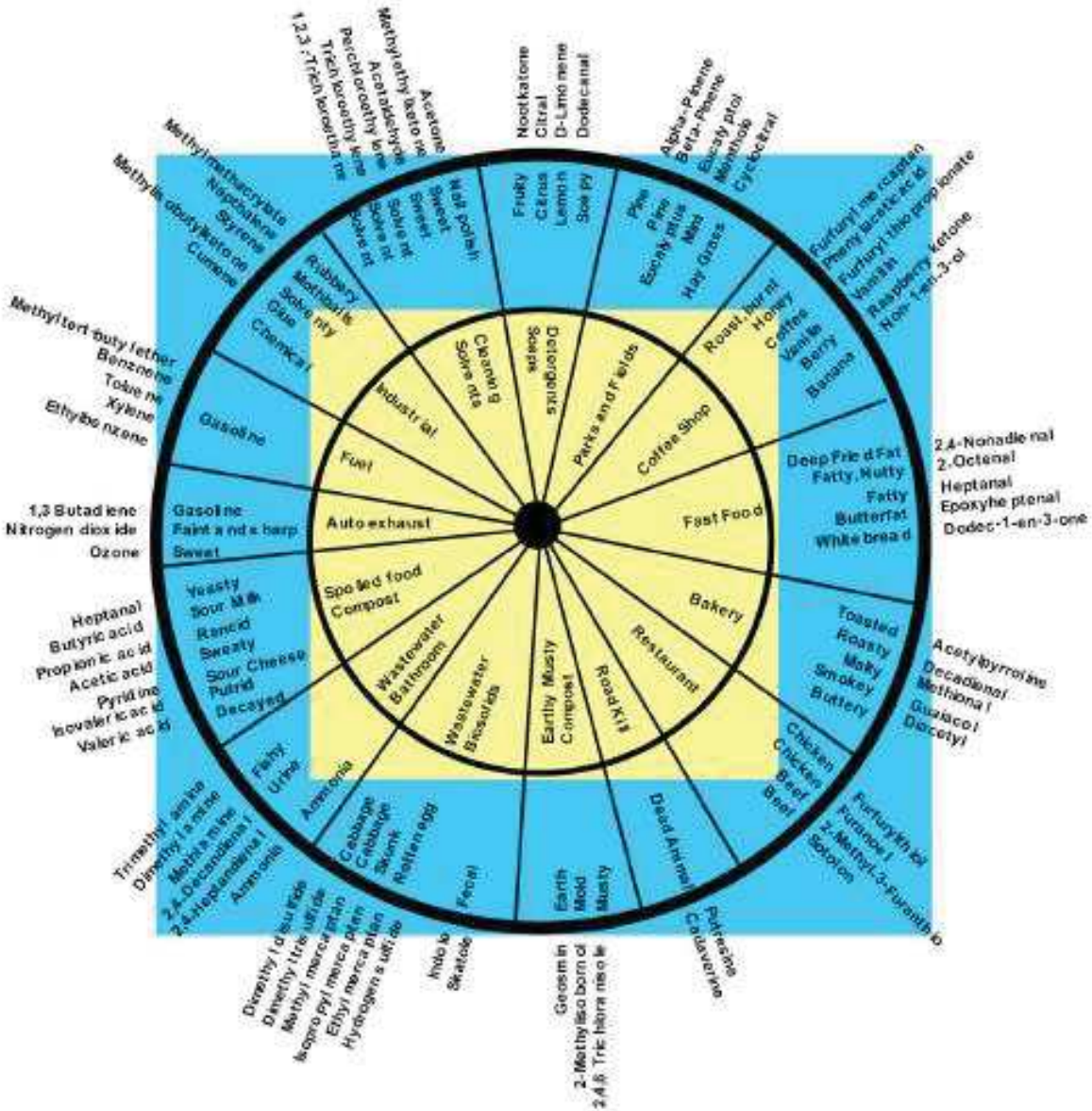
Potential Source	Odour is distinct enough to state a likely source e.g. landfill, sewage treatment works. To be stated when certain of the source (note Intensity 3 is distinct)
Odour Duration	Time 'sniffed' odour for e.g. 30 second 'wave' at intensity 4, 30 Sec @I.4

General Information

Hedonic Score Rating

Very Pleasant	+4
Pleasant	+3
Moderately Pleasant	+2
Mildly Pleasant	+1
Neutral Odour / No Odour	0
Mildly Unpleasant	-1
Moderately Unpleasant	-2
Unpleasant	-3
Very Unpleasant	-4

Odour Wheel



Location Number/ Description	**1**	**2**	**3**	**4**	**5**
Time of 'Sniff Test'	1900	1905	1910	1915	1920
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	2.8, SW	2.8, SW	3.2, SW	3.0, SW	2.9, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Downwind
Intensity (0 – 6)	No odour	1/2	1/2	1/2	No odour
Offensiveness (-4 to +4)	-	-1	-1	-1	-
Nature of odour	-	Sewage	Sewage	Sewage	-
Potential Source	-	Gloucester STW	Gloucester STW	Gloucester STW	-
Odour Duration (seconds) (5 mins = 300 seconds)	-	1 – 100 seconds 2 – 40 seconds	1 – 40 seconds 2 – 60 seconds	1 – 40 seconds 2 – 60 seconds	-
Other comments/Rationale (record as much info as you can to aid write up in office)	-	-	-	-	-

