Teddington Direct River Abstraction
EIA Scoping Report
Appendix D Odour Technical Note

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This document has been produced to support Thames Water's request for an Environmental Impact Assessment (EIA) Scoping Opinion under Regulation 10 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) for the London Water Recycling Teddington Direct River Abstraction. The information presented in this document includes material or data which is still in the course of completion, pending consultation, engagement, further design development and technical assessment as part of the ongoing EIA.

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D.1 Odour Technical Note

REPORT

Qualitative odour impact assessment for a proposed tertiary treatment plant at Mogden Sewage Treatment Works

Client:
Ricardo Energy & Environment

Report Number:
RICA22A_07_FINAL

Project Code:
RICA22A

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Executive Summary

Olfasense UK Ltd was commissioned by Ricardo on behalf of Thames Water to undertake an assessment of the odour impact risk of the proposed Tertiary Treatment Plant (TTP) at Thames Water's Mogden Sewage Treatment Works (STW) in West London. The TTP is proposed as part of the Teddington Direct River Abstraction project.

The overall purpose of the assessment was to assess the potential risk of odour impact on nearby receptors that would result from the operation of the proposed TTP.

The scope of the study was as follows:

- To undertake a qualitative risk-based assessment to assess the odour impact risk posed by the proposed TTP at Mogden STW on nearby receptors.
- To undertake a visit to Mogden STW to review the current operations and odour sources, identify nearby receptors, and review the potential location for the proposed TTP.
- To undertake a visit to a comparable TTP operating at Benson STW in Oxfordshire to evaluate the nature and extent of any odours released.

The study approach was based on the qualitative risk-based methodology which is outlined in the Institute for Air Quality Management's (IAQM) odour guidance for planning. A Source-Pathway-Receptor (S-P-R) methodology was applied, which considers the odour characteristics of the emissions Source (S), the effectiveness of the Pathway (P) for odour to travel to nearby receptors, and the nature of the Receptors (R) which could experience the odours.

The assessment was informed by outline design information for the proposed TTP. To inform the study 'sniffing assessments' were undertaken at Mogden STW and Thames Water's Benson STW which operates a Moving Bed Biofilm Reactor (MBBR) which is of comparable design to the treatment facility proposed for the TTP.

The key findings of the study are summarised as follows:

1. The results of the qualitative odour impact assessment are summarised in the table below:

Table 1: Ranking of likely odour effect matrix

Assessment area	Source odour potential	Pathway (transport effectiveness)	Odour exposure risk	Receptor sensitivity	Likely odour effect
Twickenham Road area	Small	Moderately effective pathway	Low risk	High	Negligible effect

2. The IAQM odour guidance for planning indicates that for any receptor where the effect is assessed as 'negligible' or 'slight adverse', the emissions from the facility can be considered unlikely to pose a significant risk of odour impact.
3. On the basis of this assessment the odour effect of the proposed TTP is not significant if located in the east side of Mogden STW, as detailed in Table 1.

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1 Introduction and scope

1.1 Introduction

Olfasense UK Ltd was commissioned by Ricardo on behalf of Thames Water to undertake an assessment of the odour impact risk of the proposed Tertiary Treatment Plant (TTP) at Thames Water's Mogden Sewage Treatment Works (STW) in West London. The TTP is proposed as part of the Teddington Direct Abstraction project (hereafter referred to as 'the project').

The overall purpose of the assessment was to assess the potential risk of odour impact on nearby receptors that would result from the operation of the proposed TTP.

A qualitative risk-based assessment approach was adopted, based on the qualitative odour assessment methodology which is presented in the Institute for Air Quality Management's (IAQM) Guidance on the assessment of odour for planning[1].

