Cambridge Waste Water Treatment Plant Relocation Project
Anglian Water Services Limited

Appendix 18.2: Odour Impact Assessment

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02	27.04.23	-	Updated to include introductory text
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04	02.04.24	-	2 instances of waste gas burner changed to flare stack

Contents

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Summary

Waste water and sludge treatment plant fall under the listed examples of 'potentially odorous activities' that require an odour impact assessment for planning. This report describes the odour impact assessment carried out for the Cambridge Waste Water Treatment Plant Relocation Project (CWWTPR), the Project, at the Development Consent Order (DCO) application stage of development:

Anglian Water Services Limited is proposing to build a modern, low carbon waste water treatment plant for Greater Cambridge on a new site area north of the A14 between Fen Ditton and Horningsea within the Cambridge drainage catchment area to replace the plant on Cowley Road.

This report includes a brief background section to contextualise the regulatory requirements associated with odour and the guidance available for carrying out odour impact assessment. It concludes that The Institute of Air Quality Management (IAQM) July 2018 Guidance on the assessment of odour for planning contains the most recent and most suitable guidance for a robust odour impact assessment for this Project for the DCO application.

IAQM Guidance recommends a multi-tool approach should utilised to assess the impact and resulting effects of an odour source on surrounding users of the land. As the CWWTPR Project is in the planning phase, observational or empirical methods cannot directly be utilised at the proposed site. Two predictive assessment methods were utilised, namely firstly a qualitative Source-Pathway-Receptor (SPR) method whereby data from the existing site is utilised to identify similarities for utilisation in predictions for the new – specifically to establish the baseline odour impact for the new site. The second assessment method used was odour modelling. Odour modelling affords the ability to understand and interrogate greater detail, to allow the prediction of the expected impact of the mitigated odour position in relation to the new site's surroundings.

Both the source pathway receptors and the odour modelling assessments for the proposed integrated waste water treatment site concluded that the proposed CWWTPR project will have 'Negligible' residual odour impact to all known receptors, using the multi-tool approach described.

The information used for the construction of the odour dispersion modelling, undertaken by H&M Environmental Ltd. on behalf of Anglian Water, includes:

- AERMOD Version 10.2.1 (December 2021) has been employed for the odour modelling exercise. Its use for odour modelling has been accepted by the UK Environment Agency and it is confirmed as a suitable predictive modelling odour assessment tool by the IAQM for the assessment of odour for planning purposes;
- The meteorological data used in the models are based on that from Cambridge Airfield and RAF Mildenhall MET data, compiled by following the best available technology (BAT) practices. This was verified by an external

specialist, ADM Ltd, as representative and most conservative by comparing observation station MET data with Numerical Weather Prediction (NWP) data (computer generated using satellite information for the exact location);

- The morphology input for the model was constructed from the Defra's Lidar data of the existing area around the proposed CWWTPR site, with the ground level (topography) changes associated with the proposed infrastructure (e.g. the rotunda bund, ground level changes across the site and the access road) exchanged as appropriate;
- As the proposed CWWTPR is still at planning stage, all emission rates utilised were estimated values based on historic measured values at the existing Cambridge Water Recycling Centre (WRC) or where no historical value was available, "standard" emission values from literature were used. Where neither were available, professional judgement was used to predict an emission compared to the information available ('no worse than' principle);
- Emissions for all open tanks and process units have been included in the modelling assessment, regardless of hedonic tone. This conservative approach potentially inflates the results by up to 8%; and
- Constant emission values were used for the odour impact assessment, with seasonal variations in emissions used for sensitivity testing. This conservative approach inflates the results further in excess of 25%.

A number of sensitivity tests were carried out to test the robustness of the results against other industry standard approaches. Apart from the odour modelling carried out using the same conservative input basis used throughout the various public consultation phases of the DCO development process, 18 further scenarios were utilised to vary input parameters, with changes including:

- The worst-case observation station MET data year (2016) data set was replaced with the Numerical Weather Prediction (NWP) MET (2016) data set for a number of scenarios. A full set of all five years (2016 to 2020) observational station MET data and NWP MET data was also used for one scenario to demonstrate the comparison of how the difference MET data sets impact the modelling results;
- A seasonal approach was included whereby emissions are reduced for spring (75% of summer) and further for autumn and winter (50% of summer). This seasonal reduction is industry standard practice, as highlighted in section 4.6 through reference to other industry experts' odour impact assessment emission inputs; and
- The surface roughness values were varied to simulate how planting may impact the predicted results over 5 and 15 year timescales. Furthermore, seasonal farming activities and the impact these variations may have were also considered.

The sensitivity testing showed that Scenario 1, which maintains the conservative approach used throughout the public consultation process, remained the most conservative of the 19 scenarios compared. The conservative nature of Scenario 1, used in the odour impact assessment, supports a robust odour impact assessment result to confirm ‘Negligible’ impact is predicted for all known Receptors.

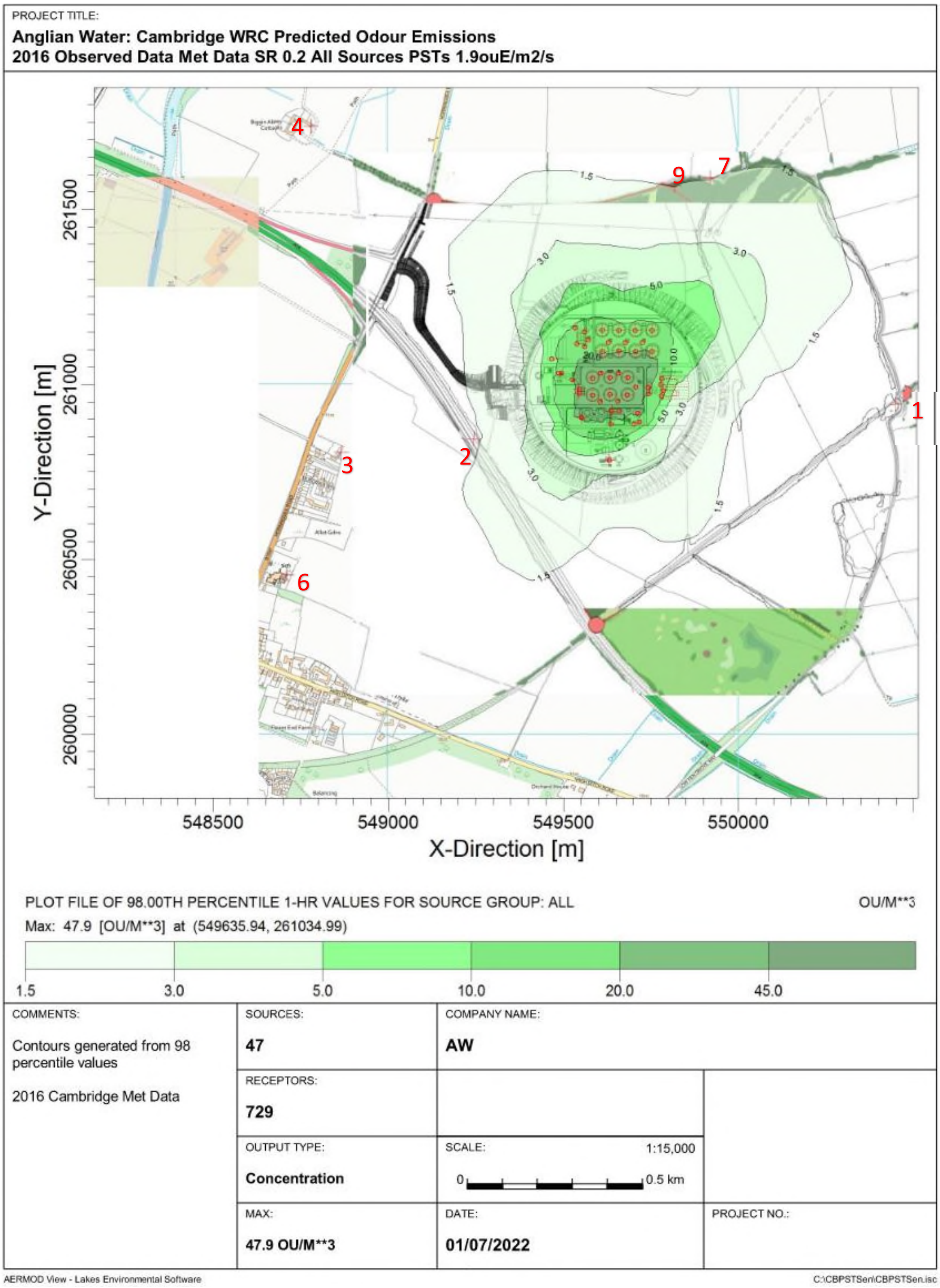
The table (Table 3-18 of the main report) and figure (Figure 4.5 of the main report) below summarises the predicted residual odour impact on the closest receptors for Scenario 1, using odour modelling. The results indicated that odour concentrations at all receptors will be less than 1.5 C_{98} OU_E/m^3. Since Scenario 1 results e.g. Future Residential 1.47 C_{98} OU_E/m^3 is based on the most conservative assumptions, as described in the bullet points above, we can therefore conclude that this and all other scenarios will have ‘Negligible’ impact to all known Receptors. Receptors further afield will be exposed to less (if any) impact and have not been included in Table 3-18. A map of the Receptors identified in the EIA covering the wider area assessed is included as Appendix B.

Odour modelling results of predicted odour exposure levels at the closest receptors for Scenario 1

ID	Name	C_{98} OU_E/m^3	Sensitivity	Impact
1	Gatehouse	0.39	High	Negligible
2	A14	1.24	Low	Negligible
3	Property east of Horningsea Road Fen Ditton	0.33	High	Negligible
4	Biggin Abbey	0.49	High	Negligible
5	Quy Mill Hotel	0.12	High	Negligible
6	Fen Ditton Community Primary School	0.25	High	Negligible
7	Low Fen Drove Way PROW 85/14	1.46	Low	Negligible
8	Property to south of Horningsea	0.46	High	Negligible
9	Future Residential	1.47	High	Negligible

Ancillary activities (e.g. sludge transport) and abnormal operations (e.g. major plant failure) have also been considered with reference to Anglian Water’s previous odour complaints received. Impacts associated with irregular activities are unpredictable, short term and low in number – i.e. less than one a year. It supports the robustness of Anglian Water’s active management of incidents in line with the Odour Management Plan for the site.

In conclusion, reasonable odour mitigation steps have been taken during design development so that the assessment concludes that the CWWTPR will have ‘Negligible’ odour impact to all known receptors. The operation of the proposed CWWTPR will be in compliance with the Odour Management Plan. This combined approach of ‘design’ and ‘active management’ assures ‘appropriate measures to minimise odour’ for the Project has and will continue to be taken. Therefore, the residual effect of the odour impacts associated with the proposed Project would be “not significant”.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Data Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 47.9 [OU/M**3] at (549635.94, 261034.99)

COMMENTS:

Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES:

47

COMPANY NAME:

AW

RECEPTORS:

729

OUTPUT TYPE:

Concentration

SCALE: 1:15,000

MAX:

47.9 OU/M3**

DATE:

01/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\CBPSTSen\CBPSTSen.isc

Odour modelling result for Scenario 1

1 Introduction

1.1 Anglian Water Services Limited

1.1.1 Anglian Water Services Limited (the 'Applicant') is the largest regulated water and water recycling company in England and Wales by geographic area, supplying water and water recycling services to almost seven million people in the East of England and Hartlepool.

1.1.2 The Applicant is committed to bringing environmental and social prosperity to the region they serve, through their commitment to Love Every Drop. As a purpose-led business, the Applicant seeks to contribute to the environmental and social wellbeing of the communities within which they operate. As one of the largest energy users in the East of England, they are also committed to reaching net zero carbon emissions by 2030.

1.2 Introduction to the relocation project

1.2.1 Anglian Water's Cambridge Waste Water Treatment Plant Relocation project (CWWTPRP) ("the Proposed Development") is funded by Homes England, the Government's housing accelerator which seeks to improve neighbourhoods and grow communities by releasing land for development.

1.2.2 The Proposed Development involves the relocation of the existing Cambridge Waste Water Treatment Plant (WWTP) currently operating at Cowley Road, Cambridge, to a new site between Horningsea, Fen Ditton and Stow cum Quy, adjacent to the A14 in Cambridgeshire.

1.2.3 The relocation would make the site of the existing WWTP available to form part of the development of a new low-carbon city district, known as North East Cambridge. The site at Cowley Road, is Cambridge's last major brownfield site, and the wider North East Cambridge district proposals envisage creating around 8,350 homes and 15,000 jobs over the next 20 years.

1.2.4 North East Cambridge is a highly sustainable location for housing. In addition to the Homes England funding, the area has benefitted from Transport Infrastructure Fund (TIF) funding for Park & Ride, the completion of Cambridge Guided Bus public transport infrastructure, the delivery of the Cambridge North rail station and the Chisholm Trail.

1.2.5 North East Cambridge is one of three key strategic sites which will form "*central building blocks of any future strategy for development*" in the proposed Greater Cambridge Local Plan being jointly prepared by Cambridge City Council and South Cambridgeshire District Council that will be subject to public consultation in Autumn 2023. The North East Cambridge Area Action Plan (AAP), currently in "Proposed Submission" form, will be the planning policy framework which ultimately guides the development of North East Cambridge city district.

1.2.6 The importance of the Proposed Development, both regionally and nationally, was recognised by the Secretary of State for Environment, Food and Rural Affairs (DEFRA) in January 2021, who directed that the Proposed Development is nationally significant and is to be treated as a development for which a Development Consent Order (DCO) is required (see Appendix 1-3 of the Planning Statement, App Doc Ref 7.5).

1.2.7 The policy context of the Proposed Development is described in more detail in the Planning Statement (App Doc Ref 7.5)

1.3 The relocation site

1.3.1 The relocation site was selected following comprehensive study and public consultation. The site selection process and consideration of alternatives is described in more detail in Chapter 3: Alternatives of the Environmental Statement (App Doc Ref 5.2.3).

1.3.2 The current environmental conditions at the existing Cambridge WWTP site and at the relocation site are described in Chapter 2: Project Description of the Environmental Statement (App Doc Ref 5.2.2). The site is located to the north-east of Cambridge and 2km to the east of the existing Cambridge WWTP, as shown on the Works Plans (App Doc Ref 4.3.1). It is situated on arable farmland immediately north of the A14 and east of the B1047 Horningsea Road in the green belt between the villages of Horningsea to the north, Stow cum Quy to the east and Fen Ditton to the south west. Two overhead lines of pylons cross the northern and eastern edges of the main development site and come together with a third line at the north eastern corner of the site. The topography is fairly flat with an approximately 4m fall across the site south west to north east.

1.4 Purpose of the Proposed Development

1.4.1 The Proposed Development for which the DCO is being sought will deliver all the functions of the existing Cambridge WWTP at Cowley Road, treating all waste water from the Cambridge catchment and wet sludge from the wider region.

1.4.2 In addition, it will have an increased capacity, being intended to treat the waste water from the Waterbeach catchment and anticipated housing growth in the combined Cambridge and Waterbeach catchment area.

1.4.3 The infrastructure provided as part of the main works will have a design life to at least 2090, and the supporting infrastructure (i.e. the transfer tunnel, pipelines and outfall) will have a designed capacity sufficient to meet population growth projections plus an allowance for climate change into the 2080s. Furthermore, there is capability for expansion in space that has been provided within the earth bank and by modification, enhancement and optimisation of the design to accommodate anticipated flows into the early 2100s.`

1.5 Outline description of the Proposed Development

1.5.1 The DCO application is seeking approval for the following main elements of the Proposed Development:

- an integrated waste water and sludge treatment plant.
- a shaft to intercept waste water at the existing Cambridge WWTP on Cowley Road and a tunnel/ pipeline to transfer it to the proposed WWTP and terminal pumping station. Temporary intermediate shafts to launch and recover the micro-tunnel boring machine.
- a gravity pipeline transferring treated waste water from the proposed WWTP to a discharge point on the River Cam and a pipeline for storm water overflows.
- a twin pipeline transferring waste water from Waterbeach to the existing Cambridge WWTP, with the option of a connection direct in to the proposed WWTP when the existing works is decommissioned.
- on-site buildings, including - a Gateway Building with incorporated Discovery Centre, substation building, workshop, vehicle parking including electrical vehicle charging points, fencing and lighting.
- environmental mitigation and enhancements including substantial biodiversity net gain, improved habitats for wildlife, extensive landscaping, a landscaped earth bank enclosing the proposed WWTP, climate resilient drainage system and improved recreational access and connectivity.
- renewable energy generation via anaerobic digestion which is part of the sludge treatment process that produces biogas designed to be able to feed directly into the local gas network to heat homes, or as an alternative potential future option burnt in combined heat and power engines.
- renewable energy generation via solar photovoltaic and associated battery energy storage system.
- other ancillary development such as internal site access, utilities, including gas, electricity and communications and connection to the site drainage system.
- a new vehicle access from Horningsea Road including for Heavy Goods Vehicles (HGV’s) bringing sludge onto the site for treatment and other site traffic.
- Temporary construction works including compounds, temporary highway controls, accesses and signage, fencing and gates, security and safety measures, lighting, welfare facilities, communication control and telemetry infrastructure.
- Decommissioning works to the existing Cambridge WWTP to cease its existing operational function and to facilitate the surrender of its operational permits including removal of pumps, isolation of plant, electrical connections

and pipework, filling and capping of pipework, cleaning of tanks, pipes, screens and other structures, plant and machinery, works to decommission the potable water supply and works to restrict access to walkways, plant and machinery.

1.5.2 Additional elements, together with more information on the above features are provided in Chapter 2: Project Description of the Environmental Statement (App Doc Ref 5.2.2). Principles of Good Design have been used to inform the development of the project, which has been guided by the National Infrastructure Commission's Design Principles, advice from the Design Council and review by the Cambridgeshire Quality Panel, as described in the Design and Access Statement (App Doc Ref 7.6).

1.5.3 Construction activities, likely to take 3-4 years, will include the creation of a shaft to intercept waste water at the existing Cambridge WWTP and temporary intermediate shafts between the existing Cambridge WWTP and the proposed WWTP to launch and recover a micro-tunnel boring machine. The sequence and location of construction activities are also detailed in Chapter 2: Project Description of the Environmental Statement (App Doc Ref 5.2.2).

1.5.4 Towards the end of the construction period, commissioning of the Proposed Development will commence, lasting for between 6 months and 1 year.

1.5.5 The Proposed Development will also involve the decommissioning of the existing Cambridge WWTP at Cowley Road. This is secured by the Development Consent Order and the Outline Decommissioning Plan (Appendix 2.3, App Doc Ref 5.4.2.3) and involves activities necessary to take the existing plant out of operational use and to surrender its current operational permits.

1.5.6 Following decommissioning, the site of the existing plant will be made available in accordance with agreements already in place with Homes England and with the master developer appointed to deliver the redevelopment of North East Cambridge

1.5.7 Consent is not sought under the Development Consent Order for the subsequent demolition or redevelopment of the Cowley Road site, which, as described in Chapter 2: Project Description of the Environmental Statement (App Doc Ref 5.2.2) will be consented under a separate and future planning permission, by master developers, U+I and TOWN, appointed under the agreements described above.

1.5.8 The relationship between the Proposed Development, the scope of the draft DCO and the future demolition and redevelopment of the site at Cowley Road is set out in Figure 1.1, below.

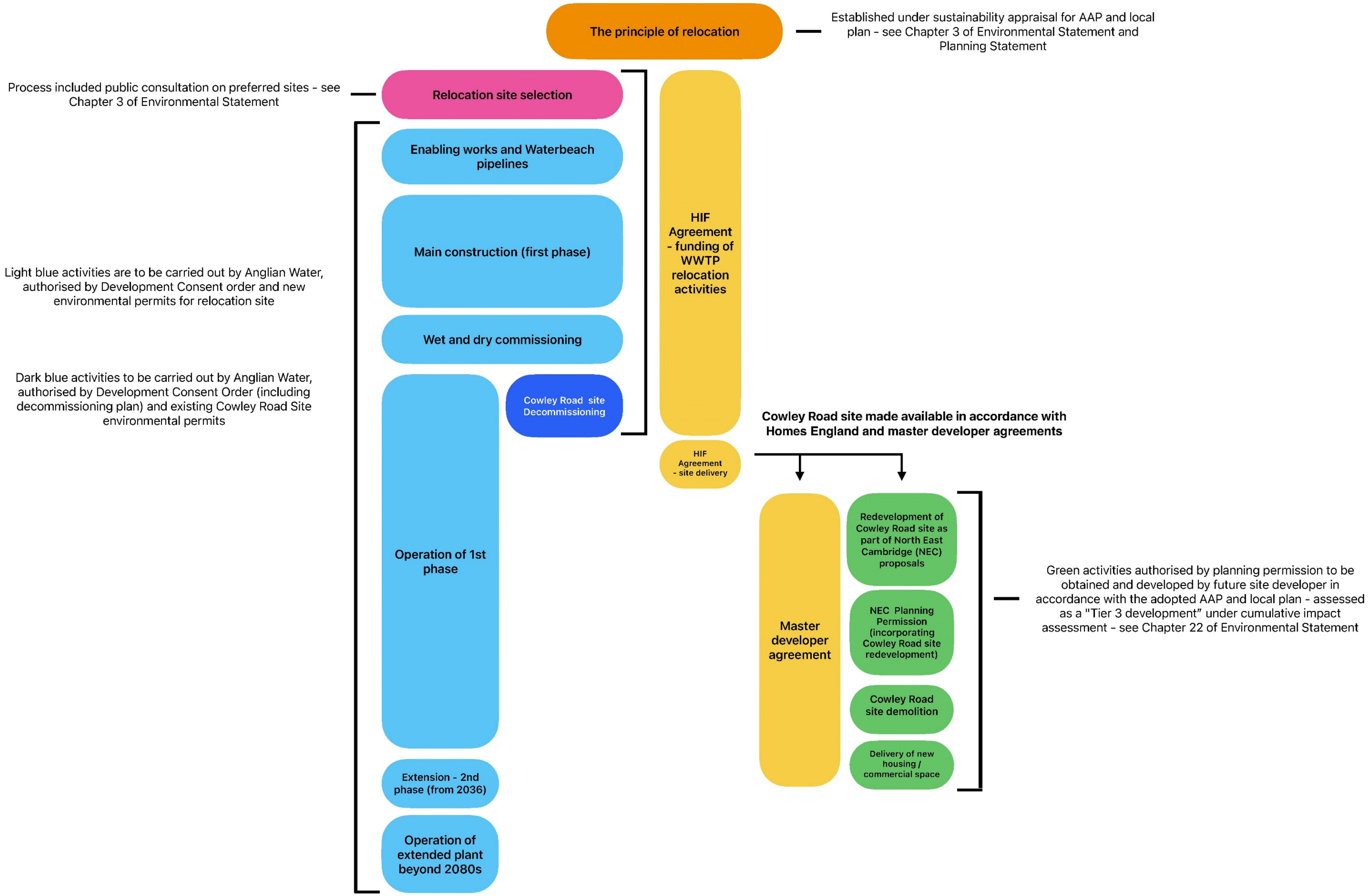


Figure 1.1: Scope of the draft DCO and the future demolition and redevelopment of the site at Cowley Road

1.6 Environmental mitigation

1.6.1 Through the environmental impact assessment process and community and technical stakeholder engagement the Proposed Development has incorporated comprehensive environmental mitigation, secured through the Development Consent Order.

1.6.2 This mitigation includes a Landscape, Ecological and Recreational Management Plan ("LERMP", Appendix 8.14, App Doc Ref 5.4.8.14) has been developed to complement regional and local initiatives, including the Wicken Fen Vision and the Cambridge Nature Network. The 22-hectare footprint of the plant is encircled by a landscaped and planted earth bank situated within the broader LERMP area of around 70-hectares,

1.7 Additional project benefits

1.7.1 In addition to enabling housing growth and future economic development of the Greater Cambridge area the project will also give rise to a number of additional benefits including:

- significantly reduced carbon emissions compared to the existing Cambridge WWTP, being operationally net zero and energy neutral, contributing to Anglian Water’s ambition of being operationally net zero as a business by 2030.
- greater resilience and improved storm management, meaning storm overflows and Combined Sewer Overflows (CSOs) are far less likely to occur. This means that, as Greater Cambridge continues to grow, the facility will be able to treat a greater volume of storm flows to a higher standard than would be the case at today’s facility.
- The proposed WWTP is being designed to reduce concentration in final treated effluent discharges of phosphorus, ammonia, total suspended solids and biological oxygen demand (BOD), compared to the existing Cambridge WWTP. This means that when the new facility starts to operate, water quality in the River Cam will improve.

2 Background to Odour Impact Assessment

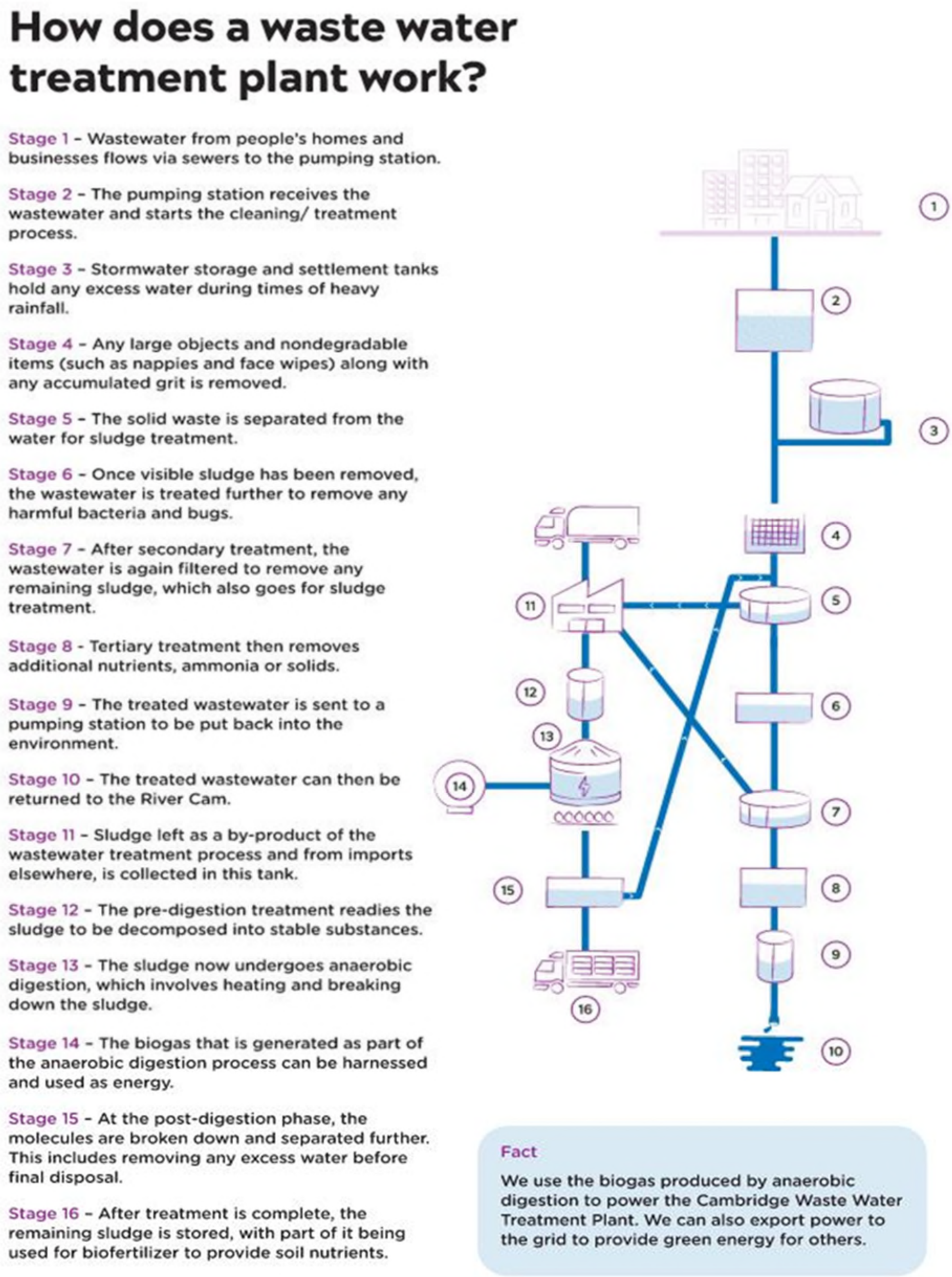
2.1 Introduction

2.1.1 Waste water and sludge treatment plant fall under the listed examples of ‘potentially odorous activities’ that require an odour impact assessment for planning application. This report describes the odour impact assessment carried out for the project.

2.1.2 A separate air quality assessment was carried out to assess other air quality parameters.

2.1.3 Out of the Proposed Development scope summary in section 1.3 above, the scope of work that is included in this assessment is limited to those associated with the integrated waste water treatment and sludge treatment plant. Figure 2-1, from the first DCO consultation, provides a brief description of the waste water treatment processes involved – listed as stages of treatment. This study is limited to the integrated treatment plant site, i.e. including the terminal pumping station (Stage 2) but excluding the network (Stage 1), including the final treated effluent discharge from site (Stage 9) but excluding the River Cam (Stage 10), and including the final treated sludge cake storage on site (Stage 16) but excluding the movement of sludge tankers and sludge application to land (Stage 16).

2.1.4 This odour impact assessment report briefly provides context for odour within the wider subject of air quality management. It further summarises the approach to assess the odour impacts and mitigation for the Project throughout the design development stages. Odour modelling inputs and results are provided, as per the IAQM requirements. Odour information used for DCO public consultation stages are repeated for information, and a sensitivity analysis carried out. Finally, the overall odour impact on receptors was assessed and conclusions presented.



How does a waste water treatment plant work?

Stage 1 – Wastewater from people's homes and businesses flows via sewers to the pumping station.

Stage 2 – The pumping station receives the wastewater and starts the cleaning/ treatment process.

Stage 3 – Stormwater storage and settlement tanks hold any excess water during times of heavy rainfall.

Stage 4 – Any large objects and nondegradable items (such as nappies and face wipes) along with any accumulated grit is removed.

Stage 5 – The solid waste is separated from the water for sludge treatment.

Stage 6 – Once visible sludge has been removed, the wastewater is treated further to remove any harmful bacteria and bugs.

Stage 7 – After secondary treatment, the wastewater is again filtered to remove any remaining sludge, which also goes for sludge treatment.

Stage 8 - Tertiary treatment then removes additional nutrients, ammonia or solids.

Stage 9 – The treated wastewater is sent to a pumping station to be put back into the environment.

Stage 10 – The treated wastewater can then be returned to the River Cam.

Stage 11 – Sludge left as a by-product of the wastewater treatment process and from imports elsewhere, is collected in this tank.

Stage 12 – The pre-digestion treatment readies the sludge to be decomposed into stable substances.

Stage 13 – The sludge now undergoes anaerobic digestion, which involves heating and breaking down the sludge.

Stage 14 – The biogas that is generated as part of the anaerobic digestion process can be harnessed and used as energy.

Stage 15 – At the post-digestion phase, the molecules are broken down and separated further. This includes removing any excess water before final disposal.

Stage 16 – After treatment is complete, the remaining sludge is stored, with part of it being used for biofertilizer to provide soil nutrients.

Fact

We use the biogas produced by anaerobic digestion to power the Cambridge Waste Water Treatment Plant. We can also export power to the grid to provide green energy for others.

Figure 2.1: Waste water treatment process summary from DCO Public Consultation No.1.

2.2 Understanding the Legislative Requirements

2.2.1 *Good air quality* considers parameters including dust, smoke, fumes or gases, steam, and smells or odour. The European Union (EU) Ambient Air Quality Directive is implemented and regulated in the UK through compliance with the National air quality objectives of the Air Quality Strategy (even after BREXIT). This sets the relevant limits and target values at a regional level based on local constraints.

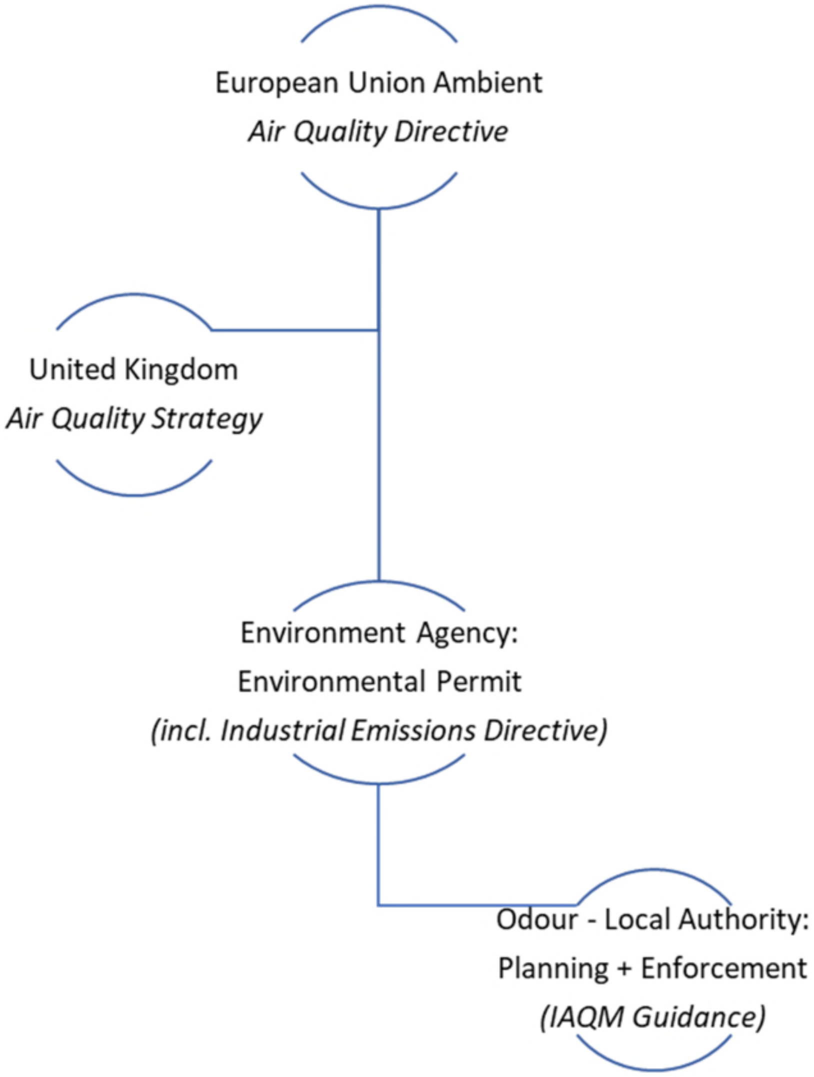


Figure 2.2: Delegated authority for odour requirements and enforcement.

2.2.2 These requirements are delegated to the UK Environment Agency (EA), who issue and enforce Environmental Permits to ensure compliance with the Industrial Emissions Directive (IED) and other environmental protection directives (e.g. Water Framework Directive, Urban Waste Water Treatment Directive, etc.) and requirements associated with other UK and local constraints. During the environmental permit application process, air quality modelling may be required, dependent on the site's activity (e.g. engines of certain size/type) and the local air quality (e.g. near Site of Special Scientific Interest).

2.2.3 Underpinned by these air quality and emission limits, local authorities enforce and (with the assistance of organisations such as the EA and the Institute of Air Quality Management (IAQM)) provide guidance towards planning for new developments to avoid creating odour pollution or nuisance. Included in the considerations of the National Planning Policy Framework is the effect of pollution on health, the natural environment and general amenity. The delegated authority for odour requirements and enforcement is simplified and presented as Figure 2.2.

2.2.4 Additional to air quality, consideration for operator safety under the Health and Safety at Work Act will also be required. This will include investigations such as HAZOP (hazard and operability) studies, DSEAR (dangerous substances and explosive atmospheres regulations) reviews, and COSHH (Control of Substances Hazardous to Health Regulations) assessments. For the gasses predominantly associated with sewage and waste, odour is generally perceived at lower concentrations than those which would be considered hazardous.

2.2.5 For waste water treatment plants, requirements for odour control and ventilation design are subject to British Standard European Standard (BS EN) 12255-9: 2002.

Further guidance available

2.2.6 The National Planning Policy requires: "*Considerations will include the proximity of sensitive receptors, including ecological as well as human receptors, and the extent to which adverse emissions can be controlled through the use of appropriate and well-maintained and managed equipment and vehicles.*". To assist in determining acceptable planning considerations several industry bodies have provided guidance documents relating to odour impact. The most relevant of these are:

- EA's *Guidance for developments requiring planning permission and environmental permits*[1], provides guidance to clarify the interface between the EA and others as part of the planning and permitting process. It provides insights into what would typically be considered trigger/focus points (e.g. distance to receptor) and an indication of what would be deemed to be acceptable, e.g.

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[1] Guidance for developments requiring planning permission and environmental permits, EA, October 2012. Web address: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/297009/LIT_7260_bba627.pdf. Last accessed 27/7/2022.

"New developments within 250m of an anaerobic digestion activity could mean people being exposed to odours. The severity of this will depend on a number of factors, including the size of the facility, the way it is operated and managed, the nature of the waste it takes and weather conditions. If the operator can demonstrate that they have taken all reasonable precautions to reduce odours, the development can go ahead, with minimal effect on those living nearby." For the proposed new site, this buffer zone or separation distance guidance has already been considered during the site selection site screening process;

- EA's *H4 Odour Management Guidance* document [2], provides guidance on '*How to comply with your environmental permit*' and focusses mainly on the operational phase of a project. It also provides benchmark values for site boundary or nearest receptors (below text box). The document is further referred to in this document as EA's H4 guidance;

EA H4 guidance benchmark targets at site boundary or nearest receptors:

- Most offensive odours (septic effluent or sludge) = 1.5 OU_E/m^3
- Moderately offensive odours (well aerated composting, fat frying) = 3 OU_E/m^3
- Less offensive (coffee, bread) = 6 OU_E/m^3

- IAQM's *Guidance on the assessment of odour for planning* Version 1.1 – July 2018 [3], is specifically aimed at the planning process – referred to in this document as the IAQM's guidance and used as the main guidance for carrying out this odour impact assessment; and
- UK Water Industry Research (UKWIR) have produced an *Odour Control in Wastewater Treatment*[4] set of technical reference documents describing typical odour emission rates and best available techniques (BAT) considerations for odour mitigation and management. Reference is made to the odour emission rates.

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[2] Additional guidance for H4 Odour Management. How to comply with your environmental permit, EA, March 2011. Web address: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296737/geho0411btqm-e-e.pdf. Last accessed 27/7/2022.

[3] Guidance on the assessment of odour for planning, IAQM, Version 1.1, July 2018. Web address: http://www.iaqm.co.uk/text/guidance/odour-guidance-2014.pdf. Last accessed 27/7/2022.

[4] Odour control in wastewater treatment – a technical reference document, UKWIR, 17/4/2002, UKWIR Reference: 01/WW/13/3, ISBN 1840572469.

Site boundary or receptors

2.2.7 Environmental permits with odour specific conditions will typically contain two types of clauses associated with odour conditions, with more or less detail, as appropriate to the site:

- The odour boundary condition: "Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in an approved odour management plan, to prevent or where that is not practicable to minimise the odour."; and
- The requirement to comply with an odour management plan (OMP).

2.2.8 The EA H4 guidance clarifies that the odour boundary refers to the 'site boundary'. However, should there be no receptors close to the boundary, permitting will revert to the nearest receptor(s). A warning is included as part of this guidance that should circumstances change (e.g. new development established closer to the site after permitting), the operator may be required to take action to reduce impacts.

2.2.9 The definition of Statutory Nuisance in England and Wales covers seven areas, which relate to odour (s.79(1) Environment Protection Act 1990): "*any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance;*". The 1990 act contains no technical definitions of nuisance, such as maximum concentrations, frequencies or durations of odour in air, and only the Court can decide whether a legal Nuisance is being caused.

'Likely to Cause Pollution' and 'Appropriate Measures'

2.2.10 Odour is a subjective expression. Even the units of measurement are subjective: Odour, expressed in OU_E/m^3 or "odour units per cubic metre", is defined as the concentration of odour in one cubic metre of air at the panel detection threshold of the odour. 1 OU is the point at which 50% of the olfactometry panellists cannot smell the odour, but 50% can.

2.2.11 Whether an individual perceives odour as acceptable, objectionable or offensive would be partly based on their sensitivities but also partly determined through life experiences. Other annoyances such as dust, noise, traffic, etc. could amplify the perception of the acceptableness of odour. Not everyone will perceive pollution or nuisance at the same point, and yet not everyone that experiences the nuisance will complain.

2.2.12 Van Harrevelt[5] described the diminishing process from odour formation to complaint. The steps of his process have been listed, along with a brief commentary, in Table 2-1.

Table 2-1: Commentary on Van Harrevelt odour formation process applicable to WWTW

Van Harrevelt odour formation process	Commentary
Odour formed	The sewage and sludge received at a waste water treatment works (WWTW) is associated with a variety of odorous gasses. Hydrogen Sulphide (H_2S) is probably the most easily recognised - smells like rotten eggs or flatulence – but Ammonia and Mercaptans have also been associated with odour complaints.
Transferred to air	The gasses are transferred to the air at the liquid-air surface, up to a saturation concentration if equilibrium can be established.
Released to atmosphere	Turbulent flow locations such as weirs, flumes and pumped pipe discharges, along with aeration of the liquid are some of the methods that amplify release of the gasses to the air and atmosphere.
Atmospheric dispersion	Sheltering/shielding/covering, air temperature, elevation (e.g. stack or ground level), and wind are some factors that may impact dispersion.
Exposure of receptor	Frequency, intensity, duration, character of the odour and location of the site in relation to its environment (similar or different) are some of the factors that will influence likelihood to proceed towards complaint.
Detection and perception	Differentiation between natures of smells are only possible if >1 OU_E/m^3 difference is detected, meaning that if a background odour exists in an area, the detection of other/different odours in the area will be harder. However, confusion between similar odours can also be perceived. Visual screening is used internationally to minimize odour perception associated with visual detection. Time of the day and activity context, relation to source, association with the odour are some of the factors that could influence detection and perception of the odour as a problem or not.
Appraisal by receptor	Perception of potential health impacts is an example of a trigger that will spur action.
Annoyance	Receptor factors such as attitude to status quo, economic relation to source, personal coping strategies, etc. are some factors that influence level of annoyance.
Nuisance	Cumulative impact of annoyance
Complaint	People with access to a complaint channel and legal instruments are more likely to complain. People will complain if they expect to see a result emanating from their complaint.

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[5] Van Harreveld A.P., From Odorant Formation to Odour Nuisance: New Definitions for Discussing a Complex Process, Water Science and Technology, Vol.44, No.9, pp9-15 (2001)

2.2.13 For the assessment of what level of odour is 'likely to cause pollution' and to determine 'appropriate measures' for mitigation, the EA's H4 guidance recommends, with reference to Table 2-2, consideration of the following two steps:

- Step 1: Is there serious pollution?; and
- Step 2: Is the operator taking appropriate measures?

Table 2-2: Three levels of odour (From figure 1 of the EA's H4 guidance)

Unreasonable odour amounting to serious pollution is being or is likely to be caused (regardless of whether appropriate measures are being used). You must take further action, or you may have to reduce or cease operations. The Environment Agency would not issue a permit if it considered that you were likely to be operating at this level.
Odour pollution is or is likely to be caused beyond boundary. **Your duty** is to use appropriate measures to minimise odour. **You are not in breach** if you are using appropriate measures. If appropriate measures are being used, residual odour will have to be tolerated by the community. For some activities appropriate measures will achieve no smell beyond the boundary.
No odour beyond the boundary or likely to be = no pollution = no action needed

2.2.14 The EA's H4 guidance describes factors to take into consideration for establishing if receptors could perceive a potential odour as pollution or nuisance, including FIDOL (frequency, intensity, duration, offensiveness and location). It provides some benchmark maximum targets at receptors, but lacks clear definition as to what could be considered a reasonable odour position.

2.2.15 The IAQM guidance (2018) is specifically for use during planning and this has been used to inform Step 1 of the above 2 step process for this Project. IAQM guidance (2018) contains the most recent and most suitable guidance for a robust odour impact assessment.

2.2.16 Anglian Water have approached Step 2 of the 2-step process for this project through applying iterative mitigation to ensure:

- Minimise odour by incorporating solutions to address odour at source, using best operational practices; and
- Ensure negligible impact on all known receptors ('negligible' as defined as per IAQM guidelines).

2.2.17 This includes compliance with the Industrial Emissions Directive (IED) for which the sludge treatment centre component of the facility will require an Environmental Permit (EP) to operate. The requirement for the EP includes no odour beyond the boundary (taken as the landscaped bund – referred to as the Rotunda bund) is required. However, the waste water treatment processes are not regulated under the same IED EP. For our odour modelling, all outputs for all waste water treatment and sludge treatment centre components were utilised combined to ensure ‘negligible’ impact to all known receptors.

2.2.18 Furthermore, management of odour at the proposed CWWTPR will be strictly controlled through an Odour Management Plan, as required under the Environmental Permit for the site.

2.2.19 This combination of odour mitigation steps taken during design development and active management approach assures ‘appropriate measures to minimise odour’ for the proposed CWWTPR and a ‘Negligible’ odour impact to all known receptors.

3 Odour Impact Assessment

3.1 Approach of this assessment

3.1.1 IAQM Guidance recommends an assessment, of the impact and resulting effects of an odour source on surrounding users of the land, should utilise a multi-tool approach. As the CWWTPR Project is in the planning phase, observational or empirical methods cannot directly be utilised for the proposed site. Two predictive assessment methods or approaches were utilised, namely:

- A Qualitative Source-Pathway-Receptor Method, and
- Odour Modelling.

3.1.2 A Source-Pathway-Receptor (SPR) method was used primarily for informing the proposed site's baseline odour condition. Odour emission data from the existing site was utilised to identify similarities for utilisation in predicting the new site's odour impacts. Mitigation of some odour emissions was applied to the Project to ensure an acceptable baseline odour position was established.

3.1.3 Odour modelling allows the ability to understand and interrogate greater detail, to allow the prediction of the expected impact in relation to the new site's surroundings. It was the main tool utilized throughout the DCO public consultation process, providing insights as the project developed. This was to ensure the methodology used and results generated throughout were consistent and transparent. It includes starting from conservative input assumptions for the baseline condition, maintaining these throughout for consistency and easy comparison, and concludes by providing a sensitivity analysis. The sensitivity analysis is to show the robustness of the assessment compared to industry standard input assumptions, as well as demonstrating the impact these inputs had/have on the predicted results.

3.1.4 These predictive analysis methods were supported and enhanced through observational/empirical data:

- Odour emission data from previous field olfactometry surveys at the existing Cambridge WRC and from literature were utilised in the assessments to provide information as closely aligned with this catchment and the Cambridge environment as possible.
- A sniff survey was carried out in the Project area to identify if other odour sources in the area could cause a compounding odour effect. It also highlighted improvements expected due to changes between the existing and proposed treatment processes, prior to the baseline odour condition.
- Odour complaints of the existing Cambridge WRC was obtained to determine if particular odour sources were the cause of odorous emissions, or if particular sensitive receptors could be highlighted, or if other issues could be identified.

3.2 Pre-Baseline Odour Condition Source-Pathway-Assessment

3.2.1 To establish the baseline odour condition, treatment processes which would be included for the proposed CWWTPR were identified and the source information associated with the existing Cambridge WRC utilised to inform our input assumptions for the proposed CWWTPR assessment. The new CWWTPR design in the proposed site location formed the basis for the unmitigated odour condition.

3.2.2 The SPR assessment was utilised to determine where and which mitigation measures would be required to form a baseline odour position or condition. This baseline odour position was then further developed (mitigated) and analysed.

Details of Potential Odour Sources

Onsite odour sources

3.2.3 All the process/structures areas associated with the CWWTPR have been described in Table 3-1 along with an indication their odour potential in terms of the following:

- Intensity (faint 5 OU_E/m^3 to strong 10 OU_E/m^3);
- Characteristics (River water, fishy, earthy, rotten, etc.); and
- Hedonic (pleasant +4/neutral 0/unpleasant -4).