Location Number/ Description	**6**	**7**	**8**	**9**	**10**
Time of 'Sniff Test'	1925	1930	1935	1945	1950
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	2.4, SW	2.2, SW	1.7, SW	3.9, SW	3.7, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Downwind
Intensity (0 – 6)	No Odour	No odour	No Odour	1/2	1/2
Offensiveness (-4 to +4)	-	-	-	-1	-1
Nature of odour	-	-	-	Sewage	Sewage
Potential Source	-	-	-	Gloucester STW	Gloucester STW
Odour Duration (seconds) (5 mins = 300 seconds)	-	-	-	1 – 45 seconds 2 – 45 seconds	1 – 50 seconds 2 – 35 seconds
Other comments/Rationale (record as much info as you can to aid write up in office)	-	-	-	-	-

Location Number/ Description	**11**	**12**	**13**	**14**	**15**
Time of 'Sniff Test'	1955	2000	2005	2010	2015
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	3.1, SW	2.6, SW	3.0, SW	3.8, SW	3.7, SW
Upwind/Downwind Location	Downwind	Downwind	Downwind	Downwind	Upwind
Intensity (0 – 6)	No odour	No odour	No odour	1/2	1/2
Offensiveness (-4 to +4)	-	-	-	-1	-1
Nature of odour	-	-	-	Sewage	Sewage
Potential Source	-	-	-	Gloucester STW	Gloucester STW
Odour Duration (seconds) (5 mins = 300 seconds)	-	-	-	1 – 85 seconds 2 – 60 seconds	1 – 70 seconds 2 – 60 seconds
Other comments/Rationale (record as much info as you can to aid write up in office)	-	-	-	-	-

Location Number/ Description	**16**	**17**	**18**	**19**	**20**
Time of 'Sniff Test'	2020	2025	2030	2035	2040
Weather conditions	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy	Dry/Cloudy
Wind Speed (m/s)/Direction	3.4, SW	3.3, SW	3.0, SW	3.4, SW	3.0, SW
Upwind/Downwind Location	Upwind	Downwind	Upwind	Downwind	Downwind
Intensity (0 – 6)	1/2	1/2	No Odour	No Odour	No odour
Offensiveness (-4 to +4)	-1	-1	-	-	-
Nature of odour	Sewage	Sewage	-	-	-
Potential Source	Gloucester STW	Gloucester STW	-	-	-
Odour Duration (seconds) (5 mins = 300 seconds)	1 – 45 seconds 2 – 65 seconds	1 – 45 seconds 2 – 60 seconds	-	-	-
Other comments/Rationale (record as much info as you can to aid write up in office)	-	-	-	-	-

Location Number/ Description	**21**				
Time of 'Sniff Test'	2045				
Weather conditions	Dry/Cloudy				
Wind Speed (m/s)/Direction	3.2, SW				
Upwind/Downwind Location	Upwind				
Intensity (0 – 6)	No Odour				
Offensiveness (-4 to +4)	-				
Nature of odour	-				
Potential Source	-				
Odour Duration (seconds) (5 mins = 300 seconds)	-				
Other comments/Rationale (record as much info as you can to aid write up in office)	-				

1 SITE VISIT 1 (29TH AUGUST 2019)

1.1 Site Visit 1 was undertaken on 29th August 2019 from approximately 13:45 to 16:05 hours during a Thursday afternoon.

1.2 Meteorological conditions at the time of the visit were as follows:

- Temperature: 21-22°c;
- Atmosphere: Dry/Partly Cloudy;
- Wind direction: SW/SSW
- Wind strength: Moderate.

1.3 Twenty-one monitoring locations were selected within the development site. These are shown on Drawing GM10710-020. The weather conditions experienced during the sniff tests were conducive to odour generation and propagation with no strong air movement to dilute and disperse odour.

Monitoring Location 1- Downwind of the STW

1.4 This location was monitored for five minutes at 13:45.

1.5 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 1 'slight/very weak'. The odour detected was 'Agricultural/Animal' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at this intensity for a total duration of 200 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

1.6 It was noted by the assessor that the odour detected did not relate to odour from the Netheridge STW and instead was believed to originate from the surrounding agricultural fields.

1.7 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 2: Downwind of the STW

1.8 This location was monitored for five minutes at 13:50.

1.9 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 1 'slight/very weak'. The odour detected was 'Faecal' in nature, with the offensiveness scored at -1 on the hedonic

tone scale. The odour was detected intermittently at this intensity for a total duration of 30 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

1.10 The average odour intensity is calculated to be 0 'not perceptible', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 3 – 6: Downwind of the STW

1.11 These locations were monitored for five minutes each between 13:55 and 14:15.

1.12 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

Monitoring Location 7: Downwind of the STW

1.13 This location was monitored for five minutes at 14:20.

1.14 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 3 'distinct'. The odour detected was 'Aeration (sweet)/Sewage (faecal)' in nature, with the offensiveness scored at -3 on the hedonic tone scale. The odour was detected intermittently at intensity 2 'slight/weak' for a total duration of 90 seconds and at intensity 3 'distinct' for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

1.15 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 8: Downwind of the STW

1.16 This location was monitored for five minutes at 14:30.

1.17 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 3 'distinct'. The odour detected was 'Dusty/Petrol/Exhaust' in nature, with the offensiveness scored at -2 on the hedonic tone scale. The odour was detected intermittently at intensity 2 'slight/weak' for a total duration of 100 seconds and at intensity 3 'distinct' for a total of 100 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

1.18 It was noted by the assessor that the odour was not related to the STW and instead was originating from the nearby adjacent road (A430).

