Greater Cambridge Local Plan – Regulation 18 : Issues and Options Consultation 2020
Brookgate Land Limited
February 2020

BIDWELLS

LAND AT CAMBRIDGE NORTH

GREATER CAMBRIDGE LOCAL PLAN – REGULATION 18 : ISSUES AND OPTIONS CONSULTATION 2020

Quality Assurance

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Client name:	Brookgate Land Limited
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SMARTER PLANNING CHAMPION

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1.0 Introduction

Background

1.1 These representations have been prepared by Bidwells LLP on behalf of Brookgate Land Limited in respect of Land at Cambridge North ("the Site") and in response to the Greater Cambridge Local Plan Regulation 18 : Issues and Options 2020 consultation ("the consultation document"). Please refer to **Appendix 1** for site location plan.

1.2 Brookgate Land Ltd is the development partner of Network Rail and D B Cargo UK (and through them Freightliner and Tarmac) who own Land at Cambridge North, formerly known as the Chesterton Sidings, and who collectively form the Chesterton Partnership.

1.3 Brookgate Land Limited has been working as promoter for The Chesterton Partnership in order to secure the rationalisation and redevelopment of the former Chesterton Sidings site. Planning permission has been granted for a 217 bed hotel (under planning application reference S/2372/17/FL) and a 90,000 sq ft office (under planning application reference S/4478/17/FL). Construction has now begun on these two important permissions which will serve to bring life to the Cambridge North station area and act as a catalyst for the development of the wider North East Cambridge AAP.

1.4 Brookgate Land Limited are now seeking to bring forward the next phase of development (the 'residential quarter' and 'commercial quarter'), alongside the emerging NEC AAP process, which will further build on the momentum created by the Station development and the hotel and office permissions. The remaining land north of Cowley Road ('Phase 2') is proposed to be brought forward within 4-8 years and will be commercial-led.

1.5 The consultation document has been published by Cambridge City Council and South Cambridgeshire District Council as the first formal stage of consultation towards preparing the new joint Local Plan for Cambridge and South Cambridgeshire; the Greater Cambridge Local Plan. Consultation took place from 13 January 2020 to 24 February 2020.

1.6 The Greater Cambridge Local Plan is proposed to set out future land use and planning policies for the Greater Cambridge area to 2040 in respect of accommodating growth for new homes, jobs and infrastructure.

1.7 The consultation document explores four 'big themes' that will influence how homes, jobs and infrastructure are planned. The big themes are:

- **Climate change** – how the plan should contribute to achieving net zero carbon, and the mitigation and adaptation measures that should be required through developments;
- **Biodiversity and green spaces** – how the plan can contribute to our 'doubling nature' vision, the improvement of existing green spaces and the creation of more;
- **Wellbeing and social inclusion** – how the plan can help spread the benefits of growth, helping to create healthy and inclusive communities; and
- **Great places** – how the plan can protect what is already great about the area, and design new developments to create special places and spaces.

1.8 Within the above four big themes, the consultation document then identifies what the Councils' consider are the key issues and options for where future growth (jobs and homes) might go. This includes an option of '**Densification of existing urban areas'** which is outlined as an option which could provide more homes and jobs on underused land within Cambridge and also potentially in existing new settlements. This could be by building taller buildings, or redeveloping underused sites at higher densities.

1.9 The principle of focusing growth along key public transport corridors and around transport hubs (the '**Public Transport Corridors'** option) is also supported. In order to reduce climate change impacts, the Local Plan will need to promote sustainable development in locations that allow existing communities to grow and thrive but also enable travel by low-carbon modes such as walking, cycling and public transport. Land at Cambridge North would achieve both of these measures, being located adjoining Cambridge North Station and the Cambridge Guided Busway (CGB).

1.10 A combination of approaches to the distribution of spatial growth are considered likely to be necessary in order to allow for sufficient flexibility when considering the locations of new housing and employment development in the district. However, the principle of densification and focusing growth along public transport corridors is supported.

1.11 Brookgate Land Limited are keen to engage with the Council, stakeholders and the local community to refine and discuss the proposals further as part of the ongoing consultation on the emerging Greater Cambridge Local Plan.

1.12 These representations respond to the relevant questions within the consultation document in respect to the redevelopment opportunity at Land at Cambridge North and within the context of the four big themes and options for growth. They should be read in conjunction with the following standalone documents:

- Appendix One: Site Location Plan;
- Appendix Two: Latest masterplan and accommodation schedule;
- Appendix Three: Arup Report.

2.0 Land at Cambridge North

Question 2. **Please submit any sites for employment and housing you wish to suggest for allocation in the Local Plan. Provide as much information and supporting evidence as possible.**

The Site

2.1 Land at Cambridge North is submitted as a potential allocation for a residential-led mixed-use allocation in the Local Plan. The extent of the site is shown on the site location plan at **Appendix 1.**

2.2 The Site is located in the north-east of Cambridge, to the north of Cambridge North railway station. The land comprises former railway sidings.

2.3 The Site is bound by the Cambridge Water Recycling Centre (CWRC) to the north beyond which lies the A14. The Site is bound by the railway line to the east and existing residential development to the south. The Site is bound by the Cambridge Guided Busway (CGB) and existing commercial development to the west.

2.4 Brookgate Land Limited has been working as promoter for The Chesterton Partnership in order to secure the rationalisation and redevelopment of the former Chesterton Sidings site. Planning permission has been granted for a 217 bed hotel (under planning application reference S/2372/17/FL) and a 90,000 sq ft office (under planning application reference S/4478/17/FL), referred to as the Phase 1a site. Construction has now begun on these two important permissions which will serve to bring life to the Cambridge North station area and act as a catalyst for the development of the wider North East Cambridge AAP (NEC AAP).

2.5 Brookgate Land Limited are now seeking to bring forward the next phase of development; a residential quarter and commercial quarter, alongside the North East Cambridge Area Action Plan (NEC AAP) process which will further build on the momentum created by the Station development and the hotel and office permissions. A location plan is included at **Appendix 1** and the next phase of the residential and commercial quarter is included at **Appendix 2.**

2.6 Brookgate Land Limited has made clear from the outset and through the NEC AAP workshops their aspiration and intention to bring forward the residential and commercial quarter as early as is practicable. The NEC AAP workshops have been extremely useful and clearly demonstrated that the next phase at Cambridge North would not in any way prejudice the outcome of the AAP process and the achievement of the comprehensive vision for the area as a whole that will be established by the NEC AAP. The residential and commercial quarter would therefore be a policy compliant application, having regard to other relevant policies in the Plan.

The Economic Context

National Policy

2.7 The NPPF confirms the Government's objective of significantly boosting the supply of homes and that it is important that a sufficient amount and variety of land can come forward where it is needed, that the needs of groups with specific housing requirements are addressed and that land with permission is developed without unnecessary delay.

2.8 With particular reference to Build to Rent (BTR), there is also clear Government support given that it is now explicitly recognised as a distinct asset class within the private rented sector (PRS) and has been defined in the NPPF glossary.

2.9 The cost of homeownership is rising and access to social renting has declined, meaning more and more people in the UK now rely on BTR housing. In the 1980s and 1990s, BTR property represented around 10% of all households in England. However, BTR has since become the fastest-growing sector in the country, and that figure has doubled.

2.10 The ability of BTR schemes to create quality places to live cannot and should not be doubted, it is no different to any development in the built environment. It needs a clear brief and good design and delivery and collaborative working to make it successful architecturally and in urban design terms.

2.11 PRS provides a means of widening housing choice for tenants, particularly those who may be renting long term, and also to deliver much needed housing within a faster timescale.

2.12 Many authorities are developing PRS design guides (GLA, Newham) to assist developers. The authorities may wish to follow a similar route and as part of the AAP produce guidance in association with the developer but the ULI UK residential council has recently produced "Build to Rent, a Best Practice Guide", which represents significant time and expertise and a question must be posed over simply replicating existing guidance.

Regional Policy

2.13 The Greater Cambridge Housing Strategy 2019-2023 recognises that PRS models can help support the needs of those on middle incomes who come to work in the area but cannot afford to live locally.

2.14 The Strategy states, at page 17 that

> *"We recognise that PRS can meet the needs of households on a range of incomes, from those who are unlikely to be considered for social housing for rent to those who can afford but do not want to own their own home. We also recognise PRS can help accelerate overall housing build-out rates on large strategic sites. Subject to clear evidence of need, we may consider proposals for new PRS as part of a wider housing mix. Any such homes provided should remain available as PRS for an agreed period."*

2.15 The NPPF also advises that planning policies should help create the conditions in which businesses can invest, expand and adapt (paragraph 80). The NPPF specifically states that "*Significant weight should be placed on the need to support economic growth and productivity, taking into account both local business needs and wider opportunities for development"*.

2.16 The Cambridge and Peterborough Independent Economic Review (CPIER) was published in September 2018. One of the key recommendations from the review, at 2.3, is to consider some densification, particularly in Cambridge, away from the historic centre, and more on the edges, as and where new development sites comes forward. The CPIER report specifically states that the east side of Cambridge offers significant scope for housing and commercial development:

> *"Such development would have the advantage of being close to the principal centres of employment and the existing rail infrastructure whilst also opening up opportunities for*

new transport links to connect the main centres of employment more effectively. Most significantly, it includes land which has previously been safeguarded for development and is within the boundaries of the existing urban area so would proving opportunities in line with the existing spatial strategy."

2.17 The CPIER also has set a target of doubling the regional economic growth (GVA) of Greater Cambridge over the next 25 years. This requires the area going beyond what it has achieved in the past (to double an economy over twenty-five years requires an average annual growth rate of 2.81%. Historically, since 1998, the local economy has only grown at around 2.5%.). Achieving this requires employment growth and more importantly productivity growth, as we are already at comparatively high levels of employment.

2.18 In order to deliver this 'step change' in economic performance, the Consultation document states that around 2,900 homes a year would need to be built in Greater Cambridge if the jobs growth is achieved – an indicative total of 66,700 homes over 2017 – 2040. This compares with 1,800 homes per year to meet local needs using the Government's standard method.

2.19 There is clearly a need to provide for an amount of housing above the standard methodology to take account of the pressing and worsening affordability issue and to support the aspiration to grow the Greater Cambridge economy and double the GVA across the Greater Cambridgeshire and Peterborough area.

Local Policy

2.20 The Site currently falls within the 'Cambridge Northern Fringe East and Cambridge North railway station' major developed site in the adopted Local Plan, under Policy SS/4. This confirms that the site is allocated for '*high quality mixed-use development, primarily for employment within Use Classes B1, B2 and B8 as well as a range of supporting uses, commercial, retail, leisure and residential uses (subject to acceptable environmental conditions)'.*

2.21 The amount of development, site capacity, viability, time scales and phasing of development will be established through the preparation of an Area Action Plan (AAP) for the site.

2.22 Policy SS/4 confirms that all proposals also should:

a. Take into account existing site conditions and environmental and safety constraints;

b. Demonstrate that environmental and health impacts (including odour) from the Cambridge Water Recycling Centre can be acceptably mitigated for occupants;

c. Ensure that appropriate access and linkages, including for pedestrians and cyclists, are planned for in a high quality and comprehensive manner;

d. Recognise the existing local nature reserve at Bramblefields, the protected hedgerow on the east side of Cowley Road which is a City Wildlife Site, the First Public Drain, which is a wildlife corridor, and other ecological features, and where development is proposed provide for appropriate ecological mitigation, compensation, and enhancement measures either on- or off-site; and

e. Ensure that the development would not compromise opportunities for the redevelopment of the wider area.

2.23 The Plan continues, at paragraph 3.31, in confirming that;

> *Cambridge North railway station will provide a catalyst for regeneration of this area. Early development around Cambridge North station could help create a vibrant area around this key infrastructure to meet the needs of users of the station and bring forward further phased delivery elsewhere within the CNFE area.* ***Planning applications submitted before the adoption of the AAP will be considered on their own merits and subject to ensuring that they would not prejudice the outcome of the AAP process and the achievement of the comprehensive vision for the area as a whole that will be established by the AAP.*** (emphasis added).

2.24 The Plan advises, at paragraph 3.34, that exploration of the viability and feasibility of redevelopment of the Cambridge Water Recycling Centre within Cambridge City to provide a new treatment works facility either elsewhere or on the current site subject to its scale will be undertaken as part of the feasibility investigations in drawing up the AAP. If a reduced footprint were to be achieved on the current site this could release valuable land to enable a wider range of uses. Residential development could be an option subject to appropriate ground conditions, contamination issues, amenity and air quality.

North East Cambridge Area Action Plan (NEC AAP)

2.25 The Site falls within a wider area to be included within the emerging North East Cambridge Area Action Plan (NEC AAP). The NEC AAP area includes land west of Cambridge North Station, together with Cambridge Science Park.

2.26 Consultation began on the AAP in 2014 but has been subject to significant delay, in particular due to feasibility work associated with the relocation of the Cambridge Water Recycling Centre (CWRC). Government funding was confirmed in 2019 to relocate the CWRC and Anglian Water are due to start a consultation process for the relocation in Spring 2020.

2.27 A 'North East Cambridge Area Action Plan – Issues and Options 2019 Report' was subject to consultation in March 2019 and representations were submitted by Bidwells LLP on behalf of Brookgate Land Limited.

2.28 The latest Local Development Scheme (LDS) published in October 2018 and updated in November 2019 confirms that consultation on a Draft Area Action Plan (Regulation 18) is due in Spring 2020, Proposed Submission in Spring 2021, Submission in Summer 2021 and adoption by Summer 2022.

The Opportunity

2.29 The NEC AAP is the largest brownfield site in Cambridge and is served by excellent public transport infrastructure. It therefore presents a significant opportunity to transform into a high-quality gateway to the city and act as a catalyst for the regeneration of the wider area. Proposals within the NEC AAP should therefore make optimal and efficient use of the site.

2.30 The tax payer, through the construction of the Station and the relocation of the water treatment work, has contributed over £300M towards the regeneration of the area, it is imperative that a proper return is returned on this massive investment in the area and if the Mayor's Cam Metro comes to fruition, further tax payers monies will be secured.

2.31 The vision for the residential and commercial quarter is to continue the successful transformation of this part of the city and address a specific need for more housing to serve the private rented sector, thus making a significant contribution to meeting housing needs within Greater Cambridge in a manner that would diversify housing choices within the market. The proposal would also provide additional capacity to support the growing office and R&D market, with associated increase in job creation.

2.32 A high density development would represent efficient use of land in a sustainable location and create the opportunity for people to live close to where they work. A higher density of people also helps to form a critical mass and sense of place to support the range of ancillary retail uses, services and facilities that would come forward alongside the residential and employment accommodation.

2.33 To meet the many aspirations the Council has for the NEC AAP site in terms of zero carbon, quality spaces, biodiversity and green spaces, and better connectivity, the land must be optimised, particularly that around Cambridge North station and at the residential and commercial quarter. This area can support the regeneration of the wider site, the investment made in delivering the Cambridgeshire Guided Bus and potentially the new Cambridgeshire Autonomous Metro (CAM) system.

2.34 The Site is bounded by the railway line to the east, the A14 to the north, the Cambridge Science Park to the west and the suburban Chesterton to the south. The City Centre is some 3.5km from the site. This physical context presents an opportunity to investigate heights and densities which might not be supported in other locations in Cambridge: taller buildings would have no impact on any existing residential properties with regard to sunlight and daylight but could;

- Make optimal and efficient use of the capacity of the site and release significant development pressure from the historic core of the City;
- Optimise the effectiveness of substantial investment in public transport infrastructure and mobility corridors in terms of improved and more sustainable mobility choices and enhanced opportunities and choices in access to housing, jobs, community and social infrastructure;
- Create an opportunity to define the north east corner of the City with striking buildings visible from the A14;
- Support the additional uses and amenities that will make this a self-supporting district; and
- Assist in reinforcing and contributing to a sense of place, such as indicating the main centres of activity, important street junctions, public spaces and transport interchanges. In this manner increased building height is a key factor in assisting modern placemaking and improving the overall quality of our urban environments.

2.35 There is a clear demand for additional housing in Cambridge of a type and tenure that is affordable to the young professional households that make-up a considerable proportion of the population. These are people who often do not meet the criteria for social rented housing but cannot afford to buy their own home. The private rented sector can provide such accommodation.

2.36 The Cambridge private rented sector is quite unique with a population profile characterised by young adults principally living as couples with no dependent children. Contrary to popular opinion, the private rented sector is not dominated by all-student households, which account for only 7.5% of private rented households, as most students live in dedicated communal establishments. Rather, economic activity and employment rates are particularly high in the private rented sector in Cambridge with many working in financial, real estate, professional and administrative activities. Many are in professional or other senior occupations, despite the young age profile.

2.37 There is also a lack of Grade A office space in Cambridge. For the R&D and business services sector, the location decisional drivers are access and ability to recruit the right skill sets. Land at Cambridge North provides this, but the lack of available space and lack of development pipeline puts that resilience at risk and could undermine the growth of the R&D sector. Developing Land at Cambridge North can help address the demand and supply imbalance for quality office stock by bringing forward Grade A space in close proximity to the new transport hub.

2.38 The proposed residential and commercial quarter at Cambridge North is capable of delivering a well-designed, high quality development that would make efficient use of a brownfield site in a highly sustainable location. The site's proximity to Cambridge North railway station, the Cambridge Guided Busway (CGB), frequent local buses (the Citi 2), the Park and Rides services, good cycle and pedestrian connectively to Cambridge City Centre and the cycle network in general also enables opportunities to promote sustainable transport modes.

Responding to the Four Big Themes

Climate Change

2.39 The two Councils and the County Council have committed to achieve net zero carbon by 2050. In order to meet this challenge, the Local Plan will need to plan for low-carbon lifestyles and encourage low carbon activities and alternatives to private car use.

2.40 The Local Plan will also need to promote highly sustainable patterns for growth, such as densification of underused brownfield sites like Land at Cambridge north, that enables travel by low-carbon modes thus reducing car use to ease congestion and reduce airborne pollutants. The same measure offers opportunities to promote active travel choices (walking, cycling) to enhance health and wellbeing.

2.41 The Site has good public transport connectively, the CGB, frequent local buses (the Citi 2) and Park and Rides services, a mainline railway station and good cycle and pedestrian connectively to Cambridge City Centre and the cycle network in general. The Site can therefore support a low car parking strategy due to the abundance of other non-car mode options available. There are also significant opportunities to further enhance non-car modes of transport and to increase the number of 'internal trips'. As such, there are significant opportunities to build a community where people can live and work, commuting by foot or bike or public transport within the NEC AAP area and surrounding urban area.

2.42 Furthermore, there are emerging strategic schemes, such as the Cambridgeshire Autonomous Metro (CAM) which will provide a high frequency metro services between the Site and surrounding employment hubs and high-tech clusters of Greater Cambridge.

2.43 A number of climate change mitigation and adaptation measures could also be incorporated in to redevelopment proposals for the Site, such as:

- Passive design measures which lower the cooling requirement and have shorter lifecycles, such as solar shading and high fabric performance;
- Improvements to water efficiency, such as water efficient fittings and metering and systems which recover water;
- Design measures to minimise waste volume as far as possible, through the careful selection of materials and the use of techniques such as off-site and modern methods of construction, material consumption, waste volumes, and product quality;
- Improvements to flood resilience through incorporation of a range of future climate scenarios that better manage the water runoff into the wider city drainage system. Specifically, there is opportunity to explore the integration of measures such as green or blue roofs and sustainable drainage systems;
- Green infrastructure to offer greater resilience to a warmer and drier climate than currently exists and to provide broader ecosystem services such as forming part of a sustainable drainage system.

Biodiversity and Green Spaces

2.44 Both Councils have declared biodiversity emergencies and, as members of the Natural Cambridgeshire Local Nature Partnership, the Councils support the Partnership's vision to double the area of rich wildlife habitats and natural greenspaces within Cambridgeshire and Peterborough.

2.45 Brookgate Land Limited recognise the importance of improving the natural environment and Land at Cambridge North has the potential to provide areas of high quality public realm which recognises the very different character and functionality of public open space around a major transport interchange and its hinterland.

2.46 The proposed residential and commercial quarters at Land at Cambridge North can deliver a successful urban scheme where, despite public open space being limited in terms of quantum can still deliver spaces of high quality, providing green spaces to relax and socialise. Indeed, small intimate spaces often create the most successful urban experiences. New areas of green infrastructure also provide opportunities to mitigate against climate change, through creating resilient new habitats. Strategic off-site opportunities also offer the opportunity to significantly increase biodiversity other than providing site specific biodiversity improvements.

Wellbeing and Social Inclusion

2.47 Cambridge City Council has an Anti-Poverty Strategy which includes an action plan. This identified that, while the Cambridge economy continues to thrive, there are high levels of income inequality in the city. Cambridge City Council also has an Air Quality Action Plan 2018-2023 and sets out Cambridge City Council's priority actions for improving areas of poor air quality in the city and maintaining a good level of air quality in a growing city.