3.2.4 For this assessment in Table 3-1, all processes are described as if they are uncovered/unmitigated.

Table 3-1: Comparison between existing Cambridge WRC and proposed CWWTPR odour sources

Nr	Structure/Process Area	Intensity	Character	Hedonic	Existing Cambridge	Proposed CWWTPR
Waste Water Treatment:						
Reception from the transfer tunnel, plus lifting pumping station to treatment elevation						
1	Terminal pumping station (TPS)	Faint to Strong	River Water to Potentially Septic	-3	Yes	Yes
Storm storage and handling						
2	Storm Storage (this is only in use after a storm event and is emptied when flow returns to normal flow patterns)	Medium	River Water to Potentially septic if prolonged storage	-1	Yes	Yes In-line + Off-line
Preliminary treatment: screening and degritting to remove large particles from flow						
3	Channel to Screens & Grit Removal	Faint to Strong	River Water to Potentially Septic	-2	Yes	Yes
4	Fine Screens & Screenings Handling Plant	Faint to Strong	River Water to Potentially Septic	-2	Yes	Yes
5	Grit Removal Plant & Handling Plant	Faint to Strong	River Water to Potentially Septic	-2	Yes	Yes
6	Screenings Skips	Faint	Putrescent	-3	Yes	Yes

Nr	Structure/Process Area	Intensity	Character	Hedonic	Existing Cambridge	Proposed CWWTPR
7	Grit Skip	Faint	Putrescent	-3	Yes	Yes
Primary treatment: settlement of solids for removal to the STC for further treatment. Iron salts are dosed just prior to this, to ensure phosphate bound to sludge for the CWWTPR. At the existing Cambridge WRC, iron salts are dosed during secondary treatment.						
8	Primary Settlement Tank (PST) Distribution	Medium	Iron/Musty	-1	Yes	Yes Iron salts added here
9	PST	Medium	Iron/Musty	-1	Yes	Yes
Interstage pumping station (due to layout or site levels, height constraints, etc. flow need to be moved or lifted to aid hydraulics)						
10	Secondary feed pumping station	Faint	River Water	-1	Yes	Yes
Secondary treatment: biological treatment of soluble organic and inorganic fractions						
11	Activated Sludge Plant (ASP) Division/Selector	Medium	Iron/Musty	-1	Yes Iron salts added here	Yes
12	ASP Anoxic	Medium	Musty	-1	Yes	Yes
13	ASP Aerobic	Faint	Earthy - Aerated	-1	Yes	Yes
14	Final Settlement Tanks (FST)	Faint	River Water	0	Yes	Yes
Tertiary treatment: further solids removal and phosphorous removal polishing						
15	Sand Filters or other suitable proprietary equipment	Faint	Clean River Water	0	No	Yes Iron salts added here
Discharge of treated effluent and settled storm flows (during storm events) to river						
16	Final Effluent (FE)	Faint	Clean River Water	0	Yes	Yes
Sludge Treatment Centre:						
Import facilities						
17	Liquid Import	Instant at delivery	Septic	-3	Yes	Yes
18	Cake Import	Instant at delivery	Septic	-3	No	No
Sludge treatment facility - anaerobic treatment of sludge to achieve enhanced quality for land application						
19	Sludge tanks	Strong	Septic	-3 to -4	Yes	Yes
20	Post/secondary digesters	Strong	Musty/Earthy	-1 to -3	Yes	Yes
Treated cake at enhanced quality for land application						
21	Storage	Faint	Earthy	-1	Conveyors to Vehicle Bins	Cake Barn to Vehicle Bins
Sludge treatment centre digested cake dewatering liquors treatment						
22	Liquor Treatment Plant anoxic/pre-settlement	Low	Musty	-1	No	Yes
23	Liquor Treatment Plant aerobic reactor	Low	Earthy	-1	No	Yes
24	Liquor Treatment Plant FST	Faint	River Water	0	No	Yes
Ancillary works						
25	On-site storage of sludge/compost	Faint to Strong	Can be rich compost, to Earthy for Treated	-1 to -3	Yes	No

Nr	Structure/Process Area	Intensity	Character	Hedonic	Existing Cambridge	Proposed CWWTPR
26	On-site overnight storage/parking of empty sludge/water tankers	Negligible	Musty/Earthy	0	Yes	Yes

3.2.5 Odour control units (OCU) would not be classed as odour sources in their own right, as they cannot generate their own odour. However, as the collected odorous air from specific covered odour sources are directed to and treated through OCUs, they become the mitigated position of the original odour source(s) listed above. This section aims to describe the unmitigated position. Should OCUs be added for mitigation (refer section 3.3), the OCU will be considered to be the original source's outlet at the mitigated impact.

3.2.6 Comparably, the gas storage bag, gas cleaning equipment, combined heat and power engines, steam boilers and ancillary equipment, and flare stack are associated with the captured biogas from the digestion pre-treatment and anaerobic digestion processes that is captured, stored, cleaned, used and/or injected into the National Gas Network. Where emissions are discharged from these sources, these would be in relatively small quantities, mainly consisting of carbon dioxide and/or steam and subject to air quality under the IED. The emissions associated with the biogas processes are not included as odour sources.

3.2.7 Sniff field surveys were carried out on 14th April, 5th May and 15th May 2022 at the existing Cambridge WRC and locations in the wider area of the existing Cambridge WRC and proposed CWWTPR site (attached as Appendix A). Although the purpose of the survey was predominantly to understand the potential for overlapping and thus additive odour sources in the area, it was clear that the impacts of the odour associated with the secondary digesters and sludge storage/composting activities in the north east corner of the existing Cambridge WRC, had a significant impact on the sniff survey findings.

Offsite odour sources

3.2.8 The site proposed for the relocated CWWTPR was determined by the site selection process that formed part of the DCO phase 1 consultation.

3.2.9 The selected site has a rural setting on the outskirts of Cambridge, with the area's baseline background odour expected to match agricultural practises, which could include an "earthy" odour character and occasional fertiliser application, crop sowing, harvesting, ploughing, etc. The site is close to the villages of Horningsea, Fen Ditton, Milton and Stow cum Quy which all consist of residential areas and small industries. The selected site falls slightly to the west of the existing Cambridge City Airport runway approach/take-off path.

3.2.10 Although there is no direct correlation between odour and air quality, air quality problems can be associated with potential odour problems. Air quality data collected by the South Cambridgeshire District Council consist of nitrogen dioxide and particle count. Details of the data they collect is available from their website[6] and indicate that air quality concerns for the area are limited to pollution from major roads.

3.2.11 As mentioned in the previous section, to get a better indication of the background odour profile, sniff field surveys were carried out during April and May 2022 at locations in the wider area of the existing Cambridge WRC and proposed CWWTPR sites (attached as Appendix A). The survey detected 'competing' odours (defined as odours described as 'Vegetation', 'River Water', 'Earthy, 'Manure') which could, rightly or wrongly, be attributed emanating from the CWWTP. This confirms that there are already some existing odour sources that contribute to a background odour level in the area. These sources and background odour level could mask the potential odours from the proposed CWWTP being detected. Similarly, any of the above could potentially be perceived to be of similar character to aspects of the proposed Cambridge CWWTP and rightly or wrongly be associated with emissions and/or odours. For example, air quality and emissions from traffic movements on the roads could be wrongly attributed to be from site vehicles; lakes/ponds emissions could be wrongly attributed to be from CWWTP partially treated waters and waste management facilities emissions could get confused for CWWTP emissions.

3.2.12 Noting that "odours are not usually additive in their impacts unless they are of a similar character"[7]. A desktop study was carried out of the area and the following potential odour sources were identified that may be perceived to be of similar characteristics as those from a waste water treatment plant:

- Roads, including the M11, A14 to the south and A10 to the east (A14 closest, c. 0.5km away);
- River Cam (c. 2.3km away);
- Existing Cambridge WRC site (c.2.5km away) – to be relocated to new CWWTPR site;
- Pond near Gayton Farm, Horningsea (c. 2.8km away);
- Milton Country Park (c. 3.2km away);
- Milton Recycling Centre (c. 5.5km away);
- East Waste Landfill Site (c. 6.5km away);
- Milton Maize Maze (with lake/pond) (c. 5.6km away);
- Taversham WRC (5.6km away);
- Leland, Atkins and Dodd's Water (8.4km away);
- Chivers Lake (8.7km away);

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[6] Home | Air Quality in South Cambridgeshire Web address: https://scambs-airquality.ricardo-aea.com/ Last accessed 27/7/2022.

[7] Guidance for the assessment of odour for planning, Version 1.1, July 2018, published by the Institute of Air Quality Management

- Existing Waterbeach WRC (c.10km away); and
- Waterbeach Waste Management Park (incl. landfill & energy from waste facility) (c.15km away).

3.2.13 This list does not aim to be exhaustive but provides a perspective on the nature of the area. The list does not include any farms, significant cultured/tended gardens (e.g. Anglesey Abbey) or plant nurseries, of which there are several in the area (e.g. Darwin Nurseries, Scotsdale, Histon Plants, etc.). These seasonal/sporadic activities that may occur from time to time close to the CWWTPR site and may wrongly be attributed to the CWWTPR project. They will cause interference in the odour source apportionment allocation when carrying out a source-pathway-receptor assessment. However, as these are neither predictable, nor consistent impacts, they are not included in this odour impact assessment during the planning phase, but would have to be considered should complaints arise following construction and commissioning.

Additive odour sources assessment:

3.2.14 For this unmitigated source-pathway-receptor assessment, the findings of the sniff field survey and complaints received (more details in section 3.2) associated with the existing Cambridge WRC were considered, to determine the range of impact to be checked for overlapping/additive odour sources. Based on these records, 1km beyond the site boundary was viewed to be sufficient, but a 2km range was investigated in this additive odour sources investigation study to ensure results from this assessment are robust and inclusive.

3.2.15 In the Horningsea and Fen Ditton areas, the typical distance that properties are located away from the River Cam (the closest off-site odour source) is 0.3km. Although other site factors also influence housing location, such as flood risks, for the purpose of this odour impact assessment it can be reasonably concluded that these properties located themselves where they would experience “negligible odour impacts”. With 2.3km between the CWWTPR and the River Cam, i.e. more than 2km range discussed in the previous section, these potential odour sources do not overlap.

3.2.16 The Pond near Gayton Farm, Horningsea, is located c.0.5km away from the closest property. With c.2.8km between the CWWTPR and the Pond near Gayton Farm, Horningsea, potential odour sources do not overlap.

3.2.17 Similarly, properties are located c.0.2km away from the Milton Country Park. With c.3.2km between the CWWTPR and the Milton Country Park potential odour sources do not overlap.

3.2.18 When looking at the list of sources in section 3.2, the other sources are much further afield than the 2km range. Therefore, it is concluded that there are no sources that would be classed as of similar nature AND close enough to the proposed CWWTPR to be considered additive.

Pathway

3.2.19 Additional factors that are considered to impact how the odour does/doesn't find its way/path from the source to the receptor include:

- topography and terrain;
- the distance from the source to the receptor;
- the frequency (%) of winds from the source to receptor (or, qualitatively, the direction of receptors from source with respect to prevailing wind);
- the effectiveness of dispersion/ dilution in reducing the odour flux[8] to the receptor; and
- the effectiveness of any mitigation/control in reducing flux to the receptor.

3.2.20 Further details are provided associated with each of these points listed above in context of the proposed CWWTPR.

Topography and Terrain

3.2.21 The topography and terrain around the existing site for the proposed CWWTPR were described in Stage 4 – Final Site Selection Report (January 2021) as:

- "Site area 3 lies between the villages of Horningsea to the north, Stow Cum Quy to the east and Fen Ditton to the south east. The A14 extends along the south western boundary of the site and Low Fen Drove Way, an unclassified road and public byway follows parts of the eastern and north eastern boundary of the site area. Beyond Low Fen Drove Way, the open farmland extends to the north east towards and beyond Stow Cum Quy Fen, and to the east, towards Stow Cum Quy village. To the west of site area 3 lies Junction 34 of the A14, a junction intersected by Horningsea Road which extends north, parallel to the western boundary of the site area. Horningsea Road connects Fen Ditton to the south with the village of Horningsea in the north."
- "The site area itself is open farmland with large arable fields defined by boundary hedges and ditches. The topography is mostly level, at 5-10m AOD, rising towards the west. A dismantled railway, also designated as CWS (Country Wildlife Site), crosses the southern end of the site area and overhead powerlines cross the northern section and include six transmission towers within the site area."

3.2.22 Included in the proposed CWWTPR scope is a significant amount of planning and landscaping which would change the character of the c.127ha site. More specifically the area around and on the Rotunda bund, to include more woodlands, hedgerow and groups of trees. The Rotunda bund, a 5m high earth bund around the main treatment plant with openings for access and 3No. vents, will further amend the current site topology. Although the additional planting and landscaping would have

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[8] Flux describes the continuous changes, passage or movement (in this case potentially odorous air) as it flows or moves.

an odour mitigating impact, for this unmitigated SPR assessment these amendments have not been considered as potential mitigation measures.

Distance

3.2.23 During the site selection stage of the project, guidance such as the EA's *Guidance for developments requiring planning permission and environmental permits*[9] and National Planning Policy were used to establish the baseline constraints used for the site selection. These are listed in the Stage 4 – Final Site Selection report (January 2021) as:

- "The 500m buffer around listed buildings in Horningsea village to the north east and Biggin Abbey to the east;
- The site selection Study Area to the north and east;
- 400m buffer around an isolated residential property located on Low Fen Drove Way; and
- The 100m buffer along the alignment of the A14 to the south west."

3.2.24 The site location, on the outskirts of Cambridge is located c.1.5km away from Horningsea village, Fen Ditton and a much greater distance from Stow cum Quy (c.4km). A few isolated properties closer to the site have been identified as residences or receptors (refer to the *Receptors* section in section 3.2 below and Appendix B).

3.2.25 As discussed in the *Offsite odour sources* section above, 2km beyond the Rotunda has been used in this unmitigated source-pathway-receptor assessment as the range within which to determine if overlapping occurs and thus odour sources would combine to have an additive impact. Although no significant odour sources were found to overlap the study area, as was noted from the sniff field study, odours associated with farming activities on lands surrounding the CWWTPR may from time to time occur within the 1km impact range. When the farming activities occur, and dependant on the extent thereof, this will cause overlapping of odour impacts from farming activities with activities from the CWWTPR.

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[9] Guidance for developments requiring planning permission and environmental permits, EA, October 2012. Web address: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/297009/LIT_7260_bba627.pdf. Last accessed 27/7/2022.

Impact of Wind

3.2.26 Figure 3.1 below includes the wind rose compiled from five years (2016 to 2020) wind data relevant to the site. Further details of the validation of the MET data can be found in section 4.3, discussed as part of the odour modelling.

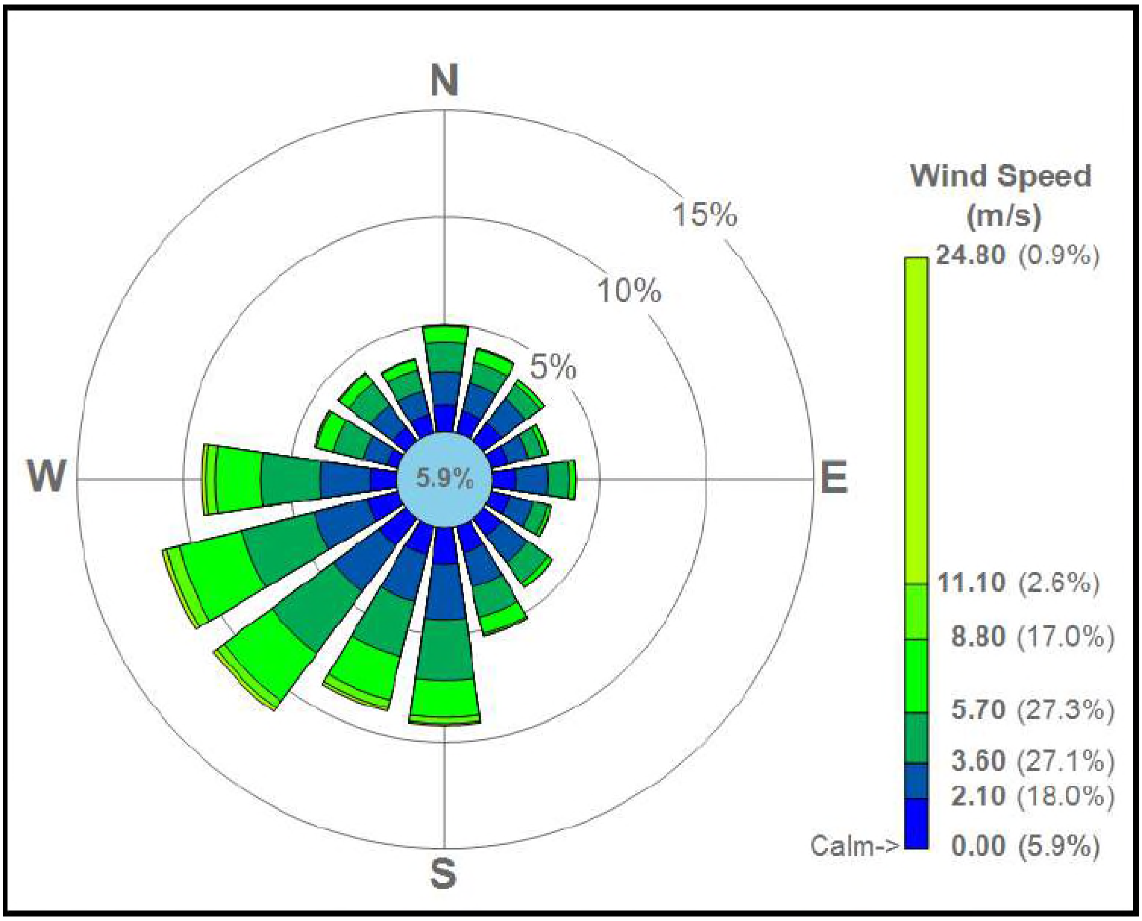

Figure 3.1: Cambridge/Mildenhall MET data windrose average 2016 to 2020.

3.2.27 From the wind rose it can be seen that at lower wind speeds, the wind direction distribution is very evenly spread, with the higher wind speeds prevailing from the south-west. Receptors to the north-east of the site would thus be at higher risk of being impacted by potential odours from the proposed CWWTPR at higher wind speeds.

Dispersion/Dilution

3.2.28 Trees, houses and buildings, or other obstructions can shelter, channel or disperse odours depending on the permeability and arrangement of these in relation to the predominant wind directions.

3.2.29 As the proposed CWWTPR site currently consists of mainly farmlands, little additional dispersion/dilution will be added from trees, houses and buildings to the unmitigated SPR assessment. The mitigated position will be discussed in latter chapters.

Receptors

3.2.30 The map of the receptors identified as part of the Environmental Impact Assessment (EIA) have been included in Appendix B and listed in Table 3-2.

Table 3-2: Potential odour receptors identified during the EIA

Receptor ID	Receptor name	National Grid Reference (X,Y coordinates)
1	Gatehouse	550452, 260942
2	A14	549244, 260843
3	Property east of Horningsea Road, Fen Ditton	548870, 260803
4	Biggin Abbey	548782, 261736
5	Quy Mill Hotel	550846, 259899
6	Fen Ditton Community Primary School	548714, 260454
7	Low Fen Drove Way PROW 85/14	549922, 261589
8	Property to south of Horningsea	549278, 262141
9	Future residential property to north of the proposed WWTP	549821, 261567
10	Land to the south of the A14 used for non-arable farming activities	549230, 260741
11	Property on Capper Road	550356, 266188
12	Cycleway	547234, 261854
13	Commercial property on Cowley Road	547108, 261646
14	Golf driving range	547194, 261392
15	Milton Country Park	547759, 261891
16	Property north of A14 near Milton Country Park	547436, 262237
17	Residential property on Fen Road	547781, 261081
18	Northern Bridge Farm	548160, 261465
19	Existing informal footpath/track	550419, 266431
20	Footpaths within Landscape Management Plan	550007, 260949
21	Property adjacent to Wildfowl Cottage	548572, 261994
22	Poplar Hall Farm	548517, 261376
23	Red House Close	548381, 261291
24	PROW 85/6, 85/8 and 162/1	548385, 261761

3.2.31 As discussed in the above section 3.2.25, the unmitigated SPR study area was determined to be c.1km around the proposed CWWTPR. That would include receptors numbered 1 to 10, 18, 20 to 24 in the list above.

Complaints history

3.2.32 Historically the existing Cambridge WRC had occasionally suffered from odour complaints. Following the A treatment stream being turned off in 2015, complaints history dropped significantly. The A treatment stream (mainly consisted of trickling filter beds) was replaced by D treatment stream (an activated sludge plant) to ensure compliance could be maintained. The A treatment stream would in summer, when dryer weather was experienced, suffer from partial drying out of the trickling filters which would decrease treatment efficiency and increase odour.

3.2.33 When a complaint is received by the Applicant, it is registered on their business operations and customer relations management system. However, each of the complaints are investigated and addressed, where required, before it will be closed on the system.

3.2.34 Between 2014 and 2020 a total of nine complaints were attributed to the existing Cambridge WRC. The odour complaints registered associated with the WRC are listed in Table 3-3 below. Of the nine: two covered the same incident; two were received by the sewage networks team and not deemed significant enough to raise to the WRC; and for two no issue could be found. That leaves four incidences, all associated with abnormal activities at the plant (e.g. emergency flare stack in use) for which incidents were reported and dealt with in accordance to the Odour Management Plan for the site.

Table 3-3: Odour complaints registered for the existing Cambridge WRC (2014 to 2020)

Notification Date	Notification Time	Notification ID	Comment on the System
2014/06/11	20:49:38	10705655	(Received by sewage network team) Site the likely source, complaint not passed to site team
2016/07/25	09:45:01	13481656	Very short-term issue, no issue found at site
2016/10/31	20:48:40	13806996	Pipework fault found on site
2016/12/15	08:15:35	13956154	Unspecified STC issue
2017/06/05	13:52:56	14528407	Site the likely source, but no particular problems found
2017/07/04	08:34:12	14631535	Site issue with flare stack
2018/04/19	07:43:53	14631535	Post storm lagoon use. Drying surface
2018/04/19	09:28:16	15683167	Post storm lagoon use. Drying surface
2018/04/29	12:50:16	15683494	(Received by sewage network team) Site the likely source, not passed to site team for investigation

3.2.35 Several other complaints pointed to the WRC. However, upon investigation these were attributed to either Milton landfill, domestic issues, or no odour source/reason could be determined.

3.2.36 Furthermore, in 2015 the Milton Air Quality Working Party (MAQWP) was established. These quarterly liaison meetings aim to provide stakeholders the opportunity to raise air quality issues/concerns, including odour. As the attendees include Milton landfill, Anglian Water and the local environmental health officer(s) (EHO), odour incidents are raised, attributed to the correct source and resolved at the earliest opportunity. This has further contributed to a reduction in odour complaints to the WRC as stakeholders gain insight to discern odour characteristics to apportion complaints to the correct source.

3.2.37 Of the complaints registered for the existing Cambridge WRC, none were registered to any of the receptors in the vicinity of the proposed site. None of the receptors in our study area would thus be classed as an odour sensitive receptor and special considerations, for odour sensitive receptors additional to normal considerations as per the IAQM guidance, would not be required.

Source-Pathway-Receptor Assessment

3.2.38 The guidance method provided in Table 9 of the IAQM guidance document was used as example to score the potential odour sources, the effectiveness of the pathway and the relative sensitivity of the receptors for the SPR assessment that follows.

3.2.39 The IAQM guidance Table 10 and Table 11 was used to determine the risk and odour effect on receptors. These have been duplicated as Table 3-4 and Table 3-5, for ease of reference:

Table 3-4: IAQM Table 10: Risk of odour exposure (impact) at the specific receptor location

		Source Odour Potential		
		Small	Medium	Large
Pathway Effectiveness	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

Table 3-5: IAQM Table 11: Likely magnitude of odour effect at the specific receptor location

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

3.2.40 The following section provides a brief summary of the scoring apportionment, with the assessment results tabulated in Table 3-6, Table 3-7 and Table 3-8.

3.2.41 Table 3-9 and Table 3-10 then contain a summary of the risk and likely odour effects assessment results, utilising Table 3-4 and Table 3-5 to determine the scoring.

Source odour potential

3.2.42 The scale used for scoring source odour potential was as follows:

- **Large**: process classed as "most offensive" in EA's H4 guidance or hedonic score between unpleasant (-2) and very unpleasant (-4);
- **Medium**: compounds involved are moderately odorous, hedonic score between neutral (0) and unpleasant (-2); and
- **Small**: process classed as "less offensive" in EA's H4 guidance or hedonic score between neutral (0) and very pleasant (+4).

Odour potential scoring for each of the sources in unmitigated form in Table 3-6.

Table 3-6: Source Odour Potential Scoring (Unmitigated)

Nr	Potential Odour Source as Structure/Process Area	Hedonic	Source Potential
1	Terminal pumping station	-3	Large
2	Storm Storage (this is only in use after a storm event and is emptied when flow returns to normal flow patterns)	-1	Medium
3	Channel to Screens & Grit Removal	-2	Medium to Large due to large channels surface area
4	Fine Screens & Screenings Handling Plant	-2	Medium to Large as best practice enclosed not open
5	Grit Removal Plant & Handling Plant	-2	Medium
6	Screenings Skips	-3	Large, reduced to Medium due to unit size
7	Grit Skip	-3	Large, reduced to Medium due to unit size
8	Primary Settlement Tank Distribution	-1	Medium, risk further reduced due to iron salt dosing
9	PST	-1	Medium
10	Secondary feed pumping station	-1	Medium
11	Activated Sludge Plant (ASP) Division/Selector	-1	Medium

Nr	Potential Odour Source as Structure/Process Area	Hedonic	Source Potential
12	ASP Anoxic	-1	Medium
13	ASP Aerobic	-1	Medium
14	Final Settlement Tanks (FST)	0	Small
15	Sand Filters or other suitable proprietary kit	0	Small
16	Final Effluent (FE)	0	Small
17	Liquid Import	-3	Large, reduced to Small due to infrequent deliveries and small coupling size
19	Sludge tanks	-3 to -4	Large, reduced to Small as covered (IED) and biogas utilised or to OCU treatment with stack high release
20	Post/secondary digesters	-1 to -3	Medium to Large
21	Storage	-1	Medium
22	Liquor Treatment Plant anoxic/pre-settlement	-1	Medium
23	Liquor Treatment Plant aerobic reactor	-1	Medium
24	Liquor Treatment Plant FST	0	Small
26	On-site overnight storage/parking of empty sludge/water tankers	0	Small

Source 18 sludge cake import and Source 25 on-site storage of sludge/compost have been removed from the table, as they will not be included in the proposed CWWTPR scope of works.

Effectiveness of pathway

3.2.43 The scale used for scoring effectiveness of pathway in terms of distance, wind direction frequency and effectiveness of dispersion was:

- **High**: Distance – adjacent to source/site; Direction – high frequency (%) of winds from source to receptor; Effectiveness of dispersion/dilution – open processes with low-level releases.
- **Moderate**: Distance – local to the source; Effectiveness of dispersion/dilution – elevated processes, but compromised by building effects.
- **Ineffective**: Distance – receptor is remote from the source; Direction – low frequency (%) of winds from source to receptor; Effectiveness of dispersion/dilution – releases are from high level, not compromised by surrounding buildings.

Effectiveness scoring for each of the pathways is presented in Table 3-7.

Table 3-7: Pathway Effectiveness Scoring (Unmitigated)

Pathway	Distance	Direction	Dispersion/dilution	Effectiveness
Comment	As part of the site selection process, only sites were selected that had no receptors that would be classed as High due to Distance. Furthermore, receptors were screened to be local to the source (Moderate) or too distant/far (Ineffective) in section 3.2, and thus discounted from this analysis	With consideration of the wind rose, all locations to the north-east quadrant are considered to score High. All other quadrants are considered to score Moderate.	All sources are considered to be unmitigated at this stage of the assessment and therefore effectiveness of dispersion/dilution is viewed High.	
Receptors closer than c.0.5km = NONE				
North-east quadrant	Moderate	High	High	High
South-east, South-west, North-west quadrant	Moderate	Moderate	High	Moderate

Pathway	Distance	Direction	Dispersion/dilution	Effectiveness
Receptors located greater than 0.5km and closer than 1km: numbered 1 to 10, 18, 20 to 24.				
North-east quadrant	Ineffective	High	High	Moderate
South-east, South-west, North-west quadrant	Ineffective	Moderate	High	Ineffective
Receptors further than c.1km around the proposed CWWTRP: numbered 11 to 17, 19.				
All	Ineffective	Moderate/High	High	Ineffective

Receptor sensitivity

3.2.44 The scale used for scoring receptor sensitivity, matching IAQM guidance, was:

- **High**: users can reasonably expect enjoyment of a high level of amenity; and people would reasonably be expected to be present continuously or at least regularly for extended periods of time as part of the normal pattern of use of the land, e.g. residential dwellings, hospitals, schools/education, tourist/cultural sites.
- **Medium**: users would expect to enjoy a reasonable level of amenity, but wouldn’t reasonably expect to enjoy the same level as in their home; or people wouldn’t reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use e.g. places of work, commercial/retail premises, playing/recreation fields.
- **Low**: the enjoyment of amenity would not reasonably be expected; or there is transient exposure, where the people would reasonably be expected to be present only for a limited period of time as part of the normal pattern of use of the land, e.g. industrial facilities, farms, footpaths and roads.
- Sensitivity scoring for each of the receptor is presented in Table 3-8.

Table 3-8: Receptor Sensitivity Scoring

Receptor ID	Receptor name	National Grid reference (X,Y coordinates)	Sensitivity
1	Gatehouse	550452, 260942	High
2	A14	549244, 260843	Low
3	Property east of Horningsea Road, Fen Ditton	548870, 260803	High
4	Biggin Abbey	548782, 261736	High
5	Quy Mill Hotel	550846, 259899	High
6	Fen Ditton Community Primary School	548714, 260454	High
7	Low Fen Drove Way PROW 85/14	549922, 261589	Low
8	Property to south of Horningsea	549278, 262141	High
9	Future residential property to north of the proposed WWTP	549821, 261567	High

10	Land to the south of the A14 used for non-arable farming activities	549230, 260741	Low
11	Property on Capper Road	550356, 266188	Low
12	Cycleway	547234, 261854	Low
13	Commercial property on Cowley Road	547108, 261646	Medium
14	Golf driving range	547194, 261392	Medium
15	Milton Country Park	547759, 261891	Low
16	Property north of A14 near Milton Country Park	547436, 262237	High
17	Residential property on Fen Road	547781, 261081	High
18	Northern Bridge Farm	548160, 261465	High
19	Existing informal footpath/track	550419, 266431	Low
20	Footpaths within Landscape Management Plan	550007, 260949	Low
21	Property adjacent to Wildfowl Cottage	548572, 261994	High
22	Poplar Hall Farm	548517, 261376	High
23	Red House Close	548381, 261291	High
24	PROW 85/6, 85/8 and 162/1	548385, 261761	Low

Source-Pathway-Receptor Analysis Summary

3.2.45 Table 3-9 contains the results summary combining the odour sources and their rated potential from Table 3-6 with the rated pathway effectiveness from Table 3-7 to present the risk of odour exposure (impact) to the receptors. Table 3-10 then reflects the risk of exposure from Table 3-9 in relation to the receptor sensitivity from Table 3-8 to present the likely magnitude of the odour effect. Table 3-10 thus summarises the likely magnitude of potential odours (unmitigated) from the CWWTRP impacting receptors to conclude the source-pathway-receptor analysis:

Table 3-9: Risk of odour exposure (impact) at the receptor locations for proposed CWWTPR (unmitigated)

			Source Odour Potential		
			Small	**Medium**	**Large**
		Odour source reference to the right Pathway classification below	14,15,16, 17,19,24,26	2,5,6,7,8,9,10,11, 12, 13,21,22,23	1,3,4, 20
Pathway Effectiveness	Highly effective pathway	None (screened out at site selection)	Low Risk	Medium Risk	High Risk
	Moderately effective pathway	North East Quadrant,>0.5km and <1km	Negligible Risk	Low Risk	Medium Risk
	Ineffective pathway	South-east, South-west, North-west quadrant; >0.5km and <1km; All >1km	Negligible Risk	Negligible Risk	Low Risk

Table 3-10 –Likely magnitude of odour effect at the receptor locations for proposed CWWTPR (unmitigated)

Risk of Odour Exposure	**Receptor Sensitivity**		
	Low	**Medium**	**High**
Receptor ID	**2,7,10,11,12,15,19,20,24**	**13,14**	**1,3,4,5,6,8,9,16,17,18,21,22,23**
High Risk of Odour Exposure	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium Risk of Odour Exposure	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low Risk of Odour Exposure	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible Risk of Odour Exposure	Negligible Effect	Negligible Effect	Negligible Effect

3.2.46 From the above tables it is predicted that the unmitigated position would result in some moderate adverse odour impacts to some of the high sensitivity receptors (domestic dwellings).

3.2.47 This position was deemed unacceptable by Anglian Water for the CWWTPR project. Initial mitigation was applied prior to site selection (first consultation July 2020). The resultant Baseline Position allowed the Applicant to commit from the start of the project to:

- Minimise odour by incorporating solutions to address odour at source, using best operational practices; and
- Ensure negligible impact on all known receptors ('negligible' as defined as per IAQM guidelines).

3.2.48 It is the conclusion of the Pre-Baseline Odour Condition SPR assessment that to fulfil Anglian Water's commitment to achieve 'negligible' impact to all known receptors, the sources No. 1,3,4,20 need to be mitigated.

3.2.49 The initial mitigation, to establish the Baseline Position for the project, is described in section 3.3.

3.2.50 Mitigation applied beyond the Baseline Position, as part of the project development, is described in section 5.6.

3.3 Initial Mitigation: Unmitigated to Baseline Position

3.3.1 To ensure that 'negligible' impact on all known receptors could be achieved, the unmitigated position would require, at a minimum, all Large odour sources (No. 1, 3, 4, 20) to be reduced.

3.3.2 The mitigation for the Baseline position was achieved through covering all the tanks in the STC, as well as the terminal pumping station and inlet works, and treating and venting the air from these processes through OCUs.

3.3.3 Some STC tanks are connected to the biogas capture and use system, and emissions from that equipment will require compliance with the IED emissions requirements.

3.3.4 Covering tanks, either for treating air through OCUs or for biomethane capture and utilisation, is viewed as highly effective odour mitigation. Firstly, it reduces the source odour potential through collection and treatment, thus moving the source potential from "Large" to "Small" potential. These mitigation measures also lift the odour discharge up from low level (ground level release) to high level releases at the top of the OCU stack and thereby reduces the pathway effectiveness. This combination of addressing the source and the pathway is viewed as highly effective odour mitigation in a SPR analysis.

3.4 SPA Post Mitigation: Baseline Position

3.4.1 A summary of the resulting odour sources that form part of the Baseline position after initial mitigation is included in Table 3-11 below.

Table 3-11: CWWTPR odour sources mitigated for Baseline position

Nr	Structure/Process Area	Intensity	Character	Hedonic	Mitigation	Mitigated Potential
Waste Water Treatment:						
Reception from the transfer tunnel, plus lifting pumping station to treatment elevation						
1	Terminal pumping station (TPS)	Faint to Strong	River Water to Potentially Septic	-3	Yes, covered to OCU	Small
Storm storage and handling						
2	Storm Storage (this is only in use after a storm event and is emptied when flow returns to normal flow patterns)	Medium	River Water to Potentially septic if prolonged storage	-1	N/A	Medium
Preliminary treatment: screening and degritting to remove large particles from flow						
3	Channel to Screens & Grit Removal	Faint to Strong	River Water to Potentially Septic	-2	Yes, covered to OCU	Small
4	Fine Screens & Screenings Handling Plant	Faint to Strong	River Water to Potentially Septic	-2	Yes, covered to OCU	Small
5	Grit Removal Plant & Handling Plant	Faint to Strong	River Water to Potentially Septic	-2	N/A	Medium
6	Screenings Skips	Faint	Putrescent	-3	N/A	Medium
7	Grit Skip	Faint	Putrescent	-3	N/A	Medium
Primary treatment: settlement of solids for removal to the STC for further treatment.						

Nr	Structure/Process Area	Intensity	Character	Hedonic	Mitigation	Mitigated Potential
Iron salts are dosed just prior to this, to ensure phosphate bound to sludge for the CWWTPR. At the existing Cambridge WRC, iron salts are dosed during secondary treatment.						
8	Primary Settlement Tank (PST) Distribution	Medium	Iron/Musty	-1	N/A	Medium
9	PST	Medium	Iron/Musty	-1	N/A	Medium
Interstage pumping station (due to layout or site levels, height constraints, etc. flow need to be moved or lifted to aid hydraulics)						
10	Secondary feed pumping station	Faint	River Water	-1	N/A	Medium
Secondary treatment: biological treatment of soluble organic and inorganic fractions						
11	Activated Sludge Plant (ASP) Division/Selector	Medium	Iron/Musty	-1	Yes, Iron salts added here	Medium
12	ASP Anoxic	Medium	Musty	-1	N/A	Medium
13	ASP Aerobic	Faint	Earthy - Aerated	-1	N/A	Medium
14	Final Settlement Tanks (FST)	Faint	River Water	0	N/A	Small
Tertiary treatment: further solids removal and phosphorous removal polishing						
15	Sand Filters or other suitable proprietary equipment	Faint	Clean River Water	0	N/A	Small
Discharge of treated effluent and settled storm flows (during storm events) to river						
16	Final Effluent (FE)	Faint	Clean River Water	0	N/A	Small
Sludge Treatment Centre:						

Nr	Structure/Process Area	Intensity	Character	Hedonic	Mitigation	Mitigated Potential
Import facilities						
17	Liquid Import	Instant at delivery	Septic	-3	N/A	Small
Sludge treatment facility - anaerobic treatment of sludge to achieve enhanced quality for land application						
19	Sludge tanks	Strong	Septic	-3 to -4	Yes, covered to OCU	Small
20	Post/secondary digesters	Strong	Musty/Earthy	-1 to -3	Yes, covered to OCU/gas system	Small
Treated cake at enhanced quality for land application						
21	Storage	Faint	Earthy	-1	Yes, Cake Barn to Vehicle Bins	Small
Sludge treatment centre digested cake dewatering liquors treatment						
22	Liquor Treatment Plant anoxic/pre-settlement	Low	Musty	-1	N/A	Medium
23	Liquor Treatment Plant aerobic reactor	Low	Earthy	-1	N/A	Medium
24	Liquor Treatment Plant FST	Faint	River Water	0	N/A	Small
Ancillary works						
26	On-site overnight storage/parking of empty sludge/water tankers	Negligible	Musty/Earthy	0	N/A	Small

3.4.2 The SRP assessment is repeated, with Table 3-12 displaying the mitigated Pathway effectiveness scoring, and Table 3-13 and Table 3-14 presenting the remaining mitigated SPR odour impact assessment results.

Table 3-12: Pathway Effectiveness Scoring (Mitigated)

Pathway	Distance	Direction	Dispersion/dilution	Effectiveness
Comments	As part of the site selection process, only sites were selected that had no receptors that would be classed as High due to Distance. Furthermore, receptors were screened to be local to the source (Moderate) or too distant/far (Ineffective) in section 3.2, and thus discounted from this analysis	With consideration of the wind rose, all locations to the north-east quadrant are considered to score High. All other quadrants are considered to score Moderate.	Uncovered sources are considered High and sources mitigated through covering, treating and discharge through OCUs are considered to achieve Ineffective dispersion/dilution effectiveness. Combined Moderate	
Receptors closer than c.0.5km = NONE				
North-east quadrant	Moderate	High	Moderate	Moderate
South-east, South-west, North-west quadrant	Moderate	Moderate	Moderate	Moderate
Receptors located greater than 0.5km and closer than 1km: numbered 1 to 10, 18, 20 to 24.				
North-east quadrant	Ineffective	High	Moderate	Ineffective
South-east, South-west, North-west quadrant	Ineffective	Moderate	Moderate	Ineffective
Receptors further than c.1km around the proposed CWWTPR: numbered 11 to 17, 19.				
All	Ineffective	Moderate/High	Moderate	Ineffective

Table 3-13: Risk of odour exposure (impact) at the receptor locations for proposed CWWTPR (mitigated)

			Source Odour Potential		
			Small	**Medium**	**Large**
		Odour source reference to the right Pathway below	1,3,4,14,15,16,17,19,20,24,26	2,5,6,7,8,9,10,11, 12,13,21,22,23	None
Pathway Effectiveness	**Highly effective pathway**	None	Low Risk	Medium Risk	High Risk
	Moderately effective pathway	None	Negligible Risk	Low Risk	Medium Risk
	Ineffective pathway	All	Negligible Risk	Negligible Risk	Low Risk

Table 3-14: Likely magnitude of odour effect at the receptor locations for proposed CWWTPR (mitigated)

Risk of Odour Exposure	**Receptor Sensitivity**		
	Low	**Medium**	**High**
Receptor ID	**2,7,10,11,12,15,19,20,24**	**13,14**	**1,3,4,5,6,8,9,16,17,18,21,22,23**
High Risk of Odour Exposure	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium Risk of Odour Exposure	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low Risk of Odour Exposure	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible Risk of Odour Exposure	Negligible Effect	Negligible Effect	Negligible Effect

3.4.3 From the above tables it can be seen that the initial mitigation was successful in reducing both the source odour potential and pathway effectiveness, resulting in a reduced risk of odour exposure and potential impact to receptors, namely ‘negligible’ odour impact is expected at all receptors.

3.5 The predicted impact on receptors using odour modelling

3.5.1 The second odour impact assessment method used was odour modelling. This was used throughout the public consultation and project development process, with the aim to obtain more refined results and results comparable as the project developed.

3.5.2 The odour modelling software, along with the model input parameters are discussed in Section 4 *Odour modelling*.

3.5.3 The results of the odour modelling run used to carry out the odour impact assessment, have been included in Table 3-15 for ease of reference. All input information has been included in Section 4 of this report. Figure 4.5 (also Appendix E.1) in Section 4 graphically show the modelled predicted odour exposure levels (C_{98} OU_E/m^3).

Table 3-15: Odour modelling results of predicted odour exposure levels at the closest receptors

ID	Name	X	Y	Z*	C_{98} OU_E/m^3
1	Gatehouse	550451.7	260942.2	1.5	0.39
2	A14	549243.5	260842.5	1.5	1.24
3	Property east of Horningsea Road Fen Ditton	548869.8	260803.5	1.5	0.33
4	Biggin Abbey	548782.4	261735.7	1.5	0.49
5	Quy Mill Hotel	550846.5	259899.2	1.5	0.12
6	Fen Ditton Community Primary School	548713.8	260453.6	1.5	0.25
7	Low Fen Drove Way PROW 85/14	549921.9	261589.5	1.5	1.46
8	Property to south of Horningsea	549277.9	262140.8	1.5	0.46
9	Future Residential	549821	261567	1.5	1.47

**Note: Z = 1.5m above ground level in all cases.*

3.5.4 Table 7 from the IAQM guidance is presented as Table 3-16 which indicates the acceptable odour exposure level for different receptors for determining the impact on receptors from a “sewage treatment works operating normally”.

Table 3-16: Proposed odour effect descriptors for impacts predicted by modelling for moderately offensive odours (Table 7 from IAQM guidance)

Odour Exposure Level C_{98} OU_E/m^3	Receptor Sensitivity		
	Low	Medium	High
≥ 10	Moderate	Substantial	Substantial

5 to < 10	Slight	Moderate	Moderate
3 to < 5	Negligible	Slight	Moderate
1.5 to < 3	Negligible	Negligible	Slight
<1.5	Negligible	Negligible	Negligible

3.5.5 This should be read in association with the classification of Sensitivity of Receptors based on Table 3-17 (Table 2 of the IAQM guidelines) to score the Receptors in Table 3-15 as part of the SPR analysis.

Table 3-17: Receptor sensitivity to odours (as per Table 2 of the IAQM guidelines)

Sensitivity of Receptors	Surrounding Land Use
High	Surrounding land where: • users can reasonably expect enjoyment of a high level of amenity; and • people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium	Surrounding land where: • users would expect to enjoy a reasonable level of amenity, but wouldn’t reasonably expect to enjoy the same level of amenity as in their home; or • people wouldn’t reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Low	Surrounding land where: • the enjoyment of amenity would not reasonably be expected; or • there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial use, farms, footpaths and roads.

3.5.6 The result of the odour modelling is summarised in Table 3-18, presenting the residual odour impact predicted on the closest receptors for Scenario 1. The results indicate that odour concentrations at all receptors will be less than 1.5 C_{98} OU_E/m^3. Since Scenario 1 results (e.g. Future Residential 1.47 C_{98} OU_E/m^3) is based on the most conservative assumptions, as described in the Section 5, we can therefore conclude that this and all other scenarios will have 'Negligible' impact to all known Receptors. Receptors further afield will be exposed to less (if any) impact and have not been included in Table 3-18.

Table 3-18 – Odour modelling results of predicted odour exposure levels at the closest receptors for Scenario 1

ID	Name	C_{98} OU_E/m^3	Sensitivity	Impact
1	Gatehouse	0.39	High	Negligible
2	A14	1.24	Low	Negligible
3	Property east of Horningsea Road Fen Ditton	0.33	High	Negligible
4	Biggin Abbey	0.49	High	Negligible
5	Quy Mill Hotel	0.12	High	Negligible
6	Fen Ditton Community Primary School	0.25	High	Negligible
7	Low Fen Drove Way PROW 85/14	1.46	Low	Negligible
8	Property to south of Horningsea	0.46	High	Negligible
9	Future Residential	1.47	High	Negligible

3.5.7 The conclusion of this assessment therefore is that the residual effect of the odour impacts associated with the proposed Project would be "not significant".

4 Odour modelling

4.1.1 The odour model construction and odour modelling were undertaken by H&M Environmental Ltd, an external and industry recognised odour emissions and modelling specialist, to ensure robust results can always be guaranteed.

4.1.2 The odour modelling software, along with the model input parameters are discussed in the following sections. Where changes or refinements to inputs were made during the duration of the project development process, these will be highlighted along with the reasons for the changes. The model inputs and results are included in the remainder of section 4, with the sensitivity testing of parameters to demonstrate the robustness of our approach and results included in section 5.

4.1.3 As we aimed to keep the odour modelling assumptions the same throughout the various consultation stage, a very robust set of modelling basis was used. A sensitivity testing of various parameters more typically used for odour impact assessments have been included in section 5.3, to demonstrate the robustness of this approach. The modelled results at the various consultation stages are summarised in section 5.2 below, for information.

4.2 Odour modelling software

4.2.1 AERMOD Version 10.2.1 (December 2021) modelling software has been employed for the latest odour modelling exercise. Prior to January 2022 an earlier version (Version 9.8.3) was used. The AERMOD model is widely used, including for the prediction of odour impact, and was developed by the US EPA, to supersede the ISC3 model.

4.2.2 Its use for odour modelling has been accepted by the UK Environment Agency and it is confirmed as a suitable predictive modelling odour impact assessment tool by the IAQM for the assessment of odour for planning purposes.

4.3 Meteorological data

4.3.1 There are two sources of hourly meteorological data suitable for modelling, namely:

- Meteorological data from registered Met Office observation stations; and
- Numerical Weather Prediction (NWP) data.

4.3.2 Typically, where Met Office observational data is available, this would be more representative. Met Office Meteorological (MET) data was used for this odour impact assessment, with results validated for accuracy and sensitivity against NWP data.

4.3.3 Hourly MET data, including wind speeds and directions, from the last 3 to 5 years from a representative MET data station, are typically employed for use within the AERMOD modelling software, to achieve representative modelling outputs. The EA's

H4 guidance and the IAQM guidance require obtaining 5 years data and using the worse results yielding year’s 98th percentile results.

4.3.4 The following considerations have been checked to confirm the available observational MET data used (2016 to 2020) comprising of Cambridge airfield MET data with the missing parameters patched from Mildenhall RAF MET data is representative for the proposed CWWTPR site:

- Spatial considerations (closeness);
    - Among the five closest available observed meteorological data sets suitable for dispersion modelling, the weather station at Cambridge Airport is the closest being only 3km away from the site. Given its proximity and similar elevation, the observed data from Cambridge Airport would be representative of the proposed CWWTPR site;
    - However, Cambridge Airport only collects information when the site is operational, typically during daytime hours, resulting in 45% to 67% of data for all parameters being missing. For modelling purposes, data are not considered usable unless they are more than 90% complete. Cambridge airport data can become usable when data from another nearby observing station is available to substitute the missing data;
    - RAF Mildenhall is the next closest (an airbase about 25km to the north east), has similar elevation to the proposed CWWTPR site and has complete data (MET data is collected on a 24 hours a

day, 7 days a week basis, with < 4% missing data). Substituting 1 hour blocks of missing data, with another representative site's data, does follow best available technology (BAT) practices (e.g. United States Environmental Protection Agency guidance for dealing with missing meteorological data[10]). Given that there are no coastal or topographical effects, data from RAF Mildenhall would be a suitable observation station to use and is considered representative of the modelling site;

  - Given the proximity of the Cambridge observing station to the modelling site, it is considered that the most representative observed data is the data that is available from Cambridge and the use of data from RAF Mildenhall for the hours when there is no data from Cambridge Airport;

- Temporal (year-to-year variation);
  - Five years (2016 to 2020) of hourly observed meteorological data has been obtained and utilised. 3 to 5 years MET data is considered enough to allow for year-to-year variations, with 5 years data considered best practice for a planning assessment;

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[10] D. Atkinson and R. F. Lee, Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models, 7/07/1992. Web address: https://www.epa.gov/sites/default/files/2020-10/missdata.txt Last accessed 27/7/2022.