1.18.1 The average odour intensity is calculated to be 2 ‘slight/weak’, and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a small overall odour exposure with reference to Table 15 of the IAQM guidance and a **slight adverse** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 9 – 10: Downwind of the STW

1.19 These locations were monitored for five minutes each between 14:40 and 14:45.

1.20 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

Monitoring Location 11: Downwind of the STW

1.20.1 This location was monitored for five minutes at 14:50.

1.20.2 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 ‘slight/weak’. The odour detected was ‘Faecal’ in nature, with the offensiveness scored at -2 on the hedonic tone scale. The odour was detected intermittently at intensity 1 ‘slight/very weak’ for a total of 60 seconds and at intensity 2 ‘slight/weak’ for a total duration of 100 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

1.20.3 The average odour intensity is calculated to be 1 ‘slight/very weak’, and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 12: Downwind of the STW

1.20.4 This location was monitored for five minutes at 14:55.

1.20.5 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 3 ‘distinct’. The odour detected was ‘Aeration (sweet)/Sewage’ in nature, with the offensiveness scored at -2 on the hedonic tone scale. The odour was detected intermittently at intensity 1 ‘slight/very weak’ for a total of 10 seconds, at intensity 2 ‘slight/weak’ for a total duration of 60 seconds and at intensity 3 ‘distinct’ for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

1.21 The average odour intensity is calculated to be 1 ‘slight/very weak’, and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 13: Downwind of the STW

1.22 This location was monitored for five minutes at 15:00.

1.23 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 3 ‘distinct’. The odour detected was ‘Aeration (sweet)/Sewage’ in nature, with the offensiveness scored at -2 on the hedonic tone scale. The odour was detected intermittently at intensity 1 ‘slight/very weak’ for a total of 60 seconds, at intensity 2 ‘slight/weak’ for a total duration of 90 seconds and at intensity 3 ‘distinct’ for a total of 80 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

1.24 The average odour intensity is calculated to be 2 ‘slight/weak’, and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a small overall odour exposure with reference to Table 15 of the IAQM guidance and a **slight adverse** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 14 – 21: Downwind of the STW

1.25 These locations were monitored for five minutes each between 15:10 and 16:00.

1.26 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

2 SITE VISIT 2 (30TH AUGUST 2019)

2.1 Site Visit 2 was undertaken on 30th August 2019 from approximately 08:15 to 10:35 hours during a Friday morning.

2.2 Meteorological conditions at the time of the visits were as follows:

- Temperature: 18°c;
- Atmosphere: Dry/Partly Cloudy;
- Wind direction: SW;
- Wind strength: Moderate

2.3 Twenty-one monitoring locations were selected within the development site. These are shown on Drawing GM10710-020. The weather conditions experienced during the

sniff tests were conducive to odour generation and propagation with no strong air movement to dilute and disperse odour.

Monitoring Location 1- Downwind of the STW

2.4 This location was monitored for five minutes at 08:15.

2.5 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Agricultural/Animal' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 40 seconds and at intensity 2 'slight/weak' for a total of 90 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

2.6 It was noted by the assessor that the odour detected did not relate to odour from the Netheridge STW and instead was believed to originate from the surrounding agricultural fields.

2.7 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 2: Downwind of the STW

2.8 This location was monitored for five minutes at 08:20.

2.9 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Agricultural/Animal' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 150 seconds and at intensity 2 'slight/weak' for a total of 30 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

2.10 It was noted by the assessor that the odour detected did not relate to odour from the Netheridge STW and instead was believed to originate from the surrounding agricultural fields.

2.11 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a

negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 3: Downwind of the STW

2.12 This location was monitored for five minutes at 08:25.

2.13 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 1 'slight/very weak'. The odour detected was 'Agricultural/Animal' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at this intensity for a total duration of 30 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

2.14 It was noted by the assessor that the odour detected did not relate to odour from the Netheridge STW and instead was believed to originate from the surrounding agricultural fields.

2.15 The average odour intensity is calculated to be 0 'not perceptible', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 4 – 6: Downwind of the STW

2.16 These locations were monitored for five minutes each between 08:30 and 08:50.

2.17 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be negligible.

Monitoring Location 7: Downwind of the STW

2.18 This location was monitored for five minutes at 09:00.

2.19 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 3 'distinct'. The odour detected was 'Sludge/Sewage)' in nature, with the offensiveness scored at -3 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 90 seconds and at intensity 3 'distinct' for a total of 30 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

2.20 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a

negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 8 – 10: Downwind of the STW

2.21 These locations were monitored for five minutes each between 08:50 and 09:15.

2.22 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

Monitoring Location 11: Downwind of the STW

2.23 This location was monitored for five minutes at 09:20.

2.24 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 3 'distinct'. The odour detected was 'Aeration (sweet)/Sludge' in nature, with the offensiveness scored at -2 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total of 90 seconds, at intensity 2 'slight/weak' for a total duration of 60 seconds, and at intensity 3 'distinct' for a total of 30 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

2.25 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 12: Downwind of the STW

2.26 This location was monitored for five minutes at 09:25.

2.27 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 4 'strong'. The odour detected was 'Sludge/Aeration (sweet)' in nature, with the offensiveness scored at -3 on the hedonic tone scale. The odour was detected intermittently at intensity 2 'slight/weak' for a total duration of 70 seconds, at intensity 3 'distinct' for a total of 90 seconds, and at intensity 4 'strong' for a total of 10 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

2.28 The average odour intensity is calculated to be 2 'slight/weak', and in combination with the calculated odour pervasiveness/extent of 3.33% corresponds to a small overall odour exposure with reference to Table 15 of the IAQM guidance and a **slight adverse** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 13: Downwind of the STW

2.29 This location was monitored for five minutes at 09:30.

2.30 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 3 'distinct'. The odour detected was 'Aeration (sweet)/Sewage' in nature, with the offensiveness scored at -2 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total of 90 seconds, at intensity 2 'slight/weak' for a total duration of 90 seconds and at intensity 3 'distinct' for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

2.31 The average odour intensity is calculated to be 2 'slight/weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a small overall odour exposure with reference to Table 15 of the IAQM guidance and a **slight adverse** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 14 – 19: Downwind of the STW

2.32 These locations were monitored for five minutes each between 09:50 and 10:20.

2.33 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

Monitoring Location 20: Downwind of the STW

This location was monitored for five minutes at 10:25.