1.2 Scope

The scope of the study was as follows:

- To undertake a qualitative risk-based assessment to assess the odour impact risk posed by the proposed TTP at Mogden STW on nearby receptors
- To undertake a visit to Mogden STW to review the current operations and odour sources, identify nearby receptors, and review the potential location for the proposed TTP
- To undertake a visit to a comparable TTP operating at Benson STW in Oxfordshire to evaluate the nature and extent of any odours released

The assessment was informed by outline design information for the proposed TTP which was provided by Ricardo Energy & Environment.

1.3 Structure of Report

The report is structured as follows:

- Section 1 provides the introduction and scope of the report
- Section 2 describes the methodology undertaken to conduct the assessment
- Section 3 presents the qualitative risk-based odour assessment
- Section 4 summarises the findings of the study

1.4 Quality Control and Assurance

Olfasense's odour measurement, assessment and consultancy services are conducted to the highest possible quality criteria by highly trained and experienced specialist staff. All activities are

[1] Guidance on the assessment of odour for planning, Institute of Air Quality Management, version 1.1, July 2018.

conducted in accordance with quality management procedures that are certified to ISO 9001 (Certificate No. A13725).

2 Description of approach

2.1 Overview

Odour annoyance is recognised as a symptom that develops as a result of intermittent but regular exposure to odours that are recognisable and have an offensive character. The key factors that contribute to the development of odour annoyance can be summarised by the acronym FIDOL:

- **F**requency of exposure
- **I**ntensity or strength of exposure
- **D**uration of exposure
- **O**ffensiveness
- **L**ocation sensitivity

Taking these factors into account, the assessment approach adopted was based on the principles described in the IAQM odour guidance for planning and used qualitative techniques to assess the potential risk of odour impact posed to nearby residential areas by any odours released from the proposed TTP.

The approach utilised a Source-Pathway-Receptor (S-P-R) methodology, which considers the odour characteristics of the emissions Source (S), the effectiveness of the Pathway (P) for odour to travel through to nearby receptors, and the nature of the Receptors (R) which could experience the odours.

The Source-Pathway steps of the process represent the first four elements of FIDOL (the frequency, intensity, duration and offensiveness of exposure are determined by a mixture of source characteristics and effectiveness of transfer between source and receptor), with the Receptor step representing the location sensitivity element.

2.2 Approach

In order to assess the potential level of risk posed by the proposed TTP, the following approach was adopted:

1. Outline design information for the proposed TTP (provided by Ricardo Energy & Environment) was reviewed to establish the type of plant that is proposed and the nature of the effluent that it will treat.
2. A site visit to Mogden STW was then undertaken by Paul Ottley, a principal consultant at Olfasense UK Ltd, to review the current site operations and odour sources, review the locations under consideration for the proposed TTP, and identify nearby receptors.
3. A site visit was then undertaken to Thames Water's Benson STW near Wallingford in Oxfordshire, where a comparable TTP to that proposed for Mogden STW is in operation. The purpose of the visit was to evaluate the nature and extent of any odours released from the TTP.

4. Both site visits included onsite observations ('sniffing assessments') in the vicinity of the final settlement tanks at Mogden STW and the TTP at Benson STW. The site visit was carried out by a trained assessor with a known acuity to odour as validated against the criteria defined in the British Standard for Olfactometry[2]. During the inspection, any odours which were detected from the TTP were appraised in terms of their nature (character, intensity and offensiveness) and the distance from the plant at which they could be detected.

5. To safeguard the quality of the assessment, the following stipulations for the assessor (which are based on those presented within the IAQM odour guidance for planning and BS EN 16841-2:2016[3]) were adhered to:

    - The odour assessor should not carry out the assessment if they have a cold, sore throat, allergic reaction, sinus trouble, etc
    - The odour assessor should not smoke or consume food or drink (other than water) for at least half an hour before the field odour survey is carried out, or during the survey
    - Scented toiletries, such as perfume/aftershave should not been used on the day of the field odour survey
    - If a vehicle is used during the field odour survey, it should not contain any deodorisers or air fresheners