    - Best practice odour modelling techniques include screening the MET data and choosing the worst year of the data set to carry out the odour modelling exercise. Different years were modelled to establish the variance predicted year on year;
    - The modelling exercise confirmed MET data for 2016 provides the most conservative i.e. worst case or most significant odour impact prediction. 2016 included prolonged periods of calmer weather. There was little variance between the other years or a model run employing the total five-year period of MET data;
- Exposure (instrument sighting);
    - The MET data stations used are World Meteorological Organisation (WMO) recognised MET stations. This provides the required quality assurance for the instrument sighting;
- Geographic (surface parameters and elevation); and
    - Considering the predominantly flat Fens landscape, the topography is not expected to vary significantly between the MET stations used and the proposed site.

4.3.5 In addition to the above checks, external validation of the observation MET data set through NWP data comparison was requested from ADM Ltd. The expectation was that the NWP data set comparison would highlight if there were any problems with the patched Cambridge Airport /RAF Mildenhall MET data set.

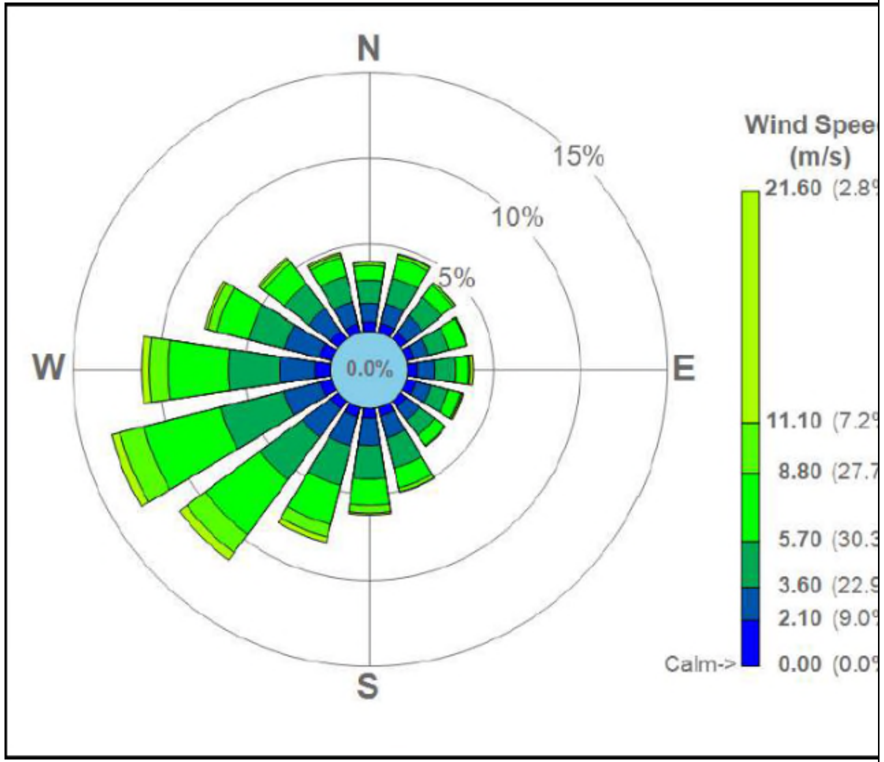
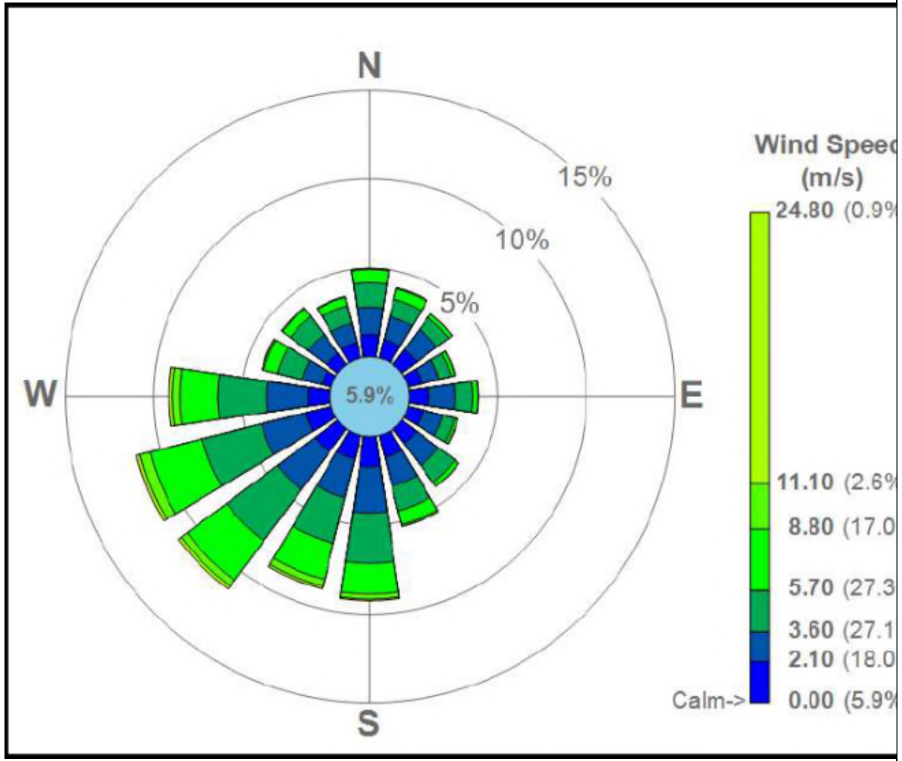
4.3.6 The following briefly describes what NWP data is and how it is generated:

- NWP data stems from the requirement for MET data in areas that are not close to actual MET Office observation stations, or where the data that is available does not meet the 90% complete criteria that is required for modelling purposes, or where instruments or elevation may place the observation data into question; and
- NWP data are available in a 4km grid resolution, with data from locations within these grid cells varying slightly depending on additional information from radar and satellites. NWP data are generated from computer simulations of the atmosphere and have been extensively validated against observations.

4.3.7 A brief discussion of ADM Ltd report findings are presented below and the full ADM Ltd report is included in Appendix C:

- ADM Ltd, who carried out our observed data validations against NWP data, had used NWP data in odour dispersion modelling comparisons in the past which have shown a good comparison of predicted odour concentrations between NWP and observed data;
- They compiled and provided the comparison NWP and Cambridge Airport /RAF Mildenhall windroses included in Table 4-1 in their report in Appendix C. The NWP and Cambridge Airport/RAF Mildenhall windroses are very similar, with the prevailing wind direction from the south-west for both. They also have similar wind direction frequencies; and

Table 4-1: Windrose comparison: NWP and Cambridge Mildenhall (2016-2020) for the proposed CWWTPR site location

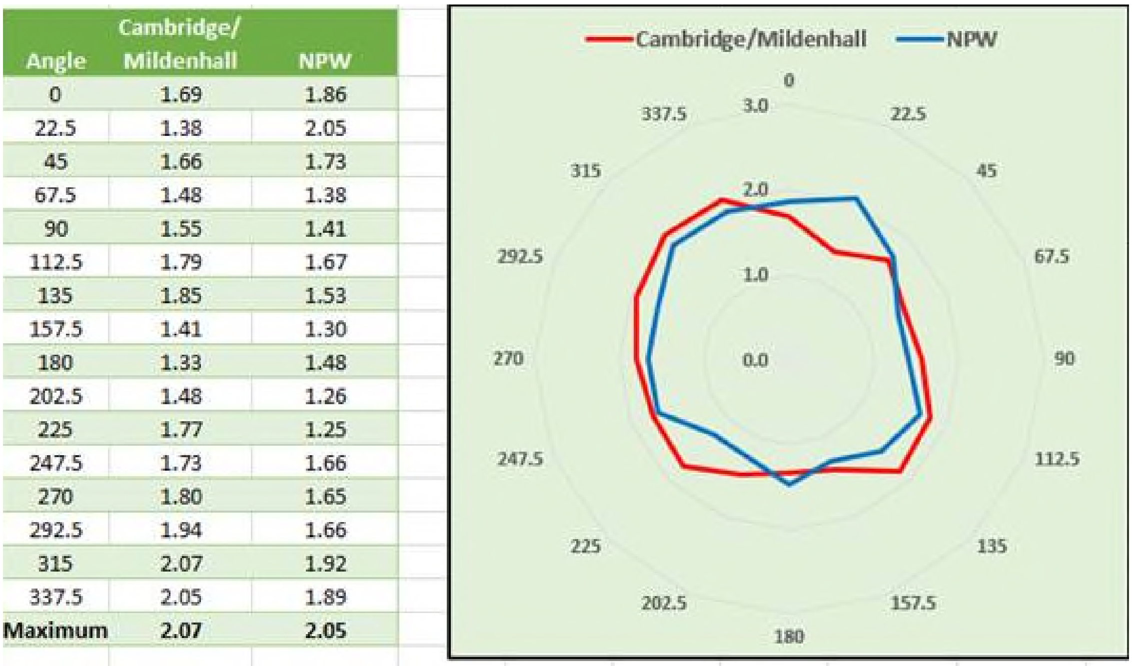
NWP Windrose	Cambridge Mildenhall (2016-2020) Windrose (duplicate of Figure 3.1)
	

- ADM Ltd states in their report: "The occurrence of low wind speeds and calms are important for odour modelling as it is often when impacts are the highest." And "It has been found that with the wind speed category that the prediction of odours from ground level sources (such as a WWTP) are most sensitive to wind speeds greater than 0 m/s and less than or equal to 1.5 m/s." Their assessment showed that the NWP data has 0.7% more in this wind speed category and would therefore return higher odour concentration compared to the MET data - Table 4-2.

Table 4-2: Windrose comparison: NWP and Cambridge Mildenhall (2016-2020)

Data set	Percentage wind speeds >0 and <= 1.5 m/s
Cambridge /Mildenhall	3.20%
NWP	3.94%

4.3.8 Additional to the validation report in Appendix C, ADM Ltd also created the maximum 98th percentile for the five years for each wind angle. The results are included as Figure 4.1. It should be noted that overall maximum concentrations are very similar between Cambridge /Mildenhall and NPW (2.07 vs 2.05 OU_E/m^3).



Angle	Cambridge/ Mildenhall	NPW
0	1.69	1.86
22.5	1.38	2.05
45	1.66	1.73
67.5	1.48	1.38
90	1.55	1.41
112.5	1.79	1.67
135	1.85	1.53
157.5	1.41	1.30
180	1.33	1.48
202.5	1.48	1.26
225	1.77	1.25
247.5	1.73	1.66
270	1.80	1.65
292.5	1.94	1.66
315	2.07	1.92
337.5	2.05	1.89
Maximum	2.07	2.05

Figure 4.1: NWP and observed MET data comparison of the maximum 98th percentile (2016 to 2020).

4.3.9 Based on the assessment by ADM Ltd, who recommended that the NWP data should return greater odour concentrations than the observed MET data and thus yield a more conservative result, the Consultation 3 odour modelling was carried out using the NWP data. However, shortly after, when the yearly observed data comparisons were produced in preparation for the odour impact assessment report, it was found that the 2016 observed MET data still yielded the most conservative results. Upon closer investigation it was found that although the NWP data was more conservative over the full five-year period (as per the ADM Ltd report), 2016 remained the most conservative year in the five years data set. Furthermore, the observed MET data set for 2016 remained more conservative than the NWP data set. After Consultation 3 we reverted to using 2016 observed MET data as the input for the odour modelling. However, the NWP results and 2016 to 2020 MET data results have been included in the sensitivity testing section (section 5.2) to show the sensitivity of the results to different MET data.

4.4 Surface characteristics

4.4.1 Three parameters are required for odour modelling to characterise the surface around the site:

- Bowen ratio;
    - Bowen ratio is a measure of moisture available for evaporation.
    - The first public consultations' model runs, a Bowen ratio of 0.75 was utilised. However, following validation of this input from ADM Ltd, this input was changed to their recommended factor of 1.077;
- Albedo factor;
    - The Albedo factor is a measure of the portion of reflected sunlight.
    - For the first public consultations' mode runs, an Albedo factor of 0.28 was utilised. However, following validation of this input from ADM Ltd, this input was changed to their recommended factor of 0.251;

ADM Ltd provided supporting information in their validation report to show that the model predicted output concentrations are not particularly sensitive to either Bowen ratio or Albedo factor value changes. As a result, no sensitivity testing was carried out for changes to these parameters;

- Surface roughness length;
    - The surface roughness length factor is a measure of the amount of drag the ground surface exerts on the wind.
    - The strict definition of surface roughness is the height at which the mean horizontal wind speed approaches zero, and is related to the roughness characteristics of the terrain. The US EPA Aermet Utility (the programme used to format raw hourly averaged MET data for use within Aermod) provides surface roughness length values for different types of land use as presented in Table 4-3.

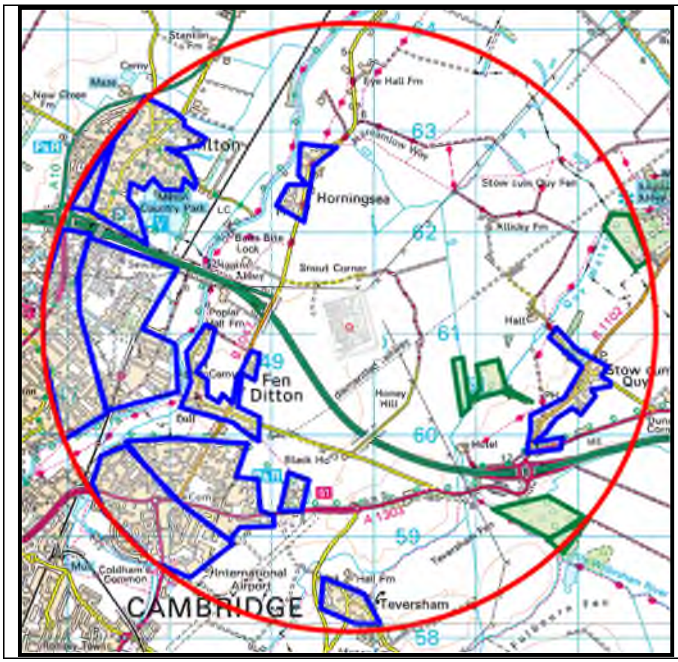
Table 4-3: Surface Roughness Values as given in the Aermet Users Guide

Land Use Type	Annual Average (m)
Water (Fresh and Sea)	0.0001
Deciduous Forest	0.9
Coniferous Forest	1.3
Swamp	0.1625
Cultivated Land	0.0725
Grassland	0.04025
Urban	1
Desert Shrubland	0.2625

4.4.2 The selection of an appropriate roughness length determines the amount of turbulence predicted by the model using the formatted MET data set which will in turn influence the degree of dispersion of odour. In simple terms, the air passing over an urban area (surface roughness value 1m to reflect structures of varying height and shape) will be more turbulent than the air passing over a field containing a cultivated crop (surface roughness value 0.0725m). As an example, for a site surrounded by cultivated fields, odour emitted from various site processes is picked up by passing air masses in the direction of the wind at a given moment and travels downwind close to the ground with little or no dilution/mixing with the ambient air. The odorous air will travel further before it is diluted to below the detection threshold of the human nose. In contrast, air mass that has passed over built up areas or large areas of tree cover, will be more turbulent and will dilute/mix odorous air more quickly.

4.4.3 Historically US EPA guidance dictates the use of an upwind fetch distance of 3 km to define user-specified values such as surface roughness length. General practice in the UK is to take a 3km radius around the study site (and thus include consideration of downwind characteristics as well). It is likely that a mixture of land use is present, and the resulting user input should be an arithmetic mean of land use types within the 3km radius. Such consideration may be broken down into sectors: for example, if a study site is bordered by an industrial estate to one side, and then surrounded by agricultural land on the remaining three sides then two sectors with separate surface roughness values may be considered.

4.4.4 For the initial stages of the project, the surface roughness was calculated by considering the percentage of the 3km study area that is taken up by each land use type and compiling a common factor to be used for the modelling of all areas. Figure 4.2 below indicates a 3km radius around the proposed CWWTPR site. In the figure urban areas are outlined in blue, significant plantations in green, and the remainder of the area is considered agricultural.



Colour	Details
Red	Study area (3km radius)
Green	Plantations/ Tree-rich area
Blue	Urban area
Unmarked area inside study area	Agricultural

Figure 4.2: Land use classification around the proposed CWWTPR site for surface roughness factor calculation.

4.4.5 Based on the area shown in Figure 4.2, a weighted surface roughness was calculated as presented in Table 4-4:

Table 4-4: Weighted Surface Roughness Value Calculation

Description	Area (ha)	SR (m)	% of Area	% Area x SR
Cambridge south of A14	389.3	1	14	13.77
Milton	80.3	1	3	2.84
Horningsea	15	1	1	0.53
Teversham	15.6	1	1	0.55
Stow cum Quy	28	1	1	0.99
Trees	47	0.9	2	1.50
Cultivated Land	2251.8	0.0725	80	5.77
Total	2827		100	26
Mean Surface Roughness				***0.26***

4.4.6 The surface roughness value of 0.26 was used for Consultation 1 and 2, with a change following validation as follows:

4.4.7 ADM Ltd was asked to provide guidance as to the surface roughness value that would be recommended for this site based on its the current land use, but also for the future planted positions. The full ADM report is attached as Appendix C.

4.4.8 ADM highlighted that “A distance of a number of kilometres may be required for a change to the nature of the surface to be fully established in the boundary layer.” And that “A distance of 1km or more is sufficient for the change in surface characteristics to be reflected in the lower part of the boundary layer. The US EPA recommend an upwind distance of 1km is used to determine the roughness length.”

4.4.9 ADM recommend that the surface roughness study area is reduced to between 1km and 1.5km around the site. The remaining land use in the reduced study area is predominantly agricultural. ADM Ltd provided a variety of surface roughness lengths from various design guidance sources associated with different agricultural descriptions and recommended 0.2m should be used.

4.4.10 The proposed landscaping and planting details were provided to ADM Ltd who proposed changing the surface roughness length to 0.23 and 0.245 m respectively to evaluate the impact of the addition of trees on the odour modelling at 5 and 15 years after planting respectively.

4.4.11 There are papers discussing the impact of planting windbreaks (e.g. Belt, et al[11], 2007) and its impact on odour mitigation. As the impact would only be realised a few years after planting, the scenario testing does not specifically include the planned landscaping and planting. Furthermore, as the planting is not planned specifically for odour mitigation, even if mitigation is expected, no further mitigation inputs have been accounted for in the odour modelling and odour impact assessment. The sensitivity testing in section 5.3 does provides an indication of the mitigation that could be offered by the planting included in the Project over time.

4.4.12 For Consultation 3 and the odour impact assessment modelling, 0.2m surface roughness factor was used. Sensitivity testing for planting (0.23m and 0.245m respectively for 5 and 15 years after planting) and 0.26 for continuity was also included in section 5.3.

4.5 Morphology input for the odour modelling

4.5.1 For the model to consider how the impacts would be transferred from source to receptor, it also requires the surface morphology of the site and its surrounds in the form of a (x,y,z) coordinate set.

4.5.2 Our GIS team created an excel sheet with this information for our modeller, H&M Environmental Ltd, from the Lidar data[12] of the existing area around the proposed CWWTPR site, with the changes associated with the proposed infrastructure (e.g. the rotunda bund, ground level changes across the site and the access road) added on top of the base Lidar data, or more correctly exchanged, as follows:

- Both DSM and DTM data sets were downloaded, to provide filtered (no trees, etc.) and unfiltered (includes for trees) outputs respectively. The DSM data set is from 2017 and the DTM is from 2020;
- Once the required tiles are downloaded, these have been mosaiced in ArcGIS to create a seamless raster file;

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[11] Belt, S.V., M. van der Grinten, G. Malone, P. Patterson and R. Shockey. Windbreak Plant Species for Odor Management around Poultry Production Facilities. Maryland Plant Materials Technical Note No. 1. USDA-NRCS National Plant Materials Center, Beltsville, MD. 21p., March 2007

[12] The Lidar data is open source data and can be downloaded via the Defra Download portal: *https://environment.data.gov.uk/DefraDataDownload/?Mode=survey*.

- A TIN (Triangular irregular networks) is then created from the site drawings and model with Z values at every 2m interval across the entirety of the bund, and surrounding areas. This TIN informs of the surface morphology of the proposed site;
- The TIN is mosaiced and combined with the lidar mosaic previously mentioned by exchanging the Z value (height) of the areas changed through the proposed plant; and
- The combined new data set is then exported as a CSV file (x,y,z), which can then be fed into the odour modelling software.

4.6 Emission Rates

4.6.1 As the proposed CWWTPR does not currently exist, all emission rates utilised were estimated values based on historic measured values at the existing Cambridge WRC or where no value was available, “standard” emission values from literature were used. Where neither were available, professional judgement was used to predict an emission compared to other information available (‘no worse than’ principle).

4.6.2 Emissions for all open tanks and process units have been included in the modelling exercise, even if some of them (e.g. final settlement tanks (FSTs), tertiary treatment, final effluent) may deliver a minimal or neutral odour impact. This is a conservative approach, which could inflate overall site emission predictions.

4.6.3 To avoid the requirement for further validation of emission rates, the Ove Arup & Partners Ltd (hereafter Arup) odour impact assessment report for Brookgate Ltd associated with the Cambridge North development, 18 September 2019, compilation and validation of emission value results were used where possible. They conducted a review and comparison of 3 separate odour emission surveys carried out at the existing Cambridge WRC between 2015 and 2019 to create an input set for their modelling study, namely:

- H&M Environmental Ltd odour emissions survey in November 2015;
    - This survey was commissioned by Anglian Water. In 2016 Anglian Water provided this data set to Arup for their 2016 odour impact assessment, commissioned by Brookgate Ltd, with the recommendation to multiply the values by two to account for the emissions being measured in winter (November);
    - Arup not only provided results as recommended (emissions measured in

winter doubled), but also applied seasonal variance of 25% reduction of this multiple for spring and autumn and 50% reduction for winter;

- Odournet odour emissions survey in August 2017;
    - The Cambridge City Council commissioned this survey and its associated odour impact assessment report for their North East Cambridge Area Action Plan. This report has sparked much debate associated with unsubstantiated/unexplained inflation of measured emissions which was then used for odour modelling, especially as the results yielded much larger impacts compared to other studies of the existing Cambridge WRC. Olfasense UK Ltd (the new name of Odournet) has subsequently produced an addendum with revised odour modelling results (21 December 2020), but no further explanations of data used was added;
    - Odournet/Olfasense applied seasonal variation to the emission rates for processes handling raw sewage to the magnitude of a factor of 5 reduction for autumn and winter, but not for other process areas;
- Silsoe Odours odour emissions survey in July 2019; and
    - Arup commissioned Silsoe Odours to carry out this survey in accordance with BS

EN 13725. The survey was undertaken on 4, 8, 9 and 15 July 2019 and was carried out with triplicate samples from 26 sources around the plant. These sources were selected to provide a comprehensive assessment of emission rates and included sources where previous surveys had highlighted disparate emission rates.

4.6.4 As part of their assessment they compared the two summertime surveys with the winter survey. They reported that the emissions from processes associated with raw sewage are lower during the winter months to a factor of up to 4. Table 4-5 below includes the information associated with the three sets of odour emission survey data they compared, the inputs Arup used in their 2019 odour modelling, as well as our odour modelling emission input values used for the CWWTPR odour modelling. For the emission rates for the processes that are not found at the existing Cambridge WRC but would be included in the CWWTPR, or would have substantially changed, a comment is added with an explanation or reference of the value used. The numbering of the structures of process areas are consistent to those used in the SPR analysis (e.g. Table 3-11: CWWTPR odour sources mitigated for Baseline position) to allow comparison to other information presented in this report.

Table 4-5: Odour emission rates

Structure/Process Area		H + M	Odournet	Silsoe	ARUP	CWWTPR	Comment
		Survey results			Odour modelling input		
		Odour emission values ($OU_E/m^2/s$)					
1	TPS	Not previously measured or included in odour modelling and assessments				N/A	covered and odour controlled
2	Storm tanks	0.17	8	Not in use	0.2	0.2	ARUP (1% of tanks residual based on infrequent use)
2a	Storm tanks return PS	Not previously measured or included in odour modelling and assessments				N/A	Gravity return – no open structure
3-5	Inlet works including: Channel to Screens & Grit Removal Fine Screens & Screenings Handling Grit Removal Plant & Handling Plant	7, 7.69, 9, 14.13	23	14.6, 14.7, 14.6, 30.4	14.6	N/A	covered and odour controlled
6	Screenings Skips	1	35	N/A	1	1	ARUP
7	Grit Skip	1.04	25	N/A	1	1	ARUP

Structure/Process Area		H + M	Odournet	Silsoe	ARUP	CWWTPR	Comment
		Survey results			Odour modelling input		
		Odour emission values ($OU_E/m^2/s$)					
8	PST dosing, mixing and distribution chamber	6.5	23	N/A	6.5	N/A	covered and odour controlled Iron salts dosed
9	PST	8.3	1.1-3.9	2.79, 5.68, 4.82, 3.04	4.1	1.9	The UK WIR Table 5.1 Emission rate for typical PSTs, as iron salt will reduce odour emission.
9a	PST collection chambers	5.82	8	40.3	40.3 or 7	0.42	Same as ASP division chamber
10	Secondary Feed-forward PS	Not available – new process				0.42	Same as ASP division chamber
11	ASP Division/Selector chamber	0.42	5	N/A	0.42	0.42	ARUP
12	ASP Anoxic with MaBR	0.42	0.2	0.19	0.3	0.3	ARUP
13	ASP Aerobic	0.42	0.2	0.67	0.5	0.5	ARUP
14a	FST distribution chambers	0.42	0.2	N/A	0.42	0.42	ARUP
14	Final settlement tanks	0.42	N/A	0.32 0.48	0.37 0.45	0.42	Average of ARUP
14c	FST collection/tertiary mixing chamber	Not available – new process				0.2	Less than FST Iron salt dosing provides further odour mitigation. Not worse than storm tanks
14d	RAS/SAS PS	Not relevant				N/A	direct pumped – no open tanks
15a	Tertiary distribution chamber	Not available – new process				0.2	Same as FST collection
15	Tertiary treatment	Not available – new process				0.1	Less than Tertiary distribution
15b	Tertiary sludge waste return PS	Not available – new process				0.5	Not close to skips, no worse than ASP
16a	Washwater take-off PS	Not relevant				N/A	direct pumped – no open tanks
16b	Flume + FE channel	Not available				0.1	Less or equal to tertiary
16c	FE sampling chamber	Not available				0.1	Less or equal to tertiary
17	Liquid import – Bauer coupling	Not available				16	Based on infrequent connection emission
19	Sludge tanks	Not relevant				N/A	covered and odour controlled
20	Post/secondary digesters	Not relevant				N/A	covered and odour controlled/gas extract
21	Storage Cake barn	Not available – new process				0.8	UK WIR Table 5.1 sludge cake low

Structure/Process Area		H + M	Odournet	Silsoe	ARUP	CWWTPR	Comment
		Survey results			Odour modelling input		
		Odour emission values (OU$_E$/m^2/s)					
							emission as advanced digested
22	LTP anoxic/pre-settlement	Not available – new process				0.42	Less than ASP mixing/division chamber
23	LTP aerobic reactor	Not available – new process				0.42	Less than ASP mixing/division chamber
24	LTP FST	Not available – new process				0.3	Less than ASP anoxic
26	On-site overnight storage/parking of empty sludge/water tankers	Not available – new process				N/A	Not included in modelling

4.6.5 All OCUs emissions are based on the calculated airflow treated (m^3/s) discharging from the OCU stacks after treatment at 1,000 OU$_E$/m^3. Typical performance guarantee levels at which OCUs are supplied range from 500 OU$_E$/m^3 upwards. Using 1,000 OU$_E$/m^3 at this stage provides further opportunity to reduce odour impacts in future, should either further mitigation be required, or further emission points be added when extending the facility within the rotunda in future. Adding sources would increase the load – increasing the treatment provided would reduce the increased input to the same previous odour load output and therefore not add any additional impact.

4.7 Modelling inputs summary

4.7.1 Table 4-6 lists the inputs used for the odour modelling based on the DCO layout and design of the proposed project. The impact of seasonal variations were investigated during sensitivity testing – refer section 5.3.

Table 4-6: Modelling inputs summary

Structure/Process Area		Odour emission ($OU_E/m^2/s$)	TWL (mAOD) (emission release level)	OU_E/s	Comment
2	Storm tanks	0.2	14	7	1% of tanks residual based on infrequent use
6	Screenings Skips	1	10.5	16	Total for 2No.
7	Grit Skip	1	10.5	8	
9	PST	1.9	10.1	10,391	Total for 6 No.
9a	PST collection chambers	0.42	8.5	6	Total for 5No.
10	Secondary Feed-forward PS	0.42	6.6	52	
11	ASP Division/Selector chamber	0.42	16.64	68	
12	ASP Anoxic with MaBR	0.3	15.95	384	Total for 4No. lanes
13	ASP Aerobic	0.5	15.87	1,600	Total for 4No. lanes
14a	FST distribution chambers	0.42	14.4	73	Total for 3No.
14	FSTs	0.42	13.1	3,232	Total for 8No.
14c	FST collection/mixing chamber	0.2	11.77	2	
15a	Tertiary distribution chamber	0.2	11.6	10	
15	Tertiary treatment	0.2	11.04	79	
15b	Tertiary sludge waste return PS	0.5	11	4	
16b	Flume + FE channel	0.1	10.3	4	
16c	FE sampling chamber	0.1	10.72	4	
17	Liquid import – Bauer coupling	16	10	16	Total for 2No.
21	Storage Cake barn	0.8	11.5	125	Based on emission 1m around perimeter
22	LTP anoxic/pre-settlement	0.42	17	6	
23	LTP aerobic reactor	0.42	17	25	
24	LTP FST	0.3	17	9	
		Flow (m^3/s)	**Top of stack**		
30	OCU 1 - TPS	8.763	25.5	8,763	1,000 OU_E/m^3
31	OCU 2 - inlet works	10.7	25.5	10,695	1,000 OU_E/m^3
32	OCU 3 - sludge imports	4	25	4,000	1,000 OU_E/m^3
33	OCU 4 - dewatering & STC drainage	0.556	25	556	1,000 OU_E/m^3
34	Gas to Grid	0.06	19	1	1,000 OU_E/m^3
TOTAL for the CWWTPR site				**40,137**	

4.7.2 Of the total 40,137 OU_E/s emission rate associated with the CWWTPR site, 3,332 OU_E/s (associated with FSTs, tertiary treatment and final effluent) would have no hedonic tone. As it is Anglian Water's modelling asset standard to include all sources regardless of hedonic tone, these have been included. However, their contribution inflates the site's total odour impact by c.8%.

4.8 Results Presentation – Polar vs Cartesian Grids

4.8.1 Odour models give results at the grid point intersects specified. The further apart the points, the less accurate a model's picture presentation of the results, but the faster it can be run. Inversely, the closer together the points, the more accurate the model's picture presentation of the results, but the longer the modelling takes per scenario run. Two types of grids are commonly used, namely polar grids and cartesian or rectangular grids:

- Polar grids, or radial rings, give a denser concentration of points closer to the source and fewer as the odour impact dissipate further from the site. Typically used when a large area beyond the site needs to be considered.

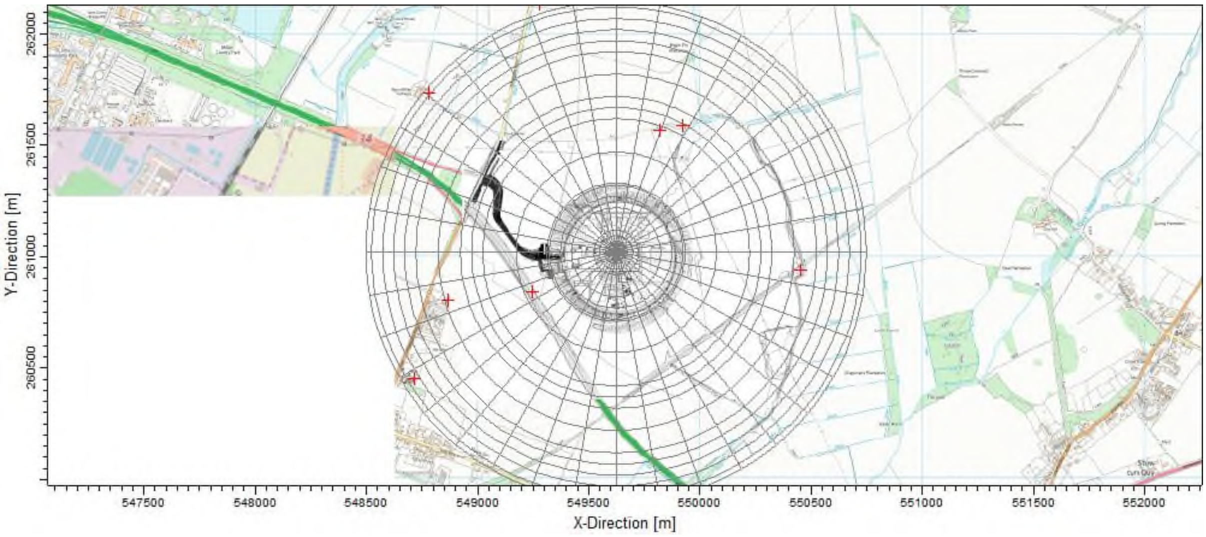


Figure 4.3: Polar grid

- Cartesian grids present an uniform grid, resulting in an even distribution of points regardless of distance from the odour source/site. The spacing of the grid can be set.

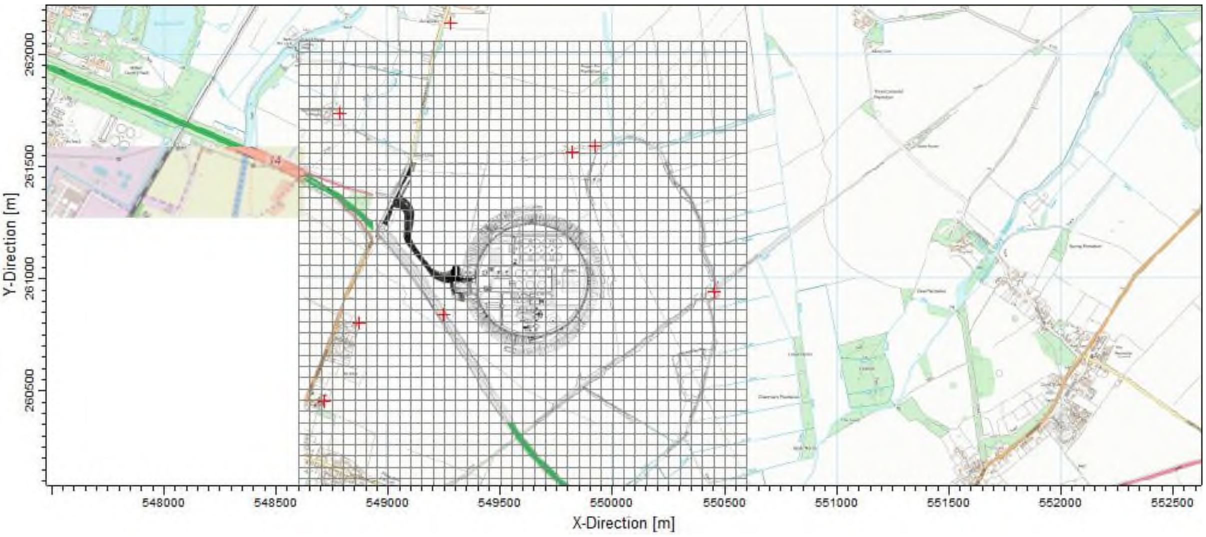


Figure 4.4: Cartesian grid (50m x 50m)

4.8.2 The polar grid type was used for the screening of the different locations earlier in the project. It's spacing was derived from the grids Anglian Water previously used for various other odour models. We used this grid type throughout (scenarios 1 to 20 and public consultations – refer Table 5-1), to remain consistent across the various sites and scenarios investigated.

4.8.3 The results were checked using a 50m x 50m cartesian grids to confirm the results achieved with both methods remained the same. This was to dispel potential concerns for poor resolution around the definition of some of the contours around receptors. The graphics results for comparing both polar and cartesian/rectangular grid presentations for both Scenario 1 and 20 have been included in Appendix D.

4.8.4 As the polar grid intervals are spaced closer together in the centre of the site, this grid picked up greater detail of odours generated on the site and thus indicates a higher, more accurate, maximum odour level (47.9 polar vs 42.7 cartesian).

4.8.5 Furthermore, all receptors were specified as their respective specific grid points This was to eliminate interpolation between grid points and thus ensure that accurate results were obtained and presented, eliminating subjective reading of results from a graphic result.

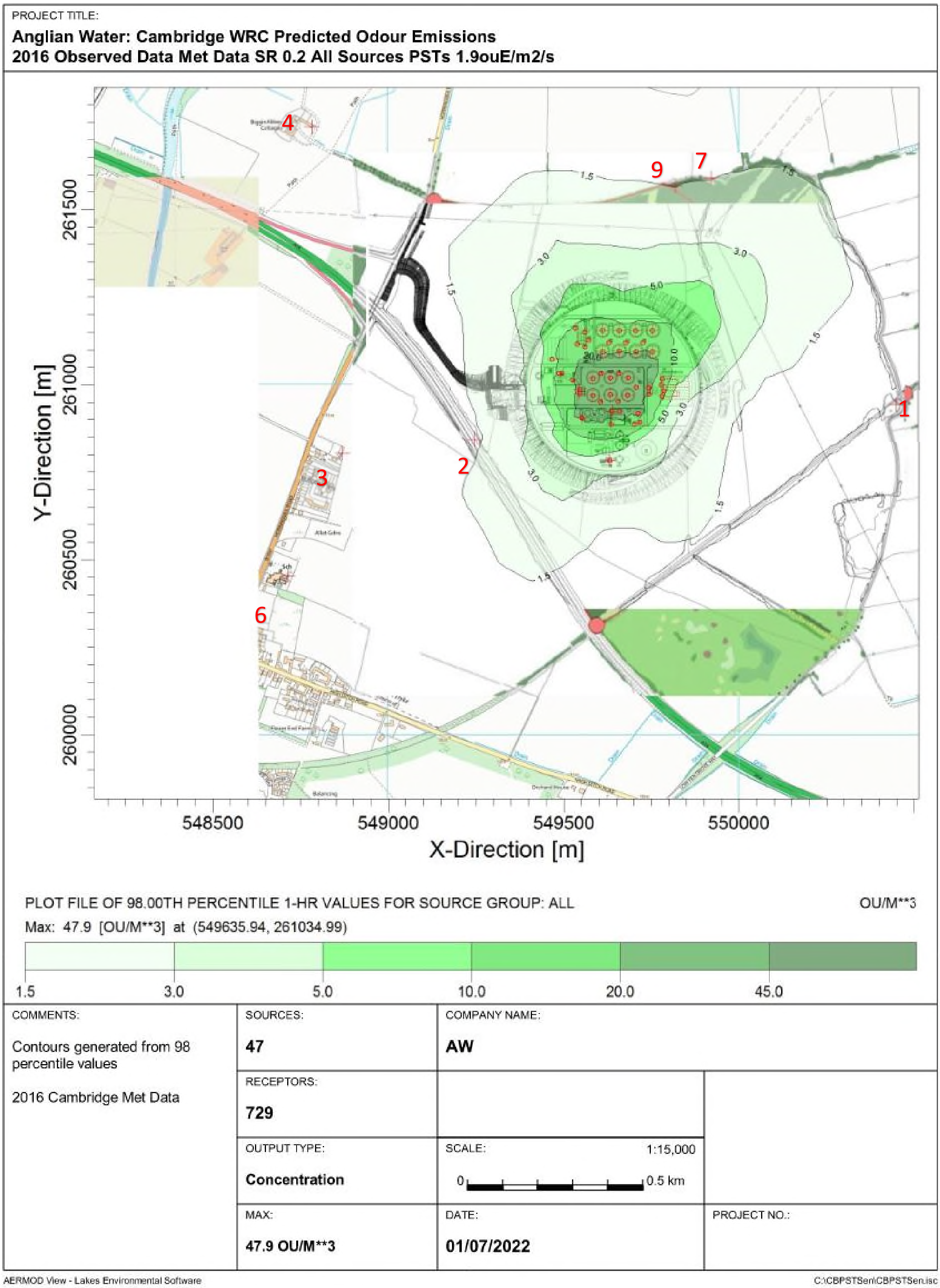
4.9 Odour modelling results

4.9.1 The results of the odour modelling, for which all input information has been included in this section and report, have been included in Figure 4.5 (also Appendix E.1). The reference ID for the closest receptors has been superimposed upon this figure (8 and 5 fall beyond the extent of the graphic) and the modelled predicted odour exposure levels (C_{98} OU_E/m^3) for the closest receptors have been listed in Table 4-7 (copy of Table 3-16). These are the values and data set used in the impact assessment in section 413.5 above.

Table 4-7: Odour modelling results of predicted odour exposure levels at the closest receptors

ID	Name	X	Y	Z*	C_{98} OU_E/m^3
1	Gatehouse	550451.7	260942.2	1.5	0.39
2	A14	549243.5	260842.5	1.5	1.24
3	Property east of Horningsea Road Fen Ditton	548869.8	260803.5	1.5	0.33
4	Biggin Abbey	548782.4	261735.7	1.5	0.49
5	Quy Mill Hotel	550846.5	259899.2	1.5	0.12
6	Fen Ditton Community Primary School	548713.8	260453.6	1.5	0.25
7	Low Fen Drove Way PROW 85/14	549921.9	261589.5	1.5	1.46
8	Property to south of Horningsea	549277.9	262140.8	1.5	0.46
9	Future Residential	549821	261567	1.5	1.47

**Note: Z = 1.5m above ground level in all cases.*



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Data Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL
Max: 47.9 [OU/M**3] at (549635.94, 261034.99)

OU/M**3

🟩	🟩	🟩	🟩	🟩	🟩
1.5	3.0	5.0	10.0	20.0	45.0

COMMENTS:

Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES: **47**

COMPANY NAME: **AW**

RECEPTORS: **729**

OUTPUT TYPE: **Concentration**

SCALE: 1:15,000

0 — 0.5 km

MAX: **47.9 OU/M**3**

DATE: **01/07/2022**

PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\CBPSTSen\CBPSTSen.isc

Figure 4.5: Odour modelling result for Scenario 1

5 Discussion on Robustness of Assessment

5.1.1 Additional to the STP analysis and the odour modelling used to conclude that 'negligible' impact is expected to all known receptors, a further discussion is provided of aspects that underline the robustness of the assessment, as follows:

- Firstly, the changes in odour modelling inputs that were made over the course of the project's public consultation phases are highlighted in section 5.2. This provides validation that the approach used remained consistent, and was robust;
- Secondly, a sensitivity analysis is provided to highlight how slight changes would impact the odour modelling results. Once again, it demonstrates that a robust, conservative basis was used for carrying out the odour modelling impact assessment;
- The predicted odour impact of the STC component on its own has been included, to demonstrate IED compliance of the STC component of the site (section 5.4);
- Ancillary activities (e.g. sludge transport) and abnormal operations (e.g. major plant failure) is discussed in section 5.5; and
- Finally, a summary of all major mitigation included in the project development thus far is listed in section 5.6.

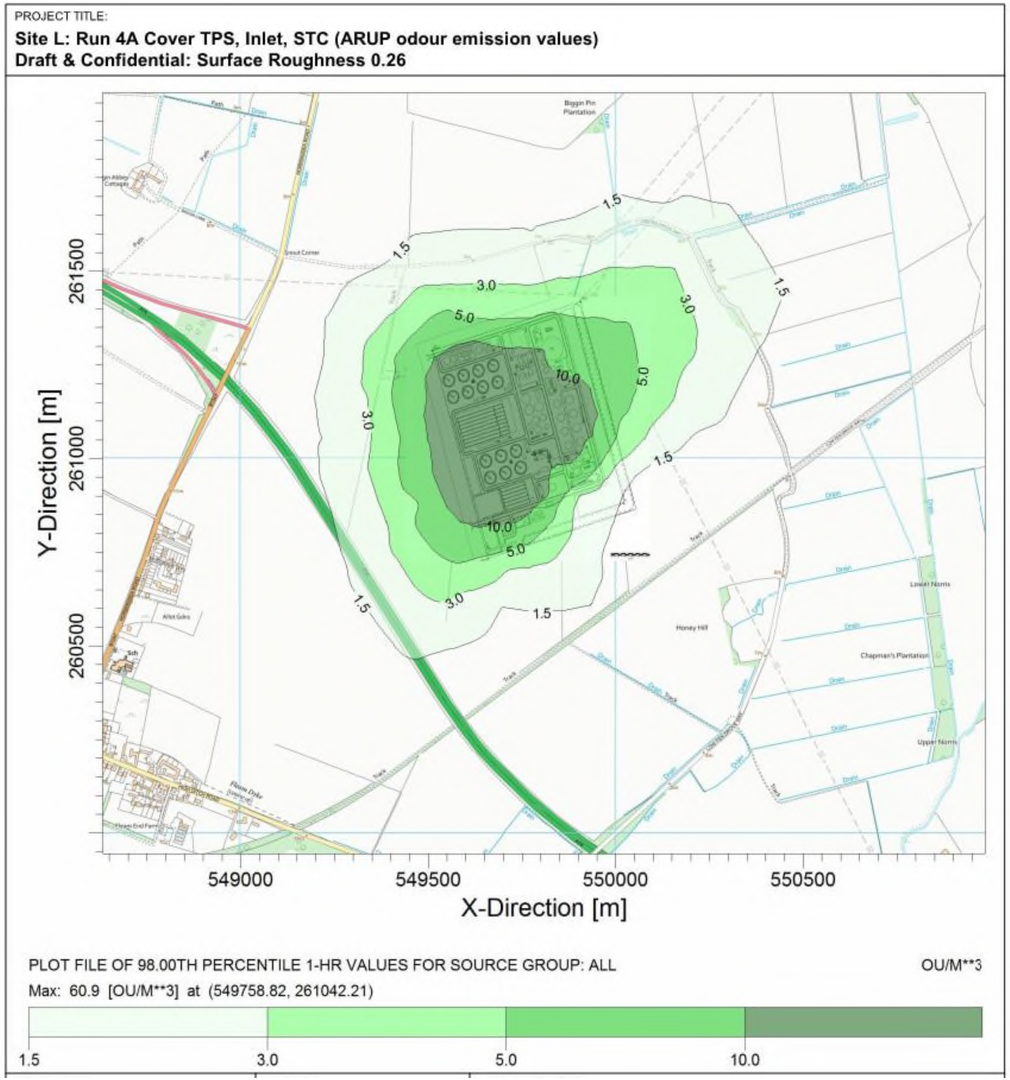
5.2 Modelling results at various consultations

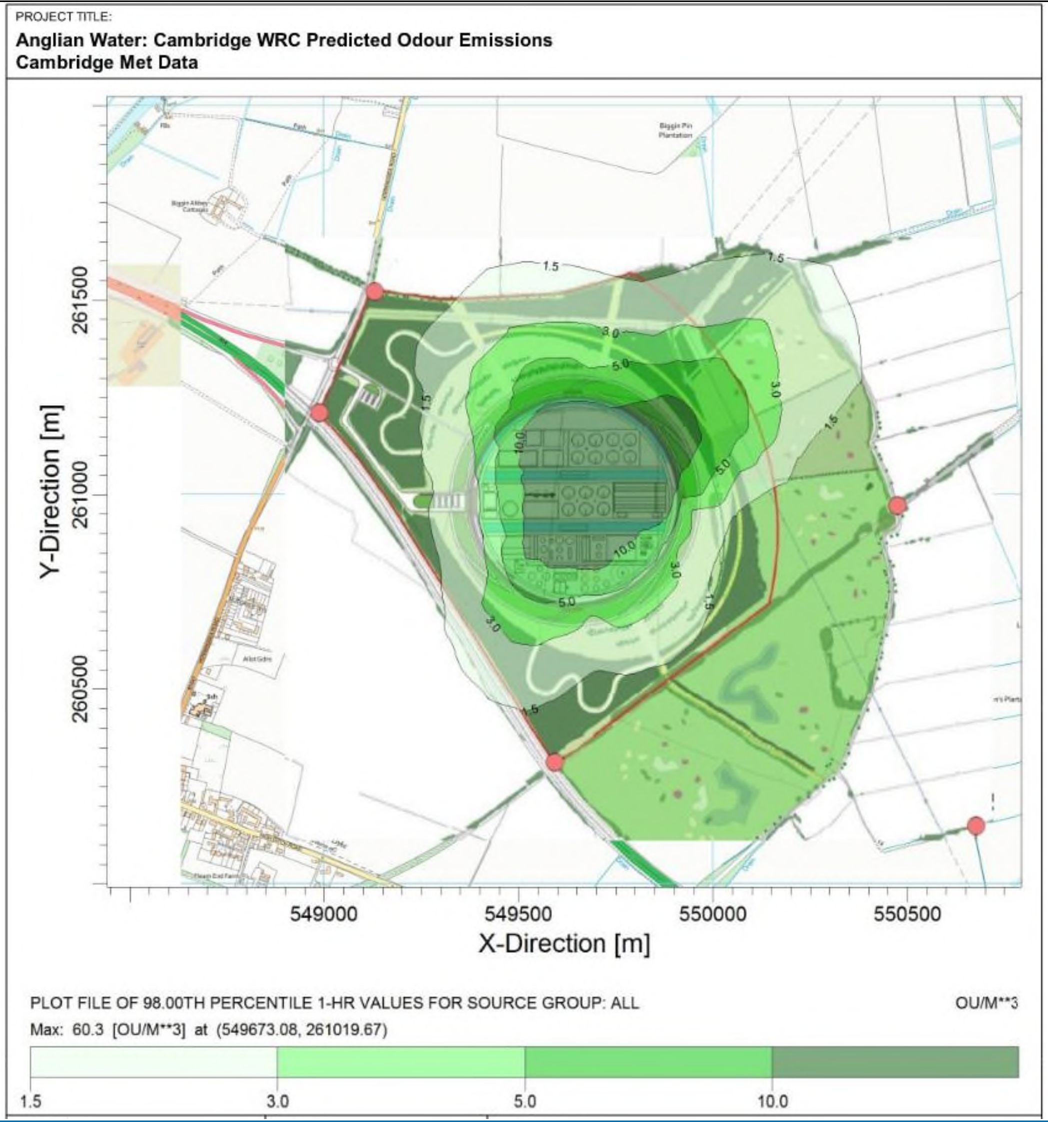
5.2.1 The odour modelling results at the various public consultations stages and for the odour impact assessments (section 3.5 *The predicted impact on receptors using odour modelling)* along with the main changes in input parameters are presented in Table 5-1.