2.34 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 1 'slight/very weak'. The odour detected was 'Aeration (sweet)/Sewage' in nature, with the offensiveness scored at -2 on the hedonic tone scale. The odour was detected intermittently at this intensity for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

2.35 The average odour intensity is calculated to be 0 'not perceptible', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 21: Downwind of the STW

2.36 This location was monitored for five minutes at 10:30.

2.37 No odour was detected during the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

3 SITE VISIT 3 (6TH SEPTEMBER 2019)

3.1 Site Visit 3 was undertaken on 6th September 2019 from approximately 08:00 to 09:50 hours during a Friday morning.

3.2 Meteorological conditions at the time of the visits were as follows:

- Temperature: 15°c;
- Atmosphere: Dry/Cloudy;
- Wind direction: SW;
- Wind strength: Moderate

3.2.1 Twenty-one monitoring locations were selected within the development site. These are shown on Drawing GM10710-020. The weather conditions experienced during the sniff tests were conducive to odour generation and propagation with no strong air movement to dilute and disperse odour.

Monitoring Locations 1: Downwind of the STW

3.3 This location was monitored for five minutes at 08:00.

3.4 No odour was detected during the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

Monitoring Location 2: Downwind of the STW

3.5 This location was monitored for five minutes at 08:06.

3.6 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 120 seconds, and at intensity 2 'slight/weak' for a total of 30 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

3.7 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 3: Downwind of the STW

3.8 This location was monitored for five minutes at 08:11.

3.9 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 30 seconds, and at intensity 2 'slight/weak' for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

3.10 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 4: Downwind of the STW

3.11 This location was monitored for five minutes at 08:16.

3.12 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 1 'slight/very weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at this intensity for a total duration of 30 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

3.13 The average odour intensity is calculated to be 0 'not perceptible', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 5: Downwind of the STW

3.14 This location was monitored for five minutes at 08:22.

3.15 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 30 seconds, and at intensity 2 'slight/weak' for a total of 30 seconds

within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

3.16 The average odour intensity is calculated to be 0 'not perceptible', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 6 – 9: Downwind of the STW

3.17 These locations were monitored for five minutes each between 08:27 and 08:42.

3.18 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

Monitoring Location 10: Downwind of the STW

3.19 This location was monitored for five minutes at 08:50.

3.20 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 1 'slight/very weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at this intensity for a total duration of 45 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

3.21 The average odour intensity is calculated to be 0 'not perceptible', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 11: Downwind of the STW

3.22 This location was monitored for five minutes at 08:55.

3.23 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 3 'distinct'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -2 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total of 80 seconds, at intensity 2 'slight/weak' for a total of 40 seconds, and at intensity 3 'distinct' for a total of 15 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

3.24 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a

negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 12: Downwind of the STW

3.25 This location was monitored for five minutes at 09:00.

3.26 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 3 'distinct'. The odour detected was 'Sludge/Aeration (sweet)' in nature, with the offensiveness scored at -3 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total of 45 seconds, at intensity 2 'slight/weak' for a total of 80 seconds, and at intensity 3 'distinct' for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

3.27 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 13 – 21: Downwind of the STW

3.28 These locations were monitored for five minutes each between 09:05 and 09:50.

3.29 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

4 SITE VISIT 4 (12TH SEPTEMBER 2019)

4.1 Site Visit 4 was undertaken on 12th September 2019 from approximately 19:00 to 21:30 hours during a Thursday evening.

4.2 Meteorological conditions at the time of the visits were as follows:

- Temperature: 11°c;
- Atmosphere: Dry/Cloudy;
- Wind direction: SW;
- Wind strength: Moderate

4.3 Twenty-one monitoring locations were selected within the development site. These are shown on drawing GM10710-020. The weather conditions experienced during the sniff tests were conducive to odour generation and propagation with no strong air movement to dilute and disperse odour.

Monitoring Locations 1: Downwind of the STW

4.4 This location was monitored for five minutes at 19:00.

4.5 No odour was detected during the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

Monitoring Location 2: Downwind of the STW

4.6 This location was monitored for five minutes at 19:05.

4.7 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 100 seconds, and at intensity 2 'slight/weak' for a total of 40 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

4.8 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 3: Downwind of the STW

4.9 This location was monitored for five minutes at 19:10.

4.10 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 40 seconds, and at intensity 2 'slight/weak' for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

4.11 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 4: Downwind of the STW

4.12 This location was monitored for five minutes at 19:15.

4.13 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 40 seconds, and at intensity 2 'slight/weak' for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

4.14 The average odour intensity is calculated to be 1 'slight/very weak', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 5 – 8: Downwind of the STW

4.15 These locations were monitored for five minutes each between 19:20 and 19:40.

4.16 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

Monitoring Location 9: Downwind of the STW

4.17 This location was monitored for five minutes at 19:45.

4.18 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 'slight/very weak' for a total duration of 45 seconds, and at intensity 2 'slight/weak' for a total of 45 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

4.19 The average odour intensity is calculated to be 0 'not perceptible', and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High

Monitoring Location 10: Downwind of the STW

4.20 This location was monitored for five minutes at 19:50.

4.21 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 'slight/weak'. The odour detected was 'Sewage' in nature, with the offensiveness scored at -1 on the hedonic

tone scale. The odour was detected intermittently at intensity 1 ‘slight/very weak’ for a total duration of 50 seconds, and at intensity 2 ‘slight/weak’ for a total of 35 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