2.48 Redevelopment of the proposed residential and commercial quarters at Land at Cambridge North Phase has the potential to achieve 'good growth' that promotes wellbeing and social inclusion, as outlined below. These benefits also serve to reinforce the potential of the site for densification:

- Securing improvements in air quality through promotion of a car-free development thus reducing car use to ease congestion and reducing airborne pollutants;
- Encouraging healthy lifestyles through provision of residential and employment opportunities in a highly accessible location by low-carbon modes, thus encouraging active travel;
- Proximity to a range of shops and services which offer healthy eating choices;
- Proximity to local services and amenities bringing opportunities for social interaction and community development. Particularly important given a large number of potential employees will not likely be resident in Cambridge and have established local networks;
- Opportunities for new build design to provide all-electric heating and hot water systems to avoid the on-site combustion of fossil fuels and incorporate passive design to support indoor air quality, improved acoustic performance and adequate levels of daylight;
- Creation of a safe and inclusive community through provision of a wide range of jobs; and
- Creation of high quality buildings and public realm that offer natural sociability, interaction and access to nature.

Great Places

2.49 The proposed residential and commercial quarters at Land at Cambridge North have the potential to create a scheme of high design quality that would make a significant contribution to the emerging city district at Cambridge North. A residential-led mixed use scheme of high density would generate the critical mass that generate exciting new places.

2.50 The Site also provides the following significant economic, social and environmental benefits:

- The opportunity to deliver residential and employment to help meet the needs of Cambridge;
- Supporting the local economy and community, including local shops and services;
- Development in a sustainable travel location: high (and improving) public transport accessibility; cycling accessibility to transport interchanges and Cambridge;
- Development that brings health and wellbeing benefits to its residents and the wider community through:
    - high quality design;
    - new and improved public realm which offers mental and physical wellbeing benefits;
    - opportunity to travel sustainably helping to tackle air pollution as well as bring physical benefits;
- Helping to maximise the benefits arising from major investment in the station interchange associated with sustainable transport and active travel; and
- A development partner who wishes to work the community in order to shape a proposal which meets the needs of and can provide wider benefits to the city.

The Emerging Proposals

2.51 The emerging proposals for the next phase are for a residential and commercial quarter; a residential mixed-use development providing of between 600- 900 BTR homes, and between 60,000 – 90,000 sq m of commercial buildings, with supporting amenity uses. It is probable that the scheme would come forward as two concurrent applications for the residential and commercial elements respectively. The intention is to submit the application/s in Autumn 2020.

This will dovetail with the initial spatial planning work the design team has worked up in conjunction with the LPA.

2.52 Brookgate Land Limited are in the process of preparing a series of technical reports to support the forthcoming applications. In particular, they have commissioned an Odour Report to review the potential impacts of the CWRC assuming it remains in its current location. This report also responds to the Council's own Odournet Report (October 2018). The Arup Odour Report is included at **Appendix 3**.

2.53 The Arup Odour Report concluded that overall the range of evidence available from all the various reported modelling studies, as well as the Arup study, indicate that odour levels on the proposed development site would be below the levels generally considered to have a low risk of adverse odour impacts. The report was based on a further, more detailed odour analysis of the potential for odours at the development site at Cambridge North in response to the Odournet report. Anglian Water collaborated with Arup in terms of inputting into the report and agreed with the methodology adopted within the report.

2.54 The conclusions of the Arup Odour Report are as follows:

> *"A qualitative Source Pathway Receptor assessment concludes that the proposed development site would have a Low to Moderate risk of adverse odour impacts. This is because the development site is more than 400-800m from the more odorous parts of CWRC meaning odours which allows for dispersion and hence dilution of the odours released.*
>
> *Overall the range of evidence available from all the various reported modelling studies and this study indicate that odour levels on the proposed development site would be below the levels generally considered to have a low risk of adverse odour impacts. The only exception is the Odournet study which appears to have made some very pessimistic assumptions and the results can only be replicated by nearly doubling the measured odour emission rates on site.*
>
> *The evidence from modelling studies is further supported by the evidence form the Source, Pathway, Receptor qualitative approach and the sensory assessments. Odour complaints are received at a frequency of once a year (and some are received in areas where all studies would suggest that there is a risk of adverse odour impacts) and the evidence from sniff testing is consistent with the modelling studies undertaken by Arup, Anglian Water and CERC"*

2.55 A number of reports have been commissioned on the potential for odour in connection with the CWRC, all of which have reached consistent findings as the Arup Odour Report detailed above, with the exception of the Odournet Report which has far higher readings.

2.56 The evidence from these reports collectively is clear and this allows the LPA to confidently take informed decisions.

3.0 General

Question 4. Do you agree that planning to 2040 is an appropriate date in the future to plan for? Please choose from the following options:

Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree

If not, what would be a more appropriate date and why?

3.1 Agree.

3.2 The proposed Local Plan period up to 2040 is considered appropriate and to accord with the requirements set out within the NPPF for local authorities to identify a sufficient supply and mix of sites between years 1-15 of the plan (Para 67).

4.0 Themes

Question 6. Do you agree with the potential big themes for the Local Plan?

4.1 Agree.

4.2 The four big themes for the Local Plan are considered suitable and all are considered to be important in the consideration of the spatial distribution of growth in the district, and for the determination of planning applications. The four big themes will generate a new way of planning, this may require a different way to make decisions; to allow other impacts to happen in order to achieve these four priorities. The Local Plan policy framework will need to allow for a clear planning balance to take place to assess and prioritise impacts.

Question 7. How do you think we should prioritise these big themes? Rank the options below 1-4 (1-Most Preferred 4-Least Preferred)

4.3 The four big themes are all considered to be important aspects to achieving positive development. All four themes should be used to inform the spatial strategy within the Local Plan in terms of distributing growth and determining planning applications to deliver growth. It is therefore not considered necessary to rank the options in order of preference.

Theme 1 Climate Change

Question 8. How should the Local Plan help us achieve net zero carbon by 2050?

4.4 The increased focus on climate change is welcomed. Climate change policy and good practice is changing quickly, and the plan will need to build in suitable flexibility to accommodate these changes within the lifetime of the plan. Climate change scenarios predict extensive changes by 2050, much of which is dependent on government and human action so there is substantial uncertainty over outcomes.

4.5 A needlessly stringent policy may inadvertently impede progress towards later years in the plan, or undermine results by not allowing for site-specific refinement. For example, policy for electric vehicle charging points should be sufficiently flexible to accommodate that quickly changing technology, as well the current grid challenges in implemented EV charging places. Energy policies should include flexibility for changing legislation, and technology, as well as the opportunity to refine a plan-wide policy for site specifics. As the Zero Carbon Futures Symposium Report (2019) submitted within the evidence base notes on page 10: where targets are too limited, and without consideration of project contexts, policy can drive dysfunctional behaviour such as photovoltaic solar panels being installed on North facing roofs merely to achieve policy compliance not to produce effective carbon reductions.

4.6 Allowing for changing technologies and approaches should also help with viability as technology and approaches improve and are more widely adopted, thereby reducing costs. Escalating targets and policies may be able to accommodate these changes, while providing clarity to developers on the costs of development over time.

4.7 The local plan Sustainability Appraisal (SA) should address variable climate change scenarios, as we would expect that different climate changes scenarios will be of interest at examination.

Lack of rigorous assessment of these scenarios in the SA could lead to the plan being found unsound.

Question 9. How do you think we should be reducing our impact on the climate? Have we missed any key actions?

4.8 Greater Cambridge is a leading local authority on climate change policy, such as through the early declaration of a climate change emergency and also through the newly adopted Sustainable Development SPD. This leadership should continue, as it is central to the sustainable development of Cambridge, leading to better development for humans, the environment, and for economic development. It should be borne in mind that Cambridge's knowledge economy increasingly demands high sustainability standards: sustainability, health and wellbeing, with climate change at the heart, is a key part of continuing Cambridge's economic development. This should remain a priority as part of a policy framework the recognises climate change as a key part of sustainable development across social, environmental and economic objectives. The planning process is taking too long to bring key brownfield sites forward; the draft AAP was first consulted on in 2014. The merits of early developments on this site needs to be clearly recognised.

Question 10. Do you think we should require extra climate adaptation and resilience features to new developments?

4.9 A policy approach with multiple options for delivering net zero carbon is likely to be most effective in delivering development, as well as carbon neutrality. A multi-pronged approach should allow different solutions for different developments, reflecting context. For example, for some developments, Passivhaus energy standards may be achievable (going well above and beyond minimums set out in the Building Regulations), but for others, Building Regulations may need to be followed but an offset solution, such as a green bond or offset fund, could be used to achieve a net carbon reduction. Possible options need to be worked up in more detail as the Plan progresses and must build in flexibility.

Question 11. Are there any other things we should be doing to adapt to climate change? We want to hear your ideas!

4.10 The Local Plan should form a flexible policy framework, so as not to stifle the benefits of new technology or modern methods of construction.

Theme 2 Biodiversity and Green Spaces

Question 12. How should the Local Plan help us improve the natural environment?

4.11 This Local Plan must deliver effective policy which protects and enhances natural capital. We support delivery of net gain for new development. Such policy must be flexible enough to enable creative and cost-effective solutions for the delivery of net gain and support the Vision for the Natural Future of Cambridgeshire in 2050 as outlined by Natural Cambridgeshire and affiliated organisations. An off-site net gain solution should be clearly allowed for by policy. While it is a Local Plan priority as a part of one of the four big themes, the Local Plan policy must allow for a planning judgement and balanced decision to allow for site and development specific issues to be taken into account.

Question 13. How do you think we should improve the green space network?

4.12 This should come through from an up to date base assessment of Greater Cambridge assets, which leads to a Local Plan wide (and beyond) strategy. Development proposals can then be shaped around the identified priorities. As part of a policy framework that allows for off-site mitigation and off-site net gain enhancements can be used to improve the wider green space network.

Question 14. How do we achieve biodiversity net gain through new developments?

4.13 The new Local Plan must ensure that policy in this matter is sufficiently flexible to accommodate the required biodiversity net gain in the most effective and efficient way for each development, with both on-site and off-site solutions possible. Strategic off-site opportunities offer the opportunity to significantly increase biodiversity other than providing site specific biodiversity improvements.

Question 15. Do you agree that we should aim to increase tree cover across the area?

4.14 Yes. With the right trees, in the right areas. A policy framework to seek tree cover increase, but allows for a planning balance within decision-making to enable the benefits and impacts of each development to be assessed.

4.15 This could be part of an on-site/off-site solution, which could generate notable s106 funds to achieve significant, meaningful and long-term planted and ecological areas. Ecological outcomes rather than an unconditional focus on native species should be considered in new planting.

Theme 3 Wellbeing and Social Inclusion

Question 16. How should the Local Plan help us achieve 'good growth' that promotes wellbeing and social inclusion?

4.16 The Local plan should include a spatial strategy that connects homes with jobs; good quality public transport; facilities/services and high-quality open spaces. Policies should also highlight wellbeing and social inclusion as a key priority for new developments.

4.17 Good growth that promotes wellbeing (including health) should be inclusive and include anti-poverty measures including:

- Energy efficient homes and employment space that deliver low energy and water bills;
- Promotion of commercial development and job creation that offers the Living Wage and opportunities for those on lower incomes to increase wages to easily access jobs;
- Allow for a wide range of social infrastructure and open space in new developments that provide pathways to free (i.e. no charge to the user) opportunities for improved health outcomes;
- Promotion of low cost housing proportionate to income in the area; and
- Promotion of 'fully accessible' social housing, within active travel of employment.

Question 17. How do you think our plan could help enable communities to shape new development proposals?

4.18 The Local Plan could help enable communities to shape new development proposals through creating policies and procedures that encourage meaningful consultation and require developers to demonstrate how schemes have been influenced by local communities.

4.19 Community engagement should be sought during the design process, during construction and through opportunities to influence the scheme and /or be engaged in its management and maintenance after completion (where relevant), particularly in circumstances where unforeseen consequences emerge.

4.20 Brookgate Land Limited is committed to providing a positive legacy from the development that it promotes, and this can be achieved from meaningful engagement with the local community to gain their input into the design of the proposed development, including the site layout and provision of specific local infrastructure or contributions towards this.

Question 18. How do you think we can make sure that we achieve socially inclusive communities when planning new development?

4.21 First and foremost, the Local Plan can achieve socially inclusive communities when planning new development by forming a spatial strategy that ensures that new development is accessible or can be made accessible. Providing everyone with the opportunity to walk, bus and cycle to jobs, schools, shops, services and social activities will be vital.

Question 19. How do you think new developments should support healthy lifestyles?

4.22 New developments such as the proposed high density mixed use redevelopment of the Travis Perkins site should support healthy lifestyles by creating a spatial strategy that can support connected spaces where people do not have to rely on the private car for their daily routine of school, work, shopping and leisure. Enabling active lifestyles and opportunities for social interaction is a priority.

4.23 The Local Plan should provide open space within developments where possible, alongside a policy framework to allow for off-site enhancements where appropriate, particularly when they can improve provision for existing communities. Standards within policies that determine the quantity and quality of provision should reflect an evidence-based assessment of need and benefits delivered.

4.24 A further measure to ensure new developments should support healthy lifestyles is for them to consider the needs of all age ranges and abilities in the detailed design of open spaces and public realm. New developments should also encourage healthy eating choices through the provision of healthy options and minimising/preventing fast food outlets.

Question 20. How do you think we should achieve improvements in air quality?

4.25 Improvements in air quality should be achieved principally through the reduced use of polluting vehicles by:

- Locating development, particularly schools, places of work and other facilities that have a high footfall, where there is good access to active travel and affordable, frequent, reliable and high quality public transport options;
- Better cycle lanes, parking and cycle security – achieved by developments directly and through a coordinated s106 infrastructure programme;
- Reducing the volume of HGV movements in the city;
- Encouraging the use of less polluting vehicles, particularly during peak hours when emissions from stationary traffic makes conditions for pedestrians and cyclists and other vulnerable groups particularly bad; and
- Tree planting along road frontages: species selected for their pollution absorbing properties.

Theme 4 Great Places

Question 21. How should the Local Plan protect our heritage and ensure new development is well designed?

4.26 The Local Plan should include for a policy framework that sets out a positive strategy for the conservation and enjoyment of the historic environment. New development within or in proximity to heritage assets can be appropriate and make a positive contribution to local character and distinctiveness. This is supported by the NPPF (paragraph 185).

Question 22. How do you think we should protect, enhance and adapt our historic buildings and landscapes?

4.27 New development can provide opportunities for improvements in the quality of the historic environment. For example, the setting of heritage assets often has elements that detract from the significance of the asset. However, it will be important for the Local Plan to balance heritage protection with the demands of growth and proposals affecting heritage assets should continue to be required to include for an assessment of significance of any heritage assets affected.

Question 23. How do you think we could ensure that new development is as well-designed as possible?

4.28 'Place-making' – creating and sustaining a positive and distinctive character in an area – is important to the economic success of the Greater Cambridge area, as identified by the CPIER. This is also supported by the NPPF (paragraph 124) which confirms that good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities.

4.29 The NPPF continues by advising that plans should set out a clear design vision and expectations and design policies should be developed with local communities so they reflect local aspirations. To provide maximum clarity about design expectations at an early stage, plans or SPDs should use visual tools such as design guides and codes. The Cambridgeshire Quality Charter for Growth sets out core principles of the level of quality to be expected in new developments in Cambridgeshire and the four 'C's' of Community, Connectivity, Climate and Character align well with the four big themes of the emerging Local Plan. This forms a good basis to set out a design vision for the new Local Plan.

5.0 Jobs / Economy

Question 24. How important do you think continuing economic growth is for the next Local Plan?

5.1 As referred to in Section 2 of these representations, National Planning Policy confirms "*Significant weight should be placed on the need to support economic growth and productivity, taking into account both local business needs and wider opportunities for development"* (NPPF, paragraph 80). The approach taken should allow each area to build on its strengths, counter any weaknesses and address the challenges of the future.

5.2 Cambridge's hi-technology clusters, particularly in AI, bio-tech and agri-tech are recognised in the UK Industrial Strategy as an essential element of the UK economy to support *"…towns such as MK, Oxford and Cambridge* (that) *have been hot spots for job creation. We must promote growth through fostering clusters and connectivity across cities, towns and surrounding areas."*

5.3 Growth relies on increases in employment and productivity and the Cambridge and Peterborough Independent Economic Review (CPIER) emphasises the need for productivity growth in this region as employment rates are so high. Economic growth is therefore essential for the next Local Plan. As part of the devolution contract to Cambridgeshire and Peterborough is a commitment to doubling the economic output of the area (Gross Value Added) over 25 years. This is a challenging target and needs to factor at the heart of the Plan.

Question 25. What kind of business and industrial space do you think is most needed in the area?

5.4 A wide variety of business and industrial space is most needed in Greater Cambridge, in terms of location, size, function and price, in order to support the growth of the economy, offering choice to meet an occupier's individual needs:

> "*The requirements for physical space, like finance, have stages. What a business needs in its start-up phase is different to its needs as it matures and grows. It is vital, if an innovation ecosystem is to be effective for there to be variety and availability at every stage*[1]*.*

5.5 Flexible commercial space in urban supports the growth of local business and strengthens opportunities for local supply chains to engage in the growth industries of the region. Local supply chains are recognised by the UK Government as a means of delivering 'clean growth' (UK Industrial Strategy) as they contribute to the Strategy's mission to halve energy use in new buildings, partly by facilitation of local supply chains.

5.6 The Science and Technology sector is the engine of the Cambridge Phenomenon that has driven the economy and it will remain an important part of the local economy and job market. Alongside, it is important to have all types of commercial space to provide for a wide range of job opportunities and to serve Greater Cambridge at close quarters to not overly rely on long-distance travel to service the area with goods and services. Further prime office floorspace in

[1] Cambridgeshire and Peterborough Industrial Strategy 2019 p 41

high quality developments is also needed to consolidate and expand the world class facilities which have recently put CB1 on the international property investment map.

5.7 All new employment space should be located and built to maximise the health and wellbeing of employees and visitors. Healthy buildings in locations that reduce commute times and improve the sleep and wellbeing of its occupants contribute significantly to their productivity. Improving productivity is a primary route through which the Greater Cambridgeshire economic expansion objectives of doubling GVA and inclusive growth will be achieved.

> "*If workers can be more productive, they can bring home more take home pay, which will flow into the local economy. And they will be able to enjoy a higher standard of life. It is this, before anything else, which needs to be looked at to create an inclusive economic future*." CPIER p38

Question 26. Do you think we should be protecting existing business and industrial space?

5.8 A broad range of employment opportunities accessible by active modes of transport (including public transport) needs to be maintained in urban and rural areas to ensure local jobs are available. All existing space and allocations should be assessed to understand their suitability for employment uses in the current climate of energy use reduction, the need for local employment, access for the workforce by public transport or active means of travel, which locations can deliver the highest health and wellbeing for workers and surrounding people.

Question 27. How should we balance supporting our knowledge intensive sectors, with creating a wide range of different jobs? What kind of jobs would you like to see created in the area?

5.9 Whilst the focus of Cambridge is the Science and Technology sector as the driving force of the economy, there is a requirement for a range of job opportunities, in urban and more rural areas. The Local Plan policy framework needs to provide for a full range of opportunities; as planned allocations and windfall employment opportunities.

5.10 The CPIER notes a missed opportunity to supply AI, science and technology and bio-medical clusters from within the region: 10.8% of supplies come from within the company's local area (30mile radius) while 27.8% came from overseas[2]. Growing these local supply chains, particularly the high value ones would help disperse the economic benefits and provide a wide range of different jobs. Availability of suitable sites and premises in excellent locations outside of Cambridge is a key factor in spreading the economic growth.

5.11 The redevelopment of the commercial and residential for a high density properly mixed-use development which offers a healthy working environment and Build to Rent housing would be welcomed. The delivery of a high quality public realm which provides both recreational space and efficient management of pedestrian and cycle through traffic is essential in these areas.

[2] CPIER p54

Question 28. In providing for a range of employment space, are there particular locations we should be focusing on? Are there specific locations important for different types of business or industry?

5.12 The UK industrial Strategy advocates focusing on our strengths, "*fostering clusters and connectivity across cities, towns and surrounding areas*" [3] Sites which support these clusters are necessary and could be urban, edge of town or rural.

5.13 Locations with high levels of public transport access should be identified for businesses with high employment densities. This would include sites within walking distance of train stations, travel hubs and along transport corridors.

> "*by ensuring good quality public transport is in place before development, the number of those new residents who will use the transport is maximised. This is also likely to be the best way to stretch some of the high-value businesses based within and around Cambridge out into wider Cambridgeshire and Peterborough. These companies will not want to be distant from the city, but these clusters could 'grow' out along the transportation links, providing connection to other market towns*." [4]

5.14 Taller prime office buildings could locate at Cambridge's railway stations to focus development at transport hubs; keeping the city compact, but supporting the demand for high quality office space, particularly that arising from knowledge intensive (KI), especially artificial intelligence firms around Cambridge Central station. This supports CPIERs third key recommendation: "*Ensuring that Cambridge continues to deliver for KI businesses should be considered a nationally strategic priority"*.

5.15 The cluster effect is well-evidenced in Cambridgeshire and an opportunity exists for Greater Cambridge to encourage the forces of agglomeration through promotion of sites around existing groups of same-sector companies. This is certainly the case for the Science and Technology Sector. A spatial strategy to provide for a range of commercial and job opportunities should be informed by the cluster approach, but not at the expense of unduly restricting employment opportunities across the Plan area, particularly to transport corridors.

5.16 Non-knowledge intensive companies tend to be more footloose and typically locate where premises are provided rather than through bespoke development, while some companies expand from humbler often rural beginnings in converted buildings. To enable this growth dynamic employment locations in settlements of all sizes and classification should be allocated or be permissible, with larger concentrations of floorspace in areas with better public transport and access to active modes of travel. CPIER supports this position noting that deeper networks on smaller clusters on the periphery of Cambridge could help spread the 'Cambridge effect'.