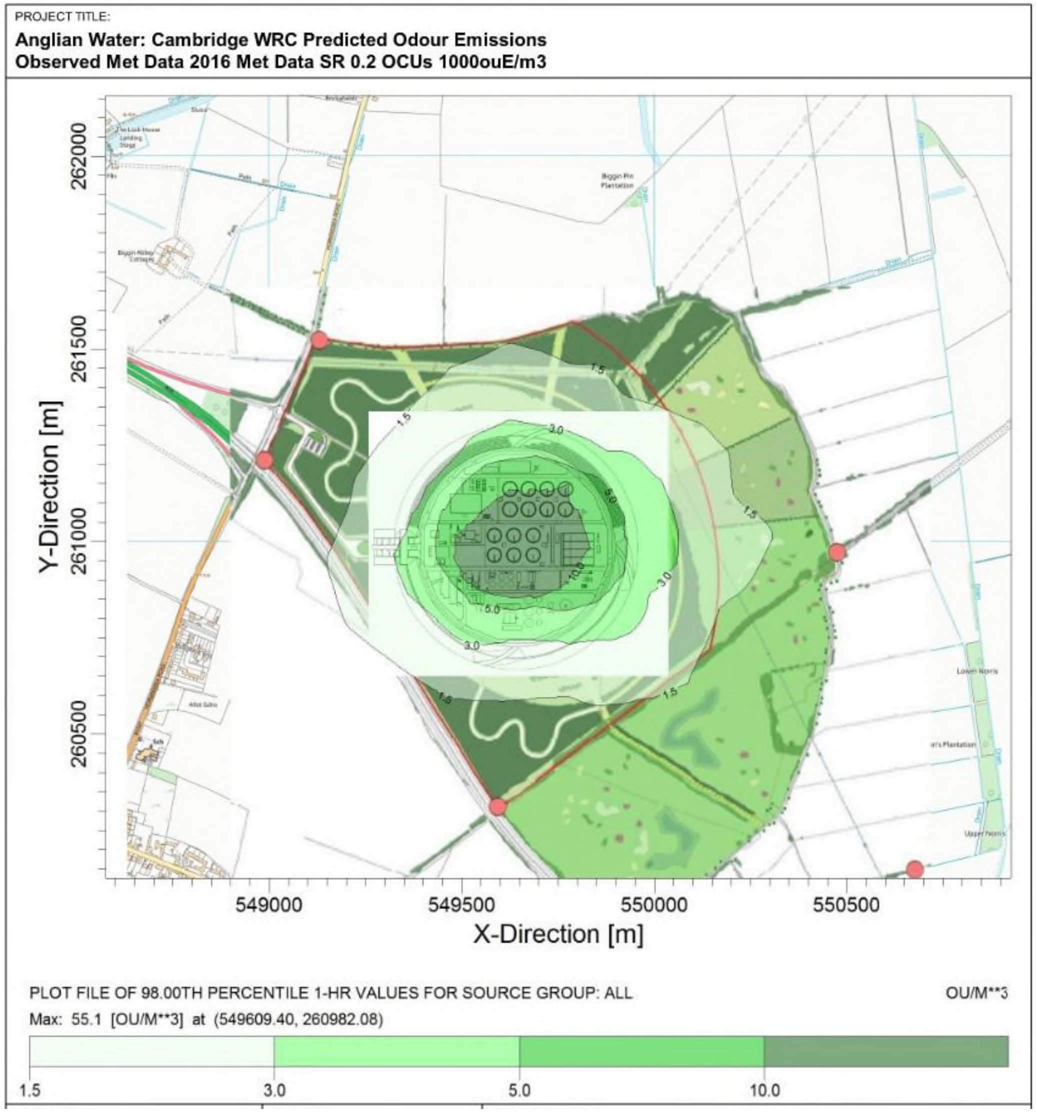
5.2.2 From the pictured results provided, 'Negligible' impact is predicted at all known receptors.

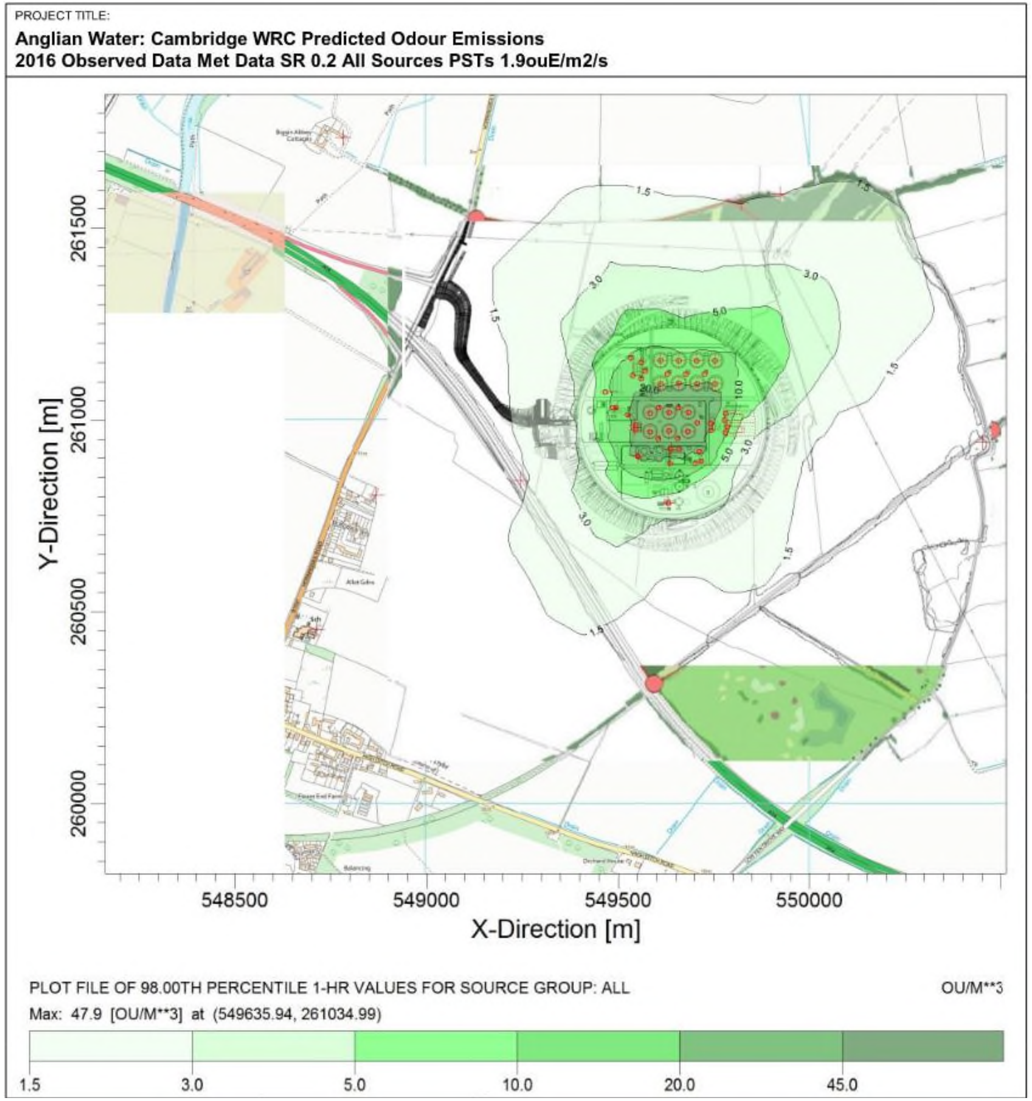
5.2.3 The departure in modelling results shown at Consultation 3 (using NWP MET data) from the results presented in Consultation 1 and 2 (using the 2016 observational MET data) was documented in section 4.3. More analysis comparing the use of NWP Met data vs Cambridge Airport /RAF Mildenhall data is described in the sensitivity testing in the following Section 5.3.

Table 5-1: Odour modelling results used in Public Consultation

Point in time	Site layout	Surface characteristics	Odour modelling results
Consultation 1: **Site selection** **BASELINE**	Rectangle	• Albedo 0.28 • Bowden Ratio 0.75 • Site Specific Surface Roughness based on 3km radius character (0.26m)	
MET data	**Morphology**	**Model run date**	
2016 observed MET data	Lidar only	21/02/2020	

Point in time	Site layout	Surface characteristics	Odour modelling results
Consultation 2: look & Feel of Rotunda and landscape	Round layout	• Albedo 0.28 • Bowden Ratio 0.75 • Site Specific Surface Roughness based on 3km radius character (0.26)	
MET data	**Morphology**	**Model run date**	
2016 observed MET data	Lidar with Rotunda bund added (no openings)	11/6/2021	

Point in time	Site layout	Surface characteristics	Odour modelling results
Consultation 3: PEIR	Round layout	• Albedo 0.28 • Bowden Ratio 0.75 • Site Specific Surface Roughness 0.2	
MET data	**Morphology**	**Model run date**	
NWP data	Lidar with Rotunda bund added (no openings)	20/1/2022	

Point in time	Site layout	Surface characteristics	Odour modelling results
Odour impact assessment report section 3.5 *The predicted impact on receptors using odour modelling* (Scenario 1)	Round layout	• Albedo 0.28 • Bowden Ratio 0.75 • Site Specific Surface Roughness 0.2	
MET data	**Morphology**	**Model run date**	
2016 observed MET data	Lidar with Rotunda bund and slits	1/7/2022	

5.3 Sensitivity testing

5.3.1 Throughout the report the basis for the modelling inputs and odour impact assessments have been listed. Any items which could impact the results have been highlighted in the text and are listed below. Throughout the odour impact assessment, a conservative approach has been used. Although this aims to achieve a robust basis for the odour impact assessment, the compounding effect can result in the over prediction of the anticipated odour impact.

- the utilisation of the summer emission rate for the entire year, rather than a seasonal approach whereby emission is reduced for spring (75% of summer) and further for autumn and winter (50% of summer). This seasonal reduction is industry standard practice, as highlighted in section 4.6 through reference to other industry experts' odour impact assessment emission inputs;
- the inclusion of all process areas in the model regardless of their hedonic tone. As highlighted in section 4.7, this inflates the overall impact by 8%; and
- the surrounding land use - reflected in the modelling through the roughness factor. The scenario used for the odour modelling impact assessment reflects the site being surrounded by agricultural land and none of the planting that is included in the project yet established. This is a conservative position as the planting will improve odour dispersion and may even trap liquid particles in leaves and branches, providing odour reduction and air quality improvement. The ability of trees to reduce odour and air pollution is widely published, e.g. Belt, et al[13], 2007, BBC Future Planet article on the best trees to reduce air pollution[14], etc.

5.3.2 To demonstrate that these items listed above does indeed inflate the results, sensitivity testing has been conducted. The odour modelling scenarios included for sensitivity analyses and the associated inputs are listed in Table 5-2. The modelling results for each of the scenario analysed are included in Appendix E. The tabulated results at the nearest receptors have been included in Table 5-3

5.3.3 The basis of the parameters tested are as follows:

- All scenarios are based on the DCO Rotunda layout and associated morphology, as described in section 5.2;
- 2016 observational data is used for Scenarios 1 to 5, with the same inputs repeated using NWP data for Scenarios 6 to 10;

---

[13] Belt, S.V., M. van der Grinten, G. Malone, P. Patterson and R. Shockey. Windbreak Plant Species for Odor Management around Poultry Production Facilities. Maryland Plant Materials Technical Note No. 1. USDA-NRCS National Plant Materials Center, Beltsville, MD. 21p., March 2007

[14] Urban trees can help cut air pollution from New York to Beijing, but which trees do the best job? Future Planet weighs up the options., Vittoria Taverso, BBC Future Planet, 5th May 2020, Web address: https://www.bbc.com/future/article/20200504-which-trees-reduce-air-pollution-best. Last accessed: 27/7/2022.

- Emissions inputs were changed from constant to demonstrate the impact of seasonal weather changes. Where emissions were varied to represent the impact of the changes in weather associated with different seasons, an emission reduction was applied: 50% of Table 4-6 emission values was used for winter months and 75% for spring and autumn; and
- Surface Roughness variance. As discussed in section 4.4, sensitivity testing for planting (0.23m and 0.245m respectively for 5 and 15 years after planting) and 0.26 for continuity was included.

Table 5-2: Odour modelling sensitivity testing inputs

Scenario	MET Data	Emissions	Surface Roughness	Appendix
1	2016	Table 4-6	0.2	E.1
2	2016	Seasonal	0.2	E.2
3	2016	Seasonal	0.23	E.3
4	2016	Seasonal	0.245	E.4
5	2016	Seasonal	0.26	E.5
6	NWP	Table 4.20	0.2	E.6
7	NWP	Seasonal	0.2	E.7
8	NWP	Seasonal	0.23	E.8
9	NWP	Seasonal	0.245	E.9
10	NWP	Seasonal	0.26	E.10

Table 5-3: Odour modelling results at the closest receptors for each of the sensitivity testing scenarios

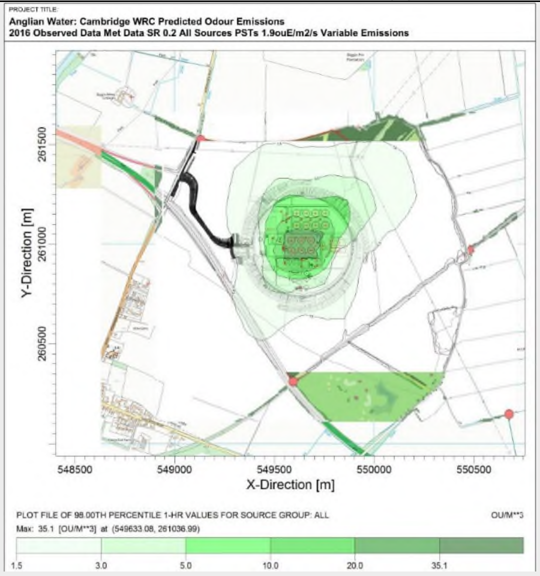
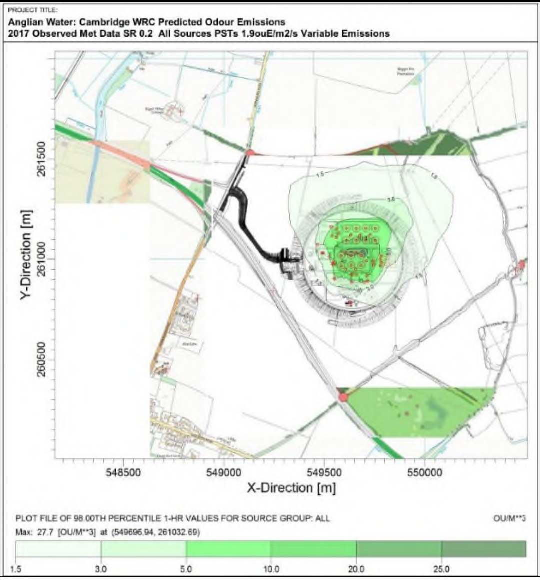
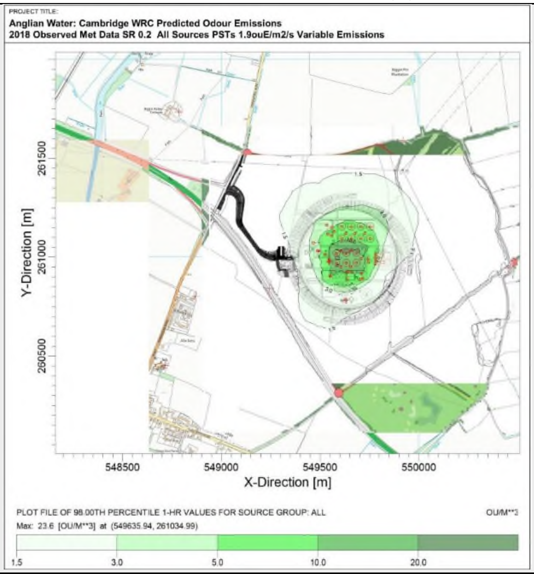
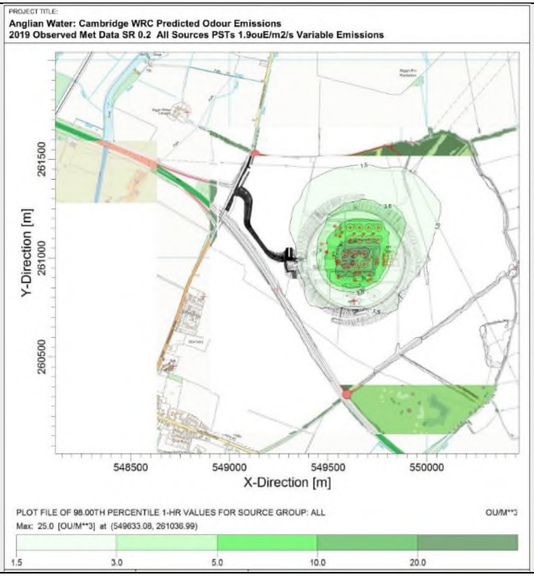
ID	Receptor Name	Predicted odour exposure levels (C_{98} OU_E/m^3) for scenarios listed in Table 5-2									
		1	2	3	4	5	6	7	8	9	10
1	Gatehouse	0.39	0.29	0.28	0.28	0.27	0.77	0.53	0.49	0.48	0.47
2	A14	1.24	1.00	0.96	0.95	0.93	1.32	1.02	0.97	0.95	0.92
3	Property east of Horningsea Road Fen Ditton	0.33	0.26	0.25	0.25	0.25	0.46	0.35	0.33	0.33	0.32
4	Biggin Abbey	0.49	0.34	0.33	0.33	0.33	0.15	0.12	0.12	0.12	0.12
5	Quy Mill Hotel	0.12	0.09	0.09	0.08	0.08	0.17	0.14	0.13	0.13	0.13
6	Fen Ditton Community Primary School	0.25	0.20	0.20	0.20	0.20	0.24	0.19	0.19	0.18	0.18
7	Low Fen Drove Way PROW 85/14	1.46	1.13	1.08	1.06	1.07	0.65	0.49	0.47	0.46	0.45
8	Property to south of Horningsea	0.46	0.34	0.33	0.32	0.31	0.23	0.15	0.15	0.15	0.14
9	Future Residential	1.47	1.12	1.06	1.03	1.01	0.73	0.54	0.50	0.49	0.48

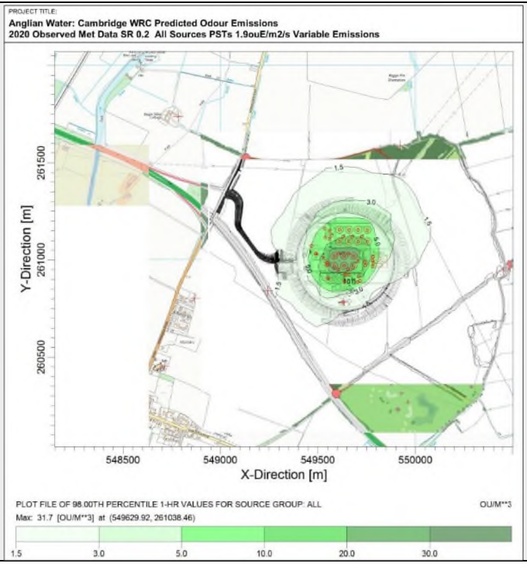
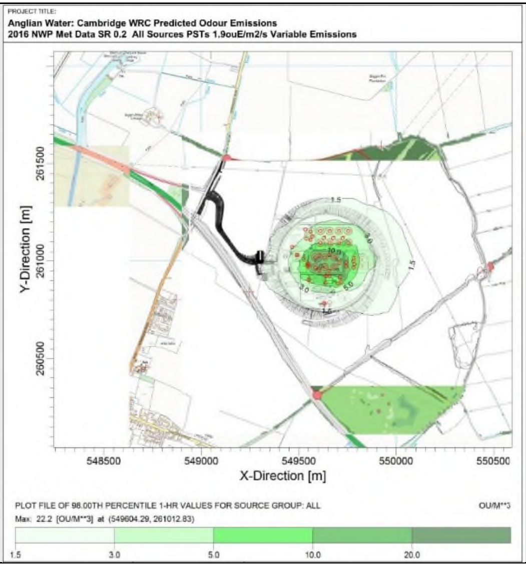
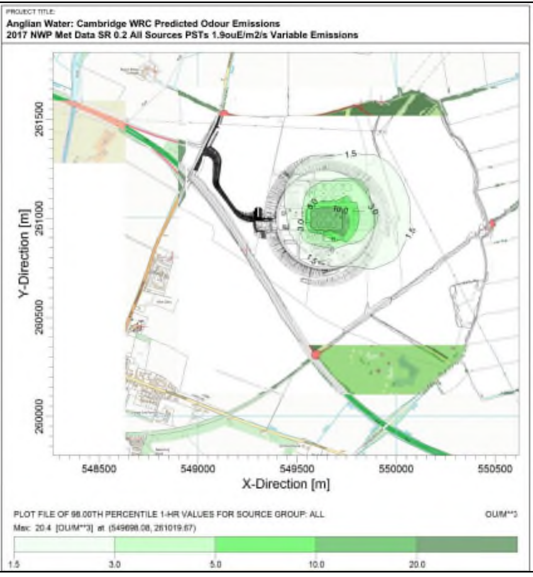
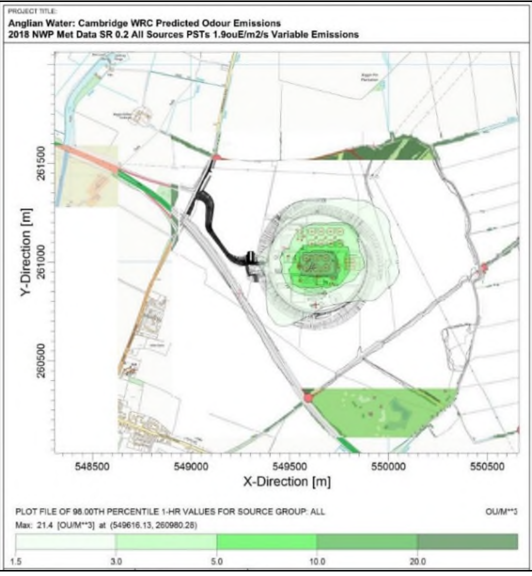
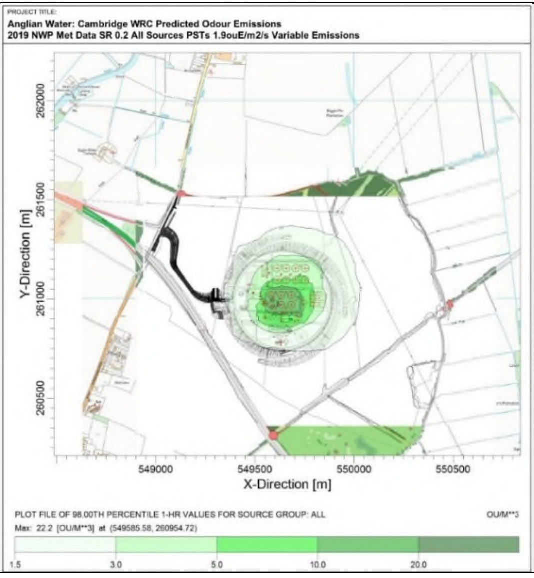
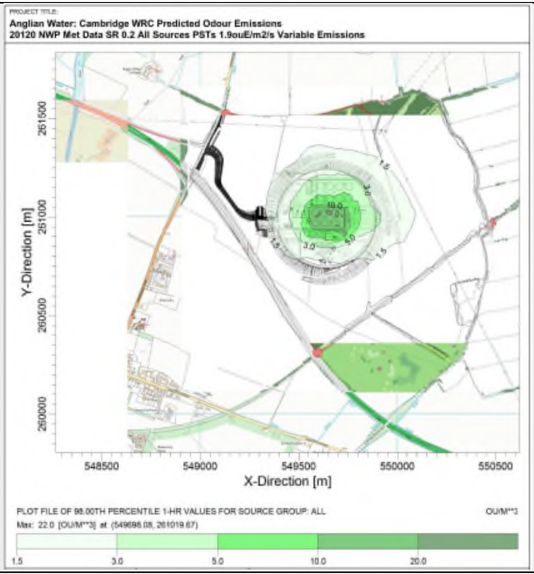
5.3.4 For completeness, a comparison between the five years Cambridge Airport /RAF Mildenhall observational MET data (2016 to 2020) and the (2016 to 2020) NWP data sets have been included to show that the 2016 observational MET data set is overall the most conservative. For this analysis industry standard approach of accounting for seasonal variation was used and a conservative 0.2 surface roughness, which is the same input basis as Scenario 2 and 7 in Table 5-2, with the MET data set varied for the different years. Table 5-4 below summarises the odour modelling results per receptor, with the results graphics included in Table 5-5 below for easy comparison. Full size results images have also been included in Appendix E. In Table 5-4 the worst impact per receptor has been shown in bold text to highlight that the 2016 observational MET data set contains more of the worst impacts than any other MET data set. The worst impact is even more visible from the graphics in Table 5-5, where the C_{98} 1.5 OU_E/m^3 contour extends the furthest beyond the site.

Table 5-4: Odour modelling results at the closest receptors for 2016 to 2020 observational data and NWP data.

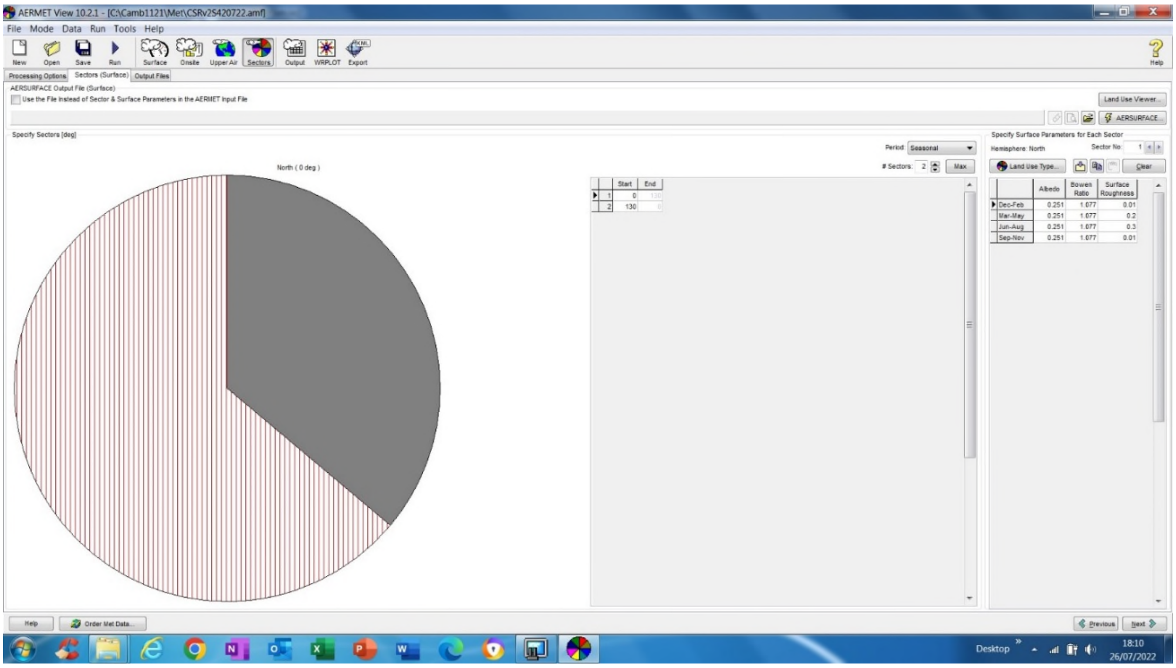
ID	Receptor Name	Predicted odour exposure levels (C_{98} OU_E/m^3)									
		2016 Obs.	2017 Obs.	2018 Obs.	2019 Obs.	2020 Obs.	2016 NWP	2017 NWP	2018 NWP	2019 NWP	2020 NWP
1	Gatehouse	0.26	0.38	0.21	0.30	0.33	0.53	0.54	0.46	0.39	**0.61**
2	A14	1.02	0.38	0.76	0.82	**1.21**	1.02	0.39	0.75	0.78	0.81
3	Property east of Horningsea Road Fen Ditton	**0.35**	0.10	0.21	0.25	0.31	**0.35**	0.10	0.22	0.21	0.26
4	Biggin Abbey	**0.32**	0.31	0.29	0.30	0.18	0.12	0.11	0.11	0.16	0.13
5	Quy Mill Hotel	0.09	0.09	0.05	0.10	0.03	0.14	**0.15**	0.08	0.10	0.08
6	Fen Ditton Community Primary School	0.20	0.06	0.14	0.10	0.23	0.19	0.05	0.14	0.15	**0.26**
7	Low Fen Drove Way PROW 85/14	**1.13**	0.98	0.79	0.98	0.89	0.49	0.56	0.56	0.61	0.53
8	Property to south of Horningsea	**0.34**	0.27	0.23	0.30	0.26	0.15	0.16	0.19	0.18	0.19
9	Future Residential	**1.12**	1.04	0.88	1.03	0.96	0.54	0.55	0.57	0.68	0.57
Appendix reference for full size results image		E.2	E.11	E.12	E.13	E.14	E.7	E.15	E.16	E.17	E.18

Table 5-5: Odour modelling results comparison between 2016 to 2020 observational data and NWP MET data.

2016 observational MET data (Appendix E.2)	2017 observational MET data (Appendix E.11)
	
2018 observational MET data (Appendix E.12)	**2019 observational MET data (Appendix E.13)**
	

<table>
<tr><th>2020 observational MET data (Appendix E.14)</th><th>2016 NWP MET data (Appendix E.7)</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><th>2017 NWP MET data (Appendix E.15)</th><th>2018 NWP MET data (Appendix E.16)</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><th>2019 NWP MET data (Appendix E.19)</th><th>2020 NWP MET data (Appendix E.20)</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

5.3.5 Another sensitivity test conducted was changing the surface roughness seasonal, to reflect differences in agricultural growth and activities throughout the year. Figure 5.1 provides a view of the modelling software input screen, showing the area to the north and east of the site for which this variation was applied.



AERMET View 10.2.1 - [C:\Camb1121\Met\CSRv2S420722.amf]

AERSURFACE Output File (Surface)

☐ Use the File Instead of Sector & Surface Parameters in the AERMET Input File

Specify Sectors [deg]

Period: Seasonal

Sectors: 2

	Start	End
1	0	130
2	130	0

Specify Surface Parameters for Each Sector

Hemisphere: North

Sector No: 1

	Albedo	Bowen Ratio	Surface Roughness
Dec-Feb	0.251	1.077	0.01
Mar-May	0.251	1.077	0.2
Jun-Aug	0.251	1.077	0.3
Sep-Nov	0.251	1.077	0.01

18:10
26/07/2022

Figure 5.1: Odour modelling software input screen showing area for which seasonal farming was applied

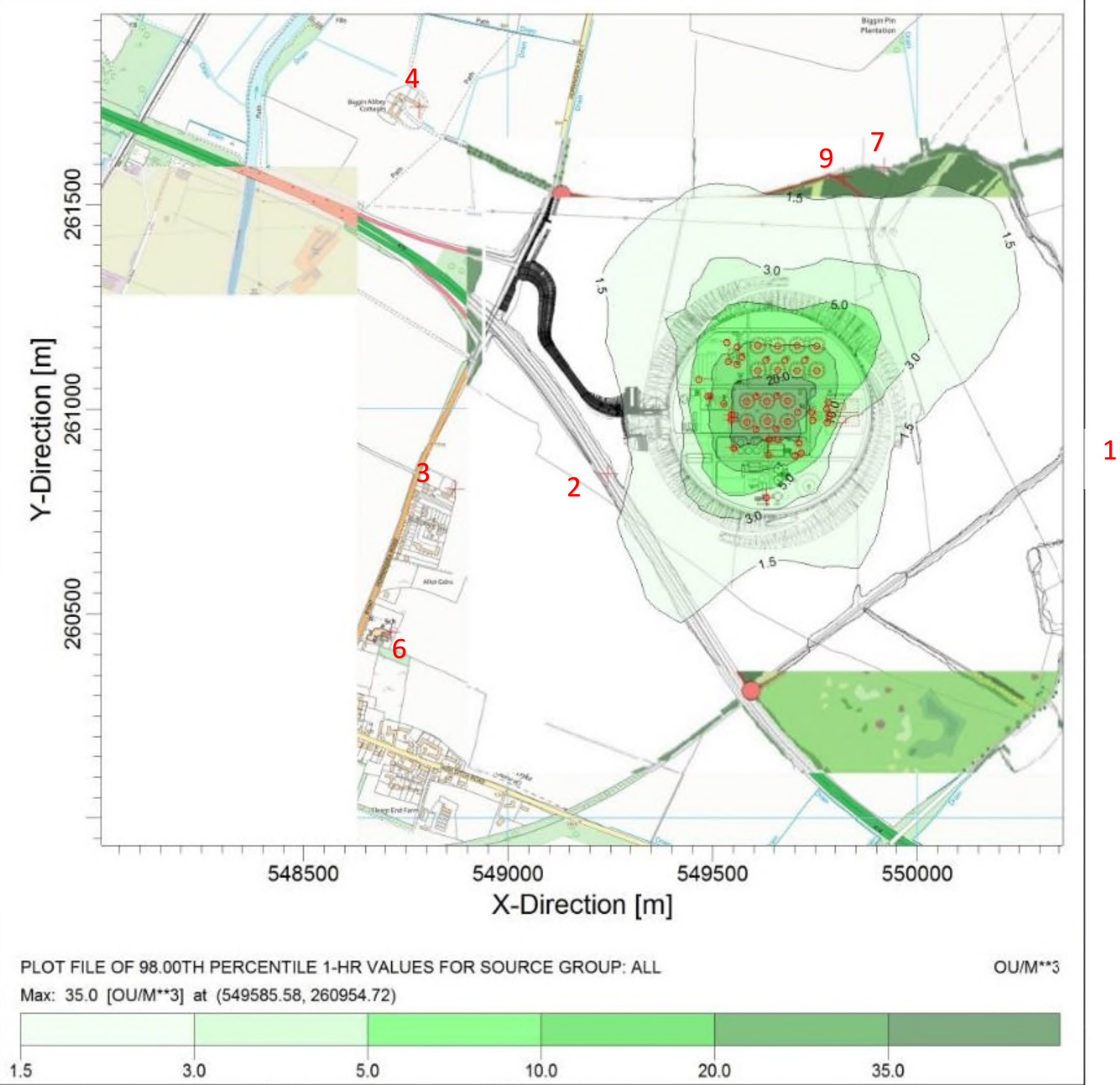
5.3.6 The constant value of 0.2 surface roughness was retained for the areas to the east and west, as they consist of the A14 and residential areas, with limited to no farming activities. Table 3.1 in the ADM Ltd report in Appendix C provides some ranges of surface roughness values that could be utilised. Surface roughness values used for the agricultural areas north of the site for this sensitivity testing scenario are listed in Table 5-6:

Table 5-6: Odour modelling results comparison between 2016 to 2020 observational data and NWP MET data.

Months	Season	Albedo	Bowen Ratio	Surface Roughness	Comment
December to February	winter	0.251	1.077	0.01	cultivated land - winter
March to May	spring	0.251	1.077	0.2	cultivated land - summer
June to August	summer	0.251	1.077	0.3	Maximum growth
September to November	autumn	0.251	1.077	0.01	cultivated land - winter

5.3.7 Figure 5.2 below, also included in Appendix E.19, represents this final sensitivity testing scenario where seasonal roughness values were used to reflect agricultural activities, with seasonal emission values, 2016 observed MET data and no additional planting the other input values.

PROJECT TITLE:
Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Met Data SR 0.3 Summer 0.2 Spring Autumn 0.05 Winter 0.05 All Sources PSTs 1.9ouE/m2/s



PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL OU/M**3
Max: 35.0 [OU/M**3] at (549585.58, 260954.72)

COMMENTS:

Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES:
47

RECEPTORS:
729

OUTPUT TYPE:
Concentration

MAX:
35.0 OU/M3**

COMPANY NAME:
AW

SCALE: 1:15,000
0 0.5 km

DATE:
24/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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Figure 5.2: Odour modelling result for Scenario 19 – Seasonal roughness factors, seasonal emission values, 2016 observed MET data, no additional planting around site included.

5.3.8 When comparing Figure 5.2 with Figure 4.5, which was used in the odour impact assessment, Figure 4.5 remains the most conservative (greatest impact) prediction. Similarly, the predicted odour exposure levels at the closest receptors for this seasonal impact sensitivity testing (Scenario 19) has been included in Table 5-7 below. Table 5-7 can be compared to Table 3-15 to confirm that Scenario 1 remains the most conservative, providing support for a robust odour impact assessment predicting ‘negligible’ impact to all known receptors.

Table 5-7: Odour modelling results of predicted odour exposure levels at the closest receptors

ID	Name	X	Y	Z*	C_{98} OU_E/m^3
1	Gatehouse	550451.7	260942.2	1.5	0.30
2	A14	549243.5	260842.5	1.5	1.00
3	Property east of Horningsea Road Fen Ditton	548869.8	260803.5	1.5	0.25
4	Biggin Abbey	548782.4	261735.7	1.5	0.36
5	Quy Mill Hotel	550846.5	259899.2	1.5	0.10
6	Fen Ditton Community Primary School	548713.8	260453.6	1.5	0.21
7	Low Fen Drove Way PROW 85/14	549921.9	261589.5	1.5	1.12
8	Property to south of Horningsea	549277.9	262140.8	1.5	0.39
9	Future Residential	549821	261567	1.5	1.22

**Note: Z = 1.5m above ground level in all cases.*

5.4 Industrial Emissions Directive Compliance

5.4.1 The STC component on site (not the waste water treatment component) would be subject to Industrial Emissions Directive (IED) permit requirements and an associated boundary odour requirement for the STC activities. The odour modelling result associated with just the STC is included in Appendix F. As can be seen, the predicted odour impact from the STC component does not reach the site boundary and would thus be compliant with the IED permit requirements.

5.5 Other considerations

5.5.1 The National Planning Policy for Water requires that an odour impact assessment should include consideration of ancillary activities (e.g. sludge transport) and abnormal operations (e.g. major plant failure).

5.5.2 As can be seen from the complaints history in Table 3-3 associated with the operation of the existing Cambridge WRC, impacts associated with irregular activities are unpredictable, short term and low in number – less than one a year. No complaints were registered associated with sludge transport. As such, odour modelling or SPR assessment methods cannot be used to define their potential impacts.

5.5.3 Abnormal conditions would be actively managed as and when they occur, in accordance with the Odour Management Plan for the Proposed Development. This includes mitigation measures for reasonably foreseeable abnormal events, e.g. sludge spills, flare stack operating, etc., reporting procedures including the requirements of when to notify authorities e.g. the Environment Agency or the Cambridge City Council, should certain unforeseen events occur.

5.5.4 Other required emergency considerations, e.g. loss of sludge disposal route, is actively planned for in Anglian Water's 25 years sludge strategy in cooperation with the landowners who apply their sludge products to land as fertiliser. Critical plant and equipment are provided with standby plant or equipment, as relevant, and electricity supply for critical plant is held in standby from diesel fuel generators on site. Furthermore, Anglian Water's large geographical operational range allows them to move treatment of imported sludges from smaller satellite sites between their larger sludge treatment sites, should breakdown of plant or equipment restrict capacity.

5.5.5 All the above reinforce the robustness of Anglian Water's asset standard treatment provision approach combined with the active management in line with the Odour Management Plan for the site.

5.6 Mitigation Summary

5.6.1 As part of the design development, driving down odour impacts remained a project priority. To highlight mitigation and differences to the existing WRC, the following summary is provided:

5.6.2 Baseline mitigation (also refer to Section 3.3 above):

- Covering and venting of air from the terminal pumping station (TPS) and inlet works through OCU(s);
- Improvements in the design configuration of the sludge treatment centre (STC) with all tanks in the STC being covered and either vented to OCU or connected to the biogas system;
- Improvements in the operation of the STC such as composting activities and storing of off-specification sludges are not included in the proposed CWWTRP; and
- Obsolete and decommissioned processes will not be included in the design of the new site such as the layout can be optimised to reduce footprint and associated surface area and odour impact.

5.6.3 Mitigation beyond the Baseline position and included in Scenario 1 to 19:

- Choosing the main treatment process for its lower turbulence and emissions, which achieves a lower odour impact potential (more turbulence can result in more effective odour dispersion);
- Layout arrangements to locate the most odorous elements towards the centre of the site and processes with treated effluent, which has unoffensive odours, near the boundary;
- Moving the preferred layout geographically to achieve the reduced impact to existing receptors;
- Inlet works layout “straightening” to reduce potential turbulent flow areas;
- Hydraulic design for the uncovered areas of the plant to utilise gravity flow to reduce turbulence;
- Pumped flows to uncovered tanks will be discharged below water level to reduce turbulence;
- Choosing the aeration equipment for appropriate portions of the treatment process as a low-pressure system to reduce turbulence;
- Designing odour control facilities (which are considered critical equipment) to operate continuously in all conditions. Their power supply will be protected and standby equipment will be brought online automatically should equipment fails;
- Reducing the overall footprint of the inlet works and sludge tanks to reduce odour emissions; and
- Using computer odour modelling to inform the effectiveness of design mitigations.

5.6.4 The trees and other planting included in the Project are for landscaping purpose and not planted specifically for odour mitigation, although odour mitigation can be expected as a consequence of their presence. The impact that different land use and planting have is discussed in Section 4.4 under surface roughness. Furthermore, the sensitivity testing in section 5.3 provides an indication of the level of odour concentration reduction offered by the planting included in the Project over time.

6 Conclusion

6.1.1 Both the source pathway receptor and the odour impact assessments for the proposed integrated waste water treatment site concluded that the proposed CWWTPR will have ‘Negligible’ residual odour impact to all known receptors, using the multi-tool assessment approach used.

6.1.2 Scenario 1 maintained the same conservative input basis used throughout the various public consultation phases of the DCO development process. In addition to Scenario 1, used in the odour impact assessment, sensitivity testing was conducted with 18 further scenarios with variables including varying MET data, different surface roughness factors and taking seasonal variations into consideration, aimed at testing other industry standard odour modelling approaches. The sensitivity testing showed that Scenario 1 produced the most conservative results. This conservative odour modelling approach reinforced that Scenario 1 has been a robust approach to confirm the proposed CWWTPR project will have ‘Negligible’ residual odour impact to all known receptors.

6.1.3 Ancillary activities (e.g. sludge transport) and abnormal operations (e.g. major plant failure) have also been considered with reference to Anglian Water’s previous odour complaints received. Impacts associated with irregular activities are unpredictable, short term and low in number – i.e. less than one a year. It supports the robustness of Anglian Water’s active management of incidents in line with the Odour Management Plan for the site.

6.1.4 In conclusion, reasonable odour mitigation steps have been taken during design development so that the assessment concludes that the CWWTPR will have ‘Negligible’ odour impact to all known receptors. The operation of the proposed CWWTPR will be in compliance with the Odour Management Plan. This combined approach of ‘design’ and ‘active management’ assures ‘appropriate measures to minimise odour’ for the Project has and will continue to be taken. Therefore, the predicted residual effect of the odour impacts associated with the proposed Project would be “not significant”.

7 Appendices

7.1 APPENDIX A – SILSOE ODOUR FIELD SURVEY – APRIL / MAY 2022

Report to
Anglian Water – Cambridge WWTW Relocation Project
Odour Field Survey
On April/May 2022

Date of report 10 June 2022

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Contents

Silsoe Odours Ltd.

Silsoe Odours Ltd. operates the independent odour measurement service with the first odour laboratory to gain UKAS accreditation since in October 2005.

We are a specialist odour consultancy with a passion for delivering independent, innovative research excellence and technical expertise. Our highly skilled team bring decades of experience in odour management, odour measurement, and consultancy to their work with clients across a range of sectors, including food, industry, planning and commercial. Our aim is to deliver excellent service for each one of our clients and, through doing so, to become leading influencers in the ways in which odour pollution is perceived and dealt with in the UK.

1. Introduction and Details of the Current and Proposed Sites

1.1. Introduction

At the CWWTRP Public Consultation CON2 engagement, Stakeholders continued to raise concerns about potential odour impacts at the proposed new works. The aim is to involve Stakeholders in compiling a background odour profile, to aid the understanding of odour in the wider area.

Silsoe Odours Ltd were engaged by Anglian Water to provide a field odour survey of the areas around the current and proposed Cambridge WRC site locations, as well as some of the current works, to assess the current odour impacts of the current works and other odour sources around both current and future sites.

The objective of the field odour survey is to subjectively record the odours perceived at observation points in the areas in and around the current and proposed Cambridge WRC site locations.

The field odour survey follows the guidance in the German guideline VDI 3940 Measurement of odour impact by field inspection and was carried out by the Silsoe Odours Ltd (registered/trained/certified) team over three separate days, to gain a spectrum of odour impacts under different weather conditions.

1.2. Current Cambridge WWTW site

Figure 1: Aerial view of existing Cambridge site.

Figure 2: Detailed aerial view of existing Cambridge site .

1.3. Proposed Cambridge WWTW relocation site

Figure 3: Aerial view of proposed relocation site.

Aerial plan showing landscape proposals for our site

More information on these proposals is available in our Landscape, Ecological and Recreational Management Plan (LERMP) and PEIR.

Figure 4: Anglian Water proposed new site landscape plan

Further information regarding the new site and the associated pending DCO application can be found via the following link;

[Cambridge Waste Water Treatment Plant Relocation Project – About The Project (cwwtpr.com)]

2. Method of Assessment

2.1 Data Collection Method

Course of the measurements. The assessors are instructed to have stop eating or smoking at least 30 minutes before the measurement. At each measuring point the measuring procedure lasts 5 minutes and comprises the registration of the description of the odour, the odour intensity and offensiveness of the odour as well as a record of the wind and weather conditions.

Performing the single measurement. The duration of a single measurement at one measuring point is 5 minutes, which is at least needed to give with 80% reliability a representative assessment of the odour situation of a particular hour. The panelist must test the ambient air for a definitely recognisable odour. The panelist will use descriptors that are relevant to the situation e.g., sewage, rendering, cooking, fire, vegetation etc. and are allowed to choose descriptors not on the list against which he/she can judge the odour.

The panelist tests the ambient air by inhaling at 10 seconds intervals, which gives 30 samples in five minutes. Following the recognition of the odour the panelist is asked to assess the odour intensity on the 0 to 6 scale and offensiveness on a scale of 0-3.

All the responses are recorded using an "App" on a tablet.