4.22 The average odour intensity is calculated to be 0 ‘not perceptible’, and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 11 – 13: Downwind of the STW

4.23 These locations were monitored for five minutes each between 19:55 and 20:10.

4.24 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

Monitoring Location 14: Downwind of the STW

4.25 This location was monitored for five minutes at 20:10.

4.26 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 ‘slight/weak’. The odour detected was ‘Sewage’ in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 ‘slight/very weak’ for a total duration of 85 seconds, and at intensity 2 ‘slight/weak’ for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

4.27 The average odour intensity is calculated to be 1 ‘slight/very weak’, and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 15: Downwind of the STW

4.28 This location was monitored for five minutes at 20:15.

4.29 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 ‘slight/weak’. The odour detected was ‘Sewage’ in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 ‘slight/very weak’ for a total duration of 70 seconds, and at intensity 2 ‘slight/weak’ for a total of 60 seconds

within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

4.30 The average odour intensity is calculated to be 1 ‘slight/very weak’, and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 16: Downwind of the STW

4.31 This location was monitored for five minutes at 20:20.

4.32 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 ‘slight/weak’. The odour detected was ‘Sewage’ in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 ‘slight/very weak’ for a total duration of 45 seconds, and at intensity 2 ‘slight/weak’ for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

4.33 The average odour intensity is calculated to be 1 ‘slight/very weak’, and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Location 17: Downwind of the STW

4.34 This location was monitored for five minutes at 20:25.

4.35 Odour was detected during the 5-minute survey period. The maximum odour intensity during the 5-minute observation period was scored at 2 ‘slight/weak’. The odour detected was ‘Sewage’ in nature, with the offensiveness scored at -1 on the hedonic tone scale. The odour was detected intermittently at intensity 1 ‘slight/very weak’ for a total duration of 45 seconds, and at intensity 2 ‘slight/weak’ for a total of 60 seconds within the 5-minute observation period. No odour was detected during the remainder of the 5-minute observation period.

4.36 The average odour intensity is calculated to be 1 ‘slight/very weak’, and in combination with the calculated odour pervasiveness/extent of 0% corresponds to a negligible overall odour exposure with reference to Table 15 of the IAQM guidance and a **negligible** odour effect when taking into account a receptor sensitivity of High.

Monitoring Locations 18 – 21: Downwind of the STW

4.37 These locations were monitored for five minutes each between 20:30 and 20:50.

4.38 No odour was detected during any of the 5-minute survey periods. As the odour was not perceptible, the odour effect is therefore deemed to be **negligible**.

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Appendix C
BLBB Consulting Limited Response for Gladman Developments Limited

Response for Gladman Developments Limited prepared by BLBB Consulting to Policy C6 Cordon Sanitaire as detailed in the Pre-Submission Gloucester City Plan 2011 - 2031 Regulation 19 of the Town and Country Planning (Local Planning) (England) Regulations 2012

September 2019

Policy C6:
Cordon sanitaire Development likely to be adversely affected by smell from Netheridge Sewage Works, within the Cordon Sanitaire defined on the policies map, will not be permitted.

3.3.31 "Severn Trent Water PLC (Severn Trent) is responsible for sewerage and sewage disposal. They operate Netheridge Sewage Treatment Works (NSTW) south of Hempsted, a facility that processes a significant amount of waste from Gloucester City and beyond. The fields adjoining Netheridge are used for sludge disposal that, in addition to the works itself, create unavoidable smell problems within the area. In order to reasonably prevent development that would be adversely affected by smell, a cordon sanitaire area is shown on the proposals map within which development will not be permitted."

Notes relating to 3.3.31 Above:

We believe that the comments made above stating that "the fields adjoining Netheridge are used for sludge disposal" are out of date and relate to an approach that may have been in operation many years ago. We believe that Severn Trent Water no longer uses the adjacent fields for sludge disposal and certainly not for liquid sludge disposal as it may have done in the past. The processes used on site currently include a dewatering facility where liquid digested sludge is processed to create a sludge cake that is stored on concrete storage pads prior to it being removed for recycling on to third party farmland well away from the works.
Our understanding is that liquid sludge has not and would not be disposed of onto the adjoining land as described above. Stringent controls and limits are imposed by the Environment Agency. Our understanding is that STW complies fully with these requirements. Recycling sludge back to land is highly regulated and the adjoining land could not be used for sludge recycling on a regular basis.
The Cordon Sanitaire proposed appears to be disproportionately large for a works like Netheridge. Most water companies use a risk-based methodology based on works size and complexity. However, the maximum expected size is up to around 500 meters from the works boundary. The area being described by this cordon sanitaire is up to 1000 meters from the works boundary and is unusually large. We believe that the data being used to calculate the Cordon Sanitaire boundary is based on a very old data set from 2008 and does not represent the current position at the works.
We are surprised that the LPA are simply prepared to accept what appears to be a very high level of odour emissions from the Netheridge. More discussion is required with STW to establish why the level of odour produced at the works is much greater than current best practice guidelines would deem acceptable for a works of this size and complexity. It seems odd that the LPA appear to accept that the works will create "unavoidable smell problems" but have not discussed what Odour Management Plans are in place at the works to minimise the odour and level of nuisance created by the works and thus minimise the amount of land required to be included within the Cordon Sanitaire.

3.3.32 “To support this policy, an assessment of odour nuisance arising from NSTW has been undertaken and has informed the boundary on the policies map. The study is informed by a review of odour complains, odour surveys, a detailed dispersion model assessment and a review of a previous model assessment. Severn Trent were engaged in the review process in order to understand currently and future operations, including plans for any proposed future infrastructure improvements to accommodate additional waste and/or to reduce the impact of odour on the surrounding area. It categorises likely odour nuisance on the basis of odour contours from the sewage works.”