Question 29. How flexible should we be about the uses we allow in our city, town, district, local and village centres?

5.17 An overly prescriptive policy framework can harm the viability and vitality of centres. A modern, responsive policy approach is welcomed to allow for a wider range of services and facilities. A

[3] UK Industrial Strategy 2017 p18
[4] CPIER p41

flexible approach to the density and heights of development that will be provided on sustainable sites such as Land at Cambridge North is welcomed.

6.0 Homes

Question 31. How should the Local Plan help to meet our needs for the amount and types of new homes?

6.1 There should be flexibility within the Local Plan to respond to changing housing needs over the Local Plan period. It is important to identify a baseline housing need but there should be scope for further development to come forward if it meets a particular housing need. This would support the Government's objective of significantly boosting the supply of homes to ensure that a sufficient amount and variety of land can come forward where it is needed and that the needs of groups with specific housing requirements are addressed (NPPF Para. 59).

6.2 There is an identified need for Build to Rent housing in Cambridge. The redevelopment of Land at Cambridge North offers an opportunity to provide a significant amount of rented accommodation in a highly sustainable location, making the best possible use of a brownfield site that is already allocated for residential development.

Question 32. Do you think we should provide for a higher number of homes than the minimum required by government, to provide flexibility to support the growing economy?

6.3 To support the Government's objective of significantly boosting the supply of homes, a sufficient amount and variety of land needs to be identified to meeting housing needs within the Joint Local Plan area. The Cambridge and Peterborough Independent Economic Review (CPIER) (September 2018) suggests that higher housing target numbers are likely to be needed in Cambridgeshire if the potential for higher growth in employment is to be met.

6.4 Housing requirements are minimums, not maximums to stay under at all costs. There is a well-evidenced affordability problem in Greater Cambridge; a greater supply of homes will be part of the solution. "*Too many of the people working in Cambridge have commutes that are difficult, long and growing: not out of choice, but necessity due to high housing costs*."[5]

Question 33. What kind of housing do you think we should provide?

6.5 There should be flexibility within the Local Plan to respond to changing housing needs over the Local Plan period. Consideration of individual site circumstances and the circumstances of a local area should be taken into account to determine the appropriate type of housing for development sites. Separate housing needs assessments should be used to inform the appropriate size, type and tenure of housing needed for different sections of the community, as set out within the Greater Cambridge Housing Strategy 2019-2023.

6.6 Flexibility will be key to a successful Local Plan; through market housing, low-cost and affordable housing. Allocations for Build to Rent housing would be welcomed on sites such as Land at Cambridge North.

[5] Cambridgeshire and Peterborough Industrial Strategy 2019, p13

Question 35. How should we ensure a high standard of housing is built in our area?

6.7 Local Plan policies can require a high standard of design for new residential development, leading from Government policy and guidance. Appropriately worded design policies should require a high quality design for new dwellings. This could include sustainable design principles including measures to improve the energy efficiency of new homes, water saving measures, use of efficient insulation material and heating systems, the reduction and recycling of construction materials, provision of appropriate amenity space and accessibility. Policy should not be prescriptive for precisely how it will be accomplished, it can set a policy-level, but developers should be able to use a host of options to achieve the target.

7.0 Infrastructure

Question 37. How should we encourage a shift away from car use and towards more sustainable modes of transport such as public transport, cycling and walking?

7.1 National Planning Policy advises (paragraph 102) that transport issues should be considered from the earliest stages of plan-making and development proposals so that:

a) the potential impacts of development on transport networks can be addressed;

b) opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;

c) opportunities to promote walking, cycling and public transport use are identified and pursued;

d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and

e) patterns of movement, streets, parking and other transport considerations are integral to the design of schemes, and contribute to making high quality places.

7.2 The NPPF continues, at paragraph 103, in stating that the planning system should actively manage patterns of growth in support of the above objectives. "*Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health."*

7.3 It is important for the Local Plan to ensure developments create an environment where accessibility to day to day services and other facilities is easy and a choice of transport modes is available. This will enable the local community to choose the more socially inclusive and sustainable methods of travel. New developments need to be designed so that this can happen from first occupation when habits start to form.

7.4 The proposal is an ideal example of a site that has the opportunities to accommodate additional growth and encourage a shift away from car use and towards more sustainable modes of transport.

8.0 Where to Build?

Question 42. Where should we site new development? Rank the options below 1-6 (1 Most Preferred 6-Least Preferred)

8.1 A combination of approaches to the distribution of spatial growth are considered likely to be necessary in order to allow for sufficient flexibility when considering the locations of new housing and employment development in the Greater Cambridge area.

Question 43. What do you think about densification?

8.2 Densification of existing urban areas has many advantages as outlined in the consultation document:

- Reduces the need to use greenfield land to accommodate growth;
- Living in central, well-connected and vibrant areas is important for many people;
- Reduces the need to travel by car and so makes a positive contribution to addressing climate change;
- Sites growth near to existing centres, which can continue to support their vitality and viability.

8.3 The principle of densification is supported. The NPPF confirms, at paragraph 118, that planning policies should "*give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs"* and *"promote and support the development of under-utilised land and buildings".* The NPPF continues, at paragraph 112, in advising that planning policies should support development that makes efficient use of land, taking into account, *inter alia,* the identified need for different types of housing and other forms of development, and the availability of land suitable for accommodating it.

8.4 As set out above, a combination of approaches for the spatial distribution of growth in the area is likely to be required. However, opportunities for densification of existing urban areas in locations well served by public transport should be maximised wherever possible.

8.5 The early commercial and residential phases identified provides an opportunity to meet an identified need for Build to Rent housing, retirement housing and commercial uses. The Site presents a significant opportunity for redevelopment whilst still being able to respond to local character. The Site is proposed for allocation in the emerging Local Plan on this basis.

Question 48. What do you think about siting development along transport corridors?

8.6 Development is best suited to being located along transport corridors to promote sustainable development and transport issues should be considered from the earliest in accordance with Para. 102 of the NPPF.

8.7 Brookgate support the principle of siting development along transport corridors, in accordance with national planning policy and guidance which encourages development to be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes.

8.8 The proposal is located on a key public transport corridor, next to Cambridge North train station making it a highly sustainable location for growth.

APPENDIX 1
SITE LOCATION PLAN

Do not scale this drawing. Contractor to confirm all dimensions on site, Notify architect immediately of any discrepancies.

Revisions:

00 VF 24.02.20 Drawn

NR Land Boundary

Key Plan

FORMATION ARCHITECTS

[redacted]

Project

Client
B

Drawing Title

B

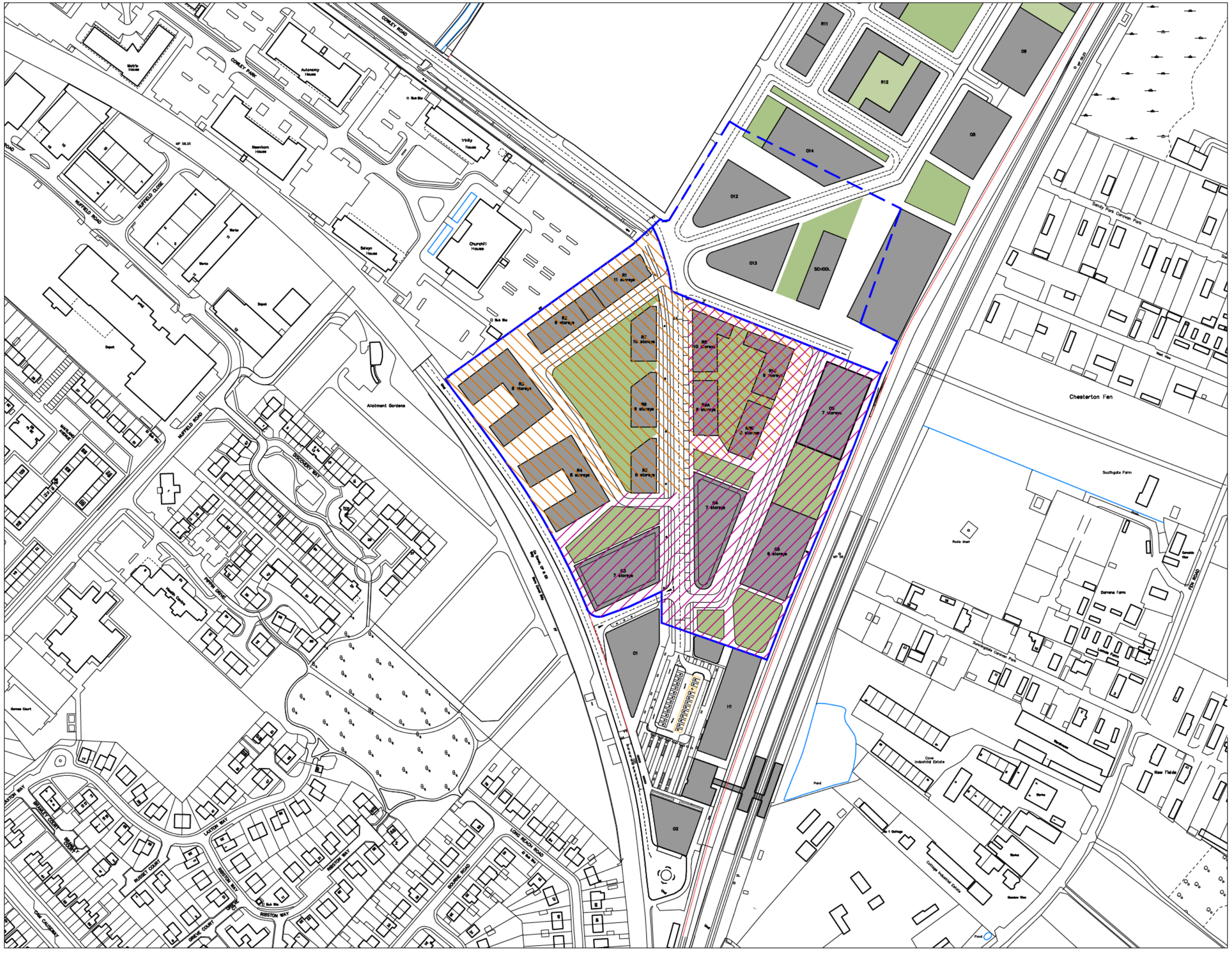
0 20 40 60 ft

Drawn by Checked by Scale

Status

Job number Drawing number Revision

APPENDIX 2
RESIDENTIAL AND COMMERCIAL QUARTER



Do not scale this drawing. Contractor to confirm all dimensions on site. Notify architect immediately of any discrepancies.

Revisions

00 VF 24.02.20 Drawn

Notes:
Initial Commercial Quarter
500-750,000 sqft

Initial Residential Quarter
600 - 900 Homes

Initial Development Phase

Flexible Car Park Position

Residential Use

Commercial Use

Key Plan

FORMATION ARCHITECTS

[redacted]

Project
Cambridge North

Client
Brookgate

Drawing Title
Masterplan
Initial Development Phase Plan

Drawn by	Checked by	Scale
VF	VF	1 2500@A3

Status
For Comment

Job number	Drawing number	Revision
6296	**IDPP-01**	**00**

APPENDIX 3
ARUP ODOUR REPORT

Brookgate Ltd
Cambridge North
Odour Assessment

Issue | 18 September 2019

Job number 267983

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ARUP

Document verification

ARUP

Job title		Cambridge North			**Job number** 267983
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Revision	**Date**	**Filename**	cambridge odour draft 1.docx		
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		Signature			
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Appendices

Appendix A

Anglian Water Odour Emission Data

1 Introduction

Ove Arup and Partners Ltd has been commissioned by Brookgate Ltd to undertake an odour assessment relating to the proposed development of land near to Cambridge Water Recycling Centre (CWRC). Brookgate Ltd are proposing the development of land located at the end of Cowley Road, Cambridge This is a brownfield site of approximately 16 hectares mainly consisting of disused railway sidings. It is proposed to be a mixed use development of residential, office, student housing, hotel and retail uses.

The site is located to the south east of CWRC this is a large sewage works on a large site (most of which is not used for water treatment). Sewage treatment is an inherently odorous process and as a result, planners have to consider whether the development of land nearby would be suitable for uses that would be sensitive to odour. Where it is considered that the levels of odour would result in a sufficient impact on the amenity of the area, then planning could be refused.

The area has been the subject of several odour assessments carried out by various different parties. Those known to have been carried out are:

- An Anglian Water study dated 2012 to assess the odour impact of the existing works;
- An Anglian Water odour study dated March 2014 in connection with proposed changes to the operations and processes at CWRC;
- Various assessments carried out by CERC between 2012 and 2017 mainly in connection with planning applications near to CWRC;
- A previous study carried out by Arup in 2016 for Brookgate Ltd to assess the suitability of the same site for development purposes;
- An assessment carried out by Odournet in 2018; and
- This report.

These reports taken together, provide a comprehensive evidence base to assess the likely odour conditions on the proposed development site. This report therefore:

- Reviews the information in the previous assessments drawing out where these are consistent and highlighting differences in data and approach;
- Presents the results of an odour survey carried out in July 2019;
- Presents new odour modelling information based on the new survey and on emission data derived from all the surveys undertaken at the works;
- Provides an analysis of sensory assessment information using complaints analysis and sniff testing;
- Brings all the evidence together to provide conclusions on the likely odour environment on the proposed development site.

2 The Proposed Development and Surroundings

Brookgate Ltd is proposing a mixed use development on a site located at the end of Cowley Road, Cambridge. This is a brownfield site consisting of approximately 16 hectare of mostly disused railway sidings. It is proposed to be a mixed use development consisting mainly of residential, office, student housing, hotel and retail uses.

The site is located near to the CWRC operated by Anglian Water. There is also a Lafarge aggregate depot to the north of the site. The east of the site is bounded by the Cambridge to Ely railway line. To the west of the site and north of Cowley Road is an industrial / trading estate, to the west of the site and south of Cowley Road is a commercial office development. South of the site is the established residential area of East Chesterton. The site location is shown in Figure 1.

The main processes on CWRC that will result in odour conditions are:

- Inlet works – where sewage enters the works and undergoes preliminary treatment through screening and grit removal;
- Primary settlement – to remove the larger suspended solids from the incoming waste water;
- Activated sludge treatment – where the sewage is aerated and brought into contact with suspended biomass which uses dissolved organic material as a food source as hence removes it from the sewage;
- Secondary settlement – to remove solids from the treated sewage; and
- Sludge treatment – to stabilise and treat the sludge produced by the process (i.e. from primary and secondary settlement) using anaerobic digestion.

Cambridge WRC has been improved recently with an activated sludge plant replacing existing trickling filters located at the north and south east of the site. The trickling filters are still in place but are no longer used.

3 Background

Odour is a mix of volatile chemical compounds or a single compound that triggers a reaction in the olfactory organ, generally at very low concentrations. Any odour, whether considered to be pleasant or unpleasant, can result in a loss of amenity for occupiers of property if it is unwanted. If the odour is perceived sufficiently often above a threshold level, a statutory nuisance can be considered to exist. Odour can therefore be an important issue in planning when a proposal is made to locate sensitive uses close to an existing odorous process. The National Planning Policy Framework in paragraph 120 also notes that "planning decisions should ensure that new development is appropriate for its location" and "the potential sensitivity of the area or proposed development to adverse effects from pollution should be taken into account".

As noted in the Defra Code of Practice on Odour Nuisance from Sewage Treatment Works[1] odour can be characterised by four attributes:

- Concentration: the "amount" of odour present in a sample of air. It can be expressed in terms of parts per million, parts per billion or in mg/m^3 of air for a single odorous compound. More usually a mixture of compounds is present and the concentration of the mixture can be expressed in odour units per cubic metre. Odour concentration is measured in European odour units (ou_E/m^3). The odour concentration at the detection threshold is defined to be 1 ou_E/m^3. If an odour sample has been diluted in an olfactometer by a factor of 10,000 to reach the detection threshold, then the concentration of the original sample is 10,000 odour units;
- Intensity: is the magnitude (strength) of perception of an odour (from faint to strong). Intensity increases as concentration increases but the relationship is logarithmic rather than linear so increases or decreases in concentration of an odour do not always produce a corresponding proportional change in the odour strength as perceived by the human nose;
- Quality/Characteristics: this is a qualitative attribute which is expressed in terms of "descriptors", e.g. "fruity", "almond", "fishy". This can be of use when establishing an odour source from complainants' descriptions; and
- Hedonic tone: this is a judgement of the relative pleasantness or unpleasantness of an odour made by assessors in an odour panel. This provides a method to differentiate odours considered to be pleasant (e.g. bakeries) from those considered to be unpleasant (e.g. rotting fish).

The Defra Odour Guidance for Local Authorities[2] notes that 5 ou_E/m^3 would be a 'faint' odour whilst 10 ou_E/m^3 would be considered a 'distinct' odour. Generally, an average person would be able to recognise the source of an odour at about 3 ou_E/m^3 although this can depend on the relative offensiveness of the odour.

It should be noted that there is no statutory limit in England and Wales for ambient odour concentrations[1], whether set for individual chemical species or for mixtures. However, guideline limits and custom-and-practice standards have been

[1] Defra, Code of Practice on Odour Nuisance from Sewage Treatment Works, 2006
[2] Defra, Odour Guidance for Local Authorities, March 2010

used in some circumstances and there is some experience from other planning decisions.

The IPPC H4 Technical Guidance[3] (known as H4) gives odour criteria that 'indicate the likelihood of unacceptable odour pollution'. H4 proposes a range of criteria that depend on the relative offensiveness of the odour and are based on the 98th percentile of hourly mean odour concentrations. The 98th percentile of hourly means is determined by calculating the odour concentration for every hour of the year at a point, sorting these concentrations into ascending order and then taking the value where 98% of the hourly means have lower predicted concentrations (and therefore 2% of the hourly mean have higher concentrations than the 98th percentile). All odour concentrations reported in this report from this point onwards are based on the 98th percentile of hourly means unless otherwise stated.

For the more unpleasant odours such as processes involving decaying animal remains an odour criterion of 1.5 ou_E/m^3 as a 98th percentile of annual hourly mean concentrations is used. Moderately offensive odours (e.g. fat frying) have a criterion of 3 ou_E/m^3. Less unpleasant odours, for example from baking, have a less stringent standard of 6 ou_E/m^3.

In relation to sewage works, the H4 guidance suggests a level of 1.5 ou_E/m^3 as appropriate for odours from processes involving septic effluent or sludge. However, there is considerable ambiguity over the application of this value as most operations at sewage works do not include septic effluent or sludge, and there is no guidance on the acceptable odour levels originating from these other sources. Many also argue that the guidance is only applicable to processes regulated under the EPR Regulations by the Environment Agency and not for planning purposes. Almost all sewage works are not regulated by the EPR regulations and therefore the guidance does not apply in a formal manner.

3.1 Relevant Planning Appeals

Numerical odour criteria have been applied for planning purposes in the UK on numerous occasions. Such an approach appears to have been first applied at an appeal by Newbiggin-by-the-Sea v Northumbrian Water. The evidence presented to the inquiry details the results of research in Holland undertaken at over 200 sites to assess the relationship between odour and nuisance. The research concluded that a level of 5 ou_E/m^3 was an appropriate indicator of nuisance. It should be noted that this study was based on Dutch odour units that are twice the value of European units so therefore this standard is equivalent to 2.5 ou_E/m^3. However, the background to this study appears to be obscure and there is little information regarding the methods applied or the study sites.

Experience from other more recent planning appeals concerning residential development near sewage works suggest that levels of odour considered to be acceptable are below 5 ou_E/m^3 as a 98th percentile and on two recent occasions a level of 3 ou_E/m^3 has been accepted and most recently a level of 1.5 ou_E/m^3 was used and accepted. These include:

[3] Environment Agency H4 Odour Management, March 2011

- Land at Stoke Road, Leighton Linslade, APP/P0240/A/09/2110667, in this inquiry the Inspector considered that a level of 5 ou_E/m^3 "could be a risk of regular and unacceptable odour annoyance to such an extent that it would detract from the future resident's living conditions";
- Low Road, Cockermouth, Cumbria CA13 0XE, APP/G0908/A/11/2151737, the inspector concluded that "should odours fall within medium offensiveness, rather than low, (i.e. 3 ou_E/m^3) level modelled by the appellant indicates that it would not impinge on the appeal dwellings" (i.e. 3 ou_E/m^3 represented acceptable odour conditions).
- Land between Upthorpe Road and Hepworth Road, Stanton, APP/E3525/A/11/2162837, the inspector concluded that "I consider that a more appropriate threshold in this case is 3 - 5 ou_E/m^3, the level of the DEFRA guidance's "faint odour". He did note that this was for a small sewage works.
- Land at Ashley Road, Middleton, Leicestershire, APP/U2805/A/11/2162384. The Inspector concluded in this case "I believe that it is reasonable to take account of the 1.5 ou_E/m^3 contour map in determining odour impact. In my view areas subject to such concentrations are unlikely to provide a reasonable permanent living environment"

3.2 Other Relevant Guidance/Research

CIWEM has produced a Policy Position Statement[4] on odours which states that for a level of less than $3ou_E/m^3$, that "complaints are unlikely to occur and exposure below this level are unlikely to constitute significant pollution or significant detriment to amenity unless the locality is highly sensitive or the odour highly unpleasant in nature".