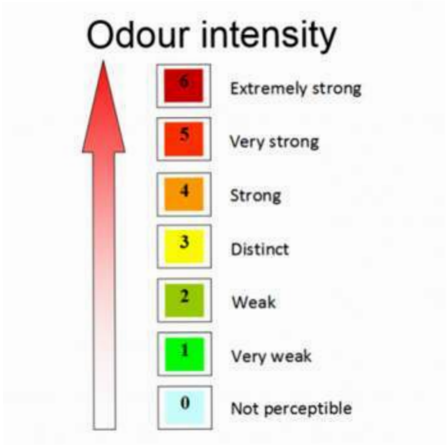
Table 1: VDI 3940 Odour Intensity Scale

0	No Odour
1	Very Weak
2	Weak
3	Distinct
4	Strong
5	Very Strong
6	Extremely Strong

Table 2: Odour Offensiveness Scale

0	Not Offensive
1	Low/potentially offensive
2	Moderately offensive
3	Highly offensive

Figure 5: Schematiation to determine concentration of odour intensity

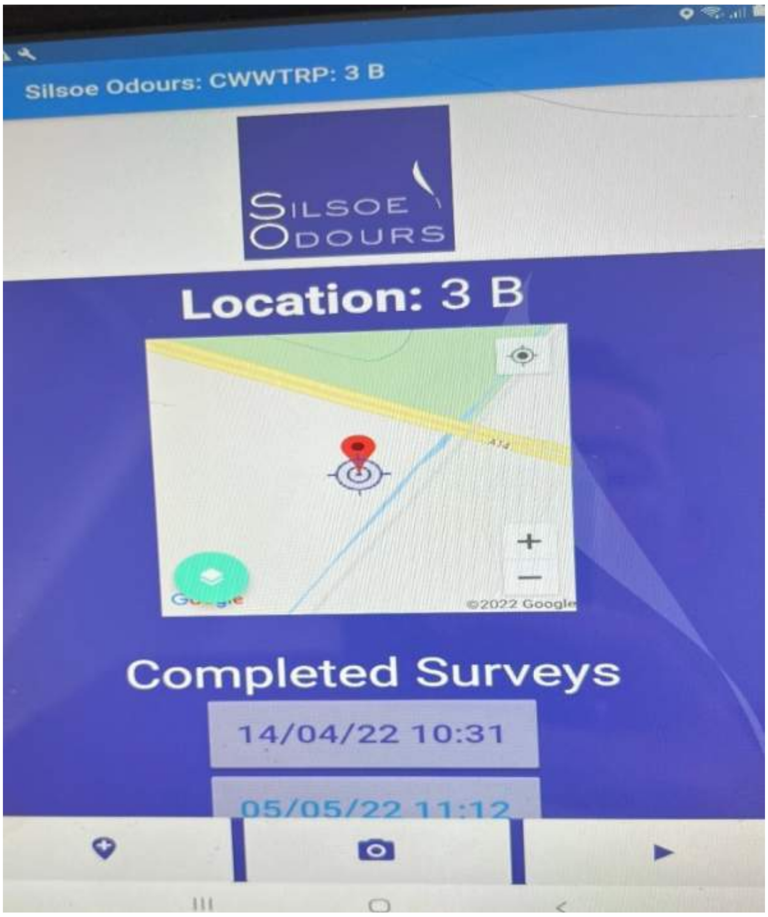


2.2 Data processing.

The percentage of time a given descriptor was used and the mean intensity of the odours with that description are calculated. It is suggested that if a particular offensive odour is detected for more than 10% of the time that may cause annoyance. The occasions when the assessors detected offensive odours and the mean intensity score for of those odours are listed in the tables shown in Sections 4.1, 4.2 and 4.3 (Sniff Surveys).

2.3 Assessors Data Collection

Data is collected using the Silsoe Odours Survey app, data includes location of monitoring point, odour description and odour intensity. Wind data such as speed and direction are also recorded in the app.



Silsoe Odours: CWWTRP: 3 B

Location: 3 B

Completed Surveys

14/04/22 10:31

05/05/22 11:12

Figure 6: Screen shot of the data collection screen during the CWWTRP survey

Two odour assessors were present during the first odour assessment (14/04/2022), three odours assessors were present during the second and third odour assessments (05/05/22 and 13/05/22).

3. Meteorological Data

During the assessment surveyors monitored the changes in wind speed and wind direction using a handheld compass and anemometer. Temperatures have been taken from www.wunderground.com using a local weather station located at Horningsea. Wind Rose diagram from www.mesonet.agron.iastate.edu using data from Cambridge Airport.
The prevailing wind for the area is West-South-Westerly.

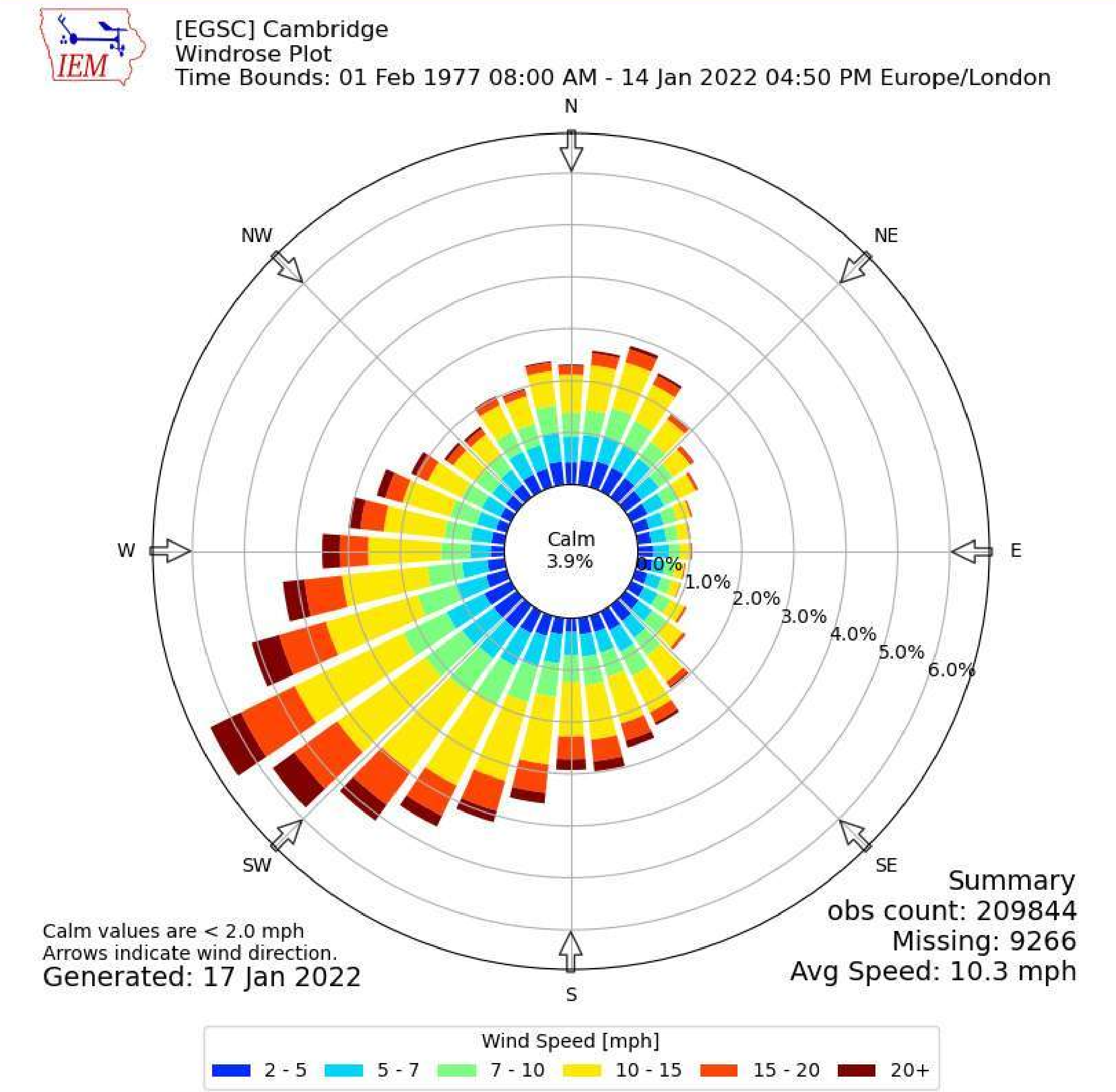


Figure 7: Cambridge Windrose Plot – Cambridge Airport

4. Field Odour Survey

An initial investigation of the area was conducted prior to the first sniff survey in order to familiarise ourselves with the location and to identify designated observation points. On each visit local meteorological conditions were taken into consideration to establish the best place to conduct the odour surveys throughout each day. Panel members located themselves at approximately 25m intervals about the designated observation point indicated as 1A, 1B, 1C etc.

The following tables (p. 12 – 22) show the date, time and location of all odours detected at the survey locations in the 5-minute period monitoring period.

Figure 8: Aerial image of Cambridge WWTW Relocation Project pinned survey area within current boundary (image from Google Earth)

Figure 9: Aerial image of Cambridge works with initial Designated Observation Points. Actual observation points are shown in Appendix 1.

4.1 Sniff Survey Results table – 14 April 2022

Time	Point	Temp °C	Wind Strength (m/s)	Wind Direction	Odour Description	Odour Intensity mean	Max Odour Intensity	Max Offensiveness	Constant/ Intermittent
09:59	6 B	16.6	0.5	WSW	A Sewage	1	1	0	13%
09:59	6 B	16.6	0.5	WSW	No Odour	0	0	0	70%
09:59	6 B	16.6	0.5	WSW	B Compost*	2	2	0	17%
09:59	6 C	16.6	0.5	WSW	D Sludge/Sludge Tank	5	6	3	100%
10:10	5 B	16.8	0.9	WSW	No Odour	0	0	0	97%
10:10	5 B	16.8	0.9	WSW	B Compost	3	3	2	3%
10:13	5 C	16.9	0.9	SSW	C Vegetation	1	2	0	30%
10:13	5 C	16.9	0.9	SSW	A Sewage	2	2	1	7%
10:13	5 C	16.9	0.9	SSW	D Sludge/Sludge Tank	2	2	1	10%
10:13	5 C	16.9	0.9	SSW	No Odour	0	0	0	53%
10:21	4 B	16.9	0.9	WSW	No Odour	0	0	0	83%
10:21	4 B	16.9	0.9	WSW	C Vegetation	3	3	0	7%
10:21	4 B	16.9	0.9	WSW	D Sludge/Sludge Tank	2	2	1	3%
10:21	4 B	16.9	0.9	WSW	B Compost	2	2	0	7%
10:22	4 C	16.9	0.9	WSW	No Odour	0	0	0	77%
10:22	4 C	16.9	0.9	WSW	D Sludge/Sludge Tank	2	2	1	7%
10:22	4 C	16.9	0.9	WSW	E Earthy	2	2	0	13%
10:22	4 C	16.9	0.9	WSW	C Vegetation	2	2	0	3%
10:31	3 B	17.2	1	SSW	K Cake	2	2	1	17%
10:31	3 B	17.2	1	SSW	No Odour	0	0	0	70%
10:31	3 B	17.2	1	SSW	D Sludge/Sludge Tank	2	2	1	13%
10:33	3 C	17.9	1	SSW	D Sludge/Sludge Tank	5	5	3	97%
10:33	3 C	17.9	1	SSW	No Odour	0	0	0	3%
11:06	2 B	18.2	0.8	WSW	No Odour	0	0	0	90%
11:06	2 B	18.2	0.8	WSW	C Vegetation	2	2	0	10%
11:07	2 C	18.2	0.8	WSW	J Sweet Chemically	2	2	1	27%
11:07	2 C	18.2	0.8	WSW	No Odour	0	0	0	63%
11:07	2 C	18.2	0.8	WSW	D Sludge/Sludge Tank	1	2	1	10%
11:16	1 B	18.5	0.6	WSW	No Odour	0	0	0	63%
11:16	1 B	18.5	0.6	WSW	C Vegetation	3	3	0	10%
11:16	1 B	18.5	0.6	WSW	D Sludge/Sludge Tank	2	2	1	27%
11:17	1 C	18.4	0.6	WSW	No Odour	0	0	0	60%
11:17	1 C	18.4	0.6	WSW	D Sludge/Sludge Tank	3	4	2	40%
11:36	16 B	18	0.8	WSW	F Farm	3	3	2	30%

11:36	16 B	18	0.8	WSW	No Odour	0	0	0	63%
11:36	16 B	18	0.8	WSW	C Vegetation	3	3	0	7%
11:38	16 C	18	0.8	WSW	F Farm	2	3	1	23%
11:38	16 C	18	0.8	WSW	No Odour	0	0	0	20%
11:38	16 C	18	0.8	WSW	C Vegetation	2	2	0	37%
11:38	16 C	18	0.8	WSW	H Manure	2	3	2	17%
11:38	16 C	18	0.8	WSW	D Sludge/Sludge Tank	2	2	0	3%
11:58	15 B	18.4	1.4	WSW	No Odour	0	0	0	80%
11:58	15 B	18.4	1.4	WSW	C Vegetation	3	3	0	20%
11:59	15 C	18.4	1.4	WSW	C Vegetation	2	3	0	93%
11:59	15 C	18.4	1.4	WSW	D Sludge/Sludge Tank	3	3	0	3%
11:59	15 C	18.4	1.4	WSW	No Odour	0	0	0	3%
12:12	9 B	18.5	1.2	WSW	No Odour	0	0	0	100%
12:12	9 C	18.5	1.2	WSW	E Earthy*	1	2	0	100%
12:23	8 B	18.2	1.7	WSW	M Traffic	2	2	1	7%
12:23	8 B	18.2	1.7	WSW	No Odour	0	0	0	80%
12:23	8 B	18.2	1.7	WSW	P Vegetation	3	3	0	13%
12:24	8 C	18.2	1.7	WSW	C Vegetation	1	2	0	93%
12:24	8 C	18.2	1.7	WSW	D Sludge/Sludge Tank	2	2	0	7%
12:33	17 B	18.2	1.4	WSW	No Odour	0	0	0	63%
12:33	17 B	18.2	1.4	WSW	P Vegetation	3	3	0	27%
12:33	17 B	18.2	1.4	WSW	L Cooking	3	3	1	10%
12:34	17 C	18.2	1.4	WSW	No Odour	0	0	0	100%
12:45	18 B	18.5	1.4	WSW	No Odour	0	0	0	80%
12:45	18 B	18.5	1.4	WSW	L Cooking	3	3	2	20%
12:47	18 C	18.1	1.4	WSW	No Odour	0	0	0	93%
12:47	18 C	18.1	1.4	WSW	C Vegetation	1	1	0	7%
13:15	13.3 C	17.5	1	WSW	No Odour	0	0	0	100%
13:16	13.3 B	17.5	1	WSW	No Odour	0	0	0	100%
13:28	13.2 B	18.1	0.5	WSW	No Odour	0	0	0	90%
13:28	13.2 B	18.1	0.5	WSW	I River Water	2	2	1	3%
13:28	13.2 B	18.1	0.5	WSW	C Vegetation	3	3	0	7%
13:29	13.2 C	18.1	0.5	WSW	I River Water	0	0	0	3%
13:29	13.2 C	18.1	0.5	WSW	No Odour	0	0	0	60%
13:29	13.2 C	18.1	0.5	WSW	C Vegetation	2	3	0	37%
13:37	13.1 B	18.3	0.3	WSW	No Odour	0	0	0	93%
13:37	13.1 B	18.3	0.3	WSW	C Vegetation	3	3	0	7%
13:39	13.1 C	18.3	0.3	WSW	C Vegetation	2	2	0	30%
13:39	13.1 C	18.3	0.3	WSW	No Odour	0	0	0	63%
13:39	13.1 C	18.3	0.3	WSW	I River Water	2	2	1	7%
13:53	13 B	18.1	0.4	WSW	No Odour	0	0	0	83%
13:53	13 B	18.1	0.4	WSW	C Vegetation	3	3	0	10%
13:53	13 B	18.1	0.4	WSW	M Traffic	3	3	2	7%

13:53	13 C	18.1	0.4	WSW	No Odour	0	0	0	30%
13:53	13 C	18.1	0.4	WSW	D Sludge/Sludge Tank	3	4	2	47%
13:53	13 C	18.1	0.4	WSW	C Vegetation	1	1	0	23%
14:03	21 B	18.1	1.1	WSW	D Sludge/Sludge Tank	2	2	1	17%
14:03	21 B	18.1	1.1	WSW	No Odour	0	0	0	67%
14:03	21 B	18.1	1.1	WSW	C Vegetation	3	3	0	17%
14:03	21C	18.1	1.1	WSW	D Sludge/Sludge Tank	2	3	1	10%
14:03	21C	18.1	1.1	WSW	No Odour	0	0	0	63%
14:03	21C	18.1	1.1	WSW	C Vegetation	1	2	0	27%
14:14	14 B	18.4	2.2	WSW	No Odour	0	0	0	100%
14:16	14 C	18.5	2.2	WSW	No Odour	0	0	0	50%
14:16	14 C	18.5	2.2	WSW	C Vegetation	1	1	0	43%
14:16	14 C	18.5	2.2	WSW	I River Water	2	2	1	7%
16:15	19 B	18.8	0.6	WSW	No Odour	0	0	0	90%
16:15	19 B	18.8	0.6	WSW	C Vegetation	2	2	0	10%
16:16	19 C	18.8	0.6	WSW	No Odour	0	0	0	100%
16:41	7 C	18.8	0.6	WSW	No Odour	0	0	0	100%
16:41	7 B	18.8	0.6	WSW	No Odour	0	0	0	100%

Table 3: Odour Exposure at time and place of sampling on 14 April 2022

Table 4: VDI 3940 Odour Intensity Scale (adapted)

0	🟦	No Odour
1	🟩	Very Weak
2	🟩	Weak
3	🟨	Distinct
4	🟧	Strong
5	🟥	Very Strong
6	🟥	Extremely Strong

N.B. * Compost and Earthy odour descriptors often associated with the odour from ASP (5B).

Figure 10: Sniff Survey 1 – Colour coded pins based on highest Odour Intensity Mean results for locations where 'relevant' odour(s) were detected

4.2 Sniff Survey – 05 May 2022

Time	Point	Temp °C	Wind Strength (m/s)	Wind Direction	Odour Description	Odour Intensity mean	Max Odour Intensity	Max Offensiveness	Constant/ Intermittent
10:34	6 A	16	1.4	NW	D Sludge/Sludge Tank	3	4	3	70%
10:34	6 A	16	1.4	NW	No Odour	0	0	0	27%
10:34	6 A	16	1.4	NW	D Sludge/Sludge Tank	4	4	3	3%
10:35	6 C	16	1.4	NW	C Vegetation	3	3	1	3%
10:35	6 C	16	1.4	NW	D Sludge/Sludge Tank	2	4	2	90%
10:35	6 C	16	1.4	NW	No Odour	0	0	0	7%
10:35	6 B	16	1.4	NW	D Sludge/Sludge Tank	5	5	3	90%
10:35	6 B	16	1.4	NW	No Odour	0	0	0	10%
10:46	5 A	16.2	0.9	NW	No Odour	0	0	0	57%
10:46	5 A	16.2	0.9	NW	C Vegetation	3	3	0	23%
10:46	5 A	16.2	0.9	NW	A Sewage	3	3	2	20%
10:46	5 C	16.2	0.9	NW	No Odour	0	0	0	63%
10:46	5 C	16.2	0.9	NW	A Sewage	1	2	1	37%
10:48	5 B	16.2	0.9	NW	A Sewage	3	3	2	17%
10:48	5 B	16.2	0.9	NW	D Sludge/Sludge Tank	4	5	2	37%
10:48	5 B	16.2	0.9	NW	J Sweet Chemically	2	2	1	13%
10:48	5 B	16.2	0.9	NW	E Earthy*	2	2	1	10%
10:48	5 B	16.2	0.9	NW	D Sludge/Sludge Tank	4	4	2	7%
10:48	5 B	16.2	0.9	NW	B Compost	3	3	2	3%
10:48	5 B	16.2	0.9	NW	B Compost	3	3	2	13%
10:59	4 C	16.5	1.6	NW	D Sludge/Sludge Tank	3	5	3	53%
10:59	4 C	16.5	1.6	NW	No Odour	0	0	0	47%
10:59	4 B	16.5	1.6	NW	J Sweet Chemically	2	3	2	23%
10:59	4 B	16.5	1.6	NW	D Sludge/Sludge Tank	4	4	2	30%
10:59	4 B	16.5	1.6	NW	B Compost	3	3	2	7%
10:59	4 B	16.5	1.6	NW	E Earthy	2	2	1	37%
10:59	4 B	16.5	1.6	NW	No Odour	0	0	0	3%
10:59	4 A	16.5	1.6	NW	J Sweet Chemically	3	3	1	7%
10:59	4 A	16.5	1.6	NW	E Earthy*	2	2	1	3%
10:59	4 A	16.5	1.6	NW	D Sludge/Sludge Tank	2	3	2	23%
10:59	4 A	16.5	1.6	NW	No Odour	0	0	0	67%
11:11	3 C	16.8	1.3	NW	No Odour	0	0	0	7%
11:11	3 C	16.8	1.3	NW	C Vegetation	2	2	0	10%
11:11	3 C	16.8	1.3	NW	D Sludge/Sludge Tank	3	4	2	83%

11:12	3 A	16.8	1.3	NW	K Cake	4	5	3	37%
11:12	3 A	16.8	1.3	NW	J Sweet Chemically	3	4	3	30%
11:12	3 A	16.8	1.3	NW	No Odour	0	0	0	13%
11:12	3 A	16.8	1.3	NW	D Sludge/Sludge Tank	3	5	3	20%
11:12	3 B	16.8	1.3	NW	K Cake	4	5	3	27%
11:12	3 B	16.8	1.3	NW	D Sludge/Sludge Tank	5	6	3	70%
11:12	3 B	16.8	1.3	NW	No Odour	0	0	0	3%
11:31	2 C	17.5	0.8	NW	G Food Van	2	3	2	33%
11:31	2 C	17.5	0.8	NW	No Odour	0	0	0	67%
11:31	2 B	17.5	0.8	NNW	X Curry	3	3	2	77%
11:31	2 B	17.5	0.8	NNW	No Odour	0	0	0	13%
11:31	2 B	17.5	0.8	NNW	Y Food	2	2	1	10%
11:31	2 A	17.5	0.8	NW	No Odour	0	0	0	53%
11:31	2 A	17.5	0.8	NW	A Sewage	1	1	0	7%
11:31	2 A	17.5	0.8	NW	C Vegetation	3	3	0	23%
11:31	2 A	17.5	0.8	NW	L Cooking	3	3	2	17%
11:41	1 C	17.5	1.1	NW	No Odour	0	0	0	67%
11:41	1 C	17.5	1.1	NW	D Sludge/Sludge Tank	2	3	2	27%
11:41	1 C	17.5	1.1	NW	C Vegetation	2	2	0	7%
11:41	1 B	17.5	1.1	NW	D Sludge/Sludge Tank	3	4	2	37%
11:41	1 B	17.5	1.1	NW	No Odour	0	0	0	20%
11:41	1 B	17.5	1.1	NW	D Sludge/Sludge Tank	2	2	1	3%
11:41	1 B	17.5	1.1	NW	C Vegetation	2	2	0	40%
11:42	1 A	17.5	1.4	NW	C Vegetation	3	3	0	17%
11:42	1 A	17.5	1.4	NW	No Odour	0	0	0	77%
11:42	1 A	17.5	1.4	NW	M Traffic	3	3	2	7%
11:58	19 B	17.3	2.4	NW	No Odour	0	0	0	3%
11:58	19 B	17.3	2.4	NW	C Vegetation	2	3	0	97%
11:58	19 C	17.3	2.4	NW	C Vegetation	2	3	0	63%
11:58	19 C	17.3	2.4	NW	No Odour	0	0	0	37%
11:58	19 A	17.3	2.4	NW	C Vegetation	2	3	0	17%
11:58	19 A	17.3	2.4	NW	J Sweet Chemically	2	2	1	13%
11:58	19 A	17.3	2.4	NW	No Odour	0	0	0	67%
11:58	19 A	17.3	2.4	NW	K Cake	3	3	0	3%
12:11	7 A	17.1	1.4	NW	C Vegetation	3	3	0	27%
12:11	7 A	17.1	1.4	NW	No Odour	0	0	0	73%
12:12	7 B	17.1	1.4	NW	No Odour	0	0	0	23%
12:12	7 B	17.1	1.4	NW	C Vegetation	1	2	0	77%
12:12	7 C	17.1	1.4	NW	C Vegetation	2	2	0	27%
12:12	7 C	17.1	1.4	NW	No Odour	0	0	0	73%
13:25	16 A	18.6	0.8	WNW	C Vegetation	3	3	0	30%
13:25	16 A	18.6	0.8	WNW	No Odour	0	0	0	70%

13:27	16 B	18.6	0.8	WNW	Z Cut Grass	1	2	0	100%
13:27	16 C	18.6	0.8	WNW	No Odour	0	0	0	100%
13:40	15 A	18.4	0.8	NNW	C Vegetation	3	3	0	20%
13:40	15 A	18.4	0.8	NNW	No Odour	0	0	0	67%
13:40	15 A	18.4	0.8	NNW	L Cooking	3	3	2	10%
13:40	15 A	18.4	0.8	NNW	M Traffic	3	3	2	3%
13:40	15 B	18.4	0.8	WSW	C Vegetation	3	3	0	100%
13:40	15 C	18.4	0.8	WNW	No Odour	0	0	0	100%
13:55	9 B	18.5	2.1	WNW	C Vegetation	1	2	0	100%
13:55	9 A	18.5	2.1	WNW	C Vegetation	3	3	0	13%
13:55	9 A	18.5	2.1	WNW	No Odour	0	0	0	87%
13:56	9 C	18.5	2.1	WNW	C Vegetation	2	2	0	40%
13:56	9 C	18.5	2.1	WNW	No Odour	0	0	0	60%
14:06	8 A	19.3	0.6	WNW	C Vegetation	3	3	0	47%
14:06	8 A	19.3	0.6	WNW	No Odour	0	0	0	53%
14:07	8 B	19.3	0.6	NNW	C Vegetation	3	3	0	3%
14:07	8 B	19.3	0.6	NNW	No Odour	0	0	0	3%
14:07	8 B	19.3	0.6	NNW	C Vegetation	3	3	0	93%
14:07	8 C	19.3	0.6	WNW	C Vegetation	2	2	0	53%
14:07	8 C	19.3	0.6	WNW	No Odour	0	0	0	47%
14:17	17 A	19.8	0.4	WNW	C Vegetation	3	3	0	20%
14:17	17 A	19.8	0.4	WNW	No Odour	0	0	0	80%
14:17	17 B	19.8	0.4	WNW	C Vegetation	1	2	0	100%
14:18	17 C	19.8	0.4	WNW	C Vegetation	2	2	0	40%
14:18	17 C	19.8	0.4	WNW	No Odour	0	0	0	60%
14:29	18 A	18.9	0.5	NNE	No Odour	0	0	0	100%
14:30	18 B	18.9	0.5	NNE	No Odour	0	0	0	100%
14:30	18 C	18.9	0.5	NNE	No Odour	0	0	0	100%
14:55	13.3 B	19	0.5	WNW	No Odour	0	0	0	100%
14:55	13.3 C	19	0.5	WNW	No Odour	0	0	0	100%
14:55	13.3 A	19	0.5	WNW	No Odour	0	0	0	100%
15:10	13.2 A	20.1	0.3	WNW	No Odour	0	0	0	100%
15:11	13.2 B	20.1	0.3	WNW	No Odour	0	0	0	57%
15:11	13.2 B	20.1	0.3	WNW	C Vegetation	2	2	0	43%
15:12	13.2 C	20.1	0.3	WNW	No Odour	0	0	0	100%
15:21	13.1 A	21.6	0	WNW	C Vegetation	3	3	0	23%
15:21	13.1 A	21.6	0	WNW	No Odour	0	0	0	77%
15:23	13.1 B	21.6	0	WNW	No Odour	0	0	0	100%
15:24	13.1 C	21.6	0	WNW	No Odour	0	0	0	87%
15:24	13.1 C	21.6	0	WNW	D Sludge/Sludge Tank	1	1	1	13%
15:35	13 C	20.6	1.2	WNW	No Odour	0	0	0	83%
15:35	13 C	20.6	1.2	WNW	D Sludge/Sludge Tank	1	2	1	17%
15:37	13 B	20.6	1.2	WNW	No Odour	0	0	0	13%

15:37	13 B	20.6	1.2	WNW	D Sludge/Sludge Tank	2	2	1	10%
15:37	13 B	20.6	1.2	WNW	J Sweet Chemically	1	1	0	3%
15:37	13 B	20.6	1.2	WNW	D Sludge/Sludge Tank	3	4	2	20%
15:37	13 B	20.6	1.2	WNW	E Earthy	1	1	0	17%
15:37	13 B	20.6	1.2	WNW	C Vegetation	1	2	0	37%
15:38	13 A	20.6	1.2	WNW	D Sludge/Sludge Tank	3	4	3	33%
15:38	13 A	20.6	1.2	WNW	No Odour	0	0	0	67%
15:48	21A	20.9	0	WNW	C Vegetation	3	3	0	43%
15:48	21A	20.9	0	WNW	No Odour	0	0	0	57%
15:48	21 B	20.9	0	WNW	C Vegetation	3	3	0	100%
15:49	21C	20.9	0	WNW	C Vegetation	2	2	0	60%
15:49	21C	20.9	0	WNW	No Odour	0	0	0	40%
16:00	14 C	20.4	0.3	WNW	C Vegetation	2	3	0	27%
16:00	14 C	20.4	0.3	WNW	No Odour	0	0	0	73%
16:01	14 A	20.4	0.3	WNW	No Odour	0	0	0	100%
16:02	14 B	20.4	0.3	WNW	No Odour	0	0	0	7%
16:02	14 B	20.4	0.3	WNW	I River Water	3	3	1	93%

Table 5: Odour Exposure at time and place of sampling on 05 May 2022

Table 4: VDI 3940 Odour Intensity Scale (adapted)

0	🟦	No Odour
1	🟩	Very Weak
2	🟩	Weak
3	🟨	Distinct
4	🟧	Strong
5	🟥	Very Strong
6	🟥	Extremely Strong

Figure 11: Sniff Survey 2 – Colour coded pins based on highest Odour Intensity Mean results for locations where 'relevant' odour(s) were detected

4.3 Sniff Survey – 13 May 2022

Time	Point	Temp °C	Wind Strength (m/s)	Wind Direction	Odour Description	Odour Intensity mean	Max Odour Intensity	Max Offensiveness	Constant/ Intermittent
10:32	7 A	16.1	2.3	WSW	No Odour	0	0	0	100%
10:49	19 A	16.6	0.9	SSW	No Odour	0	0	0	67%
10:49	19 A	16.6	0.9	SSW	A Sewage	2	2	1	13%
10:49	19 A	16.6	0.9	SSW	D Sludge/Sludge Tank	3	3	2	10%
10:49	19 A	16.6	0.9	SSW	D Sludge/Sludge Tank	3	3	2	10%
11:00	2 C	16.5	2.6	WSW	No Odour	0	0	0	100%
11:00	2 B	16.5	2.6	WSW	No Odour	0	0	0	100%
11:06	1 B	16.6	4.2	WSW	No Odour	0	0	0	100%
11:13	6 C	16.5	3.5	WSW	D Sludge/Sludge Tank	3	4	2	100%
11:14	6 B	16.5	3.5	WSW	D Sludge/Sludge Tank	3	4	3	100%
11:14	6 A	16.5	1.2	SSW	D Sludge/Sludge Tank	4	5	3	100%
11:22	5 C	17.1	2.9	WSW	No Odour	0	0	0	70%
11:22	5 C	17.1	2.9	WSW	D Sludge/Sludge Tank	1	2	1	30%
11:23	5 A	17.1	2.9	WSW	E Earthy	1	1	0	17%
11:23	5 A	17.1	2.9	WSW	No Odour	0	0	0	23%
11:23	5 A	17.1	2.9	WSW	D Sludge/Sludge Tank	4	5	3	20%
11:23	5 A	17.1	2.9	WSW	D Sludge/Sludge Tank	4	5	3	33%
11:23	5 A	17.1	2.9	WSW	B Compost	3	3	1	7%
11:24	5 B	17.1	2.2	WSW	No Odour	0	0	0	63%
11:24	5 B	17.1	2.2	WSW	A Sewage	1	2	1	37%
11:33	4 C	17.6	3.8	WSW	No Odour	0	0	0	100%
11:34	4 B	17.6	3.8	WSW	No Odour	0	0	0	50%
11:34	4 B	17.6	3.8	WSW	D Sludge/Sludge Tank	2	3	2	50%
11:34	4 A	17.6	2.7	WSW	D Sludge/Sludge Tank	3	3	2	20%
11:34	4 A	17.6	2.7	WSW	D Sludge/Sludge Tank	2	3	2	20%
11:34	4 A	17.6	2.7	WSW	No Odour	0	0	0	60%
11:41	3 C	18	4.4	WSW	D Sludge/Sludge Tank	1	3	2	57%
11:41	3 C	18	4.4	WSW	No Odour	0	0	0	43%
11:42	3 B	18	4.4	WSW	D Sludge/Sludge Tank	3	4	3	100%
11:43	3 A	18.1	4.1	WSW	D Sludge/Sludge Tank	4	5	3	30%
11:43	3 A	18.1	4.1	WSW	D Sludge/Sludge Tank	4	5	3	70%
12:24	14 B	18.4	3.4	WSW	No Odour	0	0	0	90%

12:24	14 B	18.4	3.4	WSW	A Sewage	2	2	1	10%
12:26	16 A	18.4	2.4	WSW	C Vegetation	2	2	0	23%
12:26	16 A	18.4	2.4	WSW	No Odour	0	0	0	77%
12:37	13 B	18	3.8	WSW	No Odour	0	0	0	100%
12:39	15 A	18	1.8	WSW	No Odour	0	0	0	100%
12:43	20 C	18.1	5.3	WSW	C Vegetation	1	1	0	100%
12:51	13.1 B	18.5	3.3	WSW	C Vegetation	3	3	0	17%
12:51	13.1 B	18.5	3.3	WSW	No Odour	0	0	0	80%
12:51	13.1 B	18.5	3.3	WSW	Z Cut Grass	3	3	0	3%
12:54	9 A	18.6	4.1	WSW	No Odour	0	0	0	100%
13:00	13.2 B	18.6	1.9	WSW	No Odour	0	0	0	100%
13:06	8 A	18.6	2.3	WSW	No Odour	0	0	0	100%
13:15	17 A	18.9	4.5	WSW	C Vegetation	3	3	0	40%
13:15	17 A	18.9	4.5	WSW	No Odour	0	0	0	60%
13:18	13.3 B	19	2.8	WSW	No Odour	0	0	0	100%
13:18	10 C	19	4.3	WSW	No Odour	0	0	0	100%
13:27	18 A	19.4	1.2	WSW	No Odour	0	0	0	100%
13:48	12 A	19.4	5.9	WSW	No Odour	0	0	0	100%
13:48	12 B	19.4	5.9	WSW	C Vegetation	3	3	0	7%
13:48	12 B	19.4	5.9	WSW	No Odour	0	0	0	93%
13:49	12 C	19.4	5.9	WSW	C Vegetation	2	2	0	100%
14:01	11 B	19.1	1.9	WSW	C Vegetation	3	3	0	50%
14:01	11 B	19.1	1.9	WSW	No Odour	0	0	0	50%
14:02	11 A	19.1	1.9	WSW	C Vegetation	2	2	0	27%
14:02	11 A	19.1	1.9	WSW	No Odour	0	0	0	73%
14:02	11 C	19.1	1.9	SSW	C Vegetation	2	2	0	100%

Table 6: Odour Exposure at time and place of sampling on 13 May 2022

Table 4: VDI 3940 Odour Intensity Scale (adapted)

0	🟦	No Odour
1	🟩	Very Weak
2	🟩	Weak
3	🟨	Distinct
4	🟧	Strong
5	🟥	Very Strong
6	🟥	Extremely Strong

Figure 12: Sniff Survey 3 – Colour coded pins based on highest Odour Intensity Mean results for locations where 'relevant' odour(s) were detected

5. Summary of Relevant Observations

Day 1 – 14 April 2022

- Odour with a description of Sewage was detected at the following locations:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
6 B	09:59	A Sewage	1	1	0	13%
5 C	10:13	A Sewage	2	2	1	7%

- Odour with a description of Sludge/Sludge Tank was detected at the following locations:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
6 C	09:59	D Sludge/Sludge Tank	5	6	3	100%
5 C	10:13	D Sludge/Sludge Tank	2	2	1	10%
4 B	10:21	D Sludge/Sludge Tank	2	2	1	3%
4 C	10:22	D Sludge/Sludge Tank	2	2	1	7%
3 B	10:31	D Sludge/Sludge Tank	2	2	1	13%
3 C	10:33	D Sludge/Sludge Tank	5	5	3	97%
2 C	11:07	D Sludge/Sludge Tank	1	2	1	10%
1 B	11:16	D Sludge/Sludge Tank	2	2	1	27%
1 C	11:17	D Sludge/Sludge Tank	3	4	2	40%
16 C	11:38	D Sludge/Sludge Tank	2	2	0	3%
15 C	11:59	D Sludge/Sludge Tank	3	3	0	3%
8 C	12:24	D Sludge/Sludge Tank	2	2	0	7%
13 C	13:53	D Sludge/Sludge Tank	3	4	2	47%
21 B	14:03	D Sludge/Sludge Tank	2	2	1	17%
21 C	14:03	D Sludge/Sludge Tank	2	3	1	10%

- Odour with a description of Cake was detected at the following location:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
3 B	10:31	K Cake	2	2	1	17%

- Odour with a description of Compost was detected at the following locations:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
6B	09:59	B Compost	2	2	0	17%
5B	10:10	B Compost	3	3	2	3%
4B	10:21	B Compost	2	2	0	7%

Day 2 – 05 May 2022

- Odour with a description of Sewage was detected at the following locations

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
5A	10:46	A Sewage	3	3	2	20%
5C	10:46	A Sewage	1	2	1	37%
5B	10:48	A Sewage	3	3	2	17%
2A	11:31	A Sewage	1	1	0	7%

- Odour with a description of Sludge/Sludge Tank was detected at the following locations:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
6 A	10:34	D Sludge/Sludge Tank	3	4	3	70%
6 A	10:34	D Sludge/Sludge Tank	4	4	3	3%
6 C	10:35	D Sludge/Sludge Tank	2	4	2	90%
6 B	10:35	D Sludge/Sludge Tank	5	5	3	90%
5 B	10:48	D Sludge/Sludge Tank	4	5	2	37%
5 B	10:48	D Sludge/Sludge Tank	4	4	2	7%
4 C	10:59	D Sludge/Sludge Tank	3	5	3	53%
4 B	10:59	D Sludge/Sludge Tank	4	4	2	30%
4 A	10:59	D Sludge/Sludge Tank	2	3	2	23%
3 C	11:11	D Sludge/Sludge Tank	3	4	2	83%
3 A	11:12	D Sludge/Sludge Tank	3	5	3	20%
3 B	11:12	D Sludge/Sludge Tank	5	6	3	70%
1 C	11:41	D Sludge/Sludge Tank	2	3	2	27%
1 B	11:41	D Sludge/Sludge Tank	3	4	2	37%
1 B	11:41	D Sludge/Sludge Tank	2	2	1	3%
13.1 C	15:24	D Sludge/Sludge Tank	1	1	1	13%
13 C	15:35	D Sludge/Sludge Tank	1	2	1	17%
13 B	15:37	D Sludge/Sludge Tank	2	2	1	10%
13 B	15:37	D Sludge/Sludge Tank	3	4	2	20%
13 A	15:38	D Sludge/Sludge Tank	3	4	3	33%

- Odour with a description of Cake was detected at the following locations:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
3 A	11:12	K Cake	4	5	3	37%
3 A	11:12	K Cake	4	5	3	27%
19 A	11:58	K Cake	3	3	0	3%

- Odour with a description of Compost was detected at the following locations:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
5B	10:48	B Compost	3	3	2	16%
4B	10:21	B Compost	3	3	2	7%

Day 3 – 13 May 2022

- Odour with a description of Sewage was detected at the following locations:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
19 A	10:49	A Sewage	2	2	1	13%
5 B	11:24	A Sewage	1	2	1	37%
14 B	12:24	A Sewage	2	2	1	10%

- Odour with a description of Sludge/Sludge Tank was detected at the following locations:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
19 A	10:49	D Sludge/Sludge Tank	3	3	2	10%
19 A	10:49	D Sludge/Sludge Tank	3	3	2	10%
6 C	11:13	D Sludge/Sludge Tank	3	4	2	100%
6 B	11:14	D Sludge/Sludge Tank	3	4	3	100%
6 A	11:14	D Sludge/Sludge Tank	4	5	3	100%
5 C	11:22	D Sludge/Sludge Tank	1	2	1	30%
5 A	11:23	D Sludge/Sludge Tank	4	5	3	20%
5 A	11:23	D Sludge/Sludge Tank	4	5	3	33%
4 B	11:34	D Sludge/Sludge Tank	2	3	2	50%
4 A	11:34	D Sludge/Sludge Tank	3	3	2	20%
4 A	11:34	D Sludge/Sludge Tank	2	3	2	20%
3 C	11:41	D Sludge/Sludge Tank	1	3	2	57%
3 B	11:42	D Sludge/Sludge Tank	3	4	3	100%
3 A	11:43	D Sludge/Sludge Tank	4	5	3	30%
3 A	11:43	D Sludge/Sludge Tank	4	5	3	70%

- Odour with a description of Compost was detected at the following location:

Point	Time	Odour Description	Odour Intensity mean	Maximum Odour Intensity	Max Offensiveness	Constant/ Intermittent
5A	11:23	B Compost	3	3	1	7%

Appendix 1 Sniff Survey Locations

Descriptions of Designated Observation Points used in this survey.

1. Cowley Road/Milton Road intersect. Page 30
2. Cowley Road/Cambridge Road at pedestrian access point to Jane Coston Bridge. Page 31
3. WRC site boundary north-east corner. Page 31
4. WRC site boundary south-east corner. Page 32
5. 5A and 5C near D works ASP but downwind of AD area and Secondary Digester Tanks and inlet processes. 5B Down wind of C works ASP. Page 32
6. WRC site Secondary Digester Tanks. Page 33
7. Sycamore Recreation Ground. Page 33
8. Horningsea Road – A14 Slip (Fen Dittion side of A14). Page 34
9. Horningsea Road – Biggin Abbey junction. Page 35
10. Snout Corner Fen Track – Low Fen Drove Way (derelict barn/building). Page 35
11. Low Fen Drove Way Bridge over A14. Page 36
12. Low Fen Drove Way (by pink house). Page 36
13. River Cam at A14 bridge. Page 37
    - 13.1 River Cam at Grassy Corner (bench &path). Page 37
    - 13.2 River Cam, across from tributary. Page 38
    - 13.3 River Cam at Chisholm Trail Bridge. Page 38
14. River Cam at Baits Lock. Page 39
15. Horningsea at Plough & Fleece. Page 39
16. Horningsea at Gayton Farm. Page 40
17. Horningsea Road/Musgrave Way intersect. Page 40
18. Horningsea Road at Fen Ditton village marker. Page 41
19. Milton Country Park – Car Park. Page 41
20. Station Road at farm buildings. Page 42
21. Field entrance off river path. Page 42

Designated Observation Point	Picture of Desinated Observation Point	Pin locations surveyed at Desinated Observation Point
1 **Latitude** 52°13'56.44"N **Longitude** 0° 9'7.20"E		

2

Latitude
52°14'7.95"N

Longitude
0° 9'17.99"E

3

Latitude
52°13'58.80"N

Longitude
0° 9'56.94"E

4

Latitude
52°13'51.11"N

Longitude
0° 9'49.05"E

5

Latitude
52°13'58.71"N

Longitude
0° 9'39.87"E

6

Latitude
52°13'55.31"N

Longitude
0° 9'26.21"E

7

Latitude
52°14'22.20"N

Longitude
0° 9'12.12"E

8

Latitude
52°13'41.98"N

Longitude
0°10'44.05"E

9

Latitude
52°13'54.49"N

Longitude
0°10'55.07"E

10

Latitude
52°13'55.14"N

Longitude
0°11'32.12"E

11

Latitude
52°13'3.31"N

Longitude
0°11'38.27"E

12

Latitude
52°13'34.84"N

Longitude
0°12'5.44"E

13

Latitude
52°13'56.43"N

Longitude
0°10'15.29"E

13.1

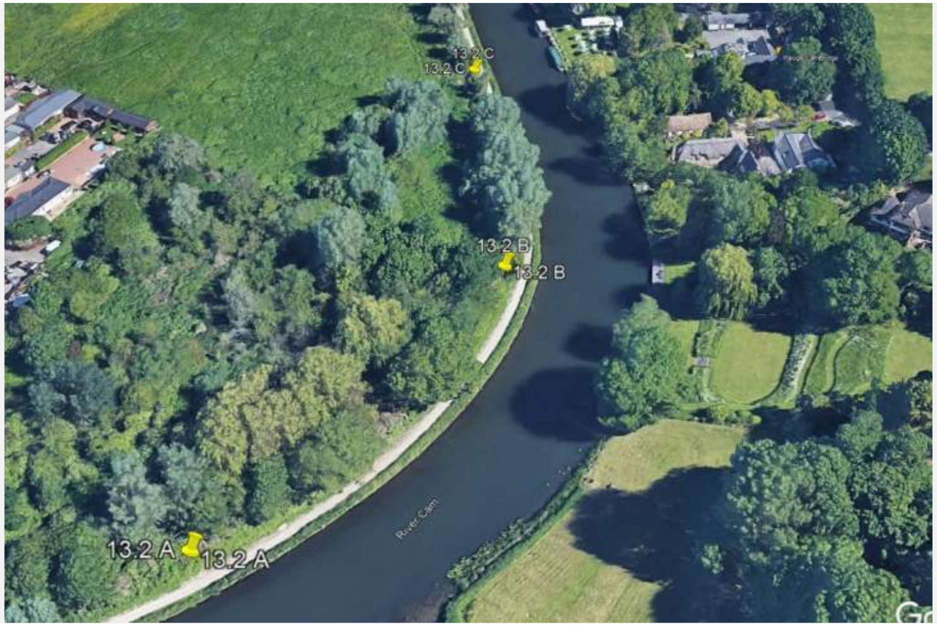
Latitude
52°13'36.01"N

Longitude
0° 9'59.36"E

13.2

Latitude
52°13'20.83"N

Longitude
0° 9'58.47"E



13.3

Latitude
52°13'13.53"N

Longitude
0° 9'25.54"E

14

Latitude
52°14'11.95"N

Longitude
0°10'29.29"E

15

Latitude
52°14'17.39"N

Longitude
0°11'5.30"E

16

Latitude
52°14'35.70"N

Longitude
0°11'20.00"E

17

Latitude
52°13'29.50"N

Longitude
0°10'34.78"E

18

Latitude
52°13'13.64"N

Longitude
0°10'23.93"E

19

Latitude
52°14'15.06"N

Longitude
0° 9'33.44"E

20

Latitude
52°14'15.60"N

Longitude
0°12'38.33"E

21

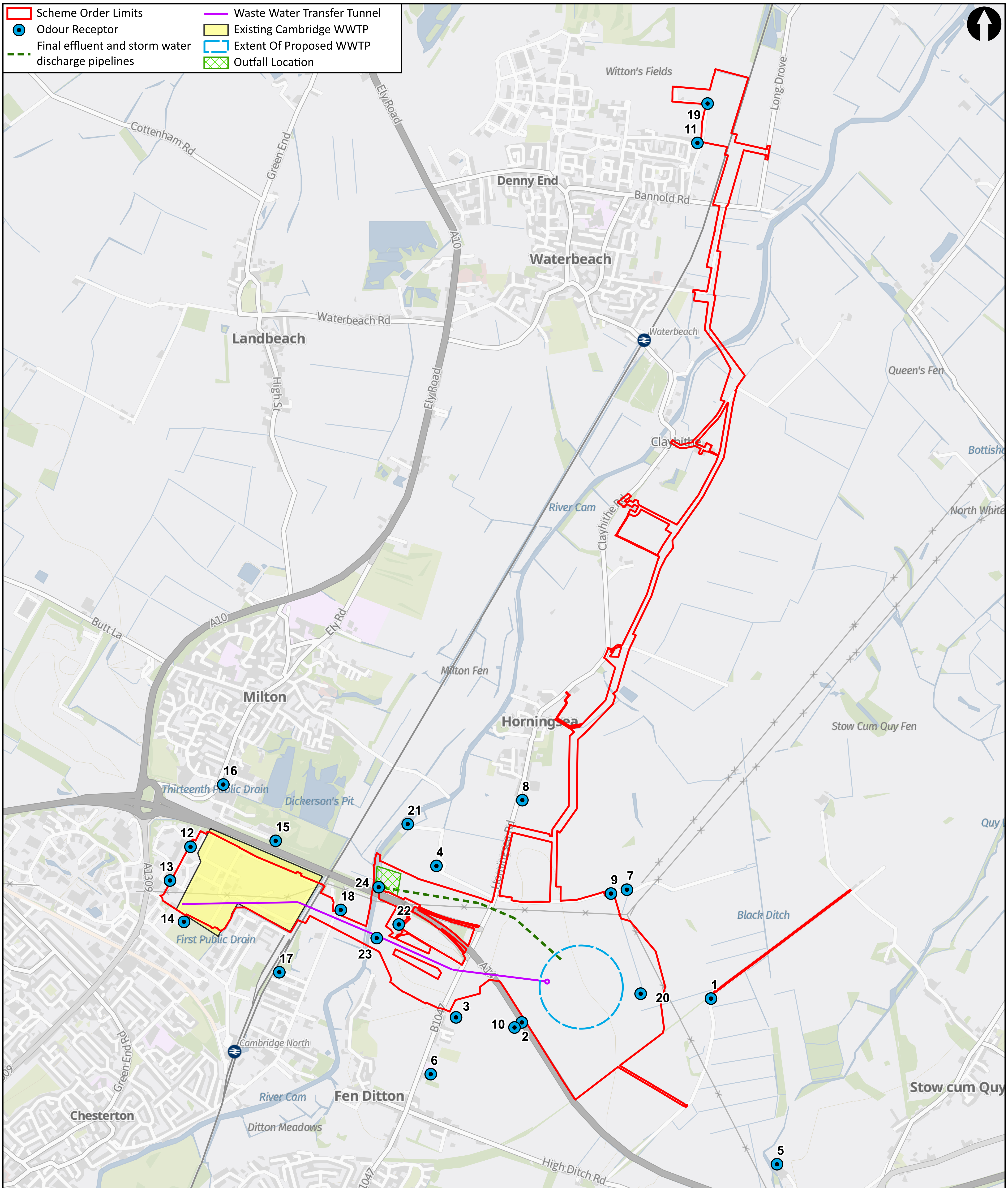
Latitude
52°14'1.17"N

Longitude
0°10'16.22"E

7.2 APPENDIX B – RECEPTORS IDENTIFIED IN EIA

7.2.1 Copy of Table 3-2 below, with the map of the Receptors (1 page).

Receptor ID	Receptor name	National Grid reference X,Y
1	Gatehouse	550452, 260942
2	A14	549244, 260843
3	Property east of Horningsea Road, Fen Ditton	548870, 260803
4	Biggin Abbey	548782, 261736
5	Quy Mill Hotel	550846, 259899
6	Fen Ditton Community Primary School	548714, 260454
7	Low Fen Drove Way PROW 85/14	549922, 261589
8	Property to south of Horningsea	549278, 262141
9	Future residential property to north of the proposed WWTP	549821, 261567
10	Land to the south of the A14 used for non-arable farming activities	549230, 260741
11	Property on Capper Road	550356, 266188
12	Cycleway	547234, 261854
13	Commercial property on Cowley Road	547108, 261646
14	Golf driving range	547194, 261392
15	Milton Country Park	547759, 261891
16	Property north of A14 near Milton Country Park	547436, 262237
17	Residential property on Fen Road	547781, 261081
18	Northern Bridge Farm	548160, 261465
19	Existing informal footpath/track	550419, 266431
20	Footpaths within Landscape Management Plan	550007, 260949
21	Property adjacent to Wildfowl Cottage	548572, 261994
22	Poplar Hall Farm	548517, 261376
23	Red House Close	548381, 261291
24	PROW 85/6, 85/8 and 162/1	548385, 261761



Data Sources
Draft Scheme Order Limits and scheme data: Anglian Water Services @One, 2022
Odour receptors: Mott MacDonald 2022
Basemapping: Contains OS data © Crown Copyright and database right 2020
Contains data from OS Zoomstack © Crown copyright and database rights 2020 OS 100022432

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Client

love every drop
anglianwater

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	16/06/22	NC	For Information	JB	CS

Title

Cambridge WwTP Relocation Project
Environmental Statement
Odour Receptors

Drawn	N Critten
Checked	J Brookes
Approved	C Squires

Scale at A3
1:22,000

Drawing Number	Security	Status	Rev
WW01090-CAMEST-MOT-93-XX-DR-X-0089	STD	PRE	P1

7.3 APPENDIX C – ADM Ltd MET DATA VALIDATION v2 15 DECEMBER 2021

Meteorological Data: Proposed Cambridge Waste Water Treatment Works (WwTW)

P2116

A Report Prepared for
H&M Environmental Ltd
By ADM Ltd
Old Chambers
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Farnham Surrey,
GU9 7EB, UK
Tel: +44 (0) 1252 720842
Email: post@ADMLtd.com
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Principal Author: David Harvey BSc, MBA, FIAQM
Client: H&M Environmental Ltd

Version/File	Issue Date
File=P2116\text\Meteorological Data WwTW v1.doc	3 Nov 2021
File=P2116\text\Meteorological Data WwTW v2.doc	15 Dec 2021

1 INTRODUCTION

H&M Environmental Ltd has commissioned David Harvey of Atmospheric Dispersion Modelling Ltd (ADM Ltd) to provide guidance on the source and processing of the meteorological data for the proposed new Waste Water Treatment Works (WwTW) for Cambridge.