We have some significant concerns about the report that has been produced for the LPA by Phlorum. Most notably the use of a data set from 2008. The data being used is not representative of the current situation at Netheridge and there have been significant changes in the process plant used at the works since 2008, which means that the odour levels currently produced at the works are likely to be very different to the situation prevailing in 2008.
The Phlorum report in paragraph 4.78 states that there have been no major changes to the works in the past 10 years and concludes that the reports and their results should be comparable. We understand that a major improvement scheme took place in 2016 which refurbished the sludge handling and storage equipment. Since 2008 the operation of the primary sedimentation tanks desludging has been improved considerably and these tanks are regularly desludged and fresh thin sludge is thickened using mechanical sludge thickening equipment. Liquid digested sludge is now dewatered using centrifuges and is stored on concrete sludge storage pads. Since the changes that have taken place involve the PST’s and the sludge route it is inevitable that the nature and level of odours produced at the works with be significantly different than those produced in 2008 when the previous data set was produced.

3.3.33 “The extent of the cordon sanitaire has been drawn on the basis the area most likely to be affected by odour nuisance, within the 3 – 5 odour contour area. This boundary does not represent the absolute limit of the area where smells can be detected but is drawn so as not unreasonably to constrain development in the existing built-up area.”

The way the boundary is drawn does indeed constrain a large area of land due to the very large distance that the Cordon Sanitaire runs to the north of the works. The data used indicates a very high concentration of odour at the boundary of the works and we believe that there should be further discussion with STW at this stage to better understand why such a high emission rate is coming from the works.
We are concerned that the odour emissions if the data is actually found to be reliable are out of step with currently accepted best practice target levels and cannot understand why the LPA is not challenging STW on why they are apparently producing such high odour levels from their activities at the works.
The Phlorum report does not address the issues of odour fully. The report states at paragraph 4.75 that “the contour fits the complaints record particularly well in Hempsted where all 4 residential complaints fit within the 1.5 Odour unit threshold for potential nuisance advocated in the EA H4 Guidance”. This a true statement but misses the point

that to the south there are 5 complaints that all fall outside the 1.5 Odour unit contour and are not addressed by Phlorum. This suggests that either the odour contour is not an accurate representation of the actual odour nuisance caused by the works or as we believe that the data set being used is not representative of the current situation.

At paragraph 4.77 Phlorum conclude that "As complaints can provide the most compelling evidence as to the reasonableness of any offensive odours, this suggests that the model might be under predicting odour concentrations to the south and south-east. It should be noted that there are four residential complaints just outside (within 200m) of the 1.5 Odour units' contour."

However even though Phlorum have correctly concluded that the model is not reliable at predicting a representative odour contour they ignore this fact when making conclusions and recommend a Cordon Sanitaire that is possibly too large to the north of the works and to small on the south side of the works.

We believe that the Phlorum report has missed the point that the current operation of the works is such that the sludge treatment and storage is now mostly taking place on the south and western side of the works and as such it is not surprising that the level of complaint is far higher on the southern side of the works. This is further endorsed when we consider the results of the Odour (sniff) Survey undertaken by Phlorum where in paragraph 4.69 they state that "the strongest odours emanating from the STW (5 on the VDI odour Intensity scale) were detected at the Fishing Lake roughly 120m to the south-east of the STW boundary and at the end of Rea Lane, within 50 m of the western boundary of the site. The odours detected at these locations were at times considered to be very strong with reference to the VDI intensity scale". Paragraph 4.70 states "During the third survey and 470m to the south-east of the STW a weak odour associated with the STW could be detected. This is the furthest that **ANY** odour associated with STW could be detected." We believe it is no surprise that odours could be detected on the south and western side of the works as this is where all the sludge treatment and storage activities now take place.

Further to this when we look at the complaints data we can see that since 2016 there have been no odour complaints reported on the north side of the works. In 2018 there are 6 reported complaints, and all of these are from residents on the south side of the works. This seems to indicate that odour from the works is far stronger on the southern side and would suggest a requirement for a Cordon Sanitaire that is smaller on the northern side of the works but larger on the southern side.

Pholrum state in paragraph 4.4 that "2012 and 2018 were the worst years for odour complaints made against the STW".

However, in 2012 only 2 of the 10 complaints came from the north (Hempsted) area all the others were from the southern side of the works.

As stated above in 2018 there were no complaints documented from the northern side of the works all 6 were from the south side. We believe this is all strong evidence to suggest that the recommended Cordon Sanitaire is not reflective of the current situation of the works.

We are also concerned that although the Phlorum report refers to the Institute of air Quality management (IAQM) guidance on the assessment of odour for planning dated 2014 it does not appear to be referring to the latest version of the IAQM report dated 2018 which gives useful guidance on the "weight of evidence approach" that should be used when using several assessment tools.

The Phlorum conclusions appear to be based solely on the use of the odour modelling data which as we have stated above makes use of an out of date set of data from 2008. The latest IAQM guidance advocates the use of several odour assessment tools and a 'weight of evidence'

approach. So, where there is an existing odour source, empirical observations will normally be possible of what is happening on the ground. The IAQM report states that “Considerable weight” should normally be given to the observational findings of community-based tools and sensory assessments (such as sniff tests). These may be supported by the findings of any dispersion modelling if these add tangible value to the study.' It seems that the Phlorum report does not attach considerable weight to the sniff tests but appears to ignore them.