6. The approach for qualitative risk-based odour assessments outlined in Appendix 1 of the IAQM odour guidance for planning was then adopted to assess the likely odour impact risk that would occur in receptor areas near the planned TTP at Mogden. This approach involved the following key steps:

    a. Estimation of the **Source Odour Potential** of the facility using the following scale:

        i. Small

        ii. Medium

        iii. Large

    The estimation of the Source Odour Potential of the TTP took into consideration the scale (magnitude) of the odours likely to be released from the TTP, the nature (character and relative pleasantness/unpleasantness) of the odours, and the frequency and duration of their release.

    b. Estimation of the **Pathway Effectiveness** for conveying odours from the TTP to the receptors using the following scale:

        i. Highly effective

[2]BSEN 13725:2003, *Air quality - Determination of odour concentration by dynamic olfactometry*

[3] BS EN 16841-2:2016 Ambient air – Determination of odour in ambient air by using field inspection

ii. Moderately effective

iii. Ineffective

The estimation of Pathway Effectiveness took into consideration factors such as the distance of nearby receptor areas to the proposed TTP, the prevalent meteorological conditions (wind patterns) in the area, and the likely effect of local topography and terrain on the dispersion and dilution of odours. A 1-year wind rose from an appropriate meteorological recording station (Kew Gardens, located approximately 4km to the northeast of the site) was used to inform this aspect of the study.

7. The combination of Source Odour Potential and Pathway Effectiveness were then used to estimate the **risk of odour exposure** (impact) to users of the nearby receptor areas from the emissions from the TTP using the matrix below:

Table 2: Risk of odour exposure (impact) matrix (from IAQM odour guidance for planning)

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

8. The **sensitivity of the receptors** was then defined using the following scale:

   a. High sensitivity (e.g. residential dwellings, hospitals, schools, tourist/cultural)

   b. Medium sensitivity (e.g. places of work, commercial/retail premises, playing/recreation fields)

   c. Low sensitivity (e.g. industrial facilities, farms, footpaths, roads)

9. The risk of odour exposure (impact) determined above was then considered alongside the receptor sensitivity to assess the likely effect of any TTP odours on the receptors using the matrix below.

Table 3: Ranking of likely odour effect matrix (from IAQM odour guidance for planning)

Risk of Odour Exposure	Receptor Sensitivity		
	Low	Medium	High
High risk of exposure	Slight adverse effect	Moderate adverse effect	Substantial adverse effect
Medium risk of exposure	Negligible effect	Slight adverse effect	Moderate adverse effect
Low risk of exposure	Negligible effect	Negligible effect	Slight adverse effect
Negligible risk of exposure	Negligible effect	Negligible effect	Negligible effect

In accordance with the IAQM guidance, for any receptor where the effect is assessed as 'Negligible' or 'Slight Adverse' using the above matrix, the emissions from the facility can be considered unlikely to pose a significant risk of odour impact. Where an odour effect is greater than 'slight adverse', the effect is considered to be significant.

3 Assessment of odour impact risk

3.1 Details of the TTP

The proposed TTP at Mogden STW will treat a proportion of the final effluent that has already been treated in the preliminary, primary, secondary and final treatment stages of the existing wastewater treatment process. A portion of this final effluent, which is currently discharged to the River Thames at the Isleworth Ait, will be diverted to the new TTP which is likely to comprise of the following:

- An initial final effluent pumping station where ferric sulphate will be added to the final effluent
- Open moving bed biofilm reactor (MBBR) tanks
- An open flocculation tank where further ferric sulphate will be added
- Open mechanical cloth filters
- An enclosed wastewater equalisation tank/pumping station for collecting filter backwashes and returning them to the head of the STW inlet works

The TTP would operate continuously with varying flow throughputs. During periods of drought the plant would run at maximum capacity, when 78 Ml/day would be abstracted from the existing final effluent culvert by the proposed pumping station and treated in the new TTP. 75 Ml/day of the recycled water would then be discharged into the Interception Shaft, and later the River Thames upstream of the Teddington Wier. In non-drought conditions, the TTP would operate at minimum flow (15 Ml/day) to maintain biomass within the MBBR tanks.