Hourly meteorological data is a critical input for the modelling required to determine the potential for annoyance to occur due to emissions of odour from the proposed WwTW works.

There are two distinct sources of meteorological data suitable for modelling:

- Historically, dispersion models have used meteorological data from observation stations. Professional judgment is required to determine which observing station is likely to be most representative.

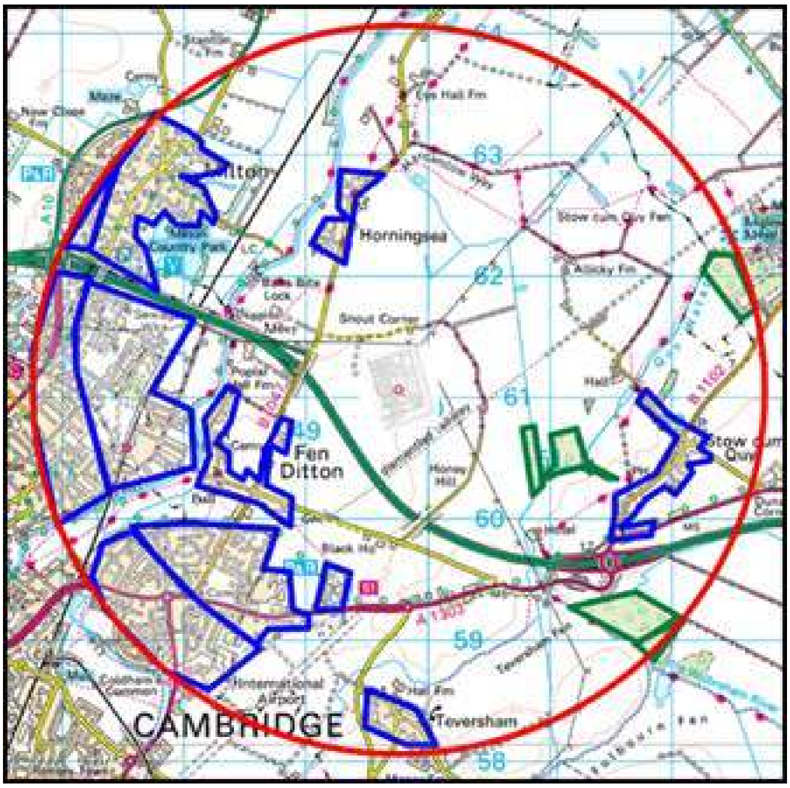
- More recently, there has been increasing use of Numerical Weather Prediction (NWP) data. NWP data are generated from computer simulations of the atmosphere.

After selecting the most representative meteorological data, professional judgment is needed to determine the following three parameters required by the model to characterise the surface around the modelling site.

- Bowen ratio: a measure of moisture available for evaporation
- Albedo: the portion of reflected sunlight
- Surface roughness length: which is a measure of the amount of drag the ground exerts on the wind

Figure 1.1 shows the location of the proposed new Cambridge WwTW.

Figure 1.1 Location of Proposed Cambridge WwTW



The remainder of this report is structured as follows:

- Section 2 – sources of data and comparisons of the data sets
- Section 3 – surface characteristics and suggested values

Recommended Values for Surface Characteristics

For the current and future land use around the location of the proposed Cambridge WwTW it is recommended the following be used:

- Albedo of 0.251
- Bowen ratio of 1.077

For the current land use, a roughness length (Ro) of 0.2 m is recommended for all wind directions, with sensitivity analysis for roughness lengths in the range of 0.1 to 0.3 m undertaken to reflect the uncertainty of this value.

The roughness for 5 and 15 years in the future will increase due to the proposed tree planting around the site. The recommended roughness length for year five is 0.22 m to 0.25 m and for year 15 is 0.23 m to 0.29 m. The values to be used depending on the wind direction.

About the Author

This report was prepared by David Harvey MBA BSc FIAQM, who has 30 years' experience in air quality and odour modelling. Mr Harvey is a Director of ADM Ltd, a company he founded in 1997 and is a Fellow of the Institute of Air Quality Management (FIAQM). Fellowship is for '*professionals who have had a distinguished career in the field of air quality*'. Mr Harvey has given expert evidence at Public Inquiries on air quality, dust and odour. He has prepared evidence for a House of Commons Select Committee on three occasions and also for the High Court on odour nuisance.

Through ADM Ltd, and supported by Erwin Prater PhD MBA CCM, who is a certified Meteorologist, David Harvey has been providing model ready meteorological data for over 20 years. Over this period, he has advised numerous clients on the most suitable datasets to use and representative values to characterise the surface around modelling sites.

2 SOURCES OF METEOROLOGICAL DATA

2.1 INTRODUCTION

This section describes the sources of meteorological data and compares the selected data sets.

2.2 SOURCES OF DATA

There are two distinct sources of hourly meteorological data suitable for modelling:

- Historically dispersion models have used meteorological data from observation stations. Professional judgment is required to determine which observing station is likely to be most representative of the modelling site. Factors that inform this judgement include; the proximity of the observation station to the modelling site, relative elevation, proximity to the coast of both the observing station and modelling site, the topography and nature of the surface.

- More recently, there has been increasing use of Numerical Weather Prediction (NWP) data.

2.2.1 OBSERVED DATA

Figure 2.1 shows the location of the five closest available observed meteorological data sets suitable for dispersion modelling.

Table 2.1 shows the distances to the proposed WwTW, the relative elevations and the missing data for each of the five closest observing stations from 2016 to 2020.

The observing station at Cambridge Airport is the closest being only 3 km. Given its close proximity and similar elevation, the observed data from Cambridge would be representative of the modelling site.

However, Cambridge is missing 45% to 67% of data for all parameters. The missing data is night hours (7 pm to 7 am) and weekends. For modelling, purposes, data are not considered usable unless they are more than 90% complete (<10% missing), and therefore without data substitution from another observing station, the data from Cambridge would be unusable as it is more than 10% missing.

Mildenhall is the next closest (25 km), has similar elevation to the modelling site and has complete data (<4% missing). Given that there are no coastal or topographical effects, Mildenhall would be a suitable observation station to use and is considered representative of the modelling site.

Figure 2.1 Location of Observing Stations

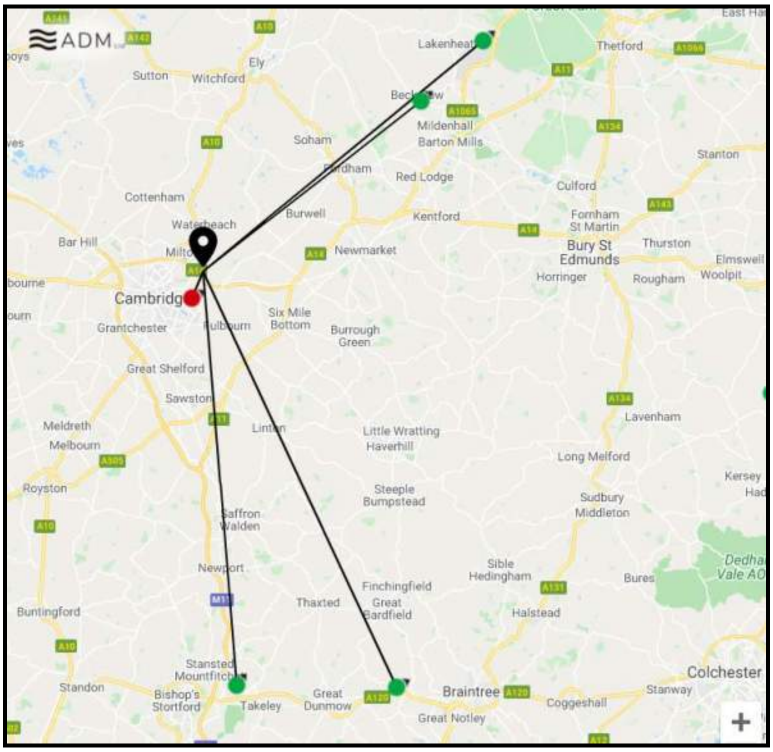


Table 2.1 Details of Missing Data

Station Name	Year	Dist from Search (km)	Difference in elevation (m)	Elevation (m)	Missing data temp (%)	Missing data cloud cover (%)	Most freq wind direction (deg)	Missing data wind speed (%)	Missing data overall (%)
CAMBRIDGE	2020	2.6	1.0	14	66.7	66.7	240	66.7	66.7
CAMBRIDGE	2019	2.6	1.0	14	67.1	67.2	240	67.2	67.2
CAMBRIDGE	2018	2.6	1.0	14	56.6	56.6	240	56.6	56.6
CAMBRIDGE	2017	2.6	1.0	14	52.8	53	250	52.8	53
CAMBRIDGE	2016	2.6	1.0	14	44.5	44.5	240	44.5	44.5
MILDENHALL	2020	25.3	-3.0	10	1.2	1.9	230	1.2	1.9
MILDENHALL	2019	25.3	-3.0	10	2	2.2	230	2.3	2.5
MILDENHALL	2018	25.3	-3.0	10	1.8	1.8	220	3.1	3.2
MILDENHALL	2017	25.3	-3.0	10	0	0.1	250	0	0.1
MILDENHALL	2016	25.3	-3.0	10	0.1	0.5	240	0.1	0.5
LAKENHEATH	2020	33.3	-3.0	10	2.9	2.3	230	1.4	3.7
LAKENHEATH	2019	33.3	-3.0	10	3.3	2.9	230	2.8	3.3
LAKENHEATH	2018	33.3	-3.0	10	2.5	2.1	240	1.8	2.7
LAKENHEATH	2017	33.3	-3.0	10	0.8	0.5	240	0.8	0.9
LAKENHEATH	2016	33.3	-3.0	10	0.3	0.8	230	0.3	0.8
STANSTED	2020	38.2	93.0	106	0	0.8	220	0	0.8
STANSTED	2019	38.2	93.0	106	1.1	1.5	230	1.1	1.5
STANSTED	2018	38.2	93.0	106	2.3	2.7	220	2.3	2.7
STANSTED	2017	38.2	93.0	106	0	0.3	230	0	0.3
STANSTED	2016	38.2	93.0	106	0.3	1.2	230	0.3	1.2
ANDREWSFIE	2020	42.2	74.0	87	0	19.4	240	0	19.4
ANDREWSFIE	2019	42.2	74.0	87	2.2	18.8	240	1.1	19.9
ANDREWSFIE	2018	42.2	74.0	87	3.3	22.9	240	3.3	22.9
ANDREWSFIE	2017	42.2	74.0	87	0	13.3	240	0	13.3
ANDREWSFIE	2016	42.2	74.0	87	0.4	15.2	240	0.3	15.2

Given the proximity of the Cambridge observing station to the modelling site, it is considered that the most representative observed data set is the data that are available from Cambridge and the use of data from Mildenhall for the hours when there is no data from Cambridge.

Five years (2016 to 2020) of hourly observed meteorological data from Cambridge with missing data from Mildenhall has been provided to H&M Environmental Ltd.

2.2.2 NWP DATA

Numerical Weather Prediction (NWP) data are available for 4 km grid resolution, although data from locations within these grid cells will vary depending on additional information from radar and satellites. NWP data are generated from computer simulations of the atmosphere and have been extensively validated against observations. ADM Ltd has undertaken verification of the use of NWP data in odour dispersion modelling. This verification shows a good comparison of predicted odour concentrations between NWP and observed data (1).

2.3 COMPARISION

Wind speeds and direction data are measured at the existing Cambridge WwTW. Although these data are not suitable for modelling, it is of interest for comparison against the Cambridge/Mildenhall and NWP data.

Comparisons are made of the windroses and the wind speeds.

2.3.1 WINDROSES

Figure 2.2, **Figure 2.3** and **Figure 2.4** show the windrose from each source of data.

---

(1) ADM LTd (21 October 2021) NWP Data Verification Stand and Ground Level Odour.

Figure 2.2 2016-2020 Windrose from Existing Cambridge WwTW

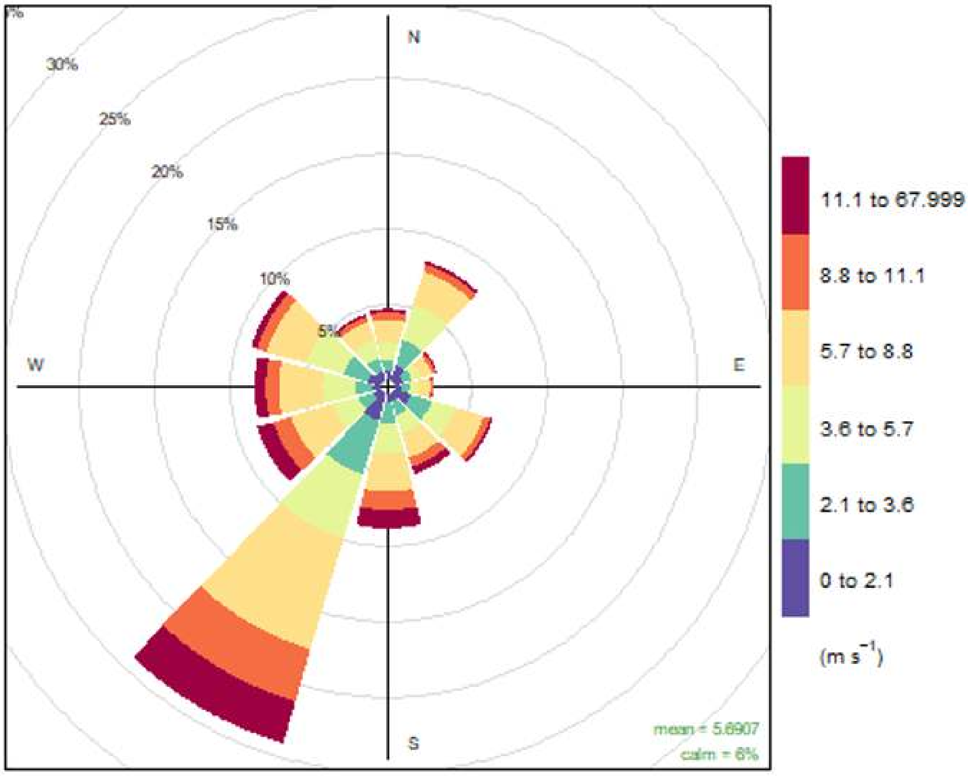


Figure 2.3 2016-2020 Windrose from Cambridge/Mildenhall

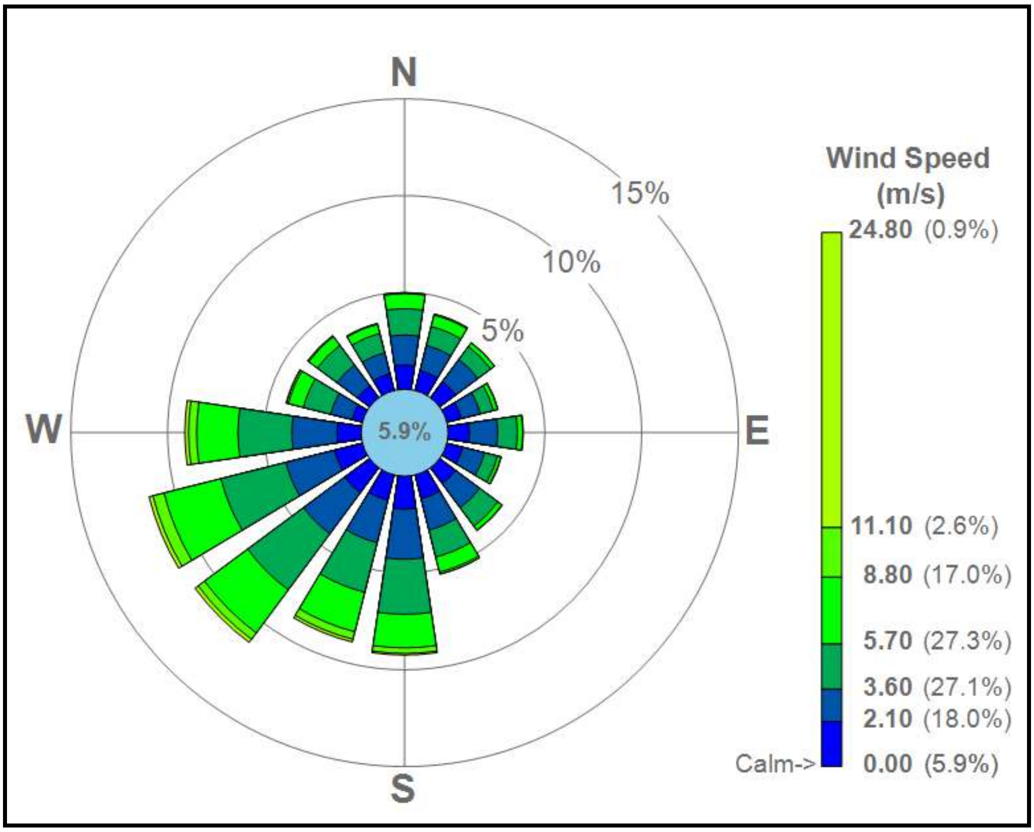
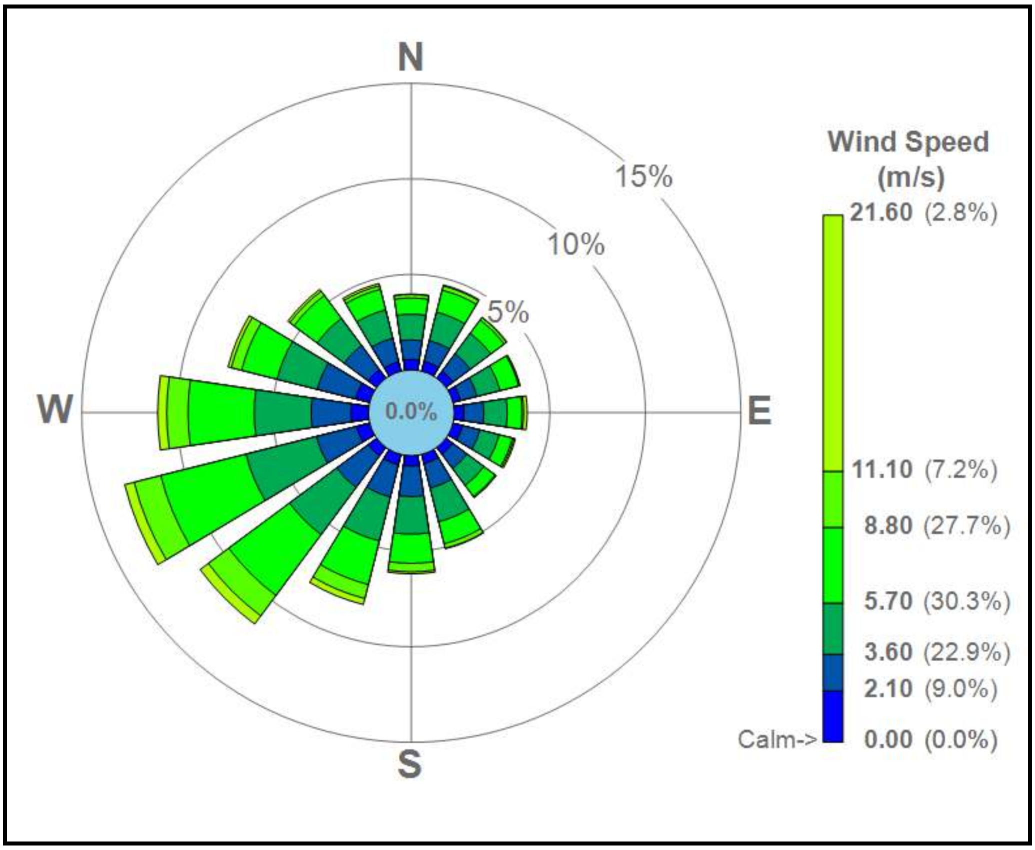


Figure 2.4 **2016-2020 Windrose from NWP Data for Proposed Location (Lat/Long 52.23,0.19)**

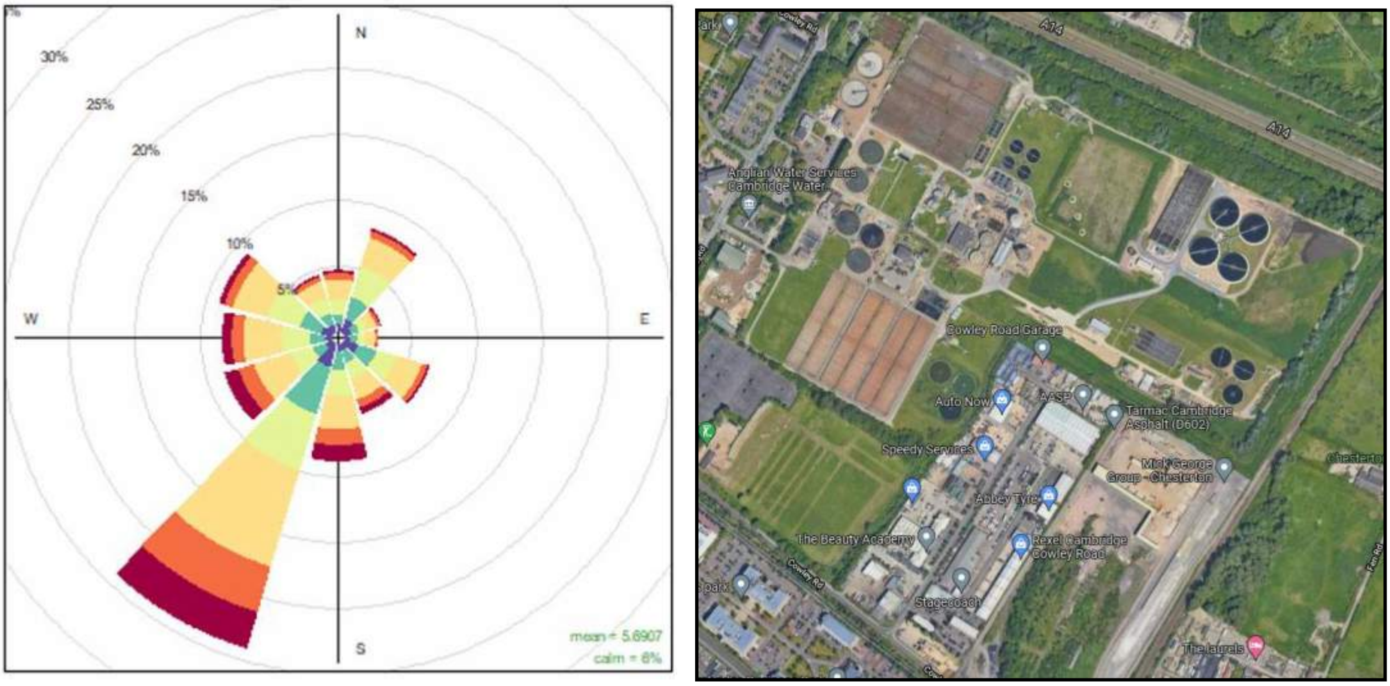


The NWP windrose and the Cambridge/Mildheall Windross are similar with the prevailing wind direction from the south-west with similar frequency.

The windrose from the existing Cambridge WwTW shows a prevailing wind direction more focused on the south-south-west rather than south-west. There is also a component from the north-north-east which is not present in the other Cambridge and NWP data sets.

It is possible that there is a degree of wind channelling at the existing WwTW as the building orientation is at the same angle as the prevailing wind components for the on-site windrose. **Figure 2.5** shows the on-site windrose next to the satellite image of the site showing the orientation of the buildings.

Figure 2.5 Windrose from Existing Cambridge WwTW and Satellite Image



The occurrence of low wind speeds and calms are important for odour modelling as it is often when impacts are the highest. However, low wind speeds are difficult to measure accurately, and conventional Gaussian based dispersion models (such as ADMS and AERMOD) break down as the wind speed approaches zero (ie calms). Some models eg AERMOD, do not process calm hours and some models such as ADMS, process calm hours by setting the wind speed to a value such as 0.75 m s^{-1}.

It has been found that the wind speed category that the predictions of odours from ground level sources (such as a WwTW) are most sensitive to is wind speeds greater than 0 m s^{-1} and less than or equal to 1.5 m s^{-1}.

Table 2.2 shows the percentage calms and wind speeds greater than zero and less than or equal to 1.5 m s^{-1}. The table shows that the NWP data has 0.7% more in this wind speed category and therefore, one would expect predicted odour concentrations to be a little higher with the use of the NWP data compared to the observed data.

Table 2.2 Percentage Calms and Percentage of Winds Speed >0 and <=1.5 m s^{-1}

Data Set	Percentage Calm (%)	Percentage >0 and <=1.5 m s^{-1} (%)
Cambridge/Mildenhall	5.87	3.20
NWP	0.02	3.94

3 SURFACE CHARACTERISTICS

3.1 INTRODUCTION

After selecting the most meteorological data, professional judgment needs to be made on what values to use for the following three parameters required by the model to characterise the surface around the modelling site.

- Bowen ratio: a measure of moisture available for evaporation.
- Albedo: the portion of reflected sunlight.
- Surface roughness length: which measures the amount of drag the ground surface exerts on the wind.

3.2 DESCRIPTION

3.2.1 ROUGHTNESS LENGTH (R_O)

The nature of the surface can have a significant influence on dispersion by affecting the vertical velocity profile (ie the rate of increase in wind speed for increasing heights above ground level). In effect, Ro is a measure of the amount of drag the ground surface exerts on the wind.

3.2.2 ALBEDO

Albedo is a measure of how reflective a surface is. The more reflective a surface is the higher the albedo value. Very white surfaces, such as fresh snow, reflect a very high fraction of incoming radiation back to space. Darker surfaces such as water, forests or asphalt have a much lower albedo and more of the sun's energy is absorbed.

3.2.3 BOWEN RATIO

The Bowen ratio is an indicator of the amount of moisture available to drive turbulent atmospheric processes.

3.3 RELATIVE SIGNIFICANCE

A number of studies have determined that of the three parameters, it is the surface roughness length (Ro) that has the greatest effect on predicted concentration, especially for ground level emissions such as odours from a WwTW.

For example, Grosch (1999) concluded the '*changes in albedo, Bowen ratio, and surface roughness length can result in changes in design concentrations of factors of 1.5, 2.7, and 160, respectively*' (1); ie the accurate determination of roughness length is of much greater importance than either albedo or the Bowen ratio.

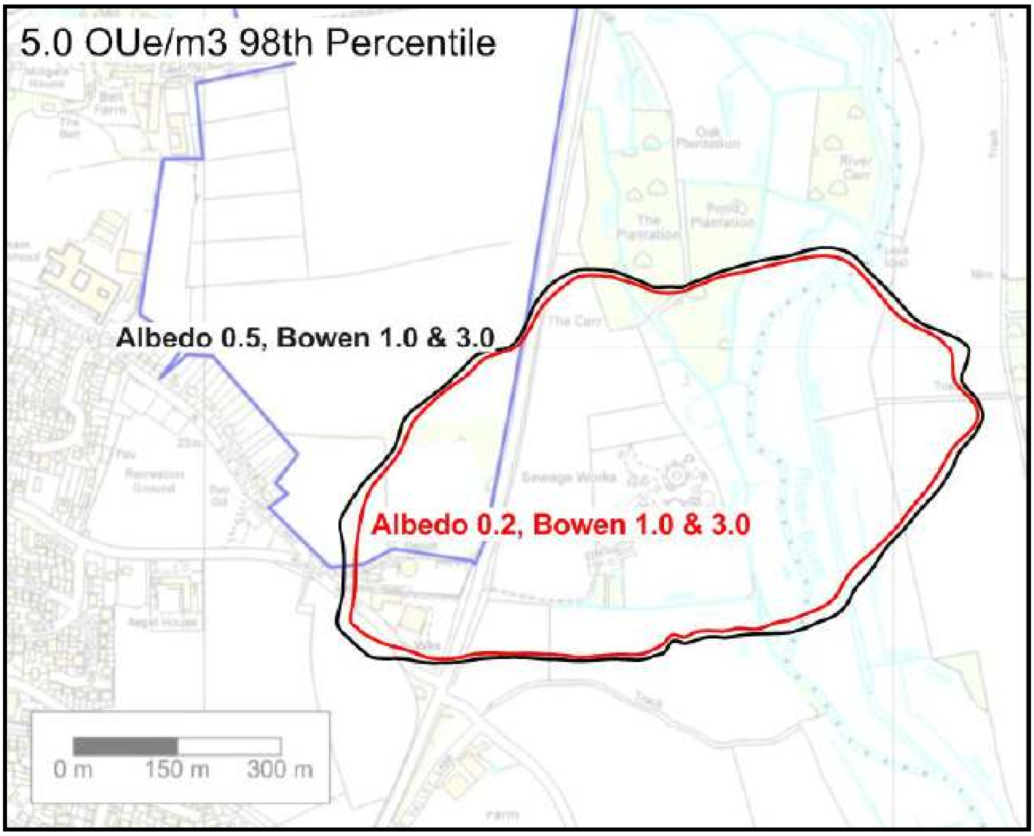
---

(1) Grosch and Lee (1999) Sensitivity of the AERMOD air quality model to the selection of land use parameters.

The Author presented similar findings to WRc's Odour Management User Group meeting in 2017 (1).

Figure 3.1 shows the 5 $OU_e\ m^{-3}$ 98th percentile predicted concentration for emissions from a WwTW albedo of 0.2 and 0.5 and Bowen ratio of 1.0 and 3.0.

Figure 3.1 ADMS Odour Predicted Concentration WwTW: Effect of Albedo and Bowen Ratio



Source: ADM Ltd Odour Modelling, WRC User Group Meeting

Figure 3.1 shows that the Bowen ratio has no discernible effect on the predicted concentration and the albedo has a small impact with an albedo of 0.5 given rise to slightly higher impacts than 0.2.

By contrast, **Figure 3.2** shows the substantial effect that roughness length can have on odour predicted concentration.

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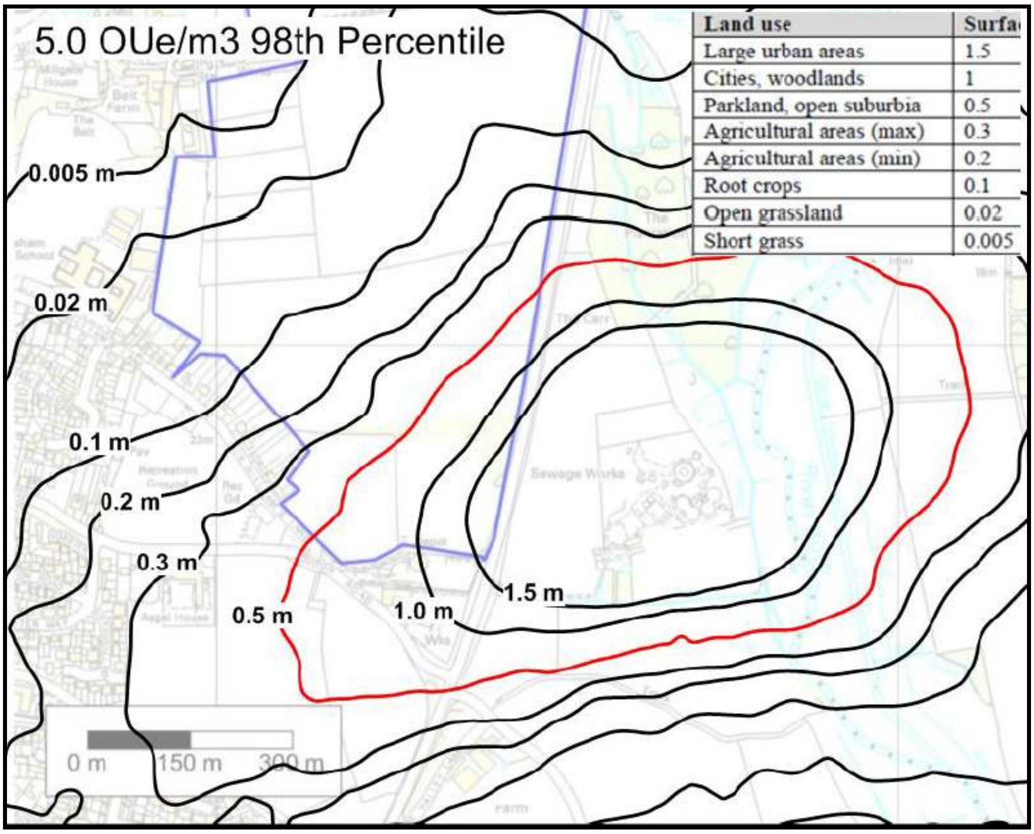
(1) David Harvey (27 April 2017) Odour Modelling, WRC User Group Meeting.

Figure 3.2 ADMS Odour Predicted Concentration WwTW: Effect of Roughness Length



Land use	Surfa
Large urban areas	1.5
Cities, woodlands	1
Parkland, open suburbia	0.5
Agricultural areas (max)	0.3
Agricultural areas (min)	0.2
Root crops	0.1
Open grassland	0.02
Short grass	0.005

Source: ADM Ltd Odour Modelling, WRC User Group Meeting

3.4 ESTIMATED VALUES

The US EPA recommend the following for the determination of surface characteristics but also say that case-by-case justification can be provided for an alternative method (1).

- The determination of the surface roughness length should be based on an inverse distance weighted geometric mean for a default upwind distance of 1 kilometre relative to the measurement site. Surface roughness length may be varied by sector to account for variations in land cover near the measurement site; however, the sector widths should be no smaller than 30 degrees.

- The determination of the Bowen ratio should be based on a simple unweighted geometric mean (i.e., no direction or distance dependency) for a representative domain, with a default domain defined by a 10 km by 10 km region centred on the measurement site.

- The determination of the albedo should be based on a simple unweighted arithmetic mean (i.e., no direction or distance dependency) for the same

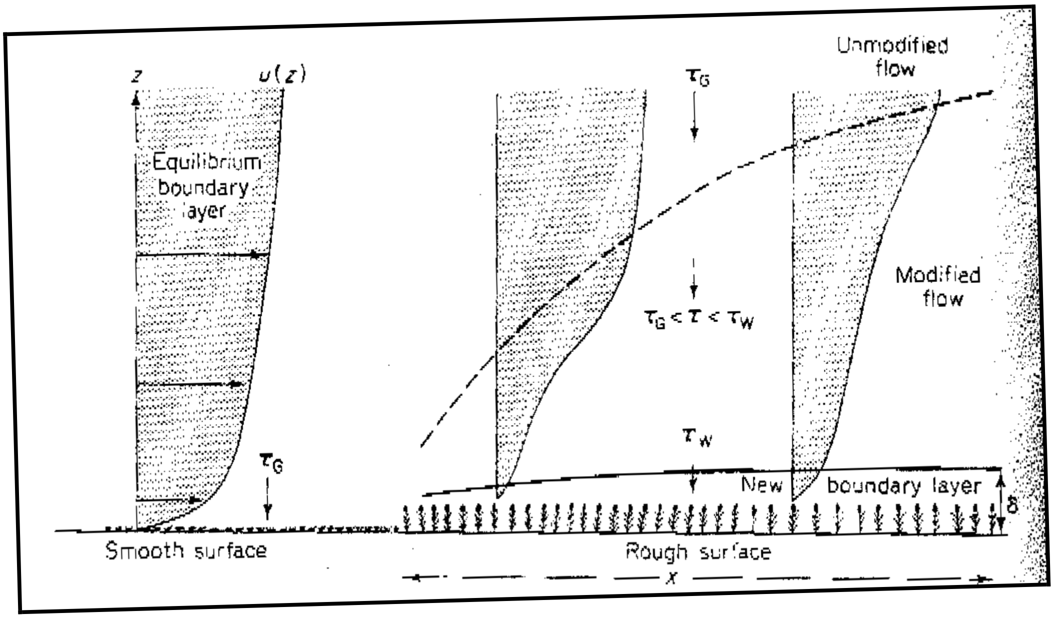
---

(1) US EPA (July 2021) AERMOD Implementation Guide.

representative domain as defined for the Bowen ratio, with a default domain defined by a 10 km by 10 km region centred on the measurement site.

3.4.1 ROUGHNESS LENGTH (Ro)

A change in the nature of the surface will give rise to a change in the velocity profile, as illustrated below (Principles of Environmental Physics).



A distance of a number of kilometres may be required for a change to the nature of the surface to be fully established in the boundary layer. However, for emissions from low level sources, such a WwTWs it is only the velocity profile in the lower part of the boundary layer that is of relevance. A distance of 1 km or more is sufficient for the change in surface characteristics to be reflected in the lower part of the boundary layer. The US EPA recommend an upwind distance of 1 km is used to determine the roughness length.

Figure 3.3 shows a 3 km diameter circle centred on the location of the proposed WwTW. It is evident that for a distance of at least 1.5 km in all directions, the current land use is agricultural with a number of hedges.

Figure 3.3 3 km Diameter Circle Centred on Location of Proposed WwTW

Table 3.1 shows the suggest rough length for agricultural areas from several sources.

Table 3.1 Roughness Lengths for Agricultural Areas (m)

Source	Description	Minimum	Maximum	Average
ADMS 5.2	Agricultural Area	0.2	0.3	-
AERMOD	Cultivated Land	0.01 (winter)	0.2 (summer)	0.0725
ADMS Technical Spec	Agricultural crops	-	-	0.1
Turner Work Book	Cultivated Land	0.01 (winter)	0.2 (summer)	-
Designers Guide	Farmland	0.03	0.1	-
ESDU	Farmland/Countryside	0.03	0.1	

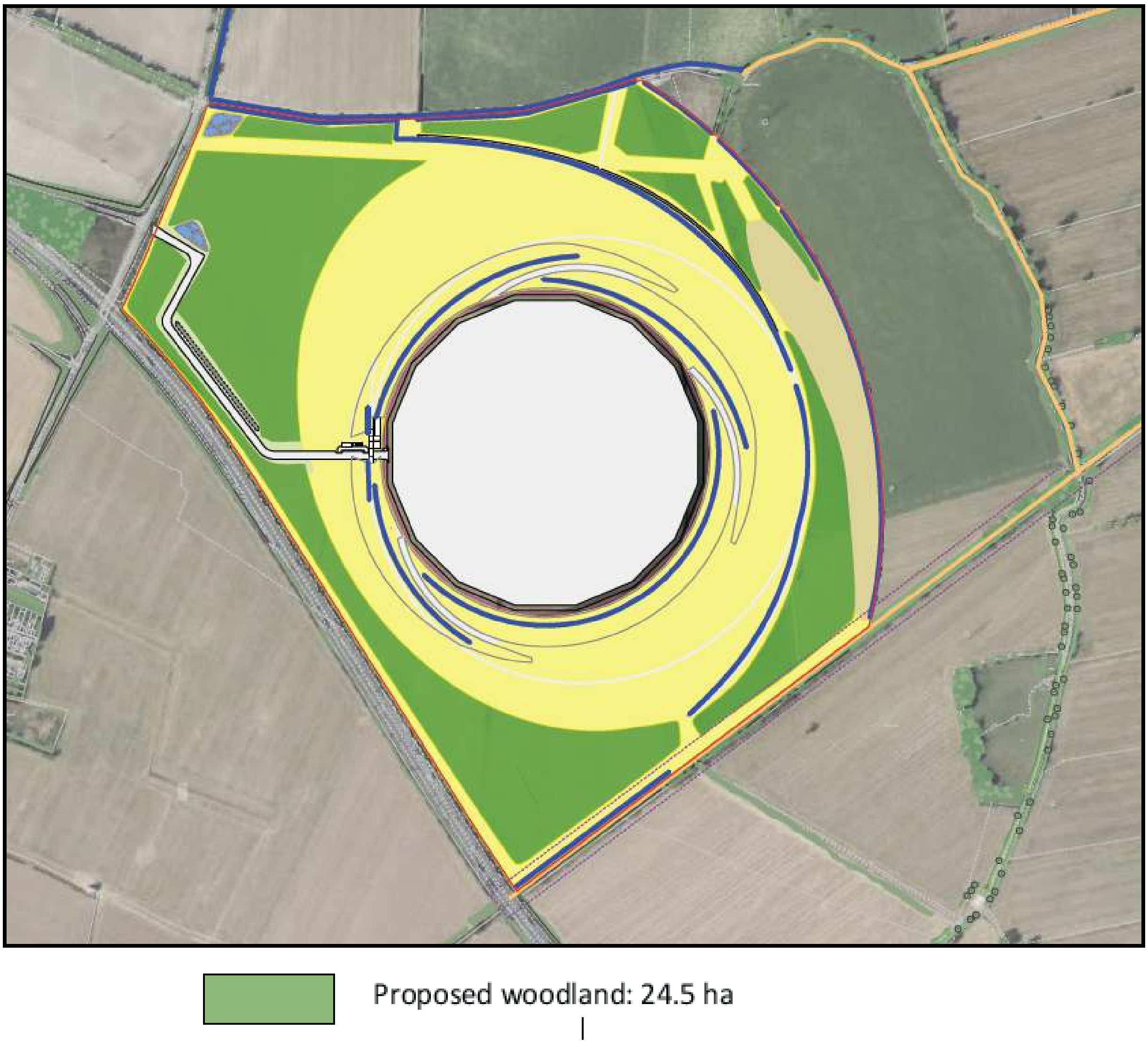
It is recommended that for the location of the proposed WwTW, a roughness length of 0.2 m is used for all wind directions for the current land use.

Given the uncertainty in the suggested roughness lengths due to the range of values quoted in the literature, it is recommended that sensitivity analysis is conducted for a range of roughness lengths from 0.1 m to 0.3 m.

The proposed planting of trees around the proposed WwTW will increase the roughness length (Ro).

Figure 3.4 shows the area of woodland around the proposed WwTW.

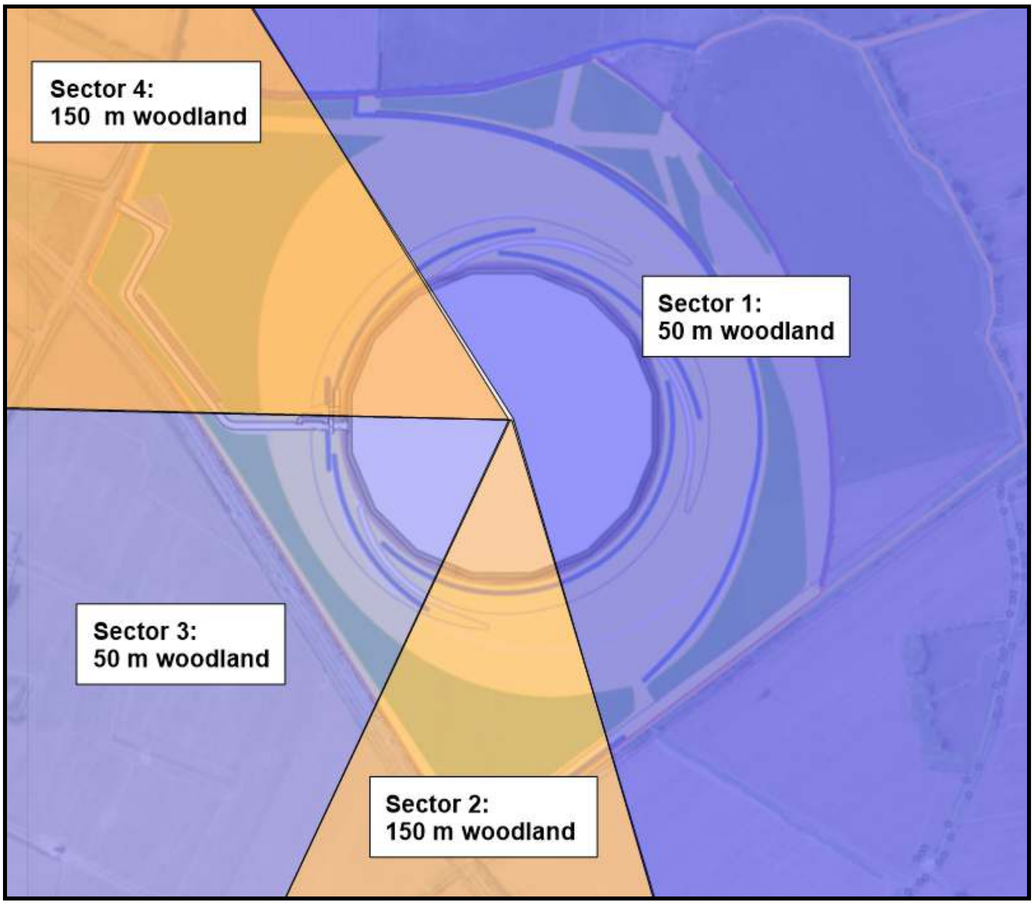
Figure 3.4 Proposed Woodland



The US EPA recommend an inverse-distance weighting for determining surface roughness using an upwind distance of 1 km.

It is appropriate to consider four wind sectors with a depth of wooded area ranging from 50 m to 150 m; these are shown in **Figure 3.5**.

Figure 3.5 Roughness Length Sectors



The roughness lengths (Ro) for 'forests' range from 0.7 m to 1.3 m. It is considered appropriate to use a roughness length of 0.5 m for the woodland area after five years and 0.8 m after 15 years. **Table 3.2** shows the effect that these wooded areas will have on the assumed roughness length of 0.2 m in the absence of the proposed tree planting.