We believe that there is an obvious mismatch in the Phlorum report between the recommendation to retain a similar size and shape of Cordon Sanitaire as previously in place when the sniff tests together with the complaint history clearly indicate a higher incidence of odour being identified on the south side of the works. All of the 2018 complaints are on the south side of the works and there are 5 complaints that fall outside of the modelled 1.5 Odour unit contour on the south side of the works. This is all clear evidence that the model outputs are not representative of the prevailing situation at the works and that the Phlorum report is not using the latest guidance to make best use of their own observational findings in the conclusions reported within their report.

We feel that the current Cordon Sanitaire being recommended within the Phlorum report will needlessly prevent development of certain areas to the north of the works where nuisance is less likely but will allow development of other areas to the south where nuisance is already being suffered by existing residents and if further development is allowed to proceed will provide unacceptable air quality and amenity for future residents.

This further underlines the requirement for a new data set to be produced that would then take account of the current operation and processes employed at the works.

Conclusion

1. It is very unlikely that the fields adjacent to Netheridge are used for 'sludge disposal'. As we have explained the biosolids are recycled under strict regulations and in any case is of anaerobically digested, dewatered sludge cake - not 'sludge' which implies liquid. The dewatered sludge cake after anaerobic digestion has relatively little odour.

2. The Phlorum report is a poor summary of the odour position at Netheridge. Primarily it re-uses data from the 2008 Odournet report. This report is certainly out of date as significant plant modifications have occurred since that date including new reception facilities for imported sludges with odour treatment provision. In addition, the model inputs e.g. emission rates have been selected to reflect the 'worst-case' (see para 3.27) situation.

As a general point, these odour surveys tend to be carried out by air quality experts who have no knowledge of sewage treatment and therefore pick published odour emission rates on the basis of 'worst case' rather than on what is most appropriate from a sewage treatment point of view. With a wide range of published data for odour emission rates this can lead to a gross over-estimate of the odour footprint.

3. The Phlorum report cites the IAQM report 'Guidance on the assessment of odour for planning', 2014. It is odd that they haven't used the latest IAQM report, Bull et al., 'IAQM Guidance on the assessment of odour for planning', Institute of Air Quality Management, London, 2018.

In this report at Section 6 (Drawing Conclusions from Assessment Results) it advocates the use of several odour assessment tools and a 'weight of evidence' approach. So, where there is an existing odour source, empirical observations will normally be possible of what is happening on the ground. The IAQM report states that “Considerable weight should normally be given to the observational findings of community-based tools and sensory assessments (such as sniff tests). These may be supported by the findings of any dispersion modelling if they add tangible value to the study.” It seems that the Phlorum report does not attach considerable weight to the sniff tests but appears to ignore them.

BLBB CONSULTING Limited
6th December 2019

BLBB Consulting Ltd

BLBB Consulting Ltd was incorporated in 2016 and is a partnership between Bill Lilly and Bob Birdsey. Bill and Bob together have over 70 years of experience of the Water Industry and set up BLBB to provide expert technical services to a wide variety of clients. Most of our work is from direct referral from existing clients.

Currently we provide technical support for the operation, maintenance, design, Capital investment and regulatory requirements of a number of waste water treatment plants owned and managed by a various industry clients.

We pride ourselves in providing high quality technical input and our personal experience together with our network of similarly expert associates means that if we don't immediately know the solution to a particular problem we are able to call upon an extensive group of suitably expert people for support. Our aim is to understand the requirements of each client and tailor the solution appropriately. We have strong links with both the Environment Agency and OFWAT and work closely with them to build confidence in the ongoing operation as well as gain agreement on long term solutions relating either to growth or tightening standards that minimise the impact and cost for our clients.

Bill Lilly

A senior Operational Manager and company Director with extensive experience of the Waste Water industry

Technical and Business Background.

Bill has over 35 years' experience of working in the water Industry. He worked in Severn Trent Water for 27 years starting as a graduate process specialist before moving onto operational roles. He became a senior manager in 2000 and in 2005 was made General Manager Sewage Treatment Field Services. In this role he had direct responsibility for the operation, maintenance and investment programmes for of all of STW's 1064 sewage treatment works, its 3000 pumping stations, 2 sludge incinerators and 48 sludge digestion plants. Bill was responsible for over 900 staff working in his department.

Bill retired from Severn Trent in 2007. He then went on to create Intervate Limited a company incorporated in 2008 set up to exploit the potential of Advanced Thermal treatment Processes in the waste and water sector. Bill was instrumental in successfully signing contracts with Yorkshire Water for Intervate to provide expert services to design build and operate the first fully integrated sludge drying and gasification system on a sewage treatment works in the UK. This Yorkshire Water Project was the largest R+D project ever undertaken by Yorkshire Water and was one of the largest in the UK water industry representing the culmination of collaboration between Intervate and Yorkshire Water that started in 2008 and has seen an investment by YW of over £17 million. The Intervate and Yorkshire Water partnership was also awarded a £1 Million DECC grant from central Government towards the project.

Bill has direct experience of the complex regulatory issues within the water industry together with a detailed knowledge of operating waste water treatment processes within a strict regulatory regime. His industry experience is extensive covering the design, installation and operation of Waste Water treatment works, as well as power generation and waste management technologies - ranging from incineration to Anaerobic Digestion, and more recently pyrolysis and gasification at the Intervate facility at Esholt Wastewater Treatment Works and now with a full scale commercially sized plant at Lower Brighouse in West Yorkshire where Intervate has designed, built and operated its latest sludge drying and gasification plant, until handed back to YW Operations in February 2016.

BLBB Consulting Ltd was incorporated in May 2016 by Bill Lilly & Bob Birdsey

Bob Birdsey

General Experience:

Broad financial and strategic responsibility for developing a fast-growing M&E contracting business in the water industry.

Over 40 years technical and commercial experience in the Water Industry.