The location of the proposed TTP is in the southeastern corner of the STW, located on a platform which would be built on top of four of the existing storm tanks within the Eastern Work Area. For the purpose of this technical note the planned area for the TTP will be referred to as Eastern Work Area.

The nearest receptors to the Eastern Work Area are those within the predominantly residential area around Twickenham Road, the western-most properties of which are located in close proximity to the western and southern boundaries of Mogden STW.

The location of Mogden STW (area shaded blue), the proposed TTP site or Eastern Work Area (area shaded green), and the nearest residential area (area shaded orange) are presented in Figure 1 below.

Figure 1: Approximate potential location in which the TTP would be located within

3.2 Estimation of Source Odour Potential

It is a reasonable expectation that some odours could be released from the proposed TTP due to the open nature of the majority of the new plant. However, the TTP will only receive and treat final effluent from Mogden STW, i.e. fully treated sewage. In Olfasense's experience final effluent typically generates little to no odour because almost all of the organic matter and residual contaminants have been removed in the upstream sewage treatment processes.

During the site visit to Mogden STW particular attention was paid to the final settlement tanks, where very little odour was detected from the multiple large surface area open tanks. The only odours that were detected in the vicinity of the tanks were of very low magnitude/intensity, of very low offensiveness, and were likened to 'fresh river' odours and described as 'nitrogenous'. These odours were only noted in close proximity (i.e. within approximately 10-15m) of some of the tanks. These observations match those that have been routinely observed by Olfasense at UK sewage treatment facilities over the last 20+ years.

On this basis it can be concluded that the effluent that will be received and treated within the proposed TTP will be extremely low (if any) odour generating.

Within the TTP the current design suggests the final effluent will be aerobically treated within open MBBR tanks and then mechanically filtered. The plant will be in continuous use, but neither of these processes is likely to result in a substantial increase in the odours from the effluent or an increase in offensiveness, and the proposed size of the plant will be small in comparison to the existing final settlement tanks at Mogden STW.

During the visit to Thames Water's Benson STW very little odour was noted from the MBBR tanks, even though at that site the tanks treat settled sewage (i.e. more odorous raw sewage that has not undergone any secondary aerobic treatment or final settlement). Odours from those tanks were noted to be low in magnitude/intensity and of low offensiveness, of an 'aerobic/river' and 'nitrogenous' character, and only detectable at a close range with no odours at all detected at a downwind distance of approximately 20m.

On the basis of the very low odour potential of the final effluent to be treated, the processes to be undertaken, the size of the proposed plant, observations of the MBBR plant at Benson STW and Olfasense's wider experience, it is considered that the Source Odour Potential of the proposed facility should be classified as 'small'.

3.3 Estimation of Pathway effectiveness

Figure 1 indicates the proposed location for the TTP in relation the Mogden STW site boundary and the nearby predominantly residential receptor area. The effectiveness of the pathway for transmission of any odours from the TTP to the nearest receptor area has been reviewed as detailed below.