Table 3.2 Roughness Lengths for each Sector for Current, 5 and 15 Years (m)

Sector	**1**	**2**	**3**	**4**
Wind Angle (from)	330 to 160	160 to 210	210 to 270	270 to 330
Assumed Depth of tree (m)	50	150	50	150
Roughness length (Ro) after 5 years (m) (a)	0.22	0.25	0.22	0.25
Roughness length (Ro) after 15 years (m) (b)	0.23	0.29	0.23	0.29

(a) Assumes a Ro for trees of 0.5 m for woodland, 0.2 m elsewhere and inverse relationship.
(b) Assumes a Ro for trees of 0.8 m for woodland, 0.2 m elsewhere and inverse relationship.

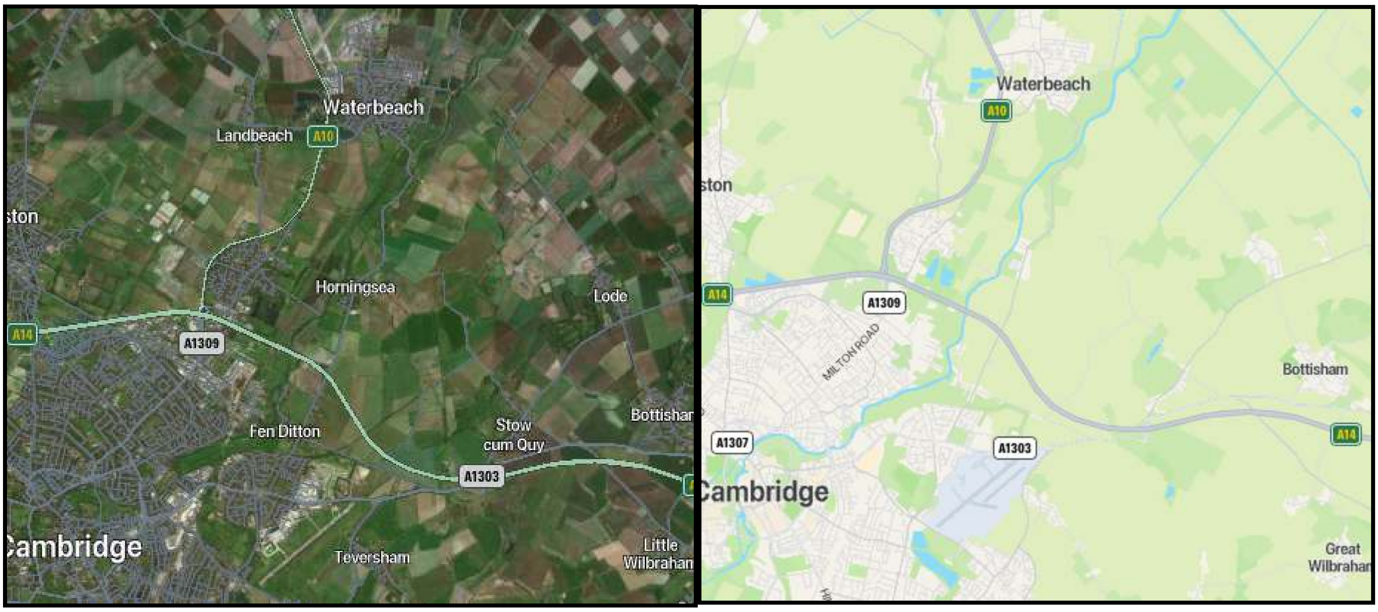
3.4.2 BOWEN RATIO AND ALBEDO

While local surface characteristics immediately upwind of the measurement site are very important for surface roughness, effective Bowen ratio and albedo values are determined over a larger domain.

For Bowen ratio and albedo, the US EPA recommend that the average surface characteristic across a 10 km by 10 km region centred on the modelling site is used.

Figure 3.4 shows 10 km by 10 km centred on the location of the proposed WwTW

Figure 3.4 **10 km by 10 km Square Centred on Location of Proposed WwTW**

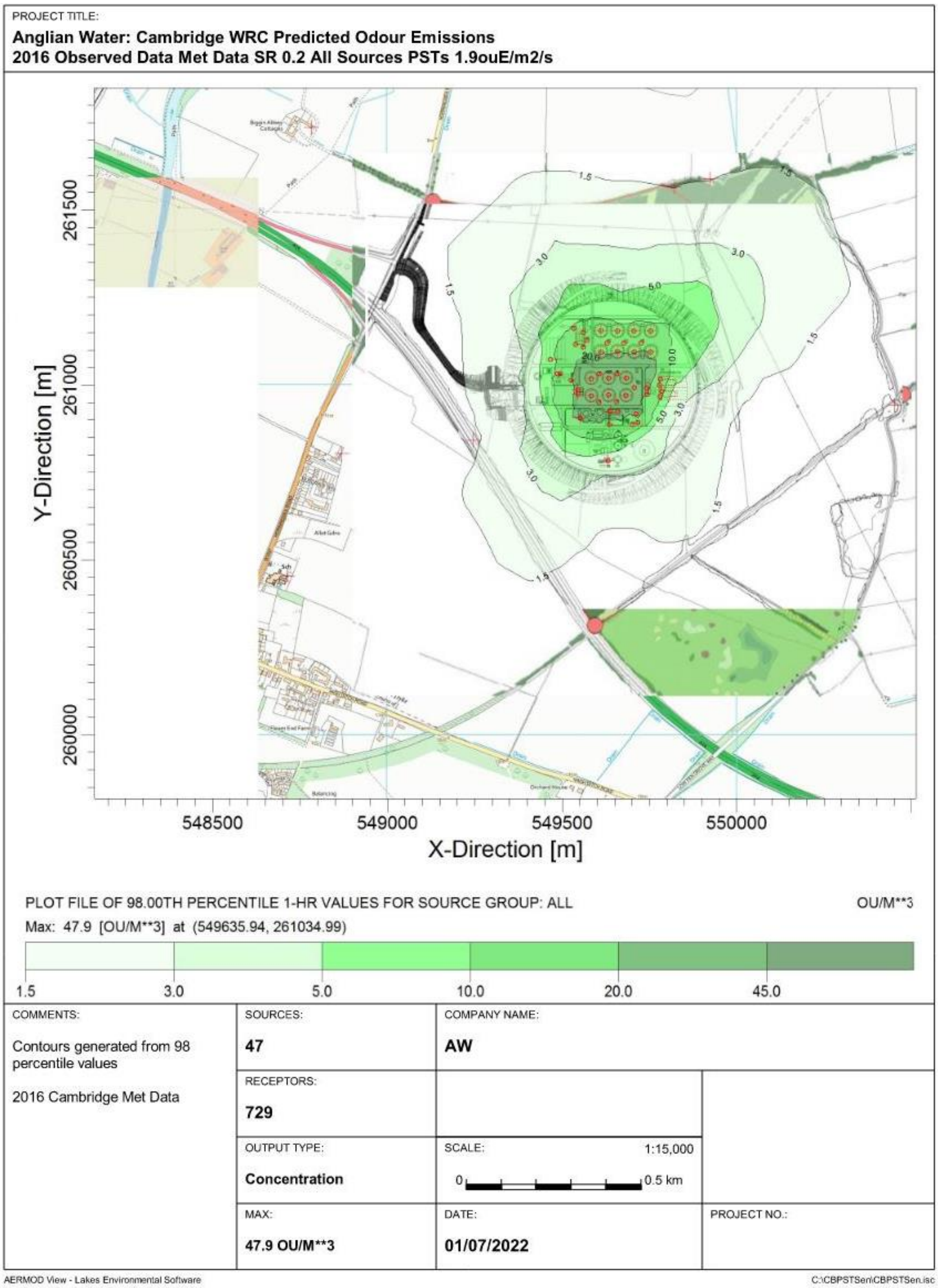


Within the 10 km by 10 km square centred on the proposed location of the WwTW, the land use is 37% urban, 3% trees (mix of coniferous and deciduous) and 60% cultivated land. Using the BREEZE AERMET utility, assuming average moisture, this equates to an albedo of 0.251 and a Bowen ratio of 1.077

These are the values that are recommended for use. Given that the model predicted concentrations are not particularly sensitive to these values, it is suggested that there is no requirement for sensitivity analysis of how changes to these values affect the predicted concentration.

7.4 APPENDIX D – GRID COMPARISON

D.1 Scenario 1: Final position: 2016 Observed MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) at constant emissions (no seasonal impact accounted) using polar grid.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Data Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 47.9 [OU/M**3] at (549635.94, 261034.99)

1.5	3.0	5.0	10.0	20.0	45.0	

COMMENTS:
Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES: **47**

COMPANY NAME: **AW**

RECEPTORS: **729**

OUTPUT TYPE: **Concentration**

SCALE: 1:15,000
0 0.5 km

MAX: **47.9 OU/M**3**

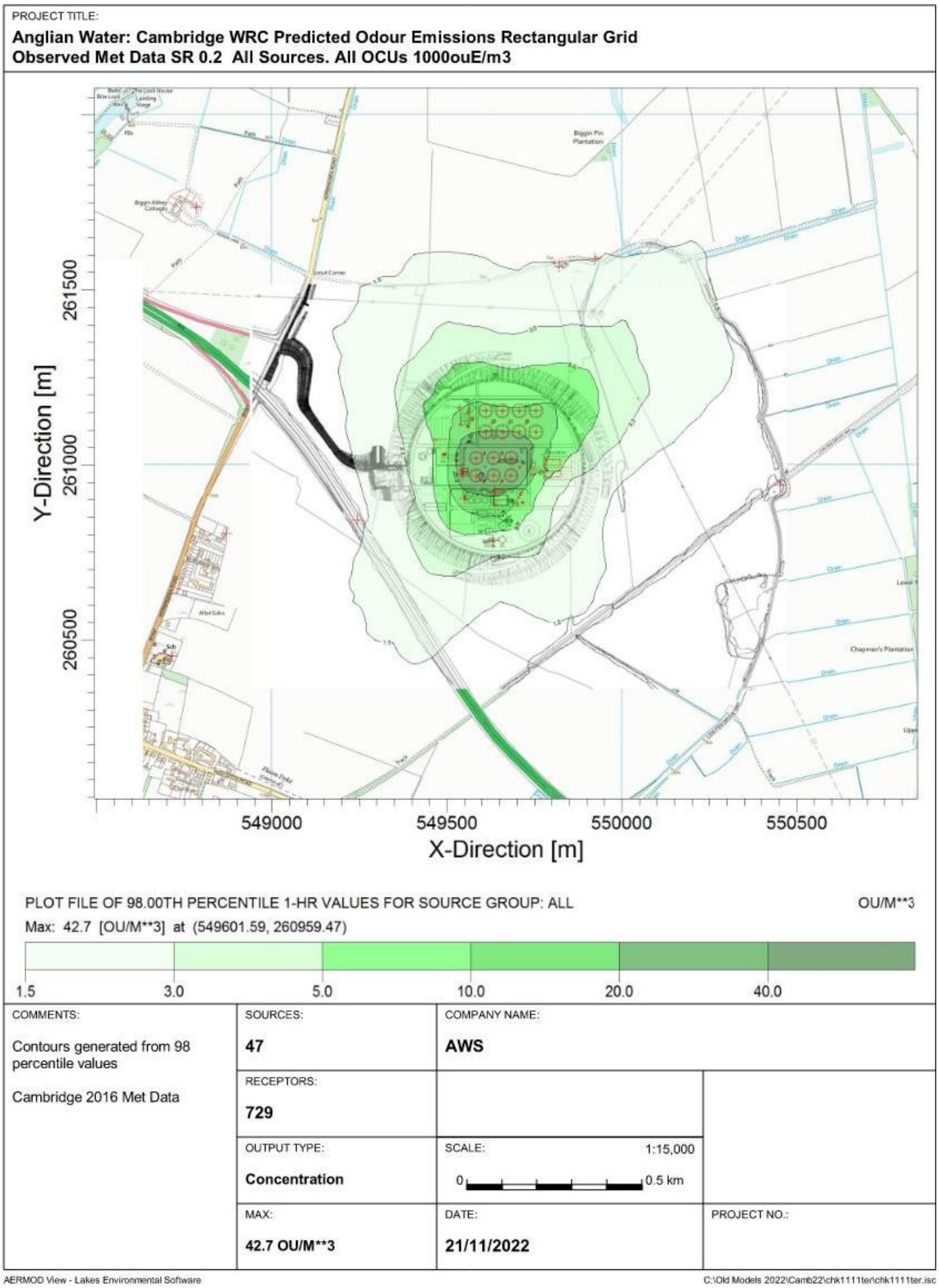
DATE: **01/07/2022**

PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\CBPSTSen\CBPSTSen.isc

D.2 Scenario 1: Final position: 2016 Observed MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) at constant emissions (no seasonal impact accounted) using cartesian/rectangular grid.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions Rectangular Grid
Observed Met Data SR 0.2 All Sources. All OCUs 1000ouE/m3

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL — OU/M**3

Max: 42.7 [OU/M**3] at (549601.59, 260959.47)

COMMENTS:

Contours generated from 98 percentile values

Cambridge 2016 Met Data

SOURCES: **47**

RECEPTORS: **729**

OUTPUT TYPE: **Concentration**

MAX: **42.7 OU/M**3**

COMPANY NAME: **AWS**

SCALE: 1:15,000 — 0 — 0.5 km

DATE: **21/11/2022**

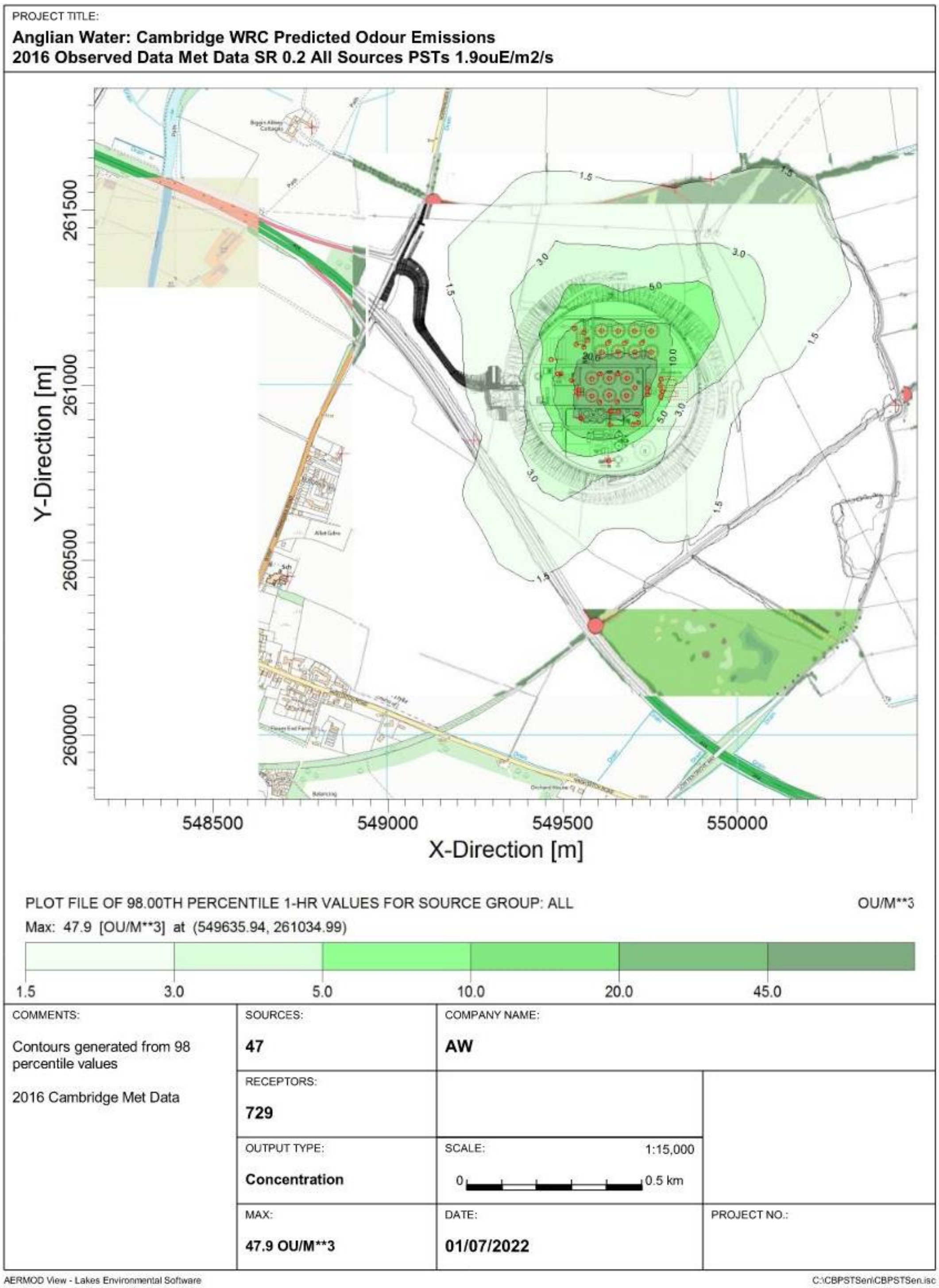
PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\Old Models 2022\Camb22\chk1111ter\chk1111ter.isc

7.5 APPENDIX E – ODOUR MODELLING RESULTS

E.1 Scenario 1: Final position: 2016 Observed MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) at constant emissions (no seasonal impact accounted).



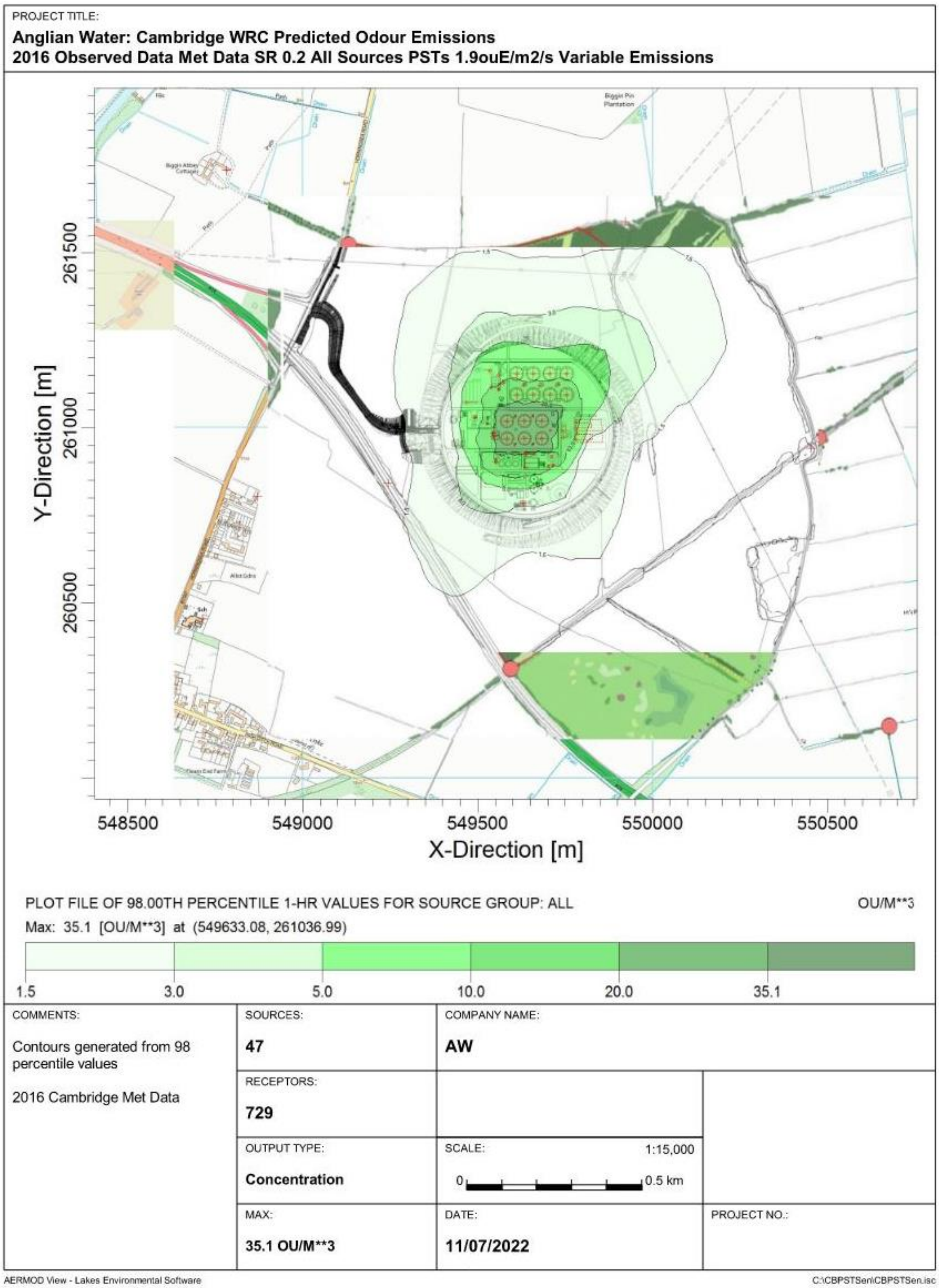
PROJECT TITLE:
Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Data Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL OU/M**3
Max: 47.9 [OU/M**3] at (549635.94, 261034.99)

COMMENTS: Contours generated from 98 percentile values
2016 Cambridge Met Data
SOURCES: **47**
RECEPTORS: **729**
OUTPUT TYPE: **Concentration**
MAX: **47.9 OU/M**3**
COMPANY NAME: **AW**
SCALE: 1:15,000
DATE: **01/07/2022**
PROJECT NO.:

AERMOD View - Lakes Environmental Software
C:\CBPSTSen\CBPSTSen.isc

E.2 Scenario 2: 2016 Observed MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Data Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 35.1 [OU/M**3] at (549633.08, 261036.99)

COMMENTS:
Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES:
47

COMPANY NAME:
AW

RECEPTORS:
729

OUTPUT TYPE:
Concentration

SCALE: 1:15,000

MAX:
35.1 OU/M3**

DATE:
11/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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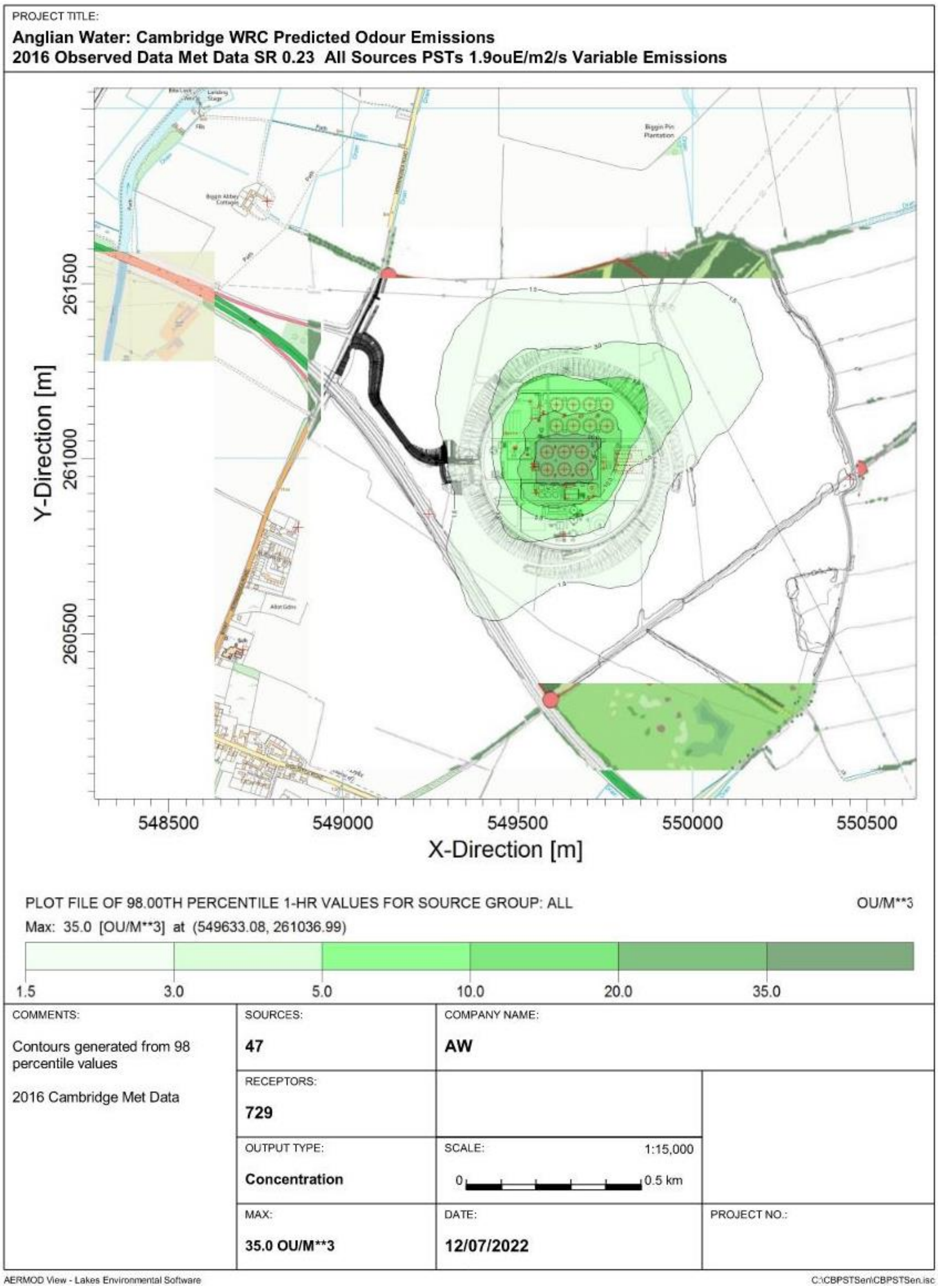
E.3 Scenario 3: 2016 Observed MET Data, Surface roughness factor 0.23, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Data Met Data SR 0.23 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL OU/M**3

Max: 35.0 [OU/M**3] at (549633.08, 261036.99)

1.5 3.0 5.0 10.0 20.0 35.0

COMMENTS:
Contours generated from 98 percentile values
2016 Cambridge Met Data

SOURCES:
47

COMPANY NAME:
AW

RECEPTORS:
729

OUTPUT TYPE:
Concentration

SCALE: 1:15,000
0 0.5 km

MAX:
35.0 OU/M3**

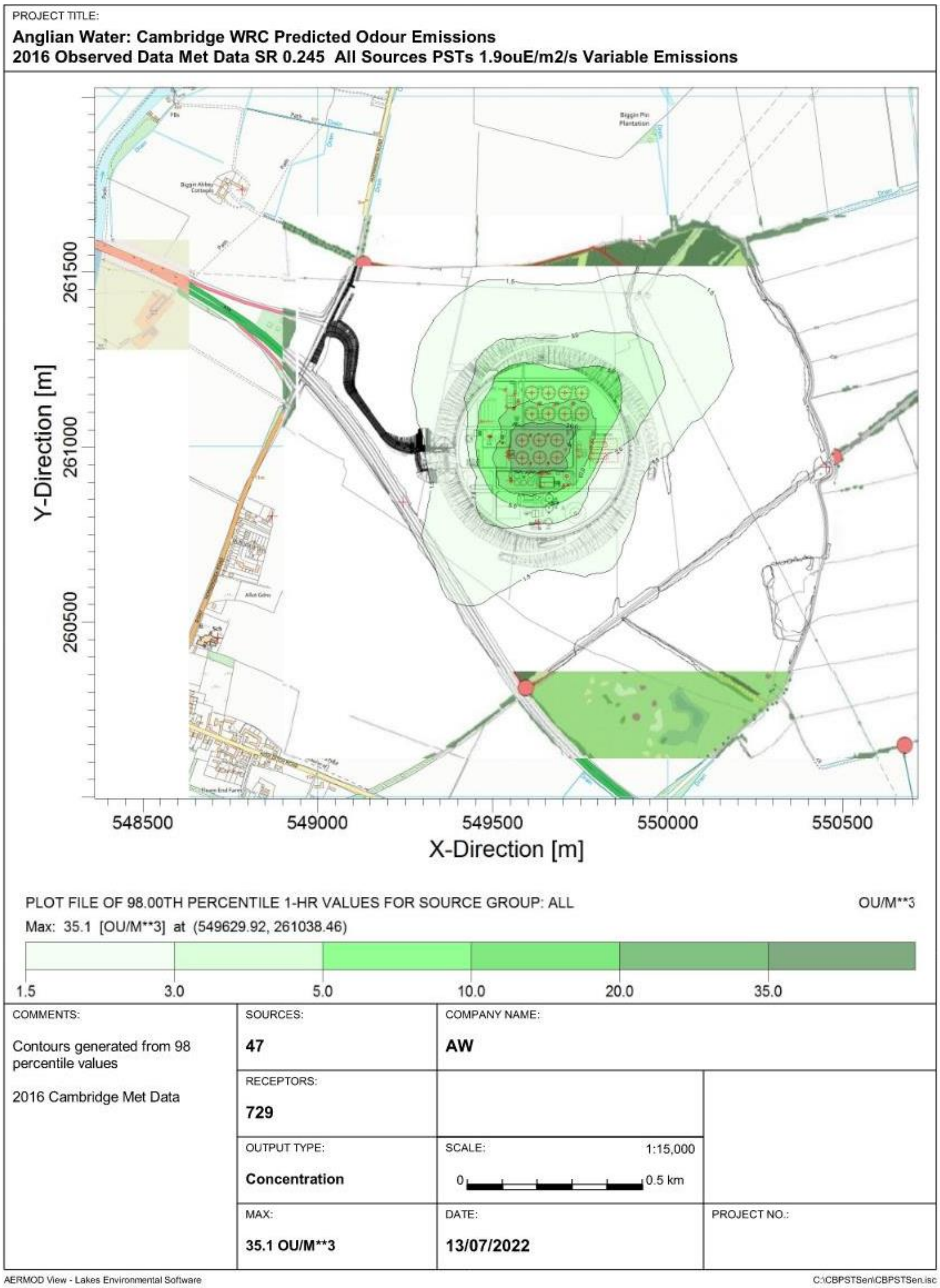
DATE:
12/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\CBPSTSen\CBPSTSen.isc

E.4 Scenario 4: 2016 Observed MET Data, Surface roughness factor 0.245, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Data Met Data SR 0.245 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 35.1 [OU/M**3] at (549629.92, 261038.46)

COMMENTS:
Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES:
47

COMPANY NAME:
AW

RECEPTORS:
729

OUTPUT TYPE:
Concentration

SCALE: 1:15,000
0 0.5 km

MAX:
35.1 OU/M3**

DATE:
13/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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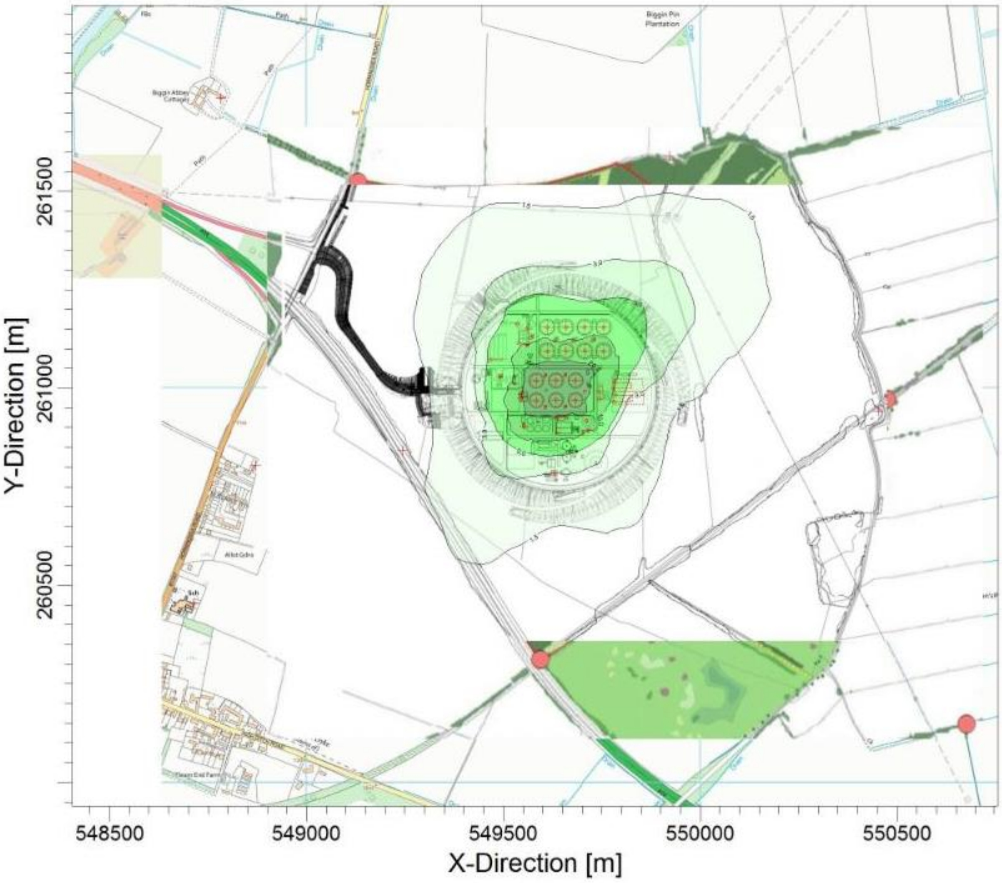
E.5 Scenario 5: 2016 Observed MET Data, Surface roughness factor 0.26, All odour sources (Table 4-6) with Seasonal Variance.

PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Data Met Data SR 0.26 All Sources PSTs 1.9ouE/m2/s Variable Emissions



PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL OU/M**3
Max: 35.0 [OU/M**3] at (549629.92, 261038.46)

1.5 3.0 5.0 10.0 20.0 35.0

COMMENTS:
Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES:
47

COMPANY NAME:
AW

RECEPTORS:
729

OUTPUT TYPE:
Concentration

SCALE: 1:15,000
0 0.5 km

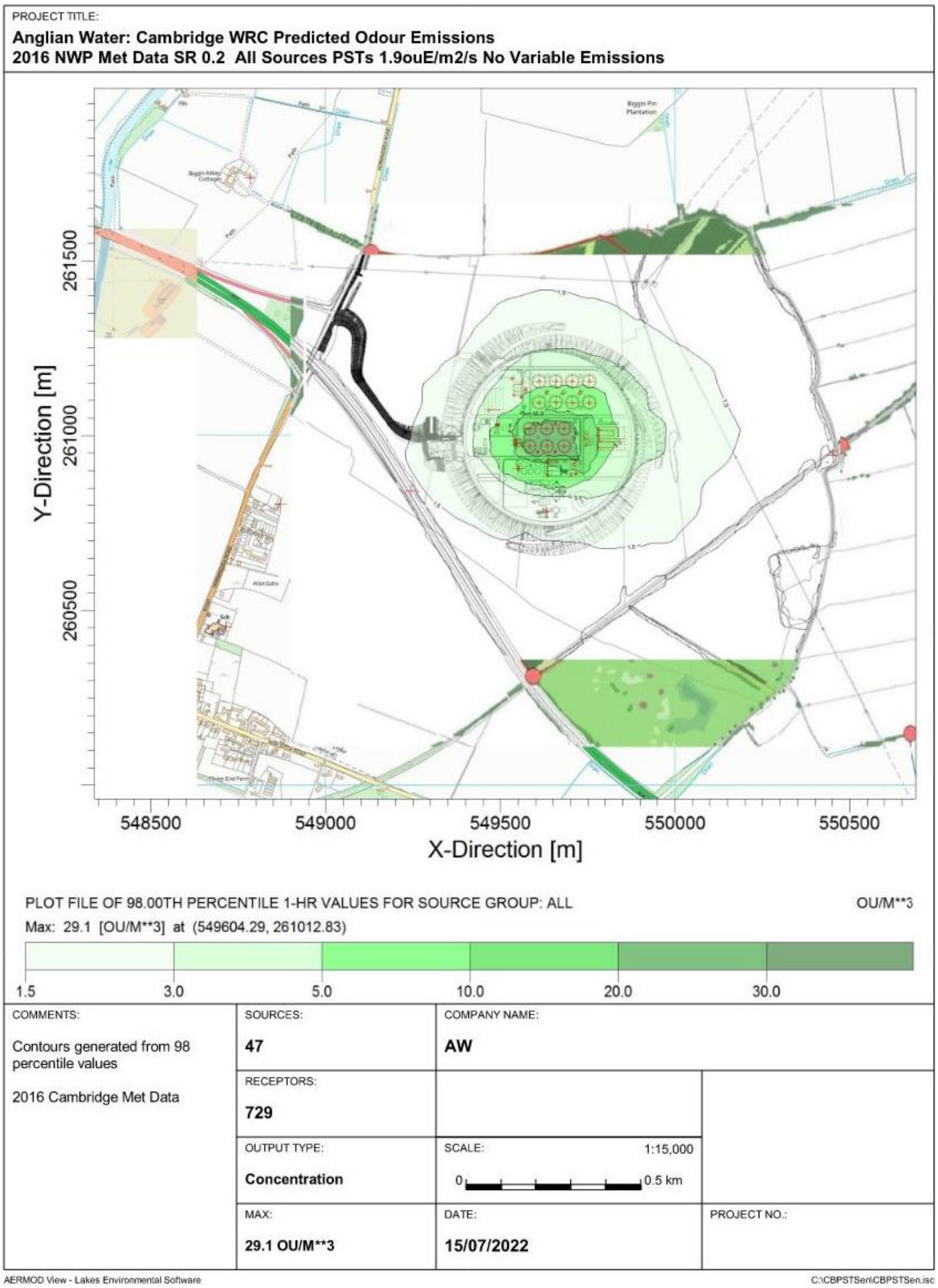
MAX:
35.0 OU/M3**

DATE:
12/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software
C:\CBPSTSen\CBPSTSen.isc

E.6 Scenario 6: 2016 NWP MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) at constant emissions (no seasonal impact accounted).



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 NWP Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s No Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 29.1 [OU/M**3] at (549604.29, 261012.83)

COMMENTS:
Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES: 47

COMPANY NAME: AW

RECEPTORS: 729

OUTPUT TYPE: Concentration

SCALE: 1:15,000

0 0.5 km

MAX: 29.1 OU/M**3

DATE: 15/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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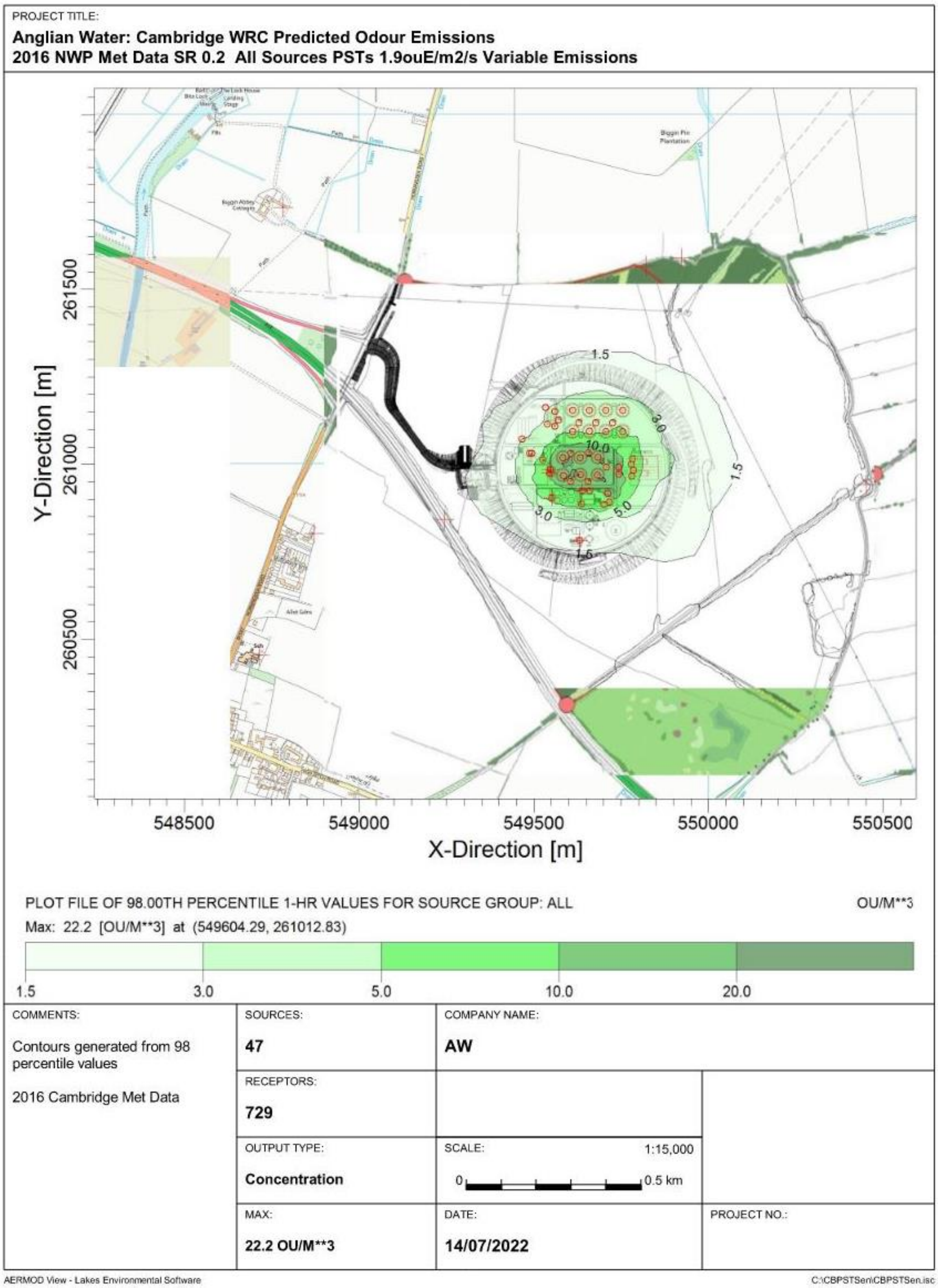
E.7 Scenario 7: 2016 NWP MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 NWP Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 22.2 [OU/M**3] at (549604.29, 261012.83)

COMMENTS:

Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES:

47

COMPANY NAME:

AW

RECEPTORS:

729

OUTPUT TYPE:

Concentration

SCALE:

1:15,000

MAX:

22.2 OU/M3**

DATE:

14/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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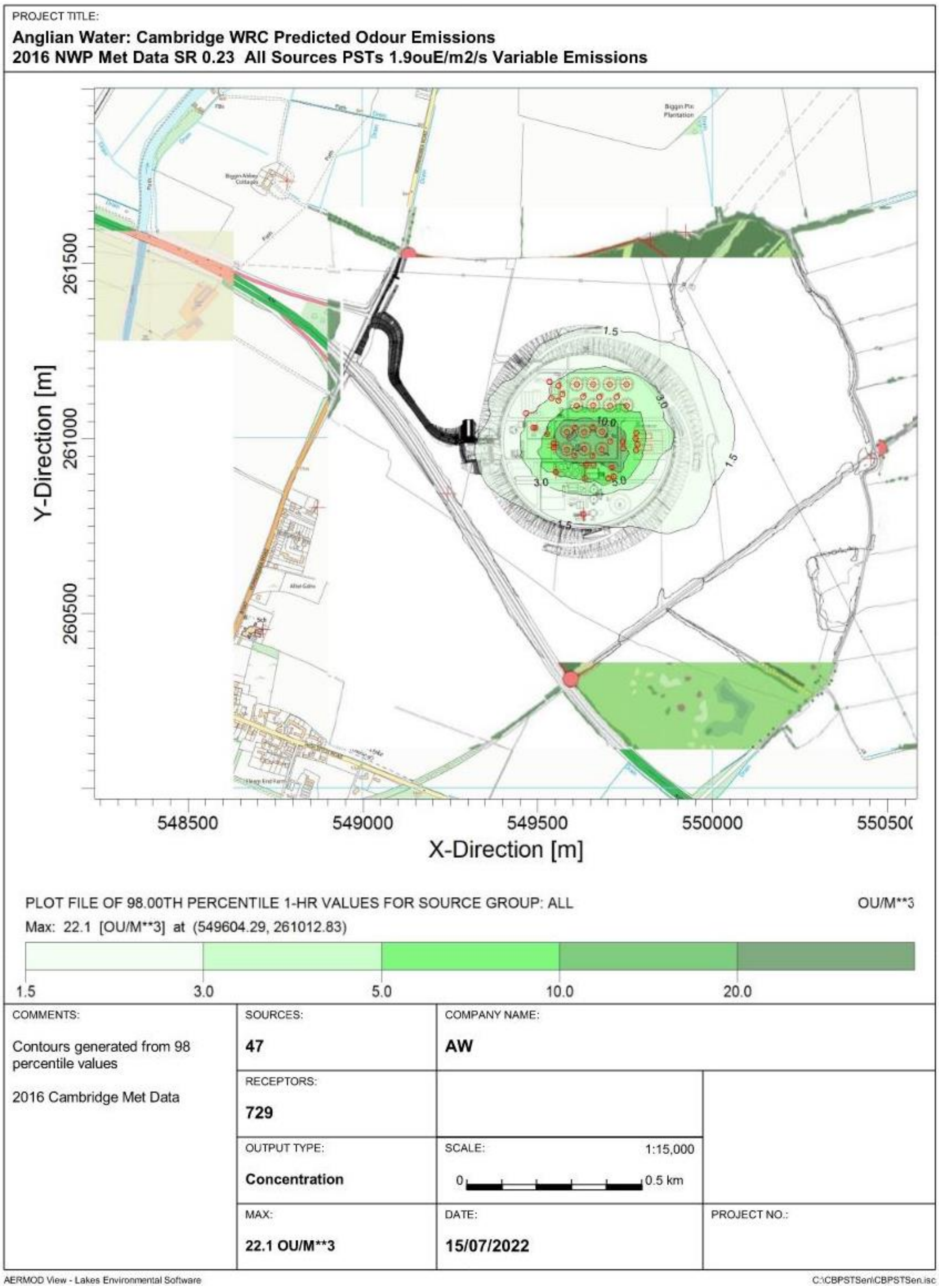
E.8 Scenario 8: 2016 NWP MET Data, Surface roughness factor 0.23, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 NWP Met Data SR 0.23 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

Max: 22.1 [OU/M**3] at (549604.29, 261012.83)

COMMENTS:

Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES: **47**

COMPANY NAME: **AW**

RECEPTORS: **729**

OUTPUT TYPE: **Concentration**

SCALE: 1:15,000

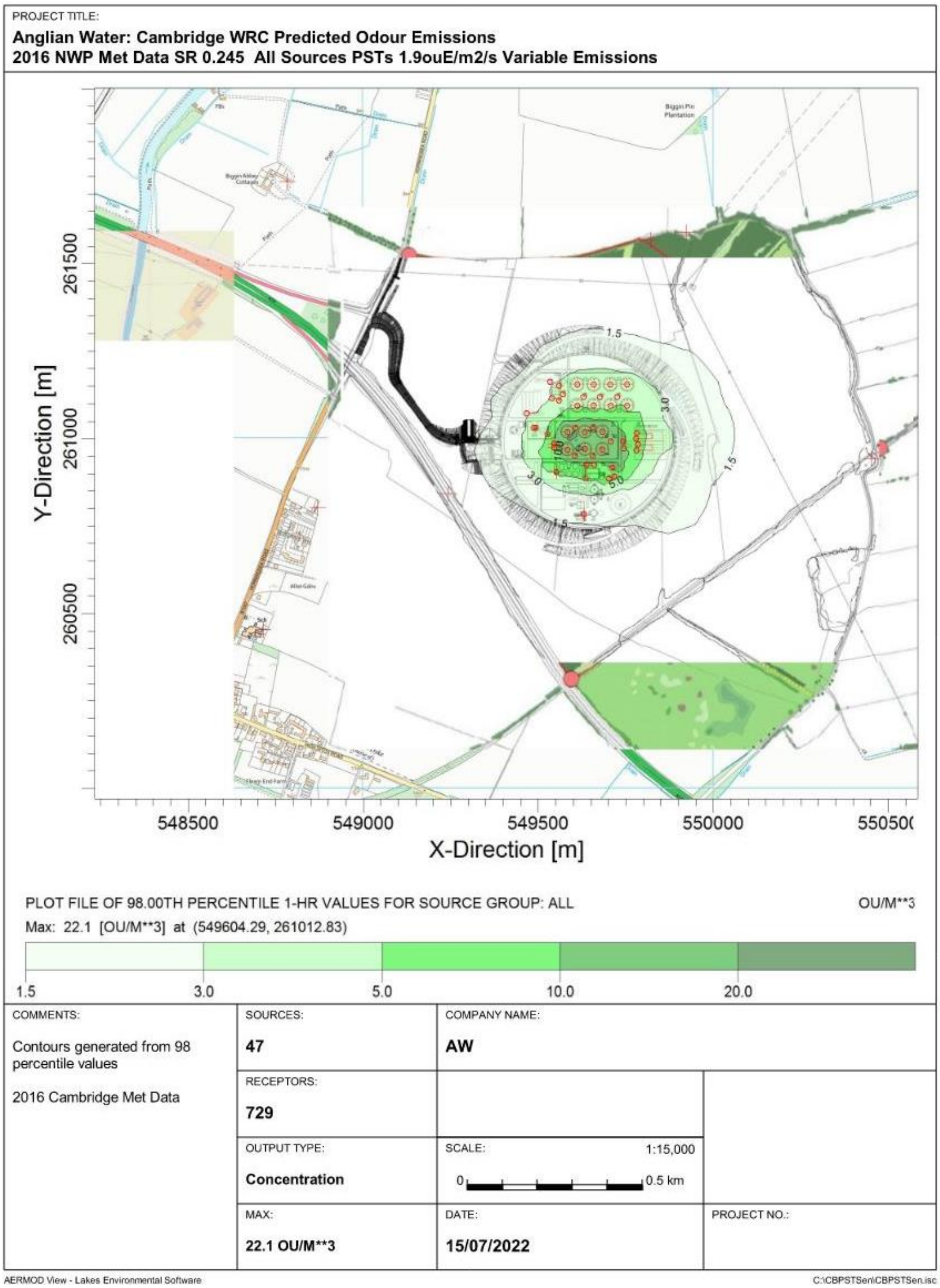
0 0.5 km

MAX: **22.1 OU/M**3**

DATE: **15/07/2022**

PROJECT NO.:

E.9 Scenario 9: 2016 NWP MET Data, Surface roughness factor 0.245, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:
Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 NWP Met Data SR 0.245 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL
Max: 22.1 [OU/M**3] at (549604.29, 261012.83)

COMMENTS:
Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES: **47**

COMPANY NAME: **AW**

RECEPTORS: **729**

OUTPUT TYPE: **Concentration**

SCALE: 1:15,000
0 0.5 km

MAX: **22.1 OU/M**3**

DATE: **15/07/2022**

PROJECT NO.:

AERMOD View - Lakes Environmental Software
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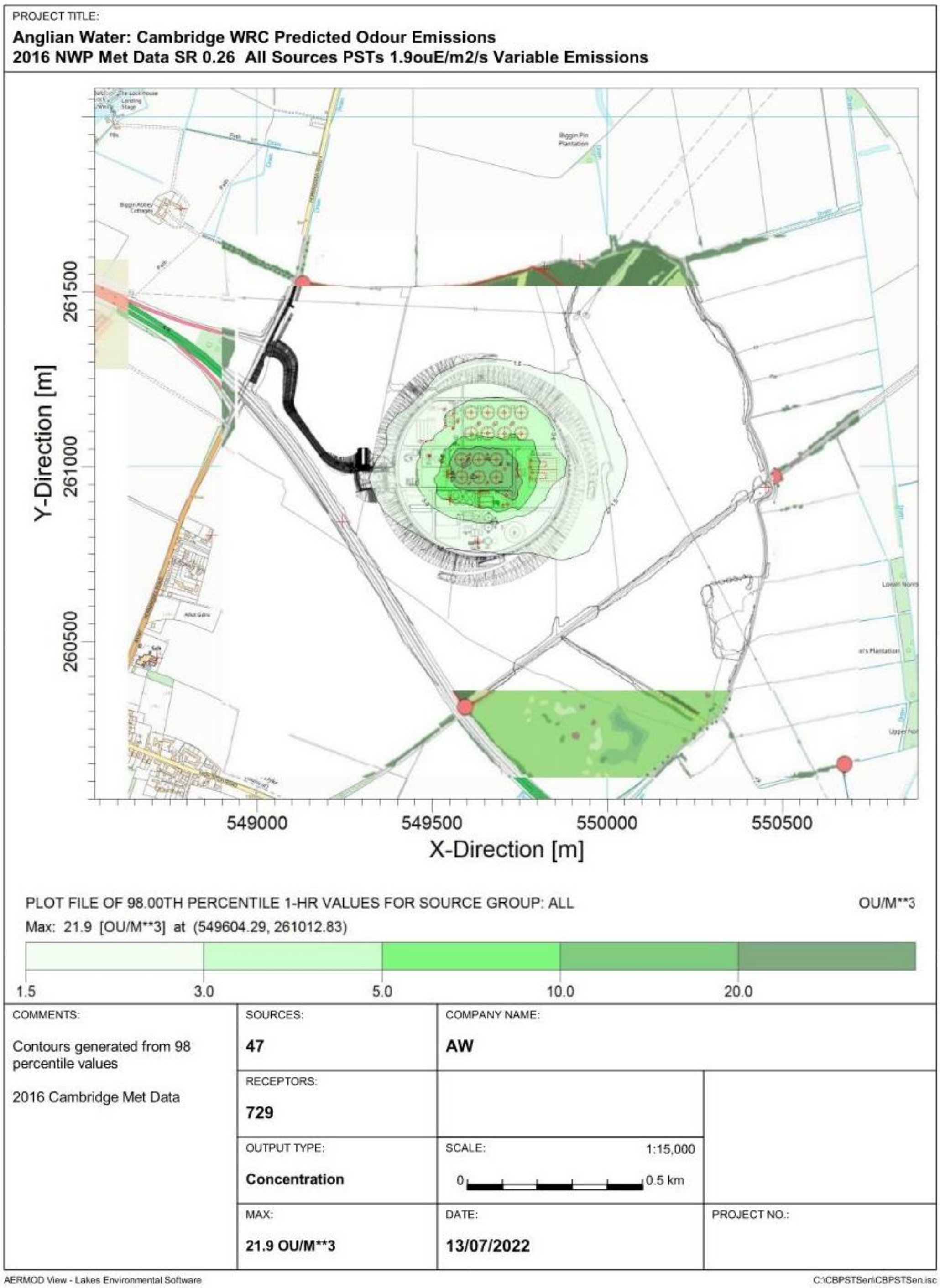
E.10 Scenario 10: 2016 NWP MET Data, Surface roughness factor 0.26, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 NWP Met Data SR 0.26 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 21.9 [OU/M**3] at (549604.29, 261012.83)

COMMENTS:

Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES: **47**

COMPANY NAME: **AW**

RECEPTORS: **729**

OUTPUT TYPE: **Concentration**

SCALE: 1:15,000

MAX: **21.9 OU/M**3**

DATE: **13/07/2022**

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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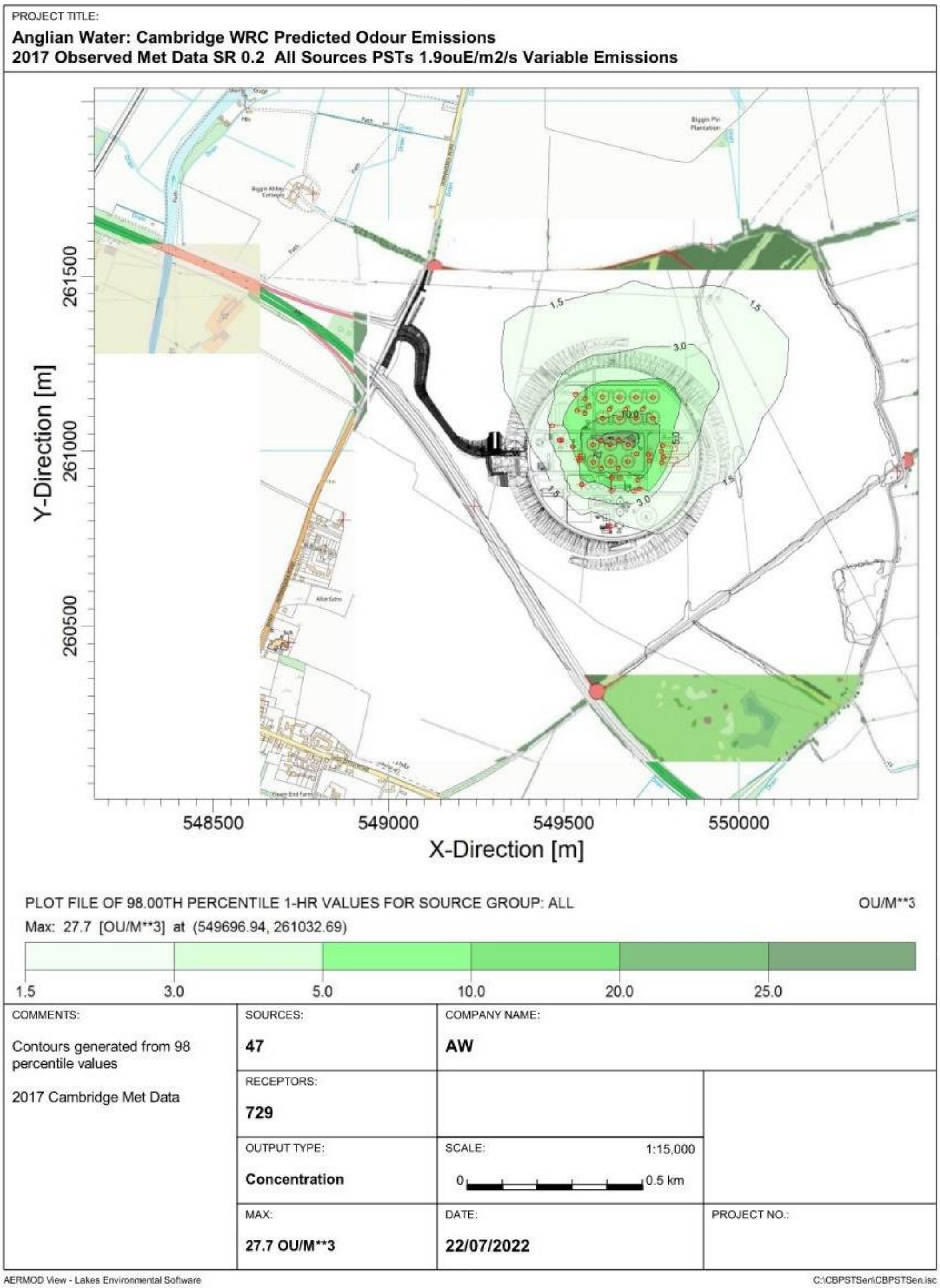
E.11 Scenario 11: 2017 Observed MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2017 Observed Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL OU/M**3

Max: 27.7 [OU/M**3] at (549696.94, 261032.69)

COMMENTS:

Contours generated from 98 percentile values

2017 Cambridge Met Data

SOURCES:

47

COMPANY NAME:

AW

RECEPTORS:

729

OUTPUT TYPE:

Concentration

SCALE: 1:15,000

MAX:

27.7 OU/M3**

DATE:

22/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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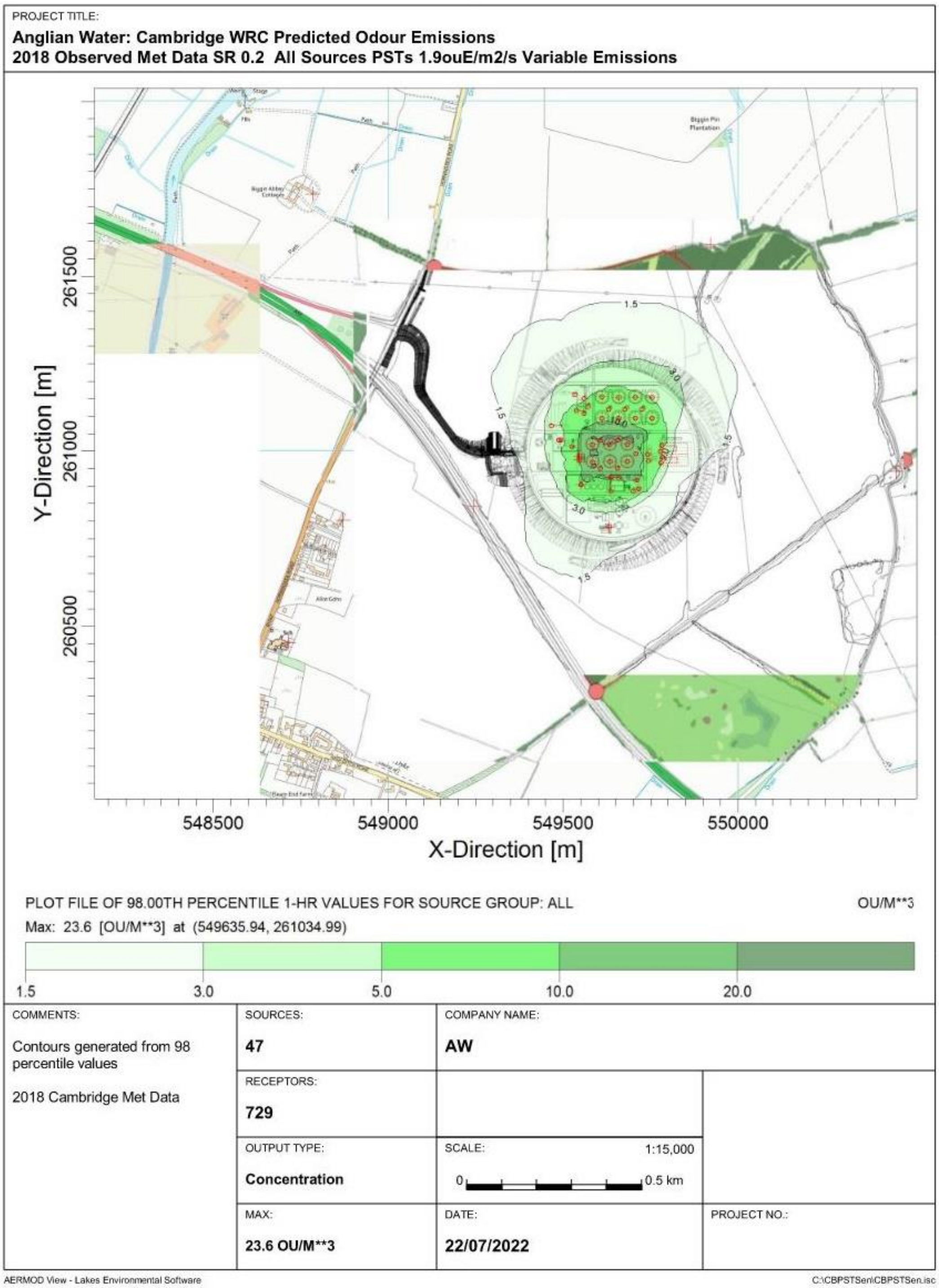
E.12 Scenario 12: 2018 Observed MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:
Anglian Water: Cambridge WRC Predicted Odour Emissions
2018 Observed Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL OU/M**3
Max: 23.6 [OU/M**3] at (549635.94, 261034.99)

COMMENTS:
Contours generated from 98 percentile values

2018 Cambridge Met Data

SOURCES: **47**

COMPANY NAME: **AW**

RECEPTORS: **729**

OUTPUT TYPE: **Concentration**

SCALE: 1:15,000
0 0.5 km

MAX: **23.6 OU/M**3**

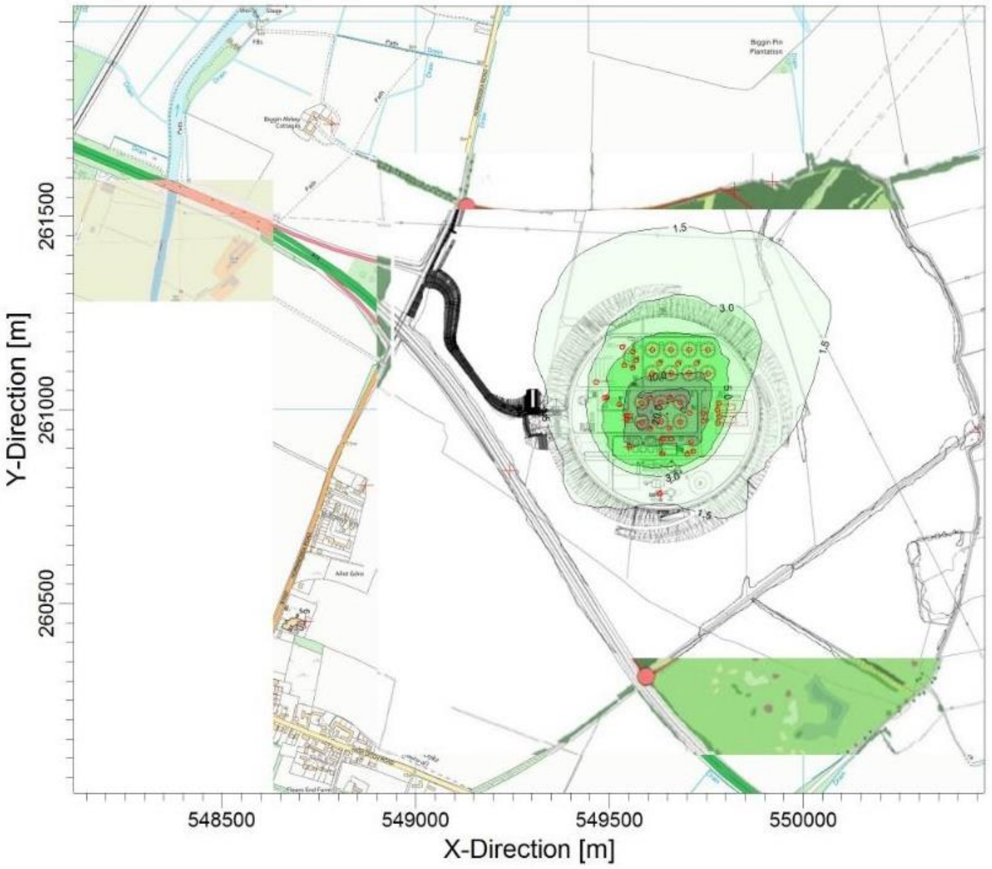
DATE: **22/07/2022**

PROJECT NO.:

E.13 Scenario 13: 2019 Observed MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.

PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2019 Observed Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions



PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL — OU/M**3

Max: 25.0 [OU/M**3] at (549633.08, 261036.99)

1.5 – 3.0	3.0 – 5.0	5.0 – 10.0	10.0 – 20.0	20.0 –
🟩	🟩	🟩	🟩	🟩

COMMENTS: Contours generated from 98 percentile values 2019 Cambridge Met Data	SOURCES: **47**	COMPANY NAME: **AW**	
	RECEPTORS: **729**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:15,000 0 — 0.5 km	
	MAX: **25.0 OU/M**3**	DATE: **22/07/2022**	PROJECT NO.:

AERMOD View - Lakes Environmental Software

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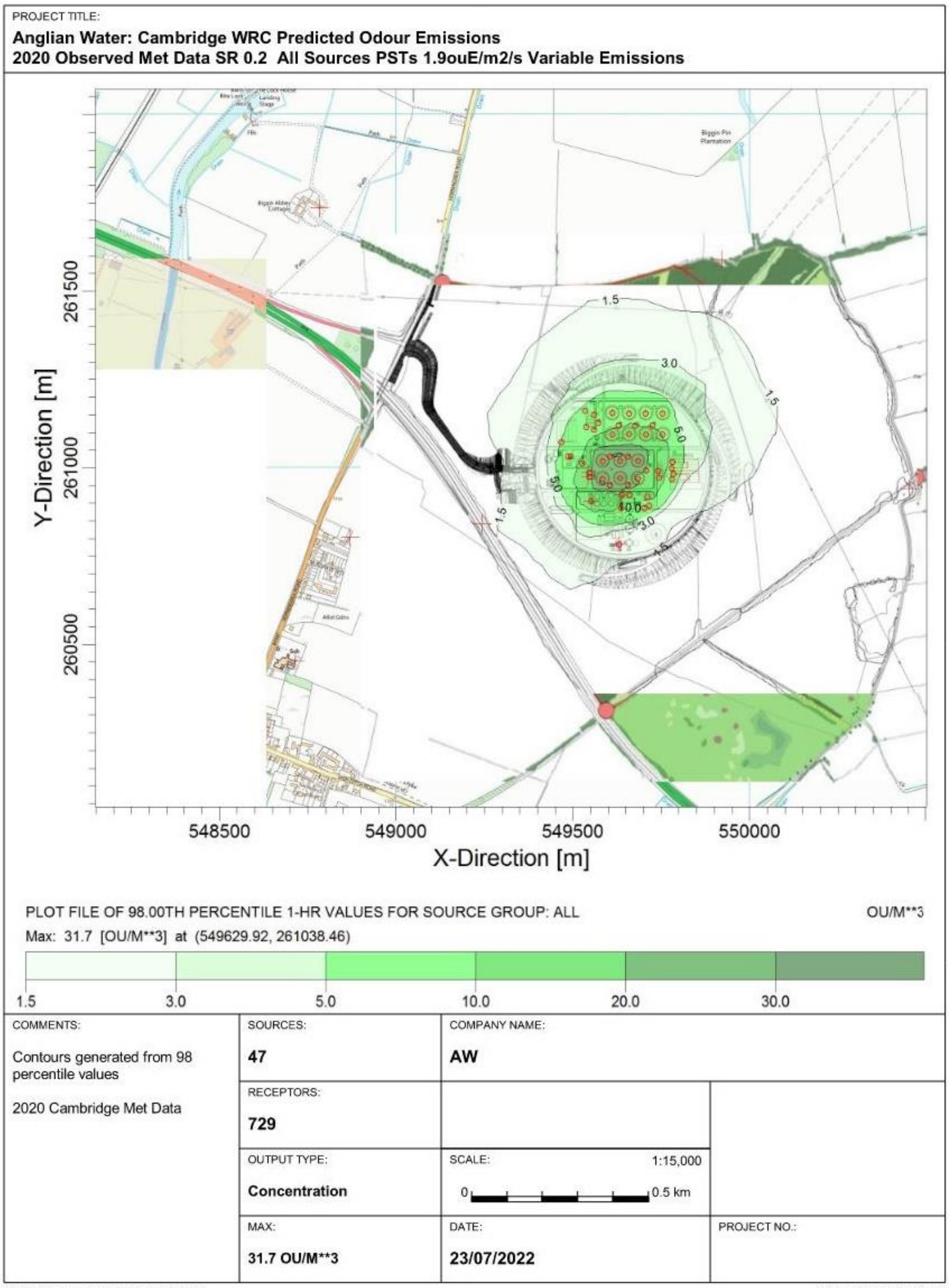
E.14 Scenario 14: 2020 Observed MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2020 Observed Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 31.7 [OU/M**3] at (549629.92, 261038.46)

COMMENTS:

Contours generated from 98 percentile values

2020 Cambridge Met Data

SOURCES:

47

COMPANY NAME:

AW

RECEPTORS:

729

OUTPUT TYPE:

Concentration

SCALE: 1:15,000

MAX:

31.7 OU/M3**

DATE:

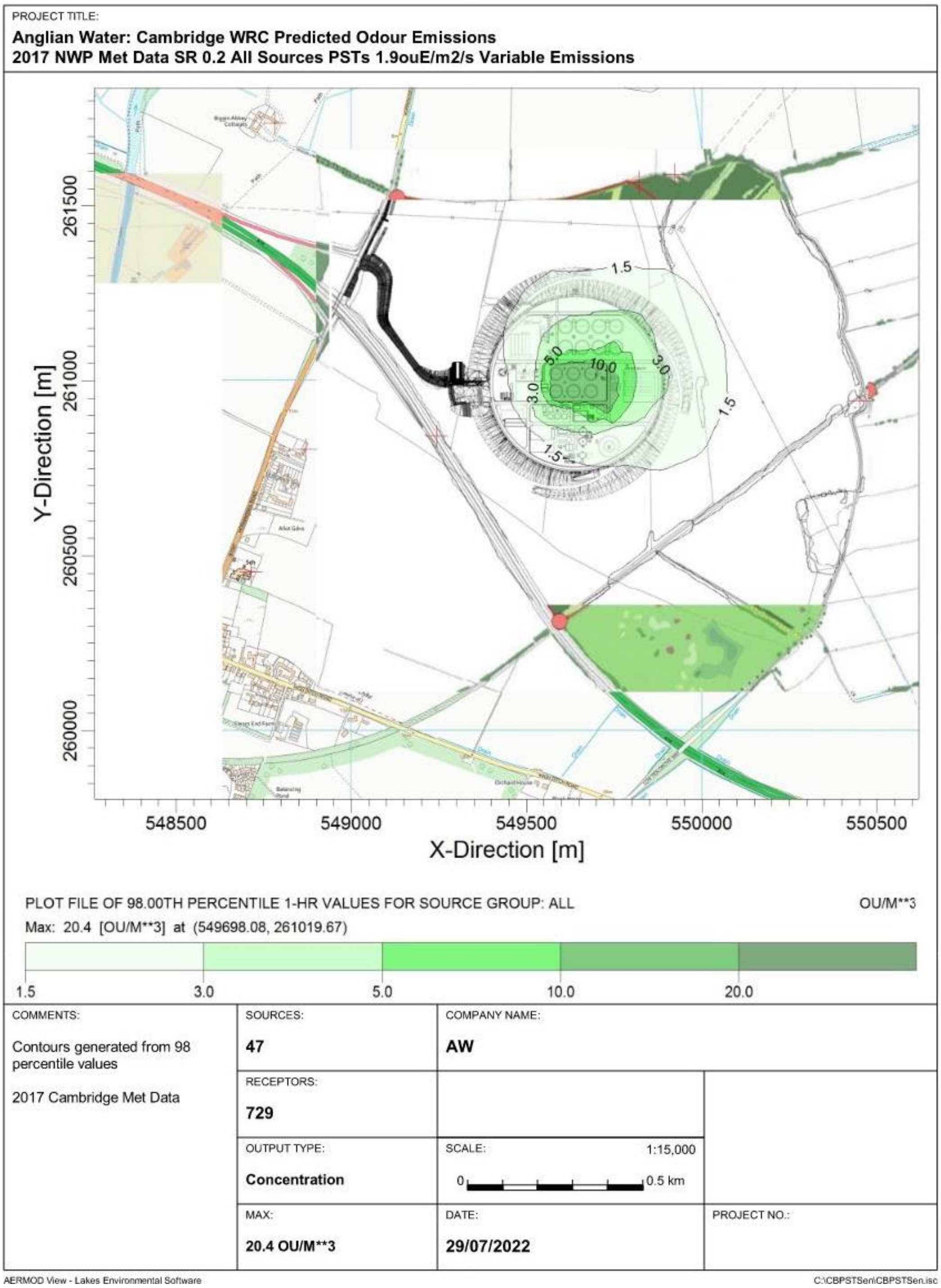
23/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\CBPSTSen\CBPSTSen.isc

E.15 Scenario 15: 2017 NWP MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2017 NWP Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

Max: 20.4 [OU/M**3] at (549698.08, 261019.67)

COMMENTS:	SOURCES:	COMPANY NAME:			
Contours generated from 98 percentile values 2017 Cambridge Met Data	47	AW			
	RECEPTORS:				
	729				
	OUTPUT TYPE:	SCALE: 1:15,000			
	Concentration	0 — 0.5 km			
	MAX:	DATE:	PROJECT NO.:		
	20.4 OU/M**3	29/07/2022			

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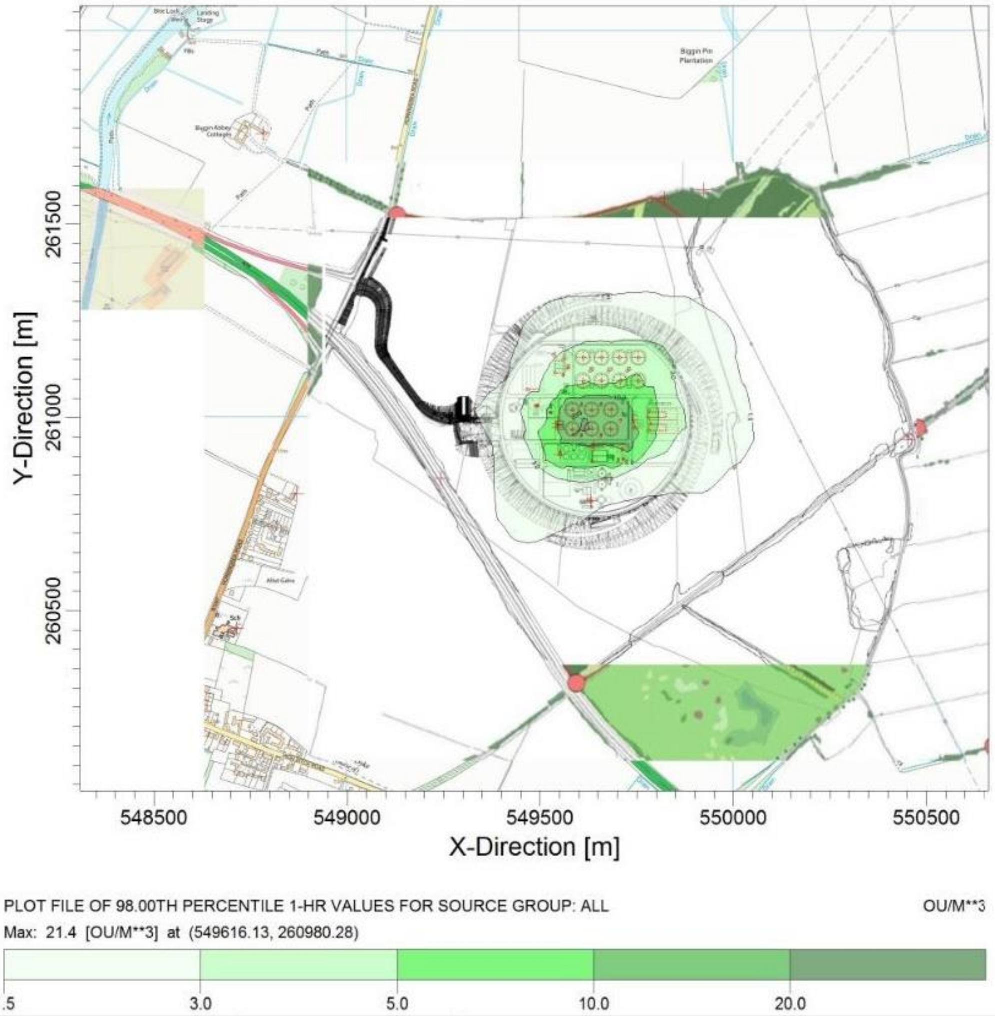
E.16 Scenario 16: 2018 NWP MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.

PROJECT TITLE:

Anglian Water: Cambridge WRC Predicted Odour Emissions
2018 NWP Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions



PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL
Max: 21.4 [OU/M**3] at (549616.13, 260980.28)

COMMENTS:
Contours generated from 98 percentile values

2018 Cambridge Met Data

SOURCES:
47

COMPANY NAME:
AW

RECEPTORS:
729

OUTPUT TYPE:
Concentration

SCALE: 1:15,000
0 0.5 km

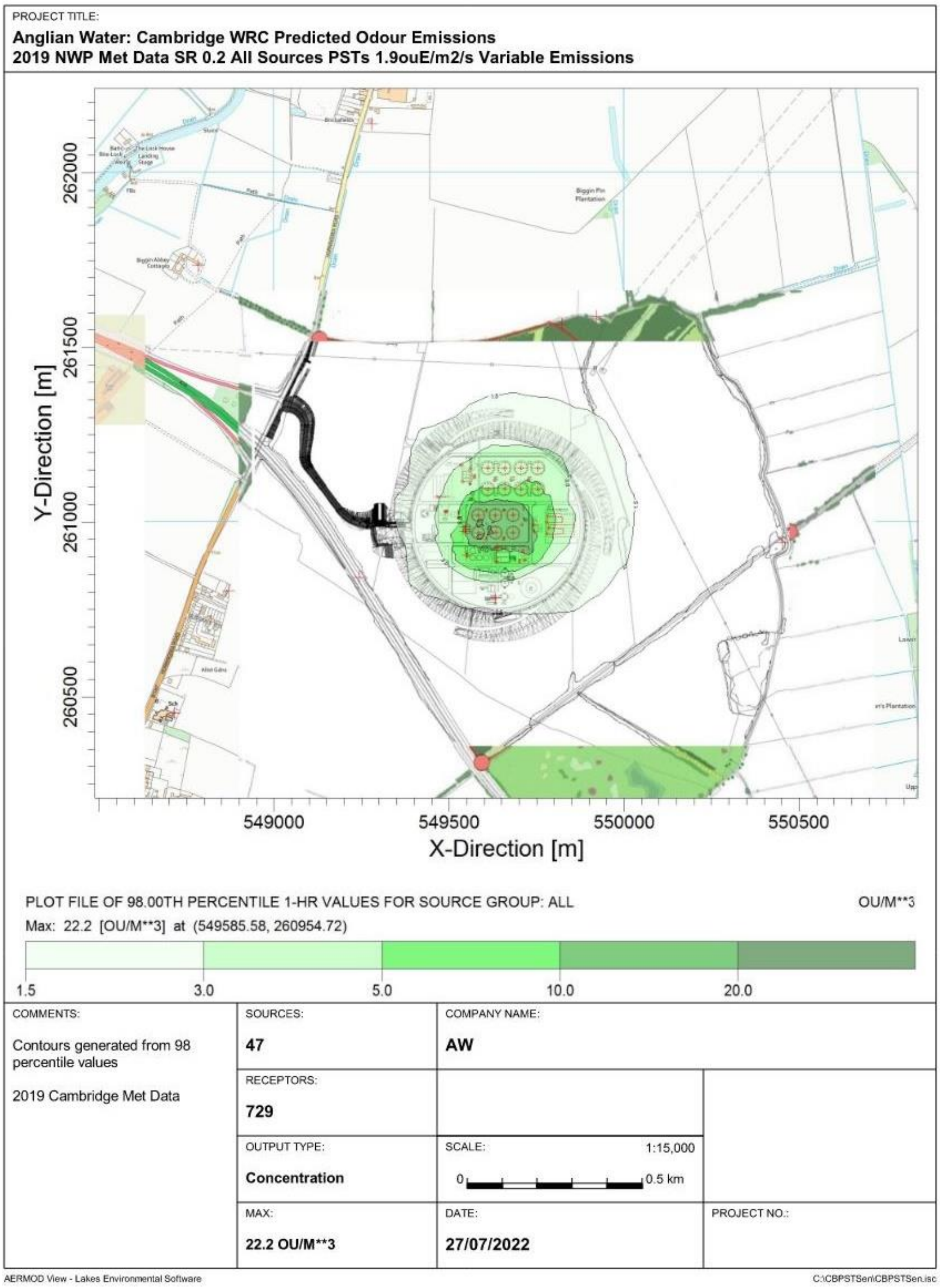
MAX:
21.4 OU/M3**

DATE:
27/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software
C:\CBPSTSen\CBPSTSen.isc

E.17 Scenario 17: 2019 NWP MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:
Anglian Water: Cambridge WRC Predicted Odour Emissions
2019 NWP Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions

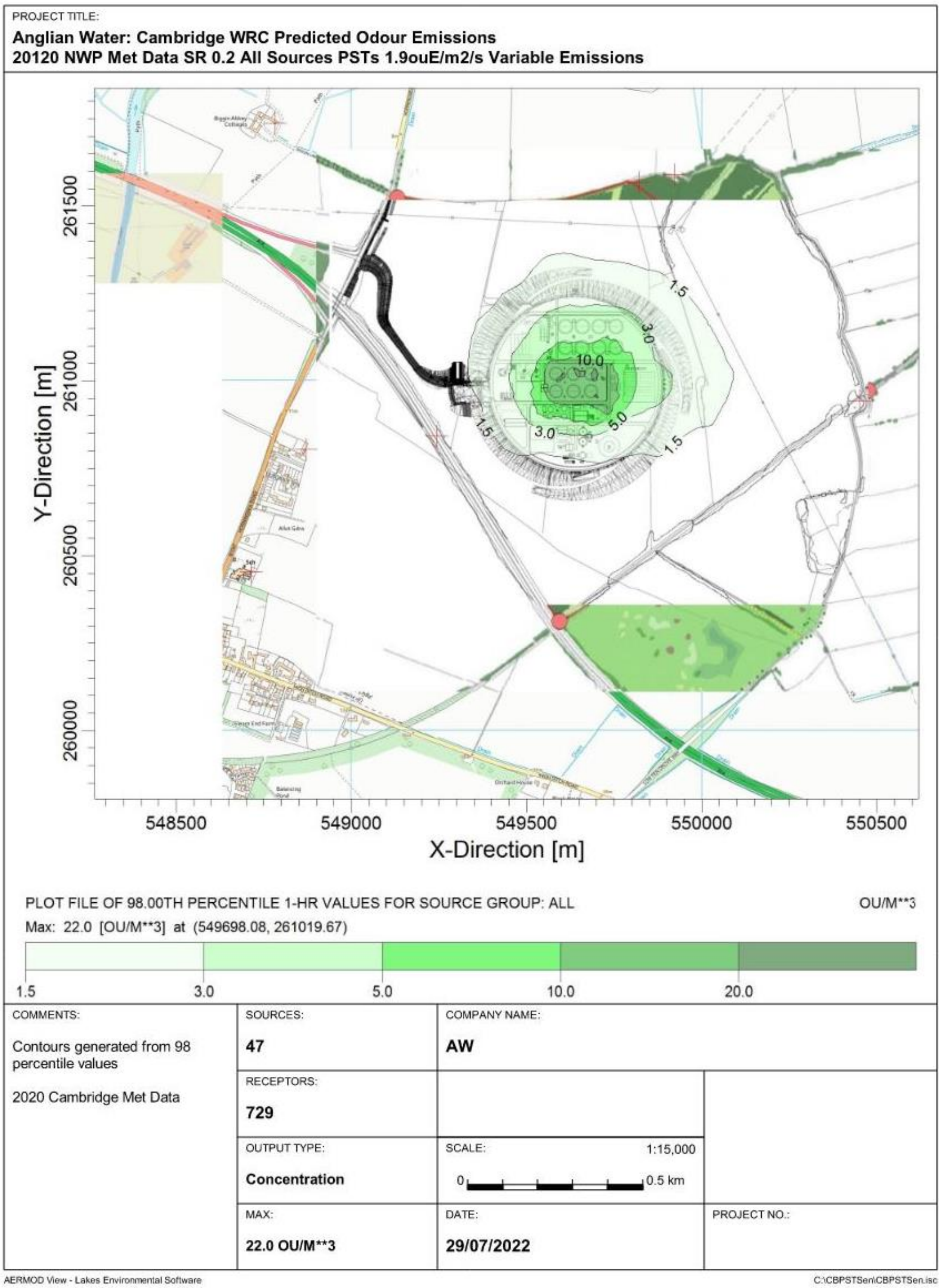
PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL OU/M**3
Max: 22.2 [OU/M**3] at (549585.58, 260954.72)

🟩	🟩	🟩	🟩	🟩
1.5	3.0	5.0	10.0	20.0

COMMENTS: Contours generated from 98 percentile values 2019 Cambridge Met Data	SOURCES: **47**	COMPANY NAME: **AW**	
	RECEPTORS: **729**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:15,000 0 — 0.5 km	
	MAX: **22.2 OU/M**3**	DATE: **27/07/2022**	PROJECT NO.:

AERMOD View - Lakes Environmental Software C:\CBPSTSen\CBPSTSen.isc

E.18 Scenario 18: 2020 NWP MET Data, Surface roughness factor 0.2, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:
Anglian Water: Cambridge WRC Predicted Odour Emissions
20120 NWP Met Data SR 0.2 All Sources PSTs 1.9ouE/m2/s Variable Emissions

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL
Max: 22.0 [OU/M**3] at (549698.08, 261019.67)
OU/M**3

COMMENTS:
Contours generated from 98 percentile values
2020 Cambridge Met Data

SOURCES:
47

COMPANY NAME:
AW

RECEPTORS:
729

OUTPUT TYPE:
Concentration

SCALE: 1:15,000
0 0.5 km

MAX:
22.0 OU/M3**

DATE:
29/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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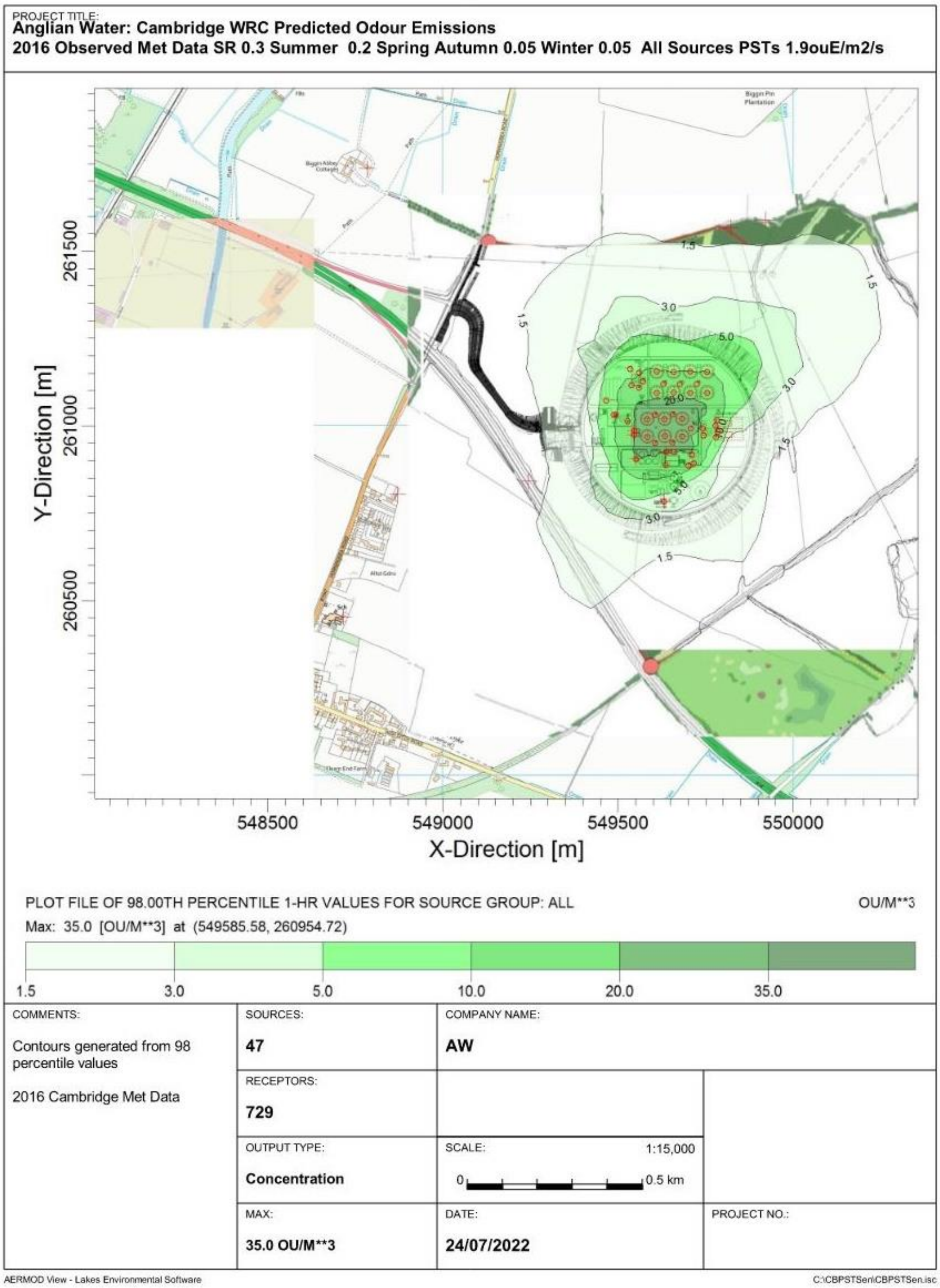
E.19 Scenario 19: 2016 Observed MET Data, Varying surface roughness factors: 0.3 summer, 0.2 spring, 0.05 autumn and winter, All odour sources (Table 4-6) with Seasonal Variance.



PROJECT TITLE:
Anglian Water: Cambridge WRC Predicted Odour Emissions
2016 Observed Met Data SR 0.3 Summer 0.2 Spring Autumn 0.05 Winter 0.05 All Sources PSTs 1.9ouE/m2/s

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL

Max: 35.0 [OU/M**3] at (549585.58, 260954.72)

1.5	3.0	5.0	10.0	20.0	35.0
🟩	🟩	🟩	🟩	🟩	🟩

COMMENTS:
Contours generated from 98 percentile values

2016 Cambridge Met Data

SOURCES:
47

COMPANY NAME:
AW

RECEPTORS:
729

OUTPUT TYPE:
Concentration

SCALE: 1:15,000
0 0.5 km

MAX:
35.0 OU/M3**

DATE:
24/07/2022

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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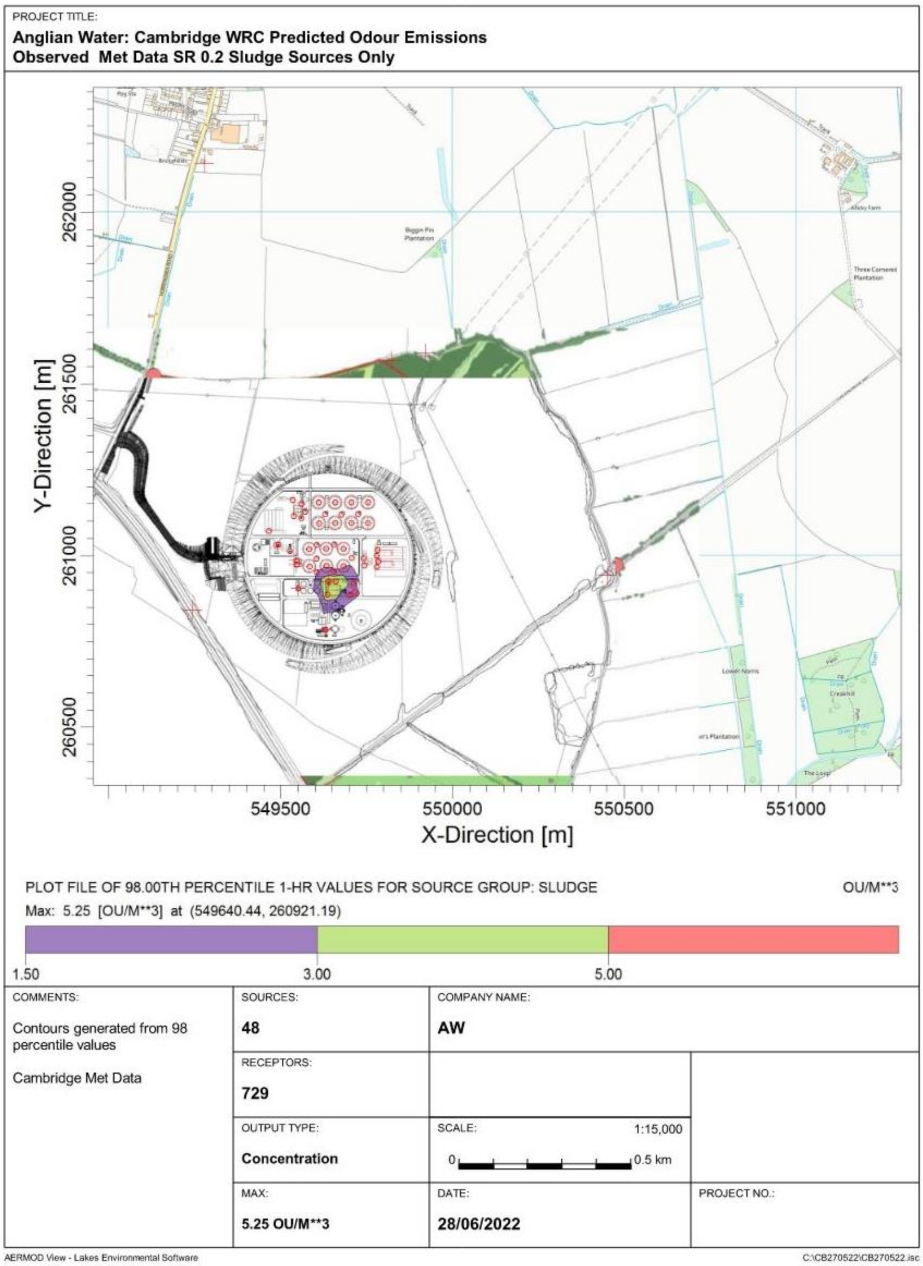
7.6 APPENDIX F – STC ONLY ODOUR MODELLING RESULT

F.1 2016 Observed MET Data, Surface roughness factor 0.2, Constant emissions (no seasonal impact accounted), Sludge Treatment Centre odour sources only.



PROJECT TITLE:
Anglian Water: Cambridge WRC Predicted Odour Emissions
Observed Met Data SR 0.2 Sludge Sources Only

PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: SLUDGE OU/M**3
Max: 5.25 [OU/M**3] at (549640.44, 260921.19)

🟪	🟩	🟥
1.50	3.00	5.00

COMMENTS: Contours generated from 98 percentile values

Cambridge Met Data

SOURCES: **48**

COMPANY NAME: **AW**

RECEPTORS: **729**

OUTPUT TYPE: **Concentration**

SCALE: 1:15,000 (0 – 0.5 km)

MAX: **5.25 OU/M**3**

DATE: **28/06/2022**

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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Get in touch

You can contact us by:

- Emailing at **info@cwwtpr.com**
- Calling our Freephone information line on **0808 196 1661**
- Writing to us at **Freepost: CWWTPR**

You can view all our DCO application documents and updates on the application on The Planning Inspectorate website:

https://infrastructure.planninginspectorate.gov.uk/projects/eastern/cambridge-waste-water-treatment-plant-relocation/