UK Water Industry Research (UKWIR)[5] published a study in 2001 that examined modelled odour concentrations and their relationship to complaints around sewage works. This was based on a review of the correlation between reported odour complaints and modelled odour impacts in relation to nine wastewater treatment works in the UK with ongoing odour complaints. The findings of this research indicated the following:

- At modelled exposures of below $5ou_E/m^3$, complaints are relatively rare, at only 3% of the total registered;
- At modelled exposures between 5-$10ou_E/m^3$, a significant proportion of total registered complaints occur; (38% of the total);
- The majority of complaints occur in areas of modelled exposure greater than $10ou_E/m^3$, 59% of the total.

There is some consistency within these sources but it must be recognised that all these studies are based on limited information. As noted in the H4 guidance, any assessment not only has to take into account the applicable standard but also the uncertainty inherent within the assessment.

[4] http://www.ciwem.org/policy-and-international/policy-position-statements/control-of-odour.aspx
[5] UKWIR Odour Control in Wastewater Treatment – A Technical Reference Document Report 01/ww/13/3, 2001.

The concept of an undeveloped buffer zone between an odorous process and sensitive receptors is well established particularly for Waste Water Treatment Works (WWTWs). Many water companies look for a 400m undeveloped zone around their works to allow odours to disperse. In the Defra Code of Practice on Odour Nuisance from Sewage Treatment Works it notes (p16):

> *"individual buffer zones can offer a practical means of preventing the exacerbation of existing problems and the occurrence of new ones".*

The code of practice also notes that a fixed distance for the buffer zone such as 400m is inappropriate and individual site circumstances should be taken into account. Anglian Water have taken such an approach when assessing odour risks around their sites developing their odour encroachment policy. This sets different distances based on the size and some operational features of the works[6].

3.3 IAQM Odour and Planning Guidance

The Institute of Air Quality Management (IAQM) has published guidance[7] for assessing odour impacts (on amenity) for planning purposes. This includes information on various assessment methods to be used to undertaken odour assessments for planning.

The guidance states that for assessing site suitability of proposed development land (e.g. residential) around an existing odour source, the odour effect can be assessed using predictive methods (which may be qualitative or modelling). Atmospheric dispersion modelling should use source terms that have been measured by Dynamic Dilution Olfactometry or if not available, use literature values.

The modelling will provide predicted concentrations (ou_E/m^3) as a 98^{th} percentile of 1-hour means. The guidance recommends that in terms of comparing predicted concentrations with odour assessment criteria, practitioners should observe from the various scientific studies, case law and practical examples of the investigation of odour annoyance cases and then determine an appropriate criterion. This criterion could lie somewhere in the range of 1 to 10 ou_E/m^3 as a 98^{th} percentile of hourly mean odour concentrations.

The guidance considers odour assessment approaches including dispersion modelling where it notes in Section 4.1 that "*Even when the model is a good representation of the real situation and the assumptions and input data are reasonable, the uncertainty for predictions from dispersion modelling can be considerable*". The guidance therefore recommends a "multi-tool" assessment approach – i.e. an assessment approach that uses at least two methods to assess the odour impacts.

[6] Anglian Water, Asset Encroachment Risk Assessment Methodology, 2019, https://www.anglianwater.co.uk/siteassets/developers/development-services/asset-encroachment-risk-assessment-methodology.pdf
[7] IAQM (2018) Guidance on the assessment of odour for planning.

Section 6 of the IAQM guidance provides advice on drawing conclusions from assessment results. It notes that:

"*the conclusion on the overall significance of likely odour effects will usually involve the practitioner drawing together the findings of several different odour assessment tools, each of which will have their own inherent strength and weakness and uncertainti*es";

It notes that this "weight of evidence" approach differs from normal assessment which or usually based on the results of one (usually dispersion modelling) assessment tool. The IAQM guidance advises the when coming to a conclusion regarding the odours impact, the right weight to the results provided by each tool needs to be given based on how well suited it is to the study scenario.

It particularly notes that for an existing activity or process, observations are possible regarding what is happening "on the ground" and that ***considerable weight*** should be placed on the findings of community based tools such as complaints analysis, community surveys and odour diaries. Dispersion modelling can be used as a supporting tool if this provides value to the study.

The IAQM guidance therefore strongly cautions on basing an assessment of an existing process only on the use of dispersion modelling and suggests that observations in the community should carry more weight.

4 Review of Previous Assessments

As noted earlier, there have been several previous assessments of the odour impacts from CWRC, this section reviews those assessments with particularly reference to:

- Input data used;
- Methodology applied;
- Predicted odour levels; and
- Conclusions.

4.1 Anglian Water Assessment 2012

This report[8] assesses the odour impacts of the existing works at the time, there has been a significant upgrade of the works since this this assessment was carried out and therefore the overall results are not representative of the current situation. At the time of the assessment, the sludge treatment processes were also not operational. However, this assessment does provide some emission on measured emission rates from parts of the process that are still operational.

The assessment partly uses measured odour emission rates taken from an odour assessment carried out by CERC in 2012 together with library values taken from the UKWIR report[5]. It is not explicitly stated which odour emission rates were measured but it does provide the odour emission rates used and compares these with the UKWIR emission rates. It has therefore been assumed that where the odours emission rates used differ from those in the UKWIR report, these are measured values.

There are values for:

Inlet works (reception, screen area and storm separation area): 36.4 $ou_E/m^2/s$

Primary settlement tanks: 2.3 $ou_E/m^2/s$

Activated sludge (C works): 2.3 $ou_E/m^2/s$ and

Final settlement tanks: 2.3 $ou_E/m^2/s$.

There are also values (2.3 $ou_E/m^2/s$) for the trickling filters and humus tanks which have since been removed. It is not reported if any seasonal variation was applied to the emissions data.

Given most of the values are the same, these have presumably been derived from measurement in one part of the works and the emission rates have been assumed to be the same for similar odour potential processes.

The report does provide a prediction for the odour concentrations around the site for the process as of 2012 – the predicted levels are shown in Figure 2. These

[8] https://www.cambridge.gov.uk/media/2700/cnfe-aap-io-anglian-water-odour-dispersion-modelling-report-2012.pdf, accessed August 2019

contours were derived using the AERMOD dispersion model and meteorological data from Cambridge collected between 2009 and 2011.

AERMOD is a well established dispersion model that has been widely used in the UK for odour assessment. It was developed on behalf of the United States Environmental Protection Agency (USEPA) and it is accepted as a suitable tool for assessment by the Environment Agency.

4.2 Anglian Water Assessment 2014

This report[9] examines the predicted changes in odour impacts because of the planned changes to the works that would involve decommissioning the percolating filter beds of Stream A and Stream B, along with the associated humus tanks and replacing these processes with a new activated sludge process (known as Stream D), comprising an activated sludge plant and final settlement tanks.

The existing activated sludge plant (known as Stream C) will remain operational in its current form. The preliminary treatment, primary settlement, tertiary treatment and sludge treat processes will not be changed. These changes have now been implemented at CWRC.

This assessment appears to have been based on similar odour emission data as the 2014 report although no emission rates are reported. It also appears to include the sludge treatment centre, this is discussed within the report as being operational although there is no explicit statement that it has been included. It is not reported if any seasonal variation has been applied to the emissions data.

The report details the expectation that the overall odour emission rates from the process will reduce as a result of removing the large area of trickling filters and humus tanks. Anecdotally, during site visits to CWRC, Anglian Water staff have reported that these trickling filters were considered to be quite odorous process at times.

The same dispersion model and meteorological data as used in 2012 were used for the assessment. The predicted odour concentrations are shown in Figure 3 which shows a reduction in odour concentrations compared with the 2012 assessment. This assessment appears to be Anglian Water's most recent assessment of the odour impact from CWRC for the existing processes at the site.

The predicted concentrations on the Chesterton sidings site are largely below 3 ou_E/m^3 with a very small area predicted to be above 3 ou_E/m^3 on the north west of the site.

[9] https://www.cambridge.gov.uk/media/2699/cnfe-aap-io-anglian-water-comparative-odour-potential-assessment-2014.pdf Accessed August 2019

4.3 CERC Assessments

Two further odour assessments of the site have been located on line, both carried out by CERC[10] [11]. Both are based on the same methods and input data and consequently can be treated as the same assessment (albeit examining different site locations).

Both assessments were carried out to assess the suitability of sites nearby for development, one examines Plots 1-21 on Cambridge Science Park and the other looking at air intakes on the Maurice Wilkes Site. The odour emission rates for the survey were based on a survey carried out by H+M Environmental in November 2015. This study was commissioned by Anglian Water. This data was also used in the Arup 2016 study (see Section 4.4 for full details). As the measurements were taken in November, the odour emission rates were multiplied by two before use in the model. The reports do not state if any seasonal variation was carried out. Given that it the winter emission rates were 50% lower, then the absence of seasonal variation would suggest this is a conservative assessment.

The assessment used the ADMS5 dispersion model, this a widely applied model used extensively in the UK and was developed by CERC. It is a similar model to AERMOD although would not be expected to produce identical results. Differences in the predictions between AERMOD and ADMS5 are indicative of some of the uncertainties associated with dispersion models.

Meteorological data was obtained from the Met Office Andrewsfield site for the years 2010 – 2014. This is an unusual choice of site given there are several other monitoring sites closer (Stansted, Bedford, Mildenhall and Cambridge Airport). While the choice of data will affect the detail of the distribution of odour contours it is not likely to make major changes in the predicted levels.

The predicted odour concentrations from these two assessments are shown in Figures 4 and 5. As for the previous Anglian Water assessment, the predicted concentrations on the Chesterton sidings site are largely below 3 ou_E/m^3 with a very small area predicted to be above 3 ou_E/m^3 on the north west of the site.

4.4 Arup 2016 Assessment

Arup carried out an odour assessment in 2016 on behalf of Brookgate Ltd. This used the same odour emission data as the CERC assessments and was provided by Anglian Water from a survey carried out by H+M Environmental. Anglian Water also provided details of the source sizes and operating conditions for input into the model. At Anglian Water's request, the AERMOD model was used for this assessment. The odour emission data used are summarised in Appendix A.

Anglian Water recommended that the emission data provide be multiplied by a factor of two to take into account the fact that it was collected during winter when

[10] CERC, Assessment of the impact from odour from Cambridge Water Recycling Centre on the Maurice Wilkes Site, St Johns Innovation Park, 26 January 2016

[11] CERC, Assessment of the impact of odour from Cambridge Water Recycling Centre on Plots 1 to 21, Cambridge Science Park

levels would be lower. Two scenarios were run, one using the corrected data and assuming the emission rates remained constant all year (a worse case given that it was known emission rates were lower in the winter). The second scenario examined reduced emission rates by 25% in the autumn and spring and 50% in the winter.

Meteorological data was obtained from the Cambridge Airport monitoring site for the years 2010-2014 with missing data taken from Mildenhall. The model was run for each year of data and the worst case result selected in accordance with the IAQM guidance.

The results predicted from the two scenarios are shown in Figures 6 and 7. These results are similar to the CERC assessments (as would be expected given they use similar input data, although the modelling approach is different). Assuming constant summer dour emission rates, a small part of the development site is predicted to have odour concentrations above 1.5 ou_E/m^3 but most of the site is predicted to be below this level. This is consistent with all the other previous assessments reported earlier.

4.5 Odournet 2018 Assessment

Odournet was commissioned by Cambridge City Council to undertake an odour impact assessment of CWRC with the intention of providing information to the Council on ongoing and future planning decisions. They report the scope of their study as:

i. To clarify the current CWRC configuration and operations;

ii. To undertake an odour survey and define odour emission estimates for each of the key elements of the treatment process at CWRC.

iii. To undertake odour dispersion modelling of CWRC under the current operational conditions and assess the extent of potential odour impact risk in the surrounding area.

Their study therefore includes a new odour survey to derive odour emission rates and odour modelling based on the new emission data. The sources included in the model and the odour emission data used are summarised in Appendix B. These are largely the same sources as used in previous assessments but with one significant new source identified, the vents from the gravity belt thickener stack. This was responsible for more than 25% of the odour emissions from the site.

Modelling was carried out using the AERMOD dispersion model and meteorological data for the years 2012-2016 taken from Cambridge Airport with missing data from Mildenhall. The report details that rural dispersion characteristics were selected as a model option. It has been assumed that the rural option mentioned applies to the processing of the meteorological data.

Odournet has applied a seasonal variation to the odour emission rates for processes involved with handling raw sewage, namely:

- Inlet works chambers, detritor and channels;

- Screenings plant and skips;
- Grit skips and dewatering plant;
- Works return channel;
- Distribution chambers;
- Primary settlement tanks; and
- Settled sewage distribution chambers.

The emission rates for these sources have been reduced by a factor of 5 during autumn and winter. Emission rates from other sources were assumed to be constant for the whole year.

For turbulent sources, a multiplier was applied to the emissions rate "*to reflect the elevation in emissions that occurs due to the increase in surface area exposed to the atmosphere*". The turbulence factors used are shown in Table 1.

Table 1 Turbulence Multipliers used by Odournet

Level of Turbulence	**Turbulence Multiplier**
Low	3
Medium	6
High	12
Very High	20

Odournet report that the application of these factors is based on their "*broader experience in the wastewater sector and the findings of research*". Neither these findings nor the research are detailed in the report. Note that the IAQM guidance states that when using library data "*to allow for external verification the full library of emission data should be publicly available*".

Turbulence factors have been applied to the sources detailed in Table 2, the report details the range of factors applied but not exactly how they have been applied and whether they were used to adjust the entire source.

Table 2 Turbulence factors applied to sources

Source	Factor applied
Inlet works, screens, detritor and channels	1-6
Storm weirs and tanks	1-6
Primary treatment distribution chambers	1-3
Primary settlement tanks (weirs)	1-3
Settled sewage distribution chamber	1-6
Secondary treatment distribution/mixing chamber	1-20
Secondary treatment outlet channels	1-20
Secondary digestion tank	1-6

Table 9 of their report provides a useful breakdown of the overall emission rates although these have been adjusted to reflect the frequency of occurrence of each source and are time weighted to reflect when some sources are not operational.

It is reported that the worst case year in 2013 (Although the results for all years are presented), the predicted odour levels for this year are shown in Figure 8. The predicted odours levels are considerably higher than any of the previous assessments, nearly all of the site is predicted to be above 1.5 ou_E/m^3 with portions of the site in the range 6->10 ou_E/m^3.

5 Odour Emission Rates

The previous studies have provided useful information on odour emission rates based on three previous surveys and a range of library data. To provide more information, a further survey was commissioned by Arup in June 2018, this survey was carried out in accordance with BS EN 13725.

5.1 July 2018 Odour Survey Results

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

The reported emission rates from the survey are provided in Table 3 below:

Table 3 Odour Emission Rates Measured by Silsoe Odours July 2019

Sample source	Odour emission rate ($ou_E/m^2/s$) except where **bold** (ou_E/s)
Inlet Reception Chamber	39.55
Inlet Works Channel	30.39
Detritor	14.58
Return Liquor	14.70
Aerobic Zone C	0.19
Anoxic Zone C	0.67
AST Chamber C	1.72
Aeration lane 1, Zone D	1.21
Aeration Lane 2, Zone D	0.83
Anoxic Lane 2, Zone D	2.30
Anoxic Lane 1, Zone D	7.56
FST 1, D Works	0.48
FST 2, C Works	0.32
PST 6	2.79
PST Distribution Chamber 2	11.71
PST 5	5.68
PST Distribution Chamber 1	37.31

PST 3	4.82
PST 2	3.04
Settled Sewage Chamber	40.33
Secondary Digester 2	67.54
Secondary Digestor 1	6.54
Belt Thickener*	**16767**
Centrifuge	**29**
OCU 1	**75**
OCU 2	**914**

These results have been used "as received" in the updated modelling. However, a further review of the range of modelling data available has also been carried out to provide a view of the typical odour emission rates likely at the site. This is described in the following section.

5.2 Review of Odour Emission Data

The data collected in this survey has been compared with that reported in the previous H+M and Odournet assessments. This is shown in Table 4 below.

Table 4 Comparison of odour emission rates

Source description	H+M Survey November 2015	Odournet August 2017	Silsoe Odours July 2019	Input for this modelling study
Inlet works reception chamber	10.2	23	39.55	39.55
Inlet works screen area	8	23		14.6
Inlet works storm separation area	8	23		14.6
Inlet works channels to detritor	7.69	23	30.4	30.4
Detritor	7.69	23	14.6	14.6
Inlet works outlet channel	9	23	14.6	14.6

Returned Liquors channel	7	23	14.7	14.7
Inlet works mixing channel	14.13	23	14.6	14.6
Screenings skip	1	35		1
Grit skip	1.04	25		1
PSTs distribution chamber	6.5	23		6.5
Settled sewage collection chamber	5.82	8	40.3	40.3
Works main sewage pumping station	16.62			16.6
C works ASP distribution chamber	0.42	5		0.4
C works - ASP anoxic zone	0.42	0.2	0.19	0.3
C works - ASP aerobic zone	0.42	0.2	0.67	0.5
C works RAS pumping station	0.42			0.42
C works FSTs distribution chamber	0.42			0.42
D works ASP distribution chamber	12.47	5		12.5
D works - ASP anoxic zone	0.42	22	2.3-7.6	4.9
D works - ASP aerobic zone	0.42	0.2	0.83-1.21	1
D works FSTs distribution chamber	0.42	0.2		0.42
Secondary digesters unaerated	1.5	6	6,5	5.5
Secondary digesters aerated	4.2	0.6	67.5	67.5
Sludge cake storage skips	1.9	6		4

Sludge cake bays	20	6		12
Centrifuges	0.83			0.83
Drum thickeners	4.99			5
Digested sludge centrifuge	0.62			
Primary settlement tanks	8.3	1.1-3.9	2.79, 5.68, 4.82, 3.04	4.1
PSTs distribution chamber	7		11.7, 37.3	18.6
Storm tanks	0.17	8	Not in use	0.2
Settled sewage collection chamber	5.82	8		7
C works final settlement tanks	0.42		0.32	0.37
D works final settlement tanks	0.42		0.48	0.45
OCU Sludge Thickening Plant	25	1		25
OCU Sludge Thickening Plant	10	1		10
SAS Thickening belt vent		***250***		-
Raw sludge thickening building		***144***		
Raw sludge gravity belt thickener vents		***19023***	***16767***	***16767***

The raw sludge gravity belt thickener vent was not identified by Anglian Water in the first survey and is a significant source of odour. Emission rates from this source have been derived from the measured odour concentrations within the building and the estimated volumetric flow through the vents.

One of the secondary digester tanks was not operating during the Odournet survey, hence the low odour emission rate. The D works anoxic zone result from the Odournet survey appears to be high compared with the results from the other anoxic zones and Silsoe survey.

Emissions from the secondary digester tanks are very variable although in the Odournet survey these were not operational. High values can be observed when the tanks are aerated.

Comparing the two summer time surveys with the winter survey carried out by H+M suggests that emissions from processes associated with raw sewage are lower during the winter months but a factor of up to four.

The final column of the table shows the odour emission rates for all sources that were used in the revised modelling reported in Section 6. These have been derived from the Silsoe Odour survey and where sources were not measured, taken from other sources. The sources not measured in the Silsoe Odours survey are relatively small sources in comparison to the site's overall odour emission rate.

The total overall emission rates from the site can be calculated from the source areas and the emission rates. These are reported as follows:

Arup 2016: 47,158 ou_E/s (although then doubled to account for seasonal variation);

Odournet 2018: 72,843 ou_E/s (time weighted average emissions); and

This study: 82,517 ou_E/s (summer time emissions).

Although the data was derived from different surveys and there are inconsistencies between the odour emissions for each source between the surveys, arguably the overall emission rates for the site are relatively consistent between the three surveys after accounting for seasonal factors.

6 Odour modelling

6.1 Dispersion model

The odour modelling has been carried out using the AERMOD dispersion model, the same model used in the earlier Arup study and by both Anglian Water and Odournet.

Dispersion models require as input, details of the emissions sources, meteorological data, information regarding the local terrain and receptor locations. Details of the input data used are provided in the following sections.

6.1.1 Emission sources

The emission sources are the same as used in the previous assessment with the addition of the vent for the belt press thickener building. This vent is mounted a few metres up the side of the building and consequently does not discharge into in an unobstructed location. This was therefore modelled as a volume source with similar dimensions to the building.

Odour emission information used is detailed in Table 4. A map showing the location of the sources in provided in Figure 9.

Three runs were carried out,

- Scenario 1 - uses same seasonal variation as the previous study reducing the odour emission rates by 25% during autumn and spring and 50% in the winter.
- Scenario 2 - as was previously noted in the 2016 report, the application of seasonal variation factors is not an area where there is universal agreement on the approach and usually these are applied only to parts of the works handling raw sewage. A worse case run was therefore undertaken using summer emission rates for the whole year; and
- Scenario 3 – the final run has used the seasonal variation approach used by Odournet applied only to the sources involving raw sewage and the digestion tanks. The emission rates were reduced by 50% during autumn and winter This is considered to be a pessimistic approach, comparing the odour emission rates measured by H+M Environmental (i.e. in autumn/winter) some source reduced by 75%.

6.1.2 Meteorological data

The AERMOD model requires meteorological data and this was obtained from the Cambridge Airport monitoring site with missing data from Mildenhall for the years 2014-18.

The windrose derived from the meteorological data used in this study is shown in Figure 10. This shows the typical situation in the UK with predominant south westerly winds.