BLBBConsulting Ltd -Founding Director with Bill Lilly

2016 – to date

Intervate - Director - working on Yorkshire Water R&D Project on Gasification 2010 - 2016

May Gurney - MEICA Director - Sale of T J Brent Ltd to May Gurney Ltd. Acquisition of 2 Companies to add to the M&E Portfolio. Growth of MEICA business from £7m/annum to over £40m/annum 2004 - 2010

TJ Brent Ltd - MEICA Director - 1 of 3 Directors to lead a management buyout of T J Brent Ltd from Pennon Group in 2000 - 1996 - 2000

Engineered Products Ltd - Managing Director - Overall control and growth of private Company from £2m to £8m per annum. Sold Company to TJ Brent Ltd a wholly owned subsidiary of South West Water 1988 – 1996

John Churchley Associate

Graduated in Chemistry at Leeds University. Joined Severn Trent Water in 1975 worked in various roles over a period of 34 years. Roles included Senior manager responsible for Research & Development (Wastewater) and Process Development Manager. Since leaving Severn Trent in 2010 John has continued to work in the Water Industry as a consultant with MWH/Stantec, as associate

process lead for BLBB Consulting and for his own company, Avon Water Consulting. John is a member of CIWEM and of RSC.

DRAWINGS

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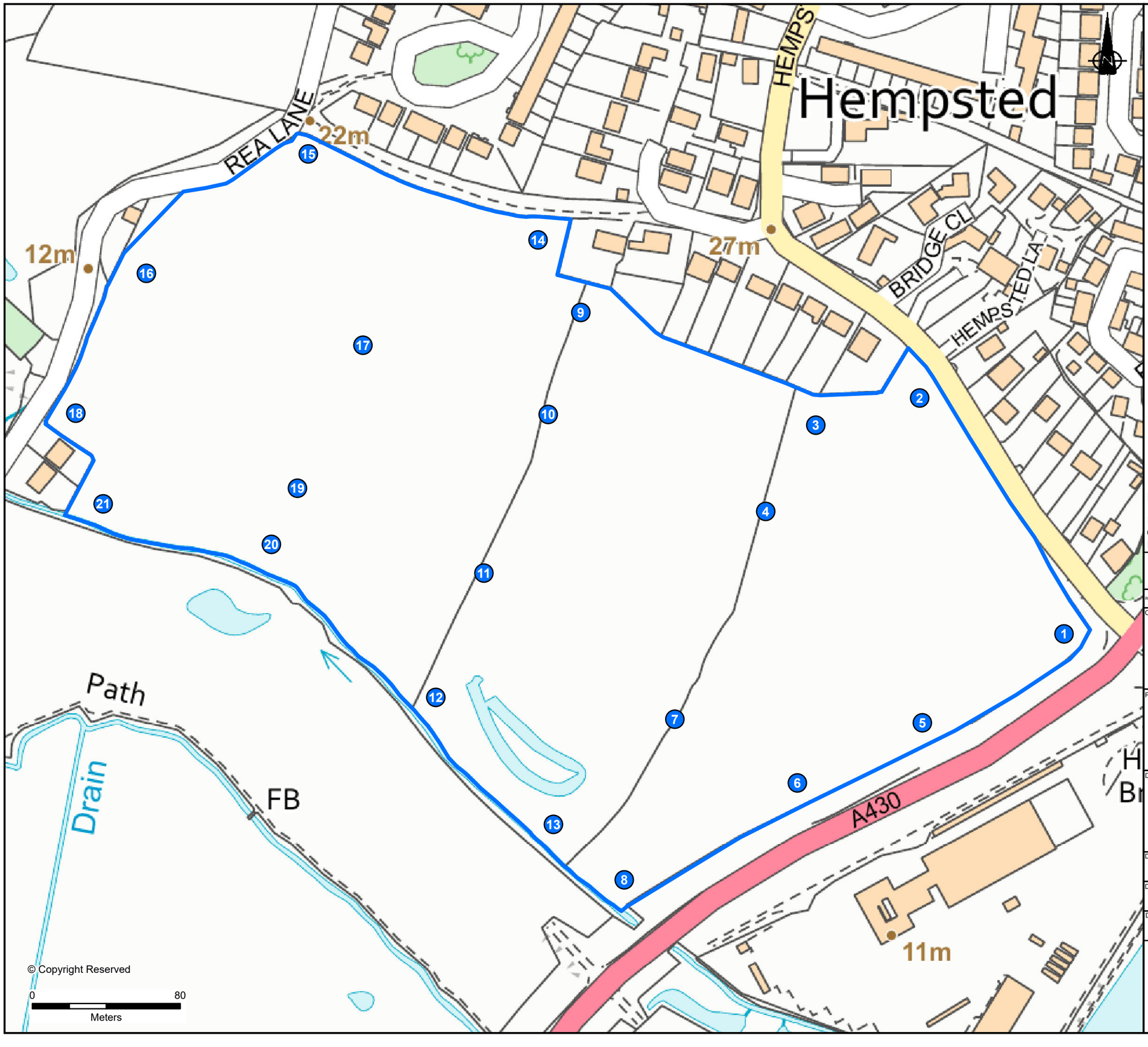

KEY

Study Area

1 Sniff Test Locations

Notes:

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D

CLIENT

GLADMAN DEVELOPMENTS LTD

PROJECT

LAND OFF HEMPSTED LANE
GLOUCESTER

DRAWING TITLE

SNIFF TEST LOCATIONS

DRG No.	REV
GM10710-020	A

DRG SIZE	SCALE	DATE
A3	1:2,000	30/01/2020

DRAWN BY	CHECKED BY	APPROVED BY
CT	PT	MW

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