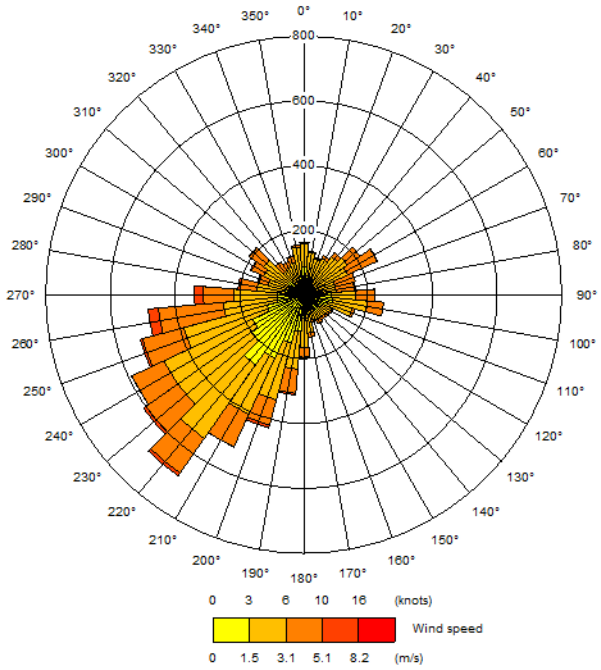
3.3.1 Distance to receptor

The predominantly residential Twickenham Road area is located in relatively close proximity to the Eastern Work Area. The distance of the new TTP plant to the nearest residential premises would be approximately 65 to 70m.

3.3.2 Prevalent meteorological conditions

A wind rose has been obtained for the Kew Gardens meteorological station (located approximately 4km to the north-east of Mogden STW) is presented in Figure 2 below. This provides an indication of the percentage of time that the wind is likely to blow in each direction and at what velocity.

Figure 2: Wind rose for Kew Gardens (2023)



Review of Figure 2 indicates that winds in the area typically blow most frequently in a north easterly direction over the course of an average year.

Reviewing this figure alongside the location plan in Figure 1 indicates that winds are likely to blow from the TTP in the general direction of the Twickenham Road area for approximately 70% of the time.

3.3.3 Topography, terrain and release heights

Indicative design details indicate that a maximum height for the proposed infrastructure in the Eastern Work Area would be 15m above ground level and a platform would be built above the storm tanks to hold the TTP. In addition the odour emissions from the MBBR tanks would be released at height, so some benefits would be achieved in terms of the dispersion and dilution of any odours released (the nearest receptors are at a similar elevation to the storm tanks).

3.3.4 Allocation of pathway effectiveness

On the basis of the above information and using professional judgment, the pathway effectiveness from the proposed TTP at the Eastern Work Area to the nearest receptors in the Twickenham Road area is considered to be 'moderately effective' due to the combined influence of the factors discussed above.

3.4 Determination of the risk of odour exposure

Using the matrix in Table 2 the risk of odour exposure occurring at the Twickenham Road area is considered to be 'negligible'.

3.5 Determination of the likely odour effect

The Twickenham Road receptor area can be categorised as highly sensitive due to the predominance of residential premises.

Using the matrix in Table 3 the likely odour effect of the proposed TTP on the Twickenham Road area is considered to be 'negligible'.

The results of the assessment are summarised in the below table.

Table 4: Ranking of likely odour effect matrix

Assessment area	Source odour potential	Pathway (transport effectiveness)	Odour exposure risk	Receptor sensitivity	Likely odour effect
Twickenham Road area	Small	Moderately effective pathway	Low risk	High	Negligible effect

The IAQM odour guidance for planning indicates that for any receptor where the effect is assessed as 'negligible' or 'slight adverse', the emissions from the facility can be considered unlikely to pose a significant risk of odour impact.

Considering the above, the finding of this qualitative assessment is that the odour effect of the proposed TTP is not significant when located in the Eastern Work Area within the Mogden STW site.

4 Summary of findings

The key findings of the study are summarised as follows:

1. The results of the qualitative odour impact assessment are summarised in the table below:

Table 5: Ranking of likely odour effect matrix

Assessment area	Source odour potential	Pathway (transport effectiveness)	Odour exposure risk	Receptor sensitivity	Likely odour effect
Twickenham Road area	Small	Moderately effective pathway	Low risk	High	Negligible effect

2. The IAQM odour guidance for planning indicates that for any receptor where the effect is assessed as 'negligible' or 'slight adverse', the emissions from the facility can be considered unlikely to pose a significant risk of odour impact.

3. On the basis of this assessment the odour effect of the proposed TTP is not significant when located within the Eastern Work Area within the Mogden STW site.

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