The data was processed using the AERMET process, the values used for the required inputs are shown below:

Surface roughness: 0.5m

Bowen ratio: 1.1875

Albedo: 0.24375

6.1.3 Receptor information

Two rectangular grids were used in the modelling, a coarse 250m spaced grid and a finer 50m grid on and around the development site.

6.2 Modelling approach

The AERMOD model was run using each year of meteorological data and the 98th percentile of hourly mean concentration predicted for each year These were examined and the results for the year 2014 identified as the worst case and are reported below.

6.3 Results of odour modelling

6.3.1 Scenario 1 – Seasonal variation as 2016 report

The predicted odour concentrations for this scenario are shown in Figure 11, these results show a similar distribution of odour contours as for the previous 2016 report. The predicted concentrations are slightly highly but most of the proposed development site is below 3ou$_E$/m, the level suggested in the Odournet report above which, odour annoyance may develop.

The predicted levels are considerably lower than those reported by Odournet, even though the overall summer odour emission rates are higher than the Odournet time weighted averages.

6.3.2 Scenario 2 – No seasonal variation

The predicted odour concentrations are shown in Figure 12. This scenario is a very pessimistic approach. The odour survey results show that odour emission rates decrease on parts of the site in the winter and there is common agreement between Arup and Odournet that emission rates from some sources will be lower in winter.

The results are very similar to Scenario 1 which indicates that the highest concentrations that contribution to the 98th percentile are found in summer months when emissions are at their peak.

6.3.3 Scenario 3 – Amended Seasonal Variation

This approach has reduced the odour emission rates only for sources associated with raw sewage or sludge handling during the autumn and winter. These sources have been reduced by a factor of two compared with the summer emission rates. The results are shown in Figure 13

The results show that the results are not sensitive to the assumptions made regarding seasonal variation which indicates that the highest concentrations are found in summer months,

6.4 Verification modelling

Given that there is a large discrepancy between the Odournet findings and this (and all other) study some verification modelling has been carried out to check the findings of this assessment. This has used a simple approach where one area source is used to represent all the emission sources from the site, no seasonal variation was applied. The emission rate was varied until a level was found that produced broadly similar predictions to the Odournet modelling, this was found to be equivalent to 150,000 ou_E/s.

The results are shown in Figure 15. These results are very similar to that predicted by the latest Arup modelling and suggest that the overall emission rate for the site would have to be over 150,000 ou_E/s to result in the same level of odour concentrations predicted by Odournet. This suggests that the Odournet approach is an extremely pessimistic approach, assuming around double the typical summer emissions from the site and is inconsistent with all other studies carried out at the site by Arup, Anglian Water and CERC.

7 Source Pathway Receptor Assessment

As noted earlier, it is now recommended in the IAQM guidance that a second assessment method is also used to assess the odour impacts of the site. Therefore, a second approach has been used following the Source, Receptor, Pathway (SPR) approach. Each of the main odour sources on site has been examined and their potential for odour generation and the type of odour likely to be released assessed and then how these odours may travel to the site of the proposed housing has been considered. Finally, a qualitative appraisal of the potential impacts from each source is determined by professional judgement. The assessment is detailed in Table 5. This approach was used in the previous Arup assessment and has been updated for this report.

Table 5 Source Receptor Pathway Assessment Outcome

Source	Source odour potential	Pathway effectiveness	Receptor	Potential impact
Inlet Works	Handling raw sewage with relatively high odour content Relatively short residence time in sewage system but some potential for septic conditions – some surveys have shown this to be a significant odour source with septic conditions.	Source located at the north east of the sewage works and is located more than 500m from the nearest part of the proposed development site. Parts of the site are more than 750m from this source. No obstruction or channelling of odour releases away from the site. Source is located north east of the receptors – wind from the north west is relatively infrequent Credible route for odour dispersion but sources are relatively distance from the receptors	Residential use – sensitive to odours.	Low-Moderate potential for odour impacts. Source has high odour potential but odours must travel several hundred metres to the proposed development.

Source	Source odour potential	Pathway effectiveness	Receptor	Potential impact
Primary Settlement Tanks	Treating screened raw sewage Total odour emission rates are high in some surveys. Continuous source	Located in the north east of the sewage works site, nearest source is more than 420m north west of the proposed development site. No obstruction or channelling of odour releases away from the site. Source is located north east of the receptors – wind from the north west is relatively infrequent Credible route for odour dispersion although sources are relatively distant from the proposed development site.	Residential use – sensitive to odours.	Low-Moderate potential for odour impacts.

Source	Source odour potential	Pathway effectiveness	Receptor	Potential impact
Activated Sludge Units - C Stream	Treating screened and settled raw sewage Highly aerated environment with little chance of septicity Low odour emission rate measured except under unusual operating conditions Continuous source	Located in the east of the site, the nearest source being approximately 200m north of the closest point on the proposed development site. Source is located north of the receptors – wind from the north has a frequency of approximately 7%. No obstruction or channelling of odour releases away from the site. Credible route for odour dispersion	Residential use – sensitive to odours.	Unlikely to result in significant odour impacts as a result of very low odour emission rate and highly aerated environment leading to less offensive odours.

Source	Source odour potential	Pathway effectiveness	Receptor	Potential impact
Activated Sludge Units - D Stream	Treating screened and settled raw sewage Highly aerated environment with little chance of septicity Low odour emission rate measured except under unusual operating conditions Continuous source	Located in the north east of the site, the nearest source being approximately 330m north of the closest point on the proposed development site. Source is located north of the receptors – wind from the north has a frequency of approximately 7%. No obstruction or channelling of odour releases away from the site. Credible route for odour dispersion but relatively distant from the source.	Residential use – sensitive to odours.	Unlikely to result in significant odour impacts as a result of very low odour emission rate and highly aerated environment leading to less offensive odours.

Source	Source odour potential	Pathway effectiveness	Receptor	Potential impact
Secondary Settlement Tanks	Process handles treated sewage with low organic content, potential for septicity is low. Continuous odour emission source. Measured emission rates are low	Located in the north east and east of the sewage works, C stream tanks are 170m from the proposed development at the nearest point, from the proposed development site. D Stream tanks are more than 300m north, north east of the proposed development at the nearest point. Source is located north, north east of the receptors – wind from the north, north east has a frequency of approximately 5%. No obstruction or channelling of odour releases away from the site. Credible route for odour dispersion	Residential use – sensitive to odours.	Unlikely to result in significant odour impacts as odour emission rates are low and there is a very low potential for septic conditions.

Source	Source odour potential	Pathway effectiveness	Receptor	Potential impact
Sludge Treatment	Processes highly organic material with a high potential for septicity. Processes are enclosed and fitted with odour control units one open vent. Odour concentrations within the building are high. Removal and handling of sludge could result in short term odour emissions Continuous and intermittent odour sources although continuous sources have very low emission rates	Process located in centre of site nearly 400m north west from the nearest point of the proposed development. No obstruction or channelling of odour releases away from the site. Source is located north west of the receptors – wind from the north, west has a frequency of approximately 3-4%. Credible route for odour dispersion	Residential use – sensitive to odours.	Moderate – source with high odour potential but located relatively distant from site and the frequency of winds is relatively low. Sludge handling outside of the processes could give rise to intermittent odour emissions at a higher level with potential for short term impacts.

The outcome of the assessment is consistent with the odour modelling demonstrating that, in typical operations, the likely potential for odour impacts on the proposed development site is low - moderate. The more offensive odours and odorous parts of the process are located on the western side of the works and are relatively distant from the proposed development site. Some intermittent operations on site do have the potential to result in higher odour levels offsite but these impacts will be short and likely to only affect the parts of the development site closest to the sewage works.

8 Observational Assessments

As noted in the IAQM guidance, for existing activities considerable weight should be given to observational assessment findings such as complaints analysis and sniff testing.

8.1 Complaints Analysis

The Odournet report details that there were five odour complaints since the works was upgraded in 2015 until September 2017, i.e. about 2 complaints a year. Where location information available, these complaints were received outside of the area where even the Odournet assessment would suggest complaints were likely.

Cambridge City Council was contacted for updated odour complaints information in August 2019, they reported one further formal complaint on the 24 April 2019 regarding regular bad odours and that that "the perceived odour on that day was the catalyst for the complaint to be made about alleged ongoing odour issues. The complaint log was updated in May 2019 to include two further alleged episodes of bad odour on 13th and 14th May". The location was noted as St John's Innovation Centre, Cowley Road. This is to the east of the site nearest the most odorous process associated with raw sewage.

The time of the odour detection was not noted, the weather conditions on the relevant days are reported to be as follows (although note that the date of the perceived odour may be different to the date it was reported):

24 April 2019: Force 5 – winds from SSE, S, SSW.

13 May 2019: Force 2 – winds from E; and

14 May 2019: Force 2 – winds from E and SE.

The works would therefore be a credible source of the odour for the reported odour in May. However, all the modelling assessments show that this area is subject to much higher odour concentrations that the proposed development site and that the concentrations are in the range 5->10 ou_E/m^3 where complaints are more likely. The assessments by Arup show that the modelled concentrations on the proposed development site are 5->10 times lower than those predicted at the site of these complaints.

8.2 Sniff testing

Sniff testing was carried out on three occasions around the site following the procedures detailed in Appendix 2 of the IAQM guidance. Sniff testing was carried out by staff with a known odour acuity. The sniff testing undertaken and observations were as follows:

3 June 2019 – 12-2pm , Wind speeds 13-15mph WSW. Observations taken at six location on the footpath along the River Cam north of the A14, see Figure 16.

No distinct sewage odour was detected at locations 1, 4 and 6. A sewage smell was detected at location 2, 3 and 5. However, media was being spread on fields west north west of the sniff test locations. The media had an animal slurry odour character which was observed at locations 2 and 3. The odour observed at location 5 had a different character, which could have been sewage from the STW but was not a clearly identifiable odour. This odour was noted for 37% of the time sampling.

23 August 2019, 1.45-3pm, wind speeds 6mph from south, south south westerly. Sniff testing was undertaken at five locations on or near to southern boundary of Milton Park, one location on corner of Cambridge Road on the turning into the aggregate plant, and one location on Cowley Road, see Figure 17.

No sewage odour was detected at any location with the exception of the location on Cowley Road where "Distinct" sewage odours were noted for 20% of the time of sampling. All odour modelling results suggest this location would be likely to experience odour levels that would affect amenity (i.e. above 5 ou_E/m^3).

5 September 2019, 11.10am-1.30pm, wind speeds 11-13 mph from north west/north north west. Sampling was carried out at three locations on Fen Road (points 1,2 and 3 on Figure 18) and three locations on Cowley Road within Cambridge Commercial Park (points 4,5 and 6 on Figure 18).

No distinct sewage odours were detected and any of the three sampling points on Fen Road, "Very Weak/Weak" odours described as burning rubber, exhaust and sewage were noted but as defined in the guidance, there was some doubt regarding their source. "Distinct" sewage odours were detected on Cowley Road at point 6, the closest location to the sewage works. Most of the modelling results suggest that this area would be likely to experience odour levels that could affect amenity (i.e. above 5 ou_E/m^3). No sewage odours were detected at point 5, midway along Cowley Road. Point 4 was near a waste disposal site and "Distinct" odours relating to rotting vegetables and possibly sewage were noted – however, these results were not conclusive given the waste transfer site odours which were a confounding factor.

The sniff testing observations are consistent with the results of the modelling studies with distinct sewage odours being detected in locations where all modelling studies expect concentrations to be at levels likely to affect amenity. However, in areas where all studies (with the exception of the Odournet study) predict odour levels to be below $3ou_E/m^3$, no distinct odours were noted.

While it is not possible to directly compare the results of odour modelling and sniff testing, sniff testing can provide some indication of how well a model is performing. Sniff testing is considered to be a robust assessment method, as detailed the in the IAQM guidance, "*Sniff tests also give an estimate of exposure; this is just expressed in a different way to modelling output*". It is important to note that strong or distinct sewage odours were not detected in any location where all the modelling studies (with the exception of the Odournet study) predict that odour concentrations are below 3 ou_E/m^3.

9 Discussion and Conclusions

Several odour studies have been carried out examining the odour environment around Cambridge WRC. These studies have included three on-site surveys and the use of library odour emission factors to inform dispersion modelling to predict odour concentrations around the site. These studies have been carried out to examine the impact of proposed changes at the works and to inform planning decisions for development near to CWRC. The studies have been carried out by four different parties and the odour surveys by three different laboratories.

These studies have been reviewed and the modelling results from each study compared. Nearly all of these studies result in similar predicted dour levels around the site the concentrations predicted on the proposed development site are in the range 1.5-3.0 ou_E/m^3 on the northern part of the site and less than 1.5 ou_E/m^3 on the southern part of the site. The results vary slightly depending on the assumptions made for seasonal variation of odour emissions but even assuming no variation, most of the development site has predicted odour levels below 3.0 ou_E/m^3 in the north of the site and below 1.5 ou_E/m^3 in the south of the site.

Although some of these studies have used the same source of odour emission data the modelling methods and assumptions used have been different. Other studies have used mainly library odour emission rate data from various sources and the predicted odour levels are at similar levels.

The most recent Arup modelling based on an entirely new odour survey remains largely consistent with these previous studies.

It is evident from comparison of the three odour surveys undertaken, that some processes were not operating in “normal” conditions at the time of the survey and as a result, had higher than expected odour emission rates.

The results from the Odournet study commissioned by Cambridge City Council predict much higher odour concentrations around the site – with levels of up to nearly 10 ou_E/m^3 being predicted on the proposed development site and several existing receptors in the area would be exposed to odour concentrations above 5-10 ou_E/m^3 – a level where complaints would be more likely to occur.

An analysis of odour complaints received suggest that since the works was upgraded 1-2 odour complaints are received a year. These complaints were either received from a location where all studies would predict that odour complaint was more likely or from locations relatively distant from the work where even the most pessimistic assessments so no predict odour concentrations to be at a level more complaints would be expected.

Sniff testing was carried out on three occasions, the results from the testing were largely consistent with the modelling assessments when distinct sewage odours were detected in areas that most of the modelling studies predict concentrations to be above 3 ou_E/m^3 (and usually above 5 ou_E/m^3). Conversely, distinct odours were not detected in locations where all the modelling studies (with the exception of the Odournet study) predict that concentrations are below 3 ou_E/m^3.

A qualitative Source Pathway Receptor assessment concludes that the proposed development site would have a Low to Moderate risk of adverse odour impacts. This is because the development site is more than 400-800m from the more odorous parts of CWRC meaning odours which allows for dispersion and hence dilution of the odours released.

Overall the range of evidence available from all the various reported modelling studies and this study indicate that odour levels on the proposed development site would be below the levels generally considered to have a low risk of adverse odour impacts. The only exception is the Odournet study which appears to have made some very pessimistic assumptions and the results can only be replicated by nearly doubling the measured odour emission rates on site.

The evidence from modelling studies in further supported by the evidence form the Source, Pathway, Receptor qualitative approach and the sensory assessments. Odour complaints are received at a frequency of once a year (and some are received in areas where all studies would suggest that there is a risk of adverse odour impacts) and the evidence from sniff testing is consistent with the modelling studies undertaken by Arup, Anglian Water and CERC.

Figures

Figure 1 Site Location

Figure 2 Predicted odour levels – Anglian Water 2012

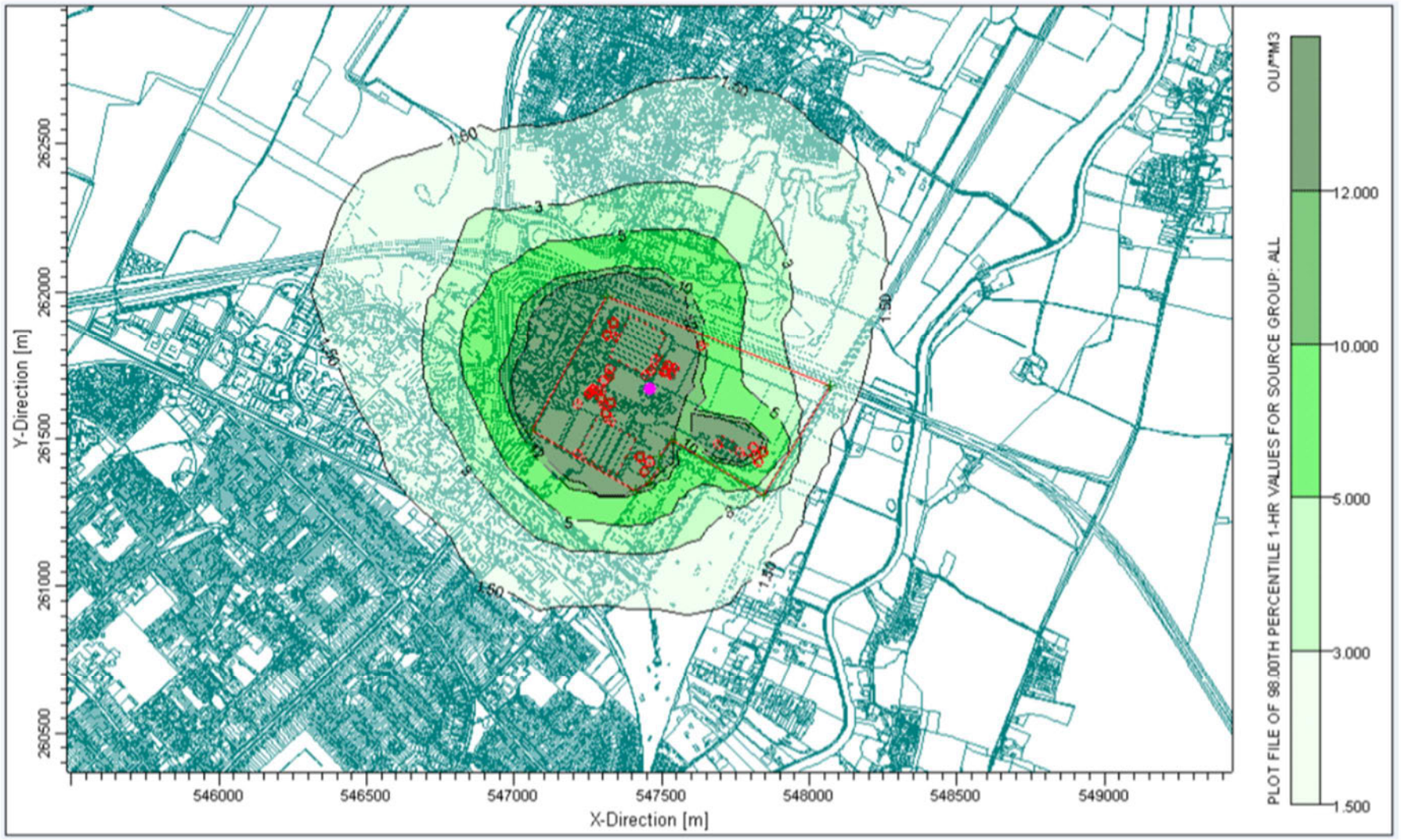

Figure 3 Predicted odour levels Anglian Water 2014

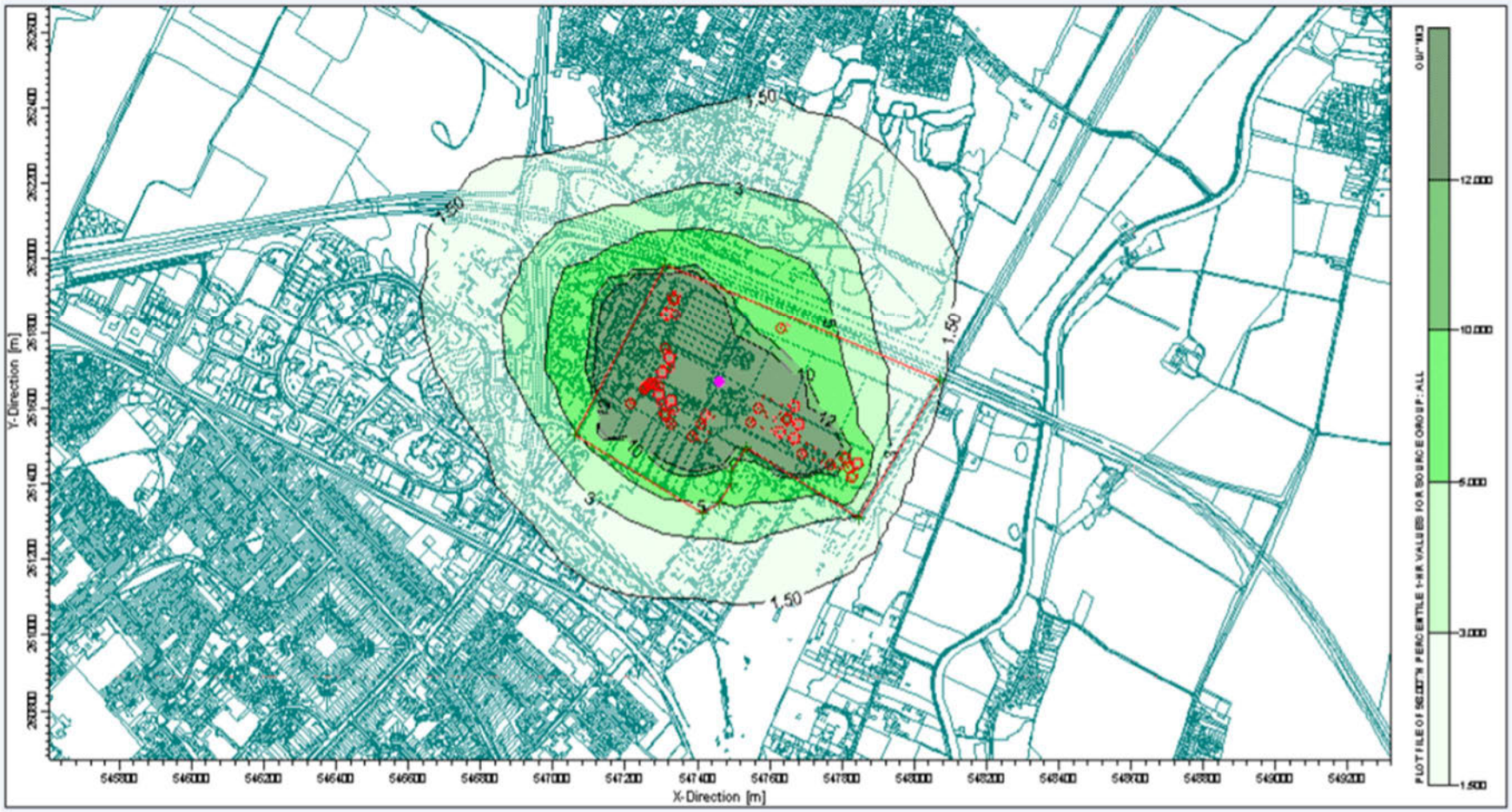

Figure 4 Predicted odour levels CERC 2016 assessment

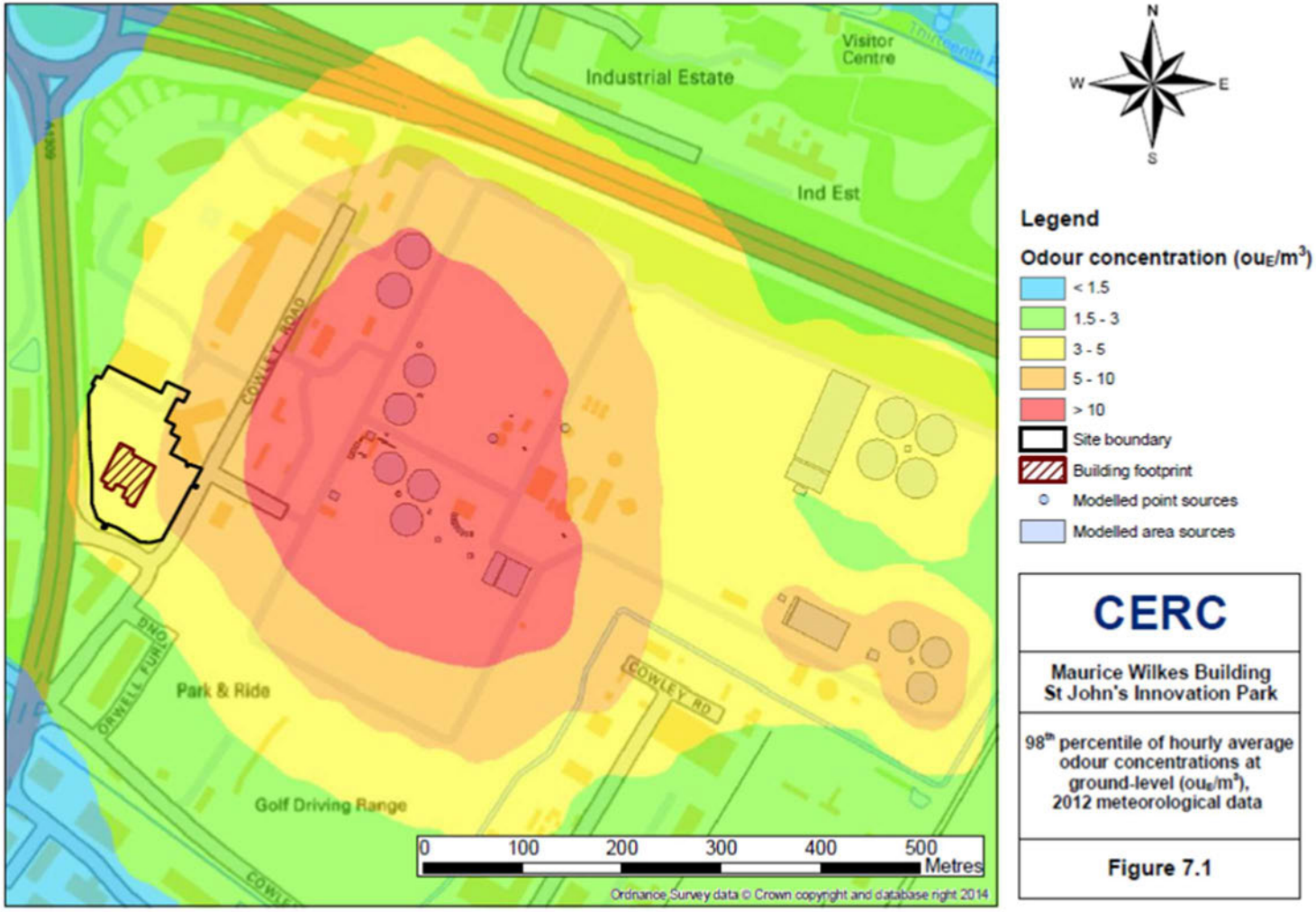

Figure 5 Predicted odour levels CERC 2017 report

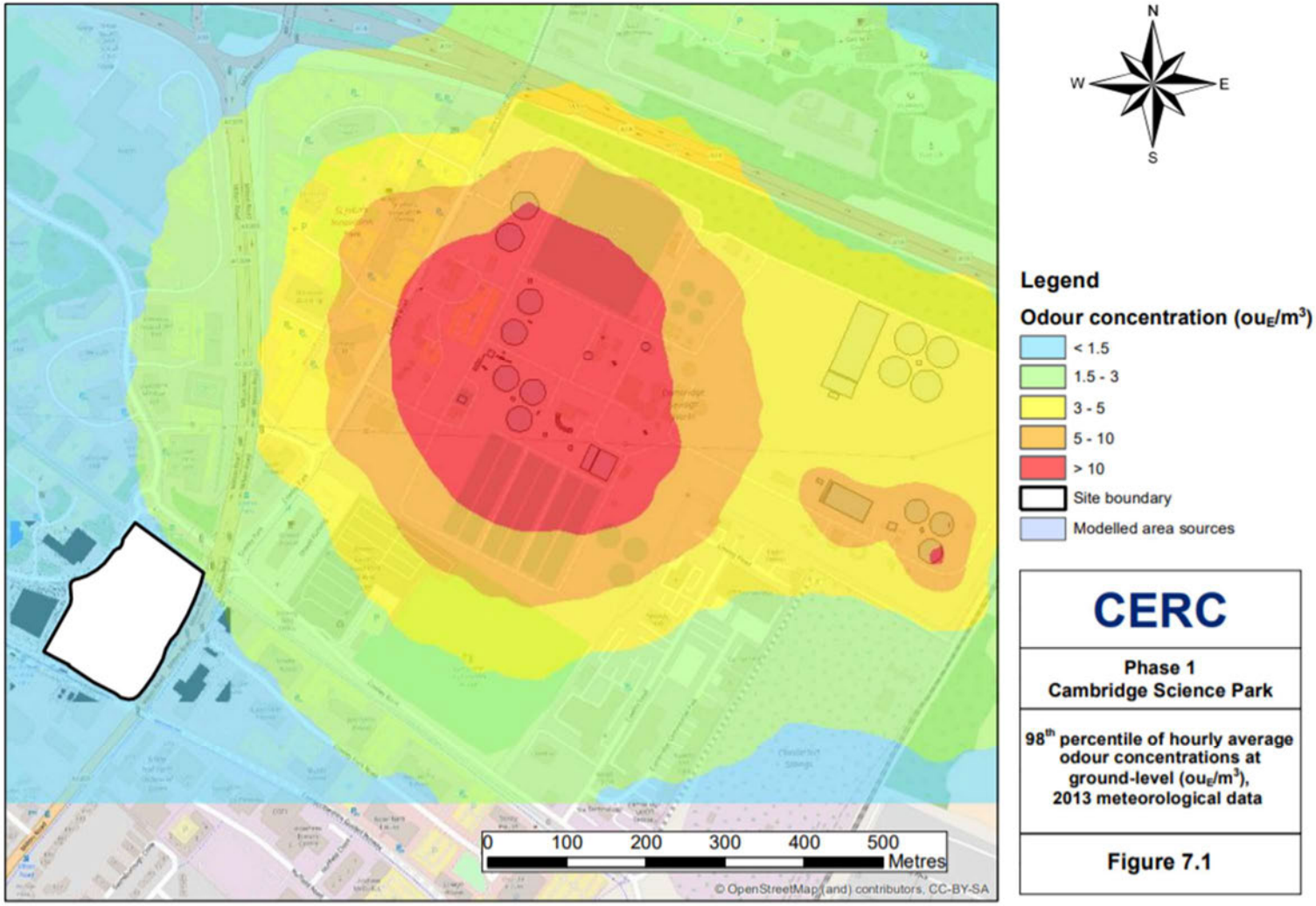

Figure 6 Predicted odour levels Arup 2016, no seasonal variation

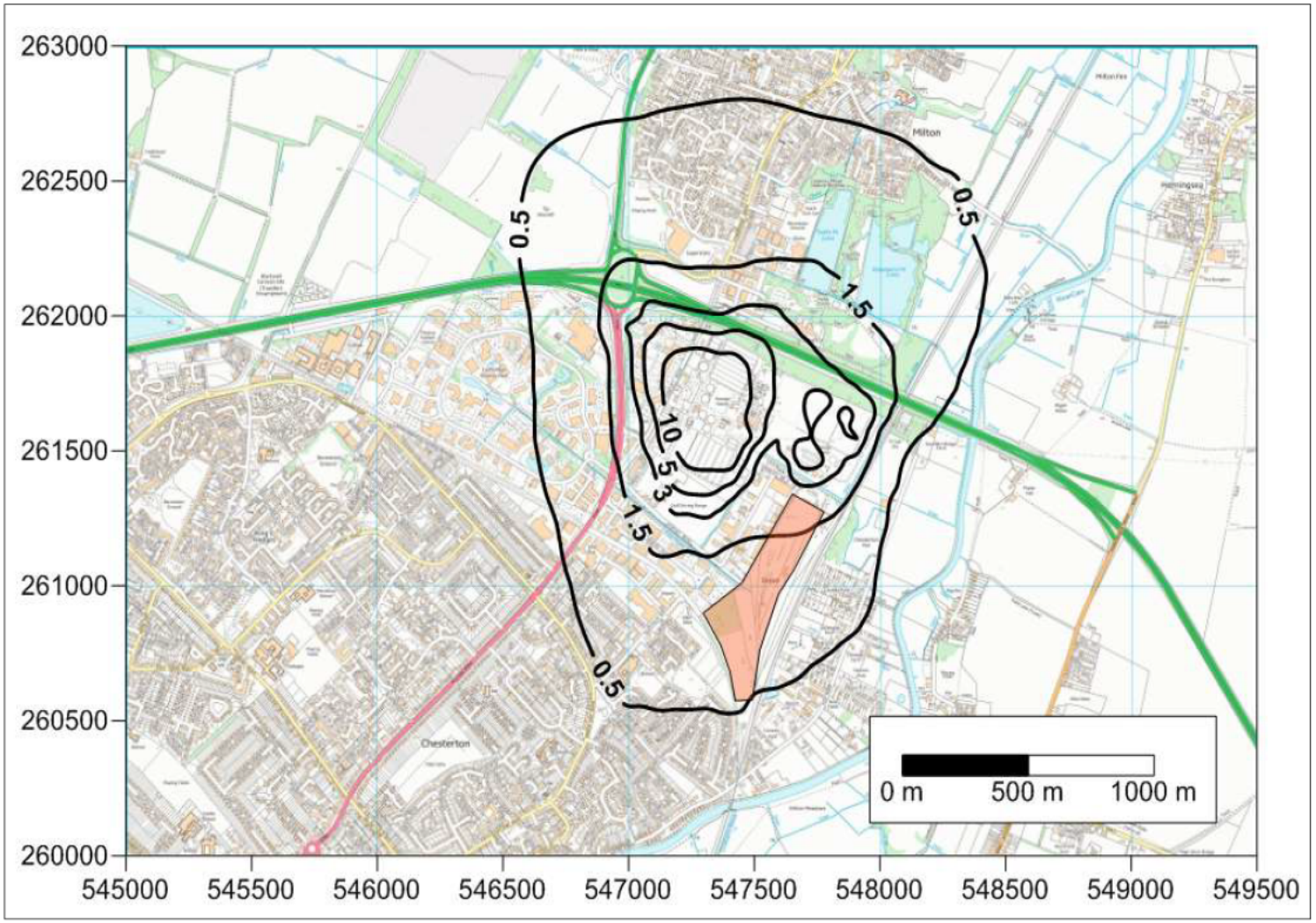

Figure 7 Predicted odour levels Arup 2016, with seasonal variation

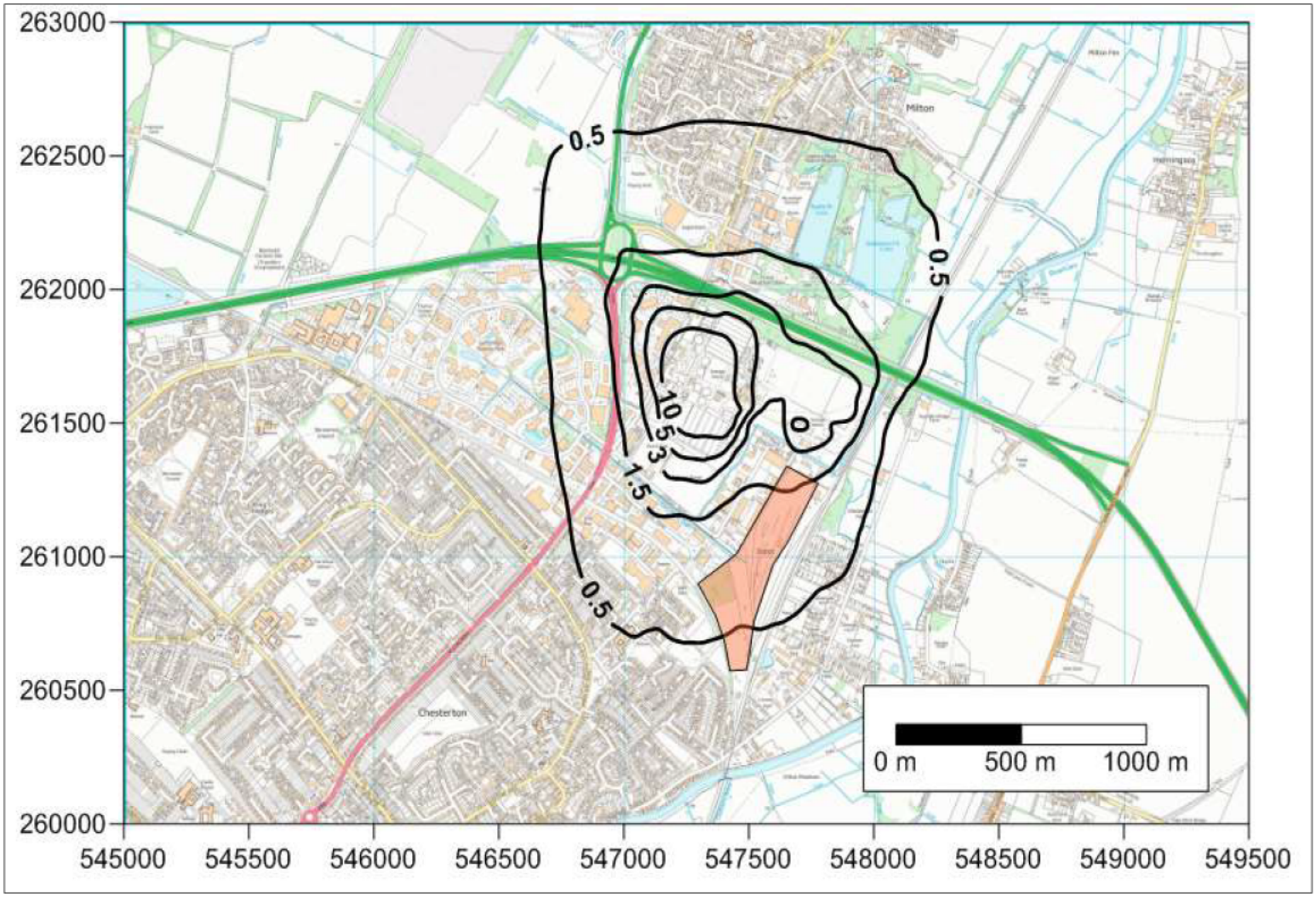

Figure 8 Predicted odour levels Odournet 2018

Figure 9 Location of sources and discrete receptors used in modelling

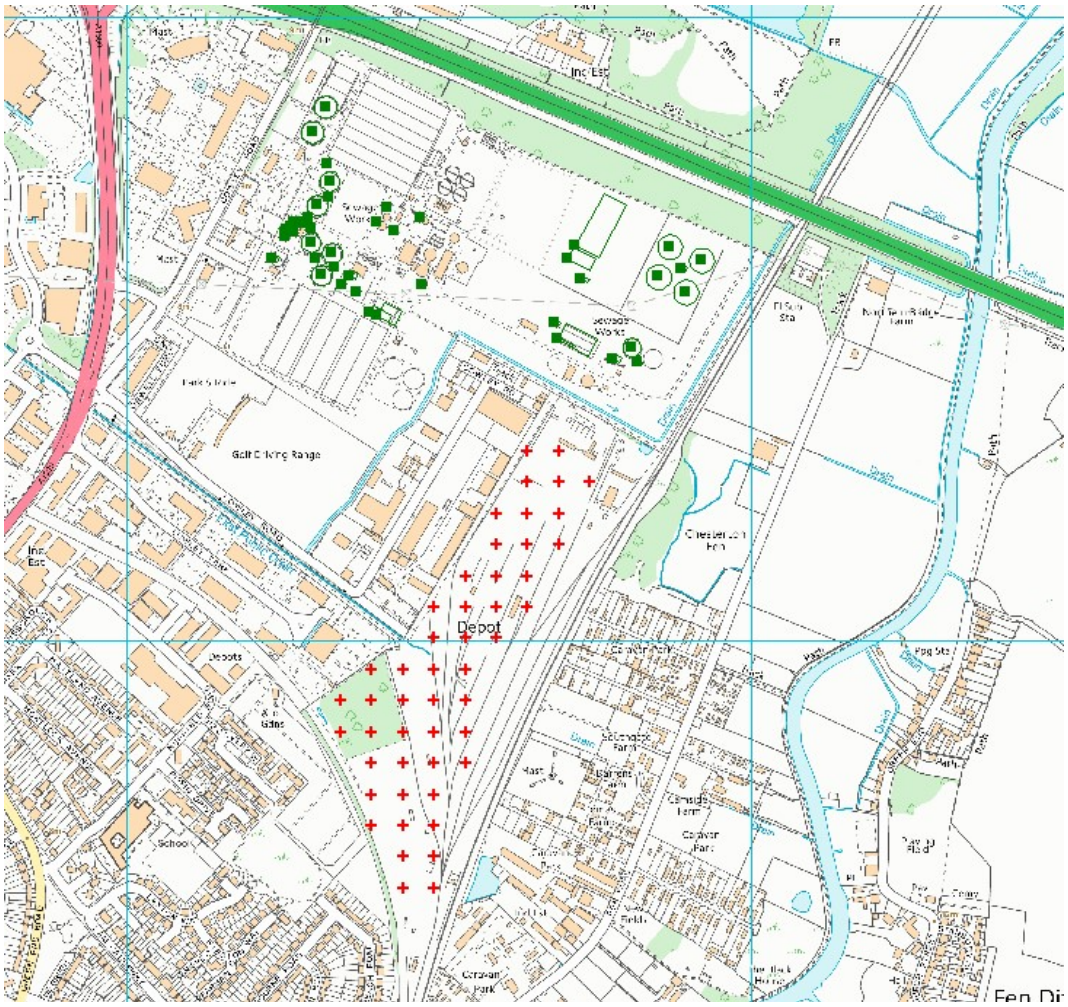

Figure 10 Wind rose for Cambridge 2014-2018

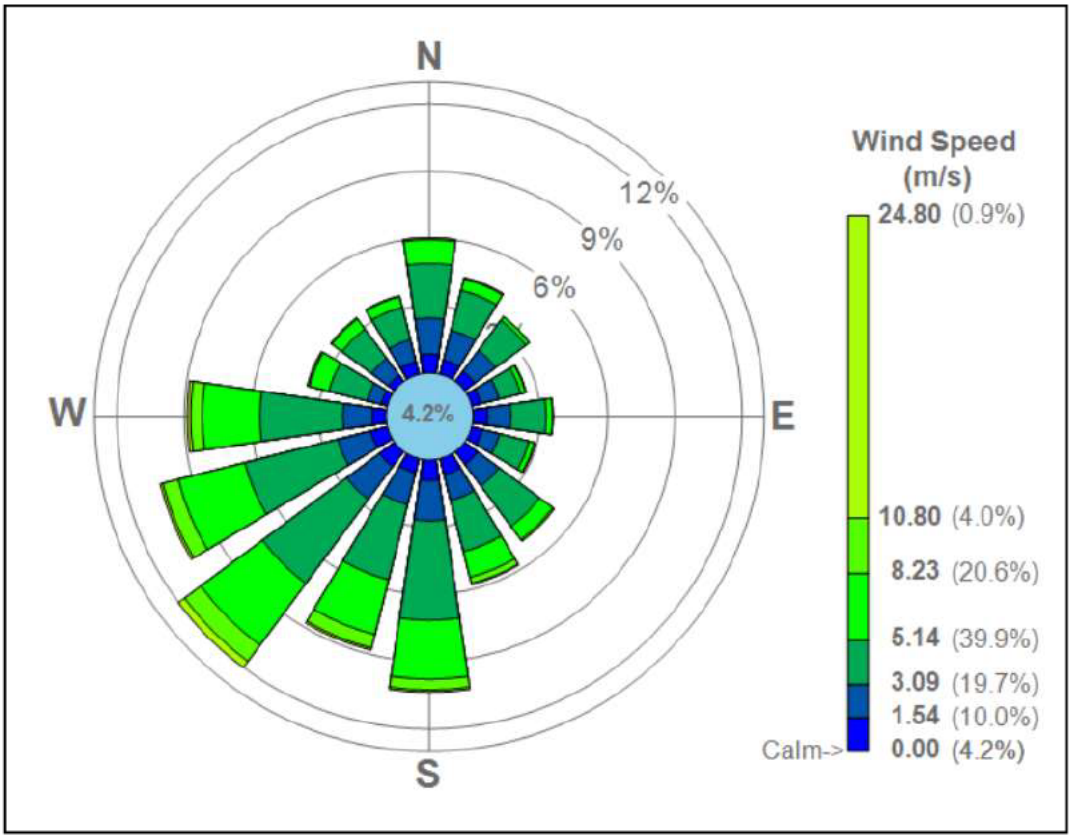

Figure 11 Predicted odour concentrations - Scenario 1

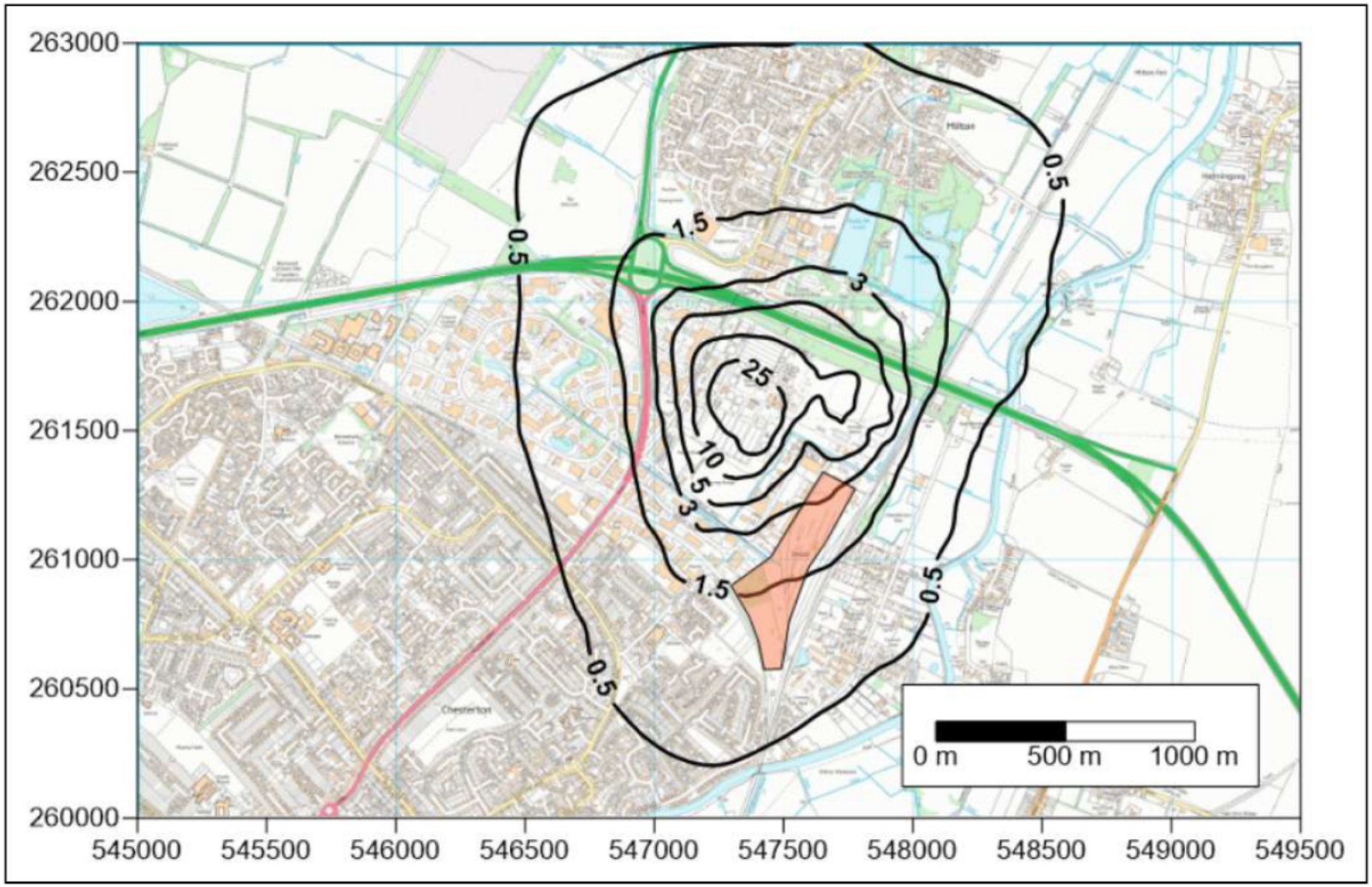

Figure 12 Predicted odour concentrations, Scenario 2

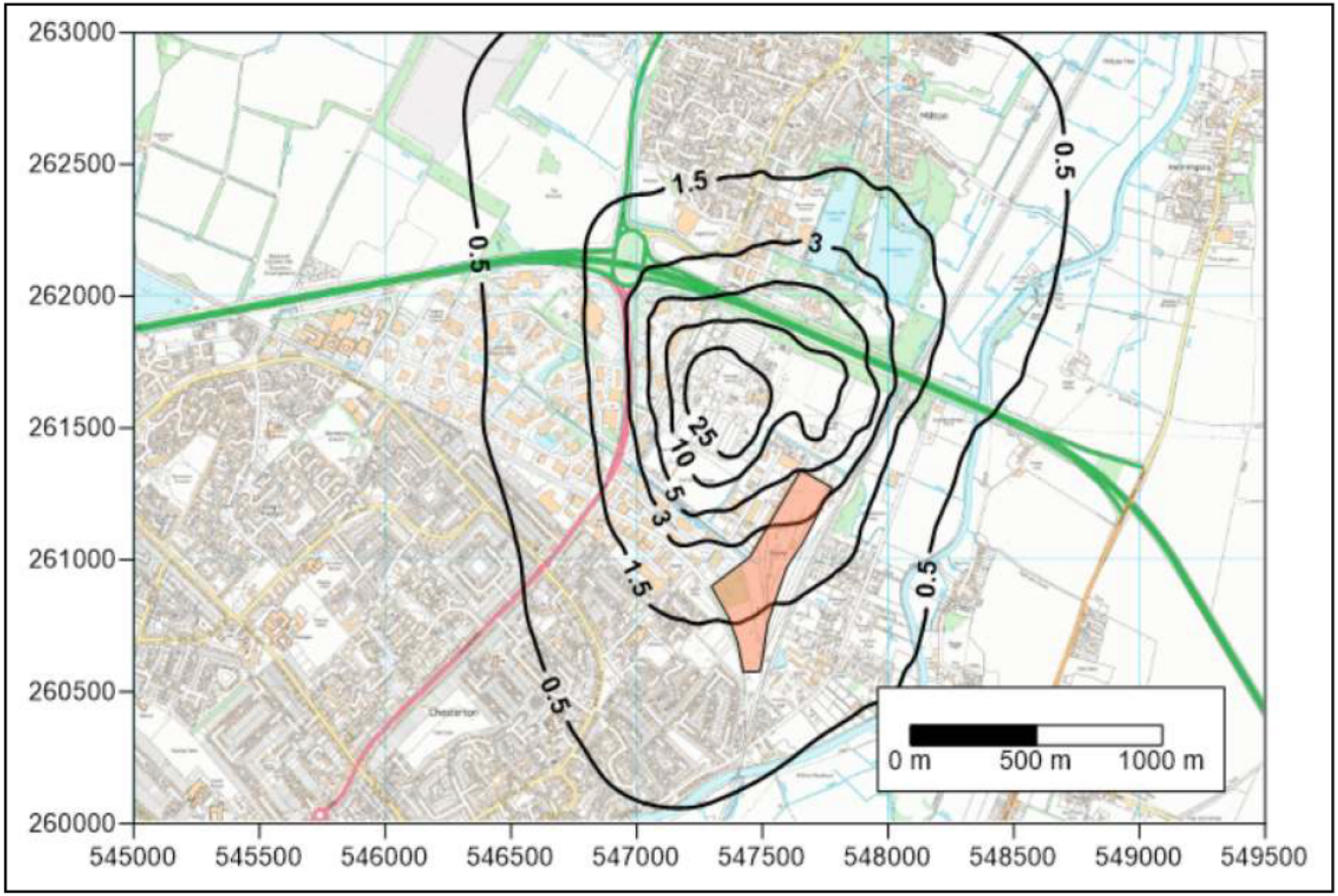

Figure 13 Predicted odour concentrations, Scenario 3

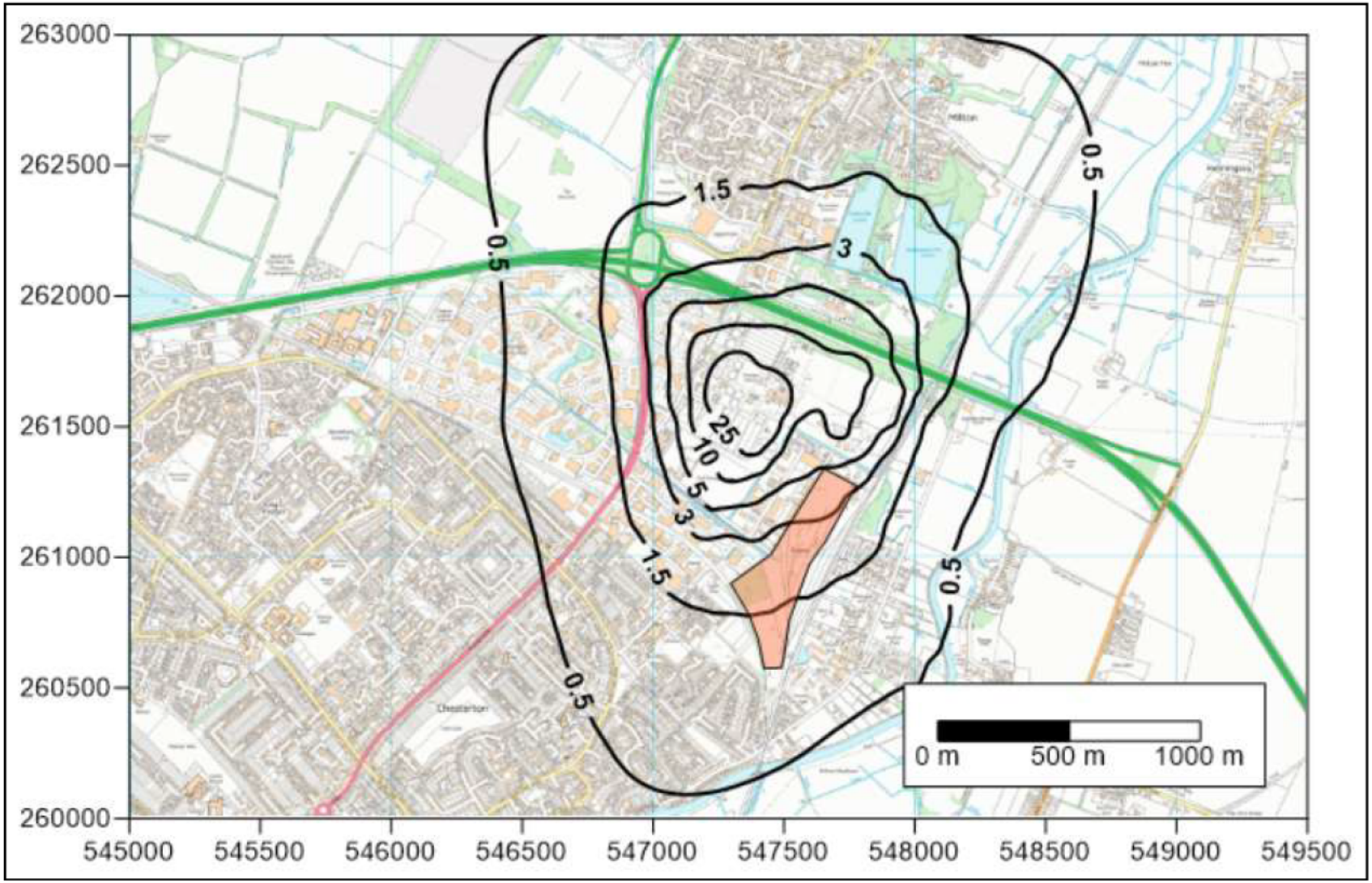

Figure 14 Simple verification modelling source and receptor layout

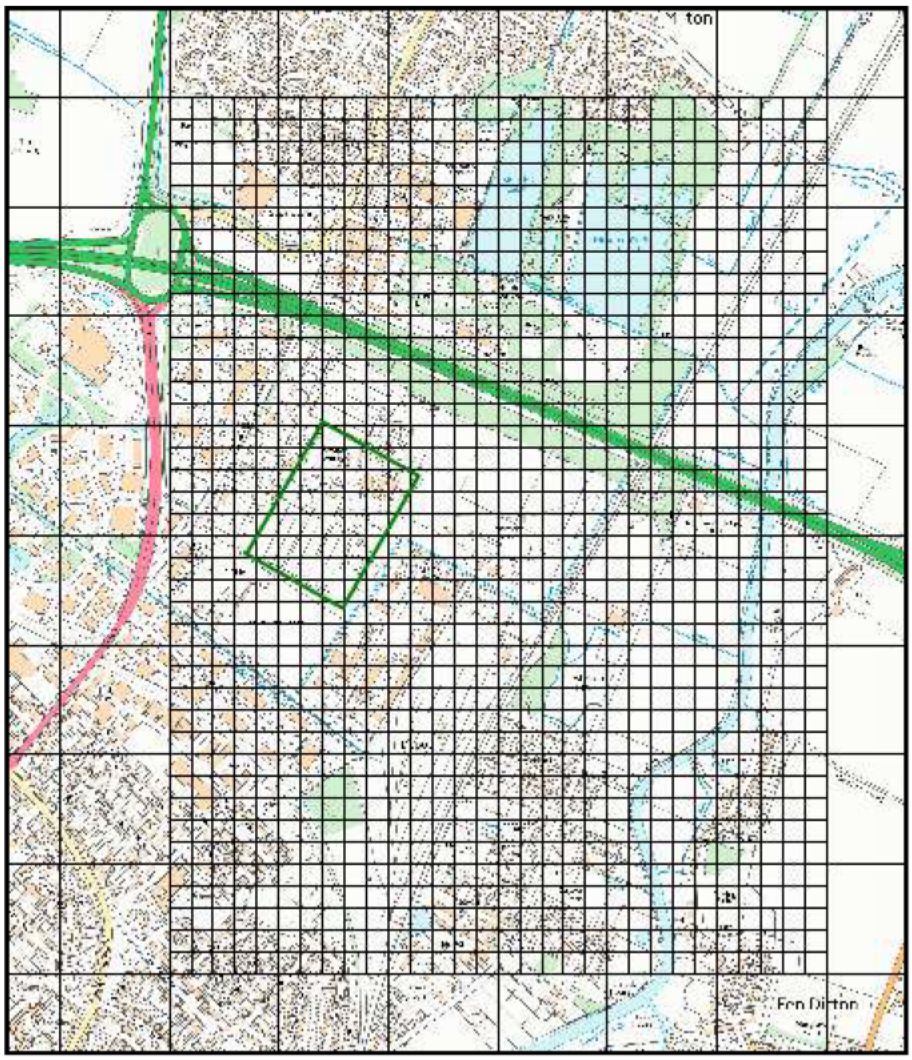

Figure 15 Predicted odour concentrations - Verification modelling 150,000 ou_E/s

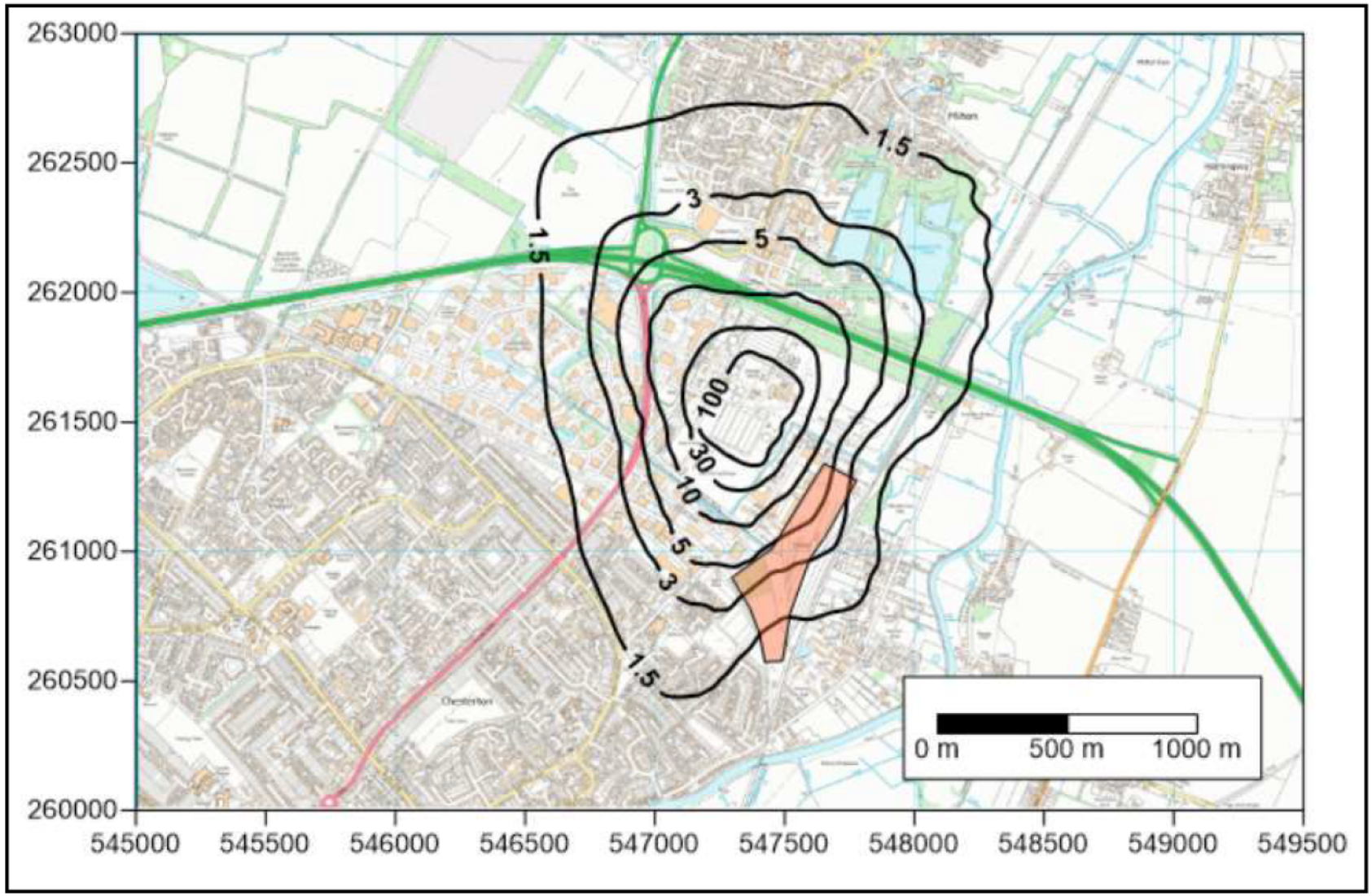

Figure 16 Sniff Test Locations 3 June 2019

Figure 17 Sniff Test Locations 23 August 2019

Figure 18 Sniff test locations 6 September 2019

Appendix A

Anglian Water Odour Emission Data

A1 Anglian Water Odour Emission Data

A1.1 Odour Sources

Anglian Water provided information on the sizes and locations of each of the odour sources on the site. Cambridge Water Recycling Centre has been subject to considerable improvement recently and several of the units on site are no longer used. The large trickling filter beds that exist are redundant and have been replaced by activated sludge units.

Annotated site aerial photos provided by Anglian Water are shown below in Figure A1 - Figure A6. The photos are annotated to mark each of the processes on site and details of these are provided in Table A1 and Table A2..

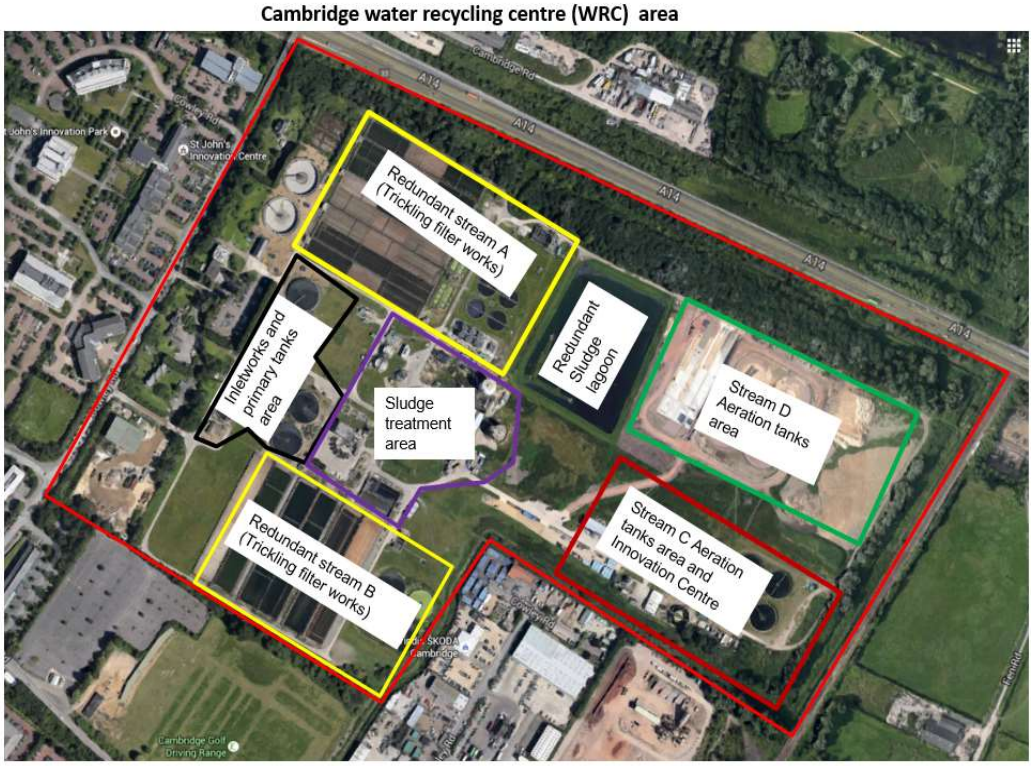

Figure A1 Aerial View of Cambridge WRC

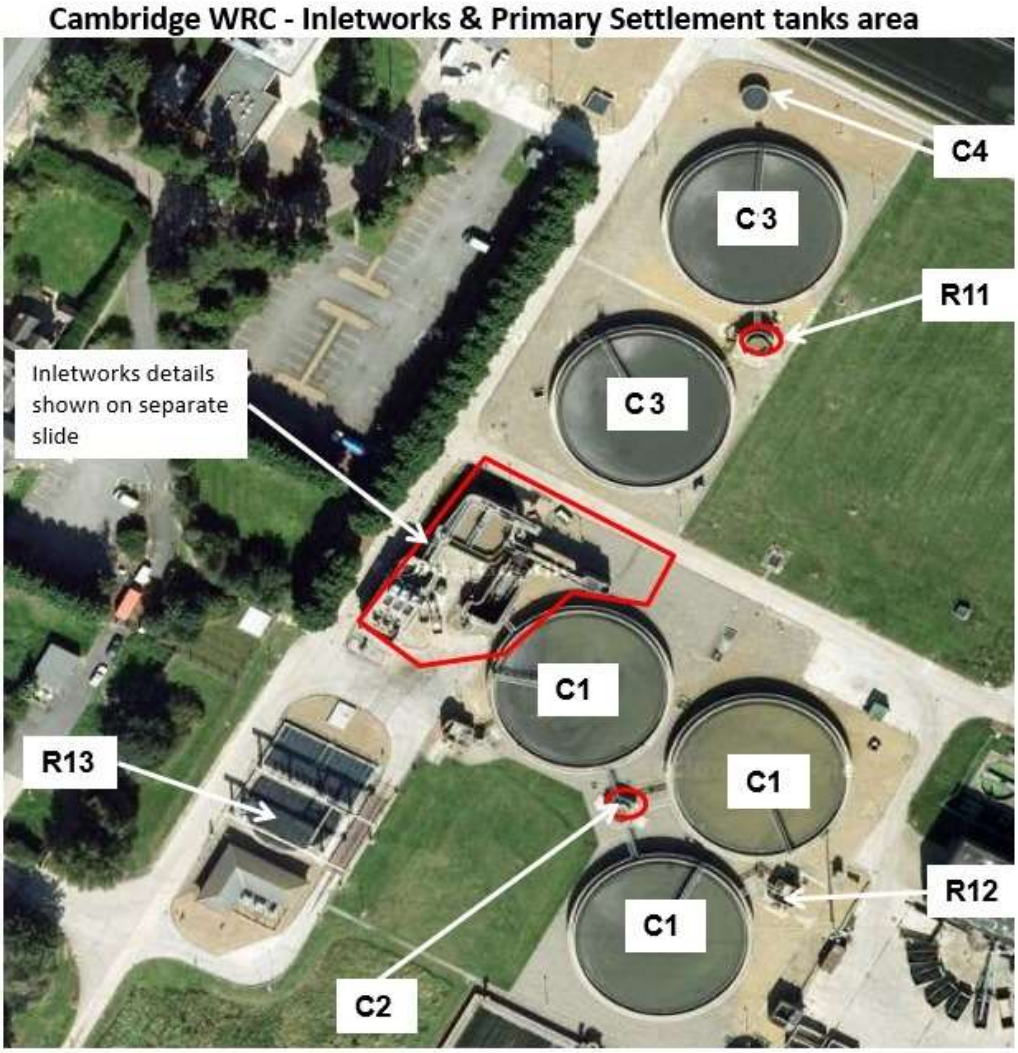

Figure A2 Inlet works and Primary Settlement Tanks

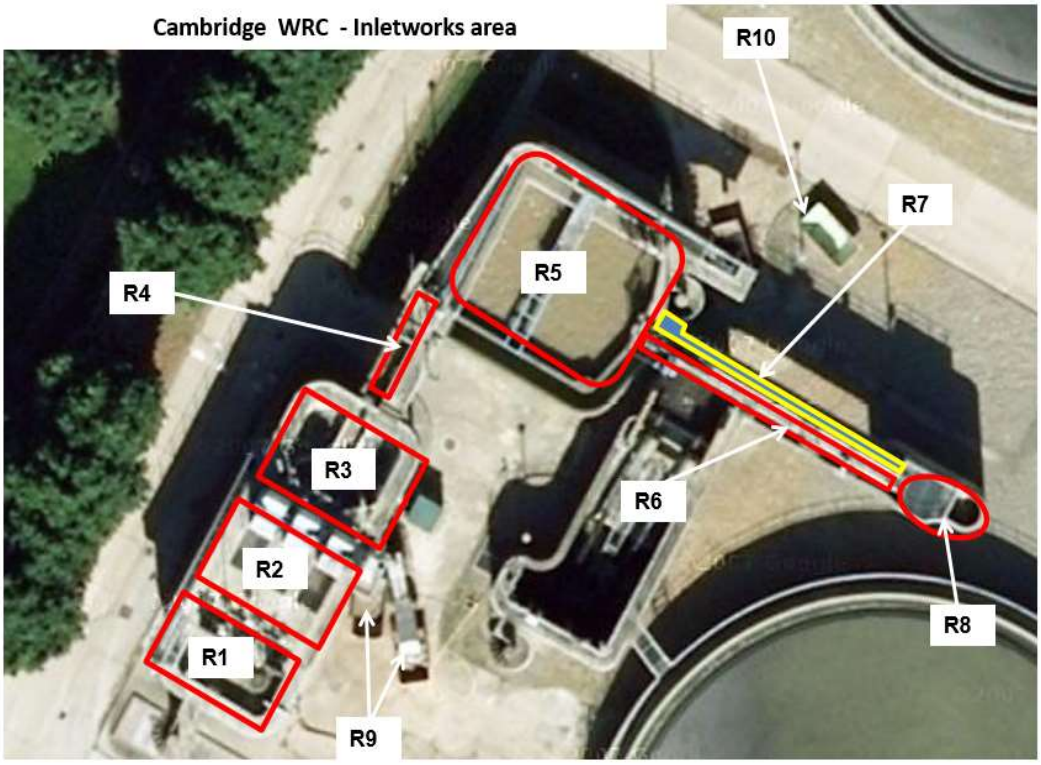

Figure A3 Detail of Inlet Works Area

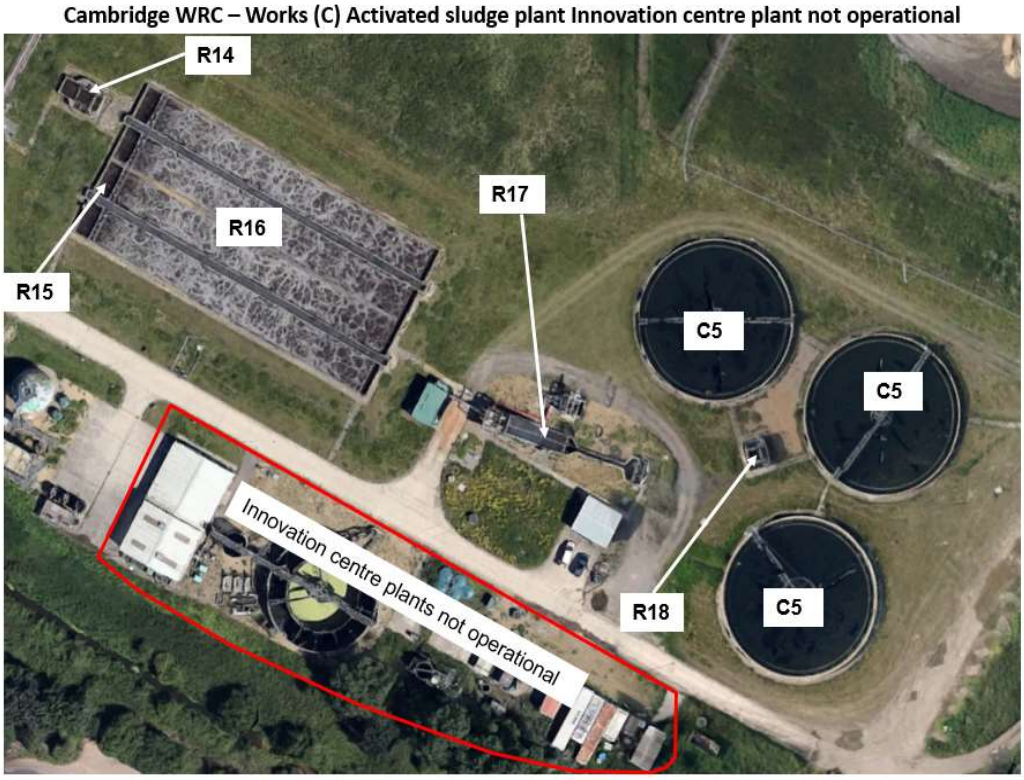

Figure A4 Activated Sludge Process

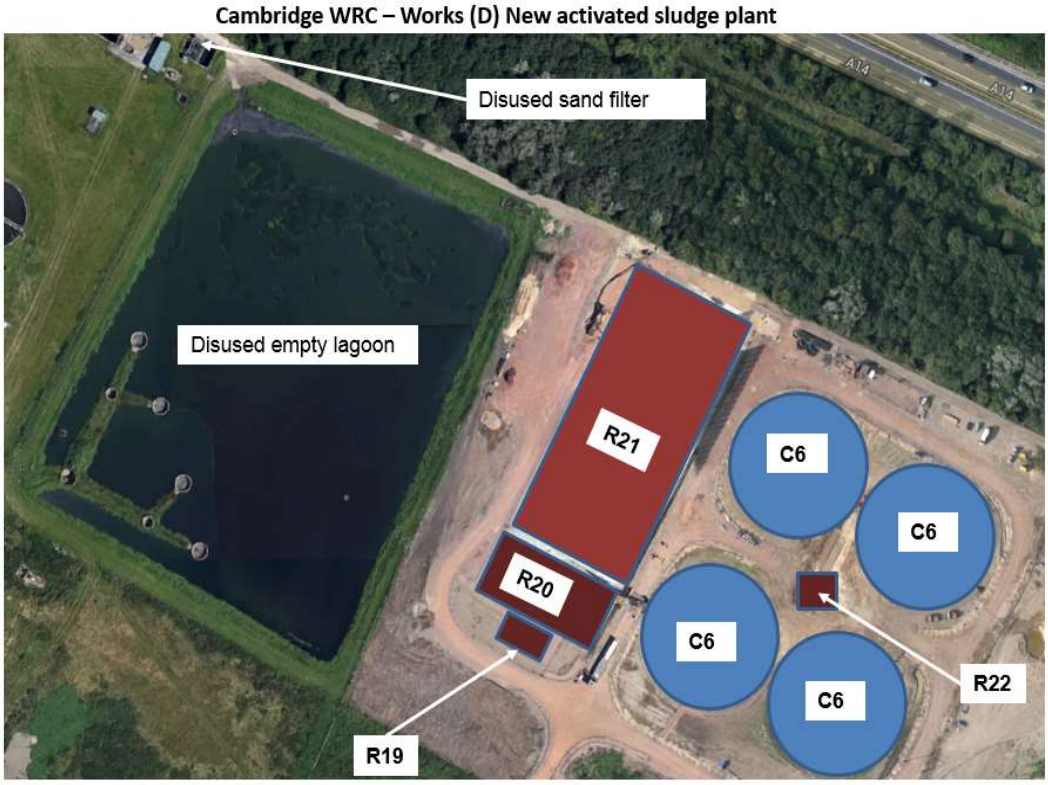

Figure A5 New Activated Sludge Area

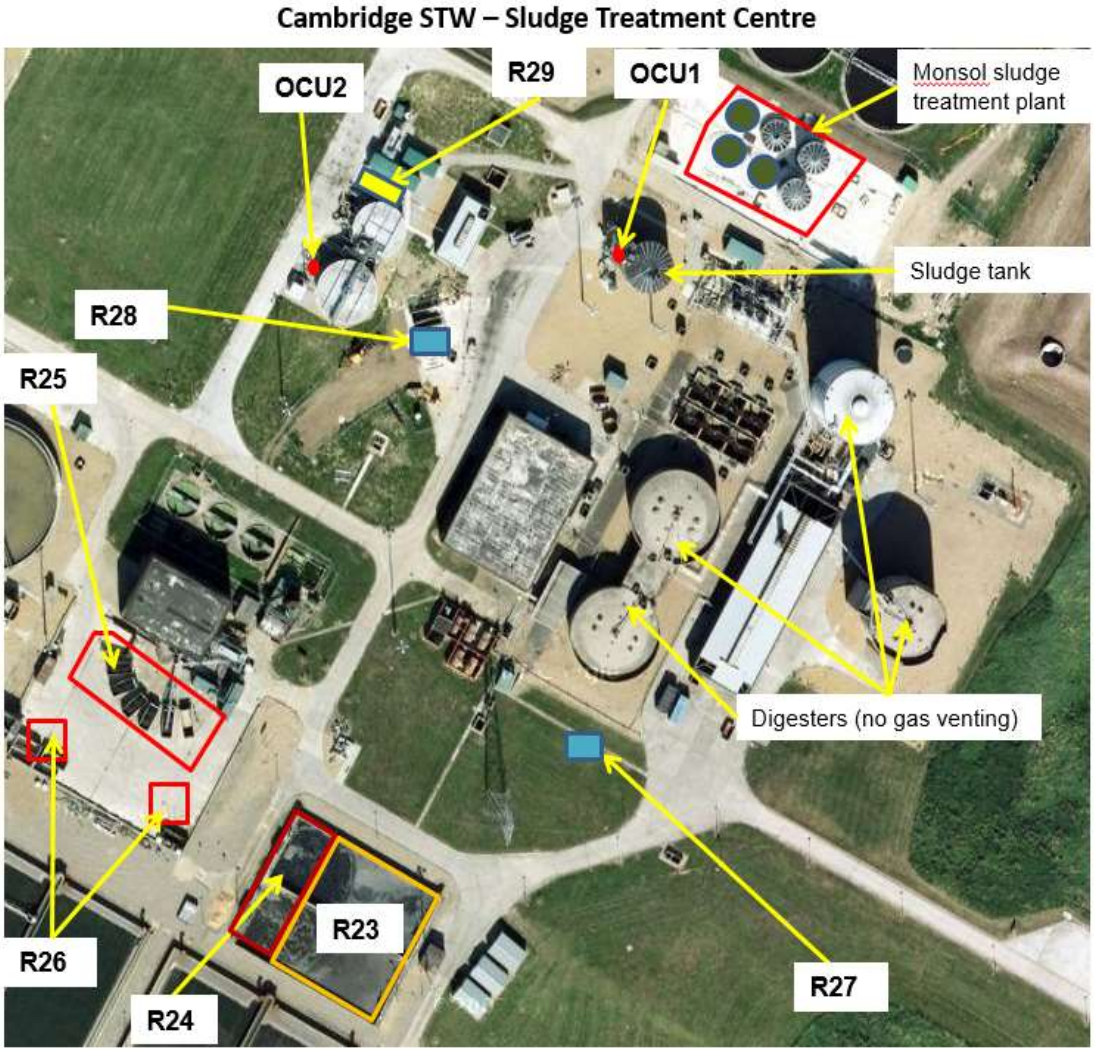

Figure A6 Sludge Treatment Centre

Table A1 Odour Sources at Cambridge WRC (Rectangular)

				m	m	m	m	m^2
number	**Rectangular odour sources**	**Shape**	**Number**	**length**	**width**	**Diameter**	**elevation**	**area**
R1	Inlet works reception chamber	rectangular	1	5	4	N/A	6	20.0
R2	Inlet works screen area	rectangular	1	5	4	N/A	6	20.0
R3	Inlet works storm separation area	rectangular	1	5	4	N/A	6	20.0
R4	Inlet works channels to detritor	rectangular	1	5	1	N/A	6	5.0
R5	Detritor	rectangular	1	8	8	N/A	6	64.0
R6	Inlet works outlet channel	rectangular	1	10	1	N/A	6	10.0
R7	Returned Liquors channel	rectangular	1	10	1.35	N/A	7	13.5
R8	Inlet works mixing channel	rectangular	1	4	1.5	N/A	6	6.0
R9	Screenings skip	rectangular	2	3	1.5	N/A	1.5	9.0
R10	Grit skip	rectangular	1	3	1.5	N/A	1.5	4.5
R11	PSTs distribution chamber	rectangular	1	4.8	2	N/A	4	9.6
R12	Settled sewage collection chamber	rectangular	1	5	2	N/A	3	0.0
R13	Works main sewage pumping station	rectangular	1	10	8	N/A	0.5	80.0
R14	C works ASP distribution chamber	rectangular	1	7	5	N/A	2	35.0
R15	C works - ASP anoxic zone	rectangular	1	30	4	N/A	2	120.0
R16	C works - ASP aerobic zone	rectangular	1	56	30	N/A	2	1680.0
R17	C works RAS pumping station	rectangular	1	10	9.6	N/A	2.5	96.0
R18	C works FSTs distribution chamber	rectangular	1	6	3	N/A	1.5	18.0
R19	D works ASP distribution chamber	rectangular	1	12	6.5	N/A	7	78.0
R20	D works - ASP anoxic zone	rectangular	1	40	20	N/A	6	800.0
R21	D works - ASP aerobic zone	rectangular	1	95	40	N/A	6	3800.0
R22	D works FSTs distribution chamber	rectangular	1	6	6	N/A	5	36.0
R23	Secondary digesters unaerated	rectangular	1	32	25	N/A	2	800.0
R24	Secondary digesters aerated	rectangular	1	32	12	N/A	2	384.0
R25	Sludge cake storage skips	rectangular	9	5	2.5	N/A	2	112.5
R26	Sludge cake bays	rectangular	2	5	5	N/A	1.5	50.0
R27	Centrifuges	rectangular	2	3	1.5	N/A	3	9.0

R28	Drum thickeners	rectangular	2	3	1.5	N/A	3	9.0
R29	Digested sludge centrifuge	rectangular	1	3	1	N/A	3	3.0

Table A2 Odour Sources at Cambridge WRC (Circular)

				m	m	m	m	m^2
Number	**Circular odour sources**	**Shape**	**Number**	**length**	**width**	**Diameter**	**elevation**	**area**
C1	Primary settlement tanks	Circular	5	N/A	N/A	32	4	4019.2
C2	PSTs distribution chamber	Circular	2	N/A	N/A	4.8	4	36.2
C3	Storm tanks	Circular	2	N/A	N/A	35	1.5	1923.3
C4	Settled sewage collection chamber	Circular	2	N/A	N/A	5	3	39.3
C5	C works final settlement tanks	Circular	1	N/A	N/A	30	1	706.5
C6	D works final settlement tanks	Circular	4	N/A	N/A	40	4	5024.0

Table A3 Odour Sources at Cambridge WRC (Odour Control Units)

number	Odour control units	outlet Shape	Number	lenghth	width	Diameter	elevation	area
OCU1	Serving sludge thickening plant	circular	1	N/A	N/A	0.16	6	0.02
OCU2	Serving sludge thickening plant	circular	1	N/A	N/A	0.16	6	0.02

BIDWELLS