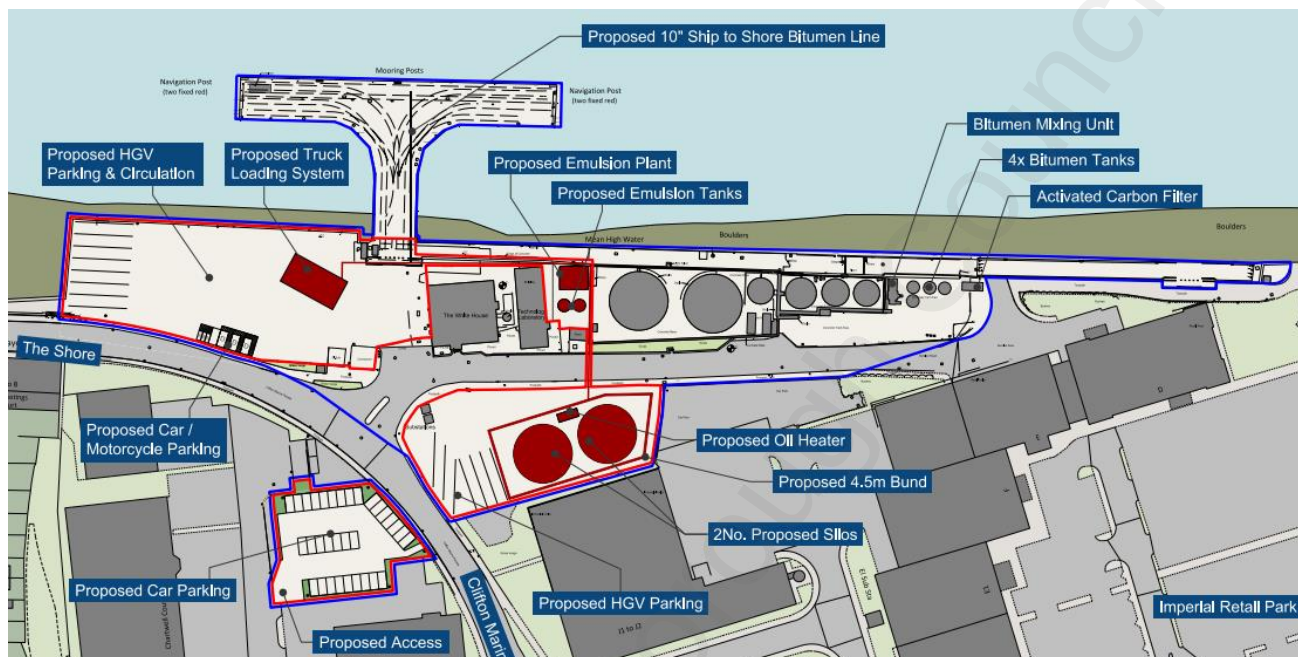


# Imperial Wharf, Clifton Marine Parade, Gravesend, Kent, DA11 0DY

## Air Quality Assessment and Odour Assessment



### PRESENTED TO

**PDE Consulting Limited**  
6 Forbes Business Centre  
Kempson Way  
Bury St Edmunds  
Suffolk, IP32 7AR

### PRESENTED BY

**NALO, Tetra Tech**  
Executive Park, Avalon Way,  
Anstey, Leicester, LE7 7GR  
+44 (0)116 234 8000  
NALO.UK@tetratech.com

Prepared by:  
**Dr Zhiyuan Yang** 30<sup>th</sup> May 2022  
Principal Environmental Consultant

Reviewed by:  
**Matthew Smith** 30<sup>th</sup> May 2022  
Principal Environmental Consultant

Authorised by:  
**Nigel Mann** 30<sup>th</sup> May 2022  
Director

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|       |                            |                                                                                                                                                                |
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## ACRONYMS/ABBREVIATIONS

| Acronyms/Abbreviations | Definition                                                                       |
|------------------------|----------------------------------------------------------------------------------|
| AADT                   | Annual Average Daily Traffic                                                     |
| ADMS                   | An advanced distribution management system                                       |
| AERMOD                 | American Meteorological Society/Environmental Protection Agency Regulatory Model |
| AQAL                   | the Air Quality Assessment Level                                                 |
| AQAP                   | Air Quality Action Plan                                                          |
| AQMA                   | Air Quality Management Area                                                      |
| AQO                    | Air Quality Objectives                                                           |
| AQS                    | Air Quality Standards                                                            |
| CHP                    | Combined Heat and Power                                                          |
| CL                     | Critical Level                                                                   |
| CO                     | Carbon Monoxide                                                                  |
| DEFRA                  | Department for Environment Food & Rural Affairs                                  |
| EAL                    | Environmental Assessment Limits                                                  |
| EC                     | European Commission                                                              |
| EFT                    | The Emissions Factors Toolkit                                                    |
| EPUK                   | Environmental Protection UK                                                      |
| EU                     | European Union                                                                   |
| EPAQS                  | The Expert Panel on Air Quality Standards                                        |
| IAQM                   | The Institute of Air Quality Management                                          |
| ISC3                   | The Industrial Source Complex                                                    |
| LA                     | Environmental Assessment Limits                                                  |
| LAQM                   | Local Air Quality Management                                                     |
| NGR                    | The United Kingdom National Grid Reference                                       |
| NO                     | Nitric Oxide                                                                     |
| NO <sub>2</sub>        | Nitrogen Dioxide                                                                 |
| PC                     | Process Contribution                                                             |
| MHCLG                  | the Ministry for Housing, Communities and Local Government                       |
| NPPF                   | The National Planning Policy Framework                                           |
| OS                     | the UK Ordnance Survey                                                           |
| PEC                    | Predicted Environment Concentration                                              |
| PPG                    | Planning Policy Guidance                                                         |
| PPS                    | Planning Policy Statements                                                       |
| SAC                    | Special Areas of Conservation                                                    |
| SPA                    | Special Protection Area                                                          |
| SSSI                   | Sites of Special Scientific Interest                                             |

| Acronyms/Abbreviations | Definition                 |
|------------------------|----------------------------|
| VOC                    | Volatile organic compounds |
| WHO                    | World Health Organization  |
| UK                     | The United Kingdom         |

Gravesend Borough Council

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## EXECUTIVE SUMMARY

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The report presents the results of an air quality and odour assessment undertaken to support a planning application for the installation of two additional bitumen tanks, load out gantry, the installation of a bitumen emulsion plant and alternative car parking, at Imperial Wharf, Clifton Marine Parade, Gravesend, Kent, DA11 0DY.

### Gas Burner Emission Impact Assessment

The predicted long-term and short-term NO<sub>2</sub> concentrations from the emissions of the existing and the proposed gas burner operations are all below the relevant AQOs for the protection of human health. The significance of effects on the NO<sub>2</sub> impacts on the ground level receptors is considered 'negligible'.

### Habitat Assessment

The annual mean and daily (24 hour mean) NO<sub>x</sub> PEC at the ecological receptor from the burner operations are below the relevant critical level for the protection of vegetation and Ecosystems. the NO<sub>x</sub> impacts from the existing and the proposed gas burner operations on the ecological receptors are insignificant.

### Odour Impact Assessment from the Existing and Proposed Tanker Operations

The odour emissions from the existing bitumen tanks and two proposed bitumen tank operations were assessed and the maximum predicted odour concentration at sensitive/residential receptors is below the odour benchmark. The odour effects from the site operations on the sensitive receptors are insignificant.

The proposed development is not considered to be contrary to any of the national and local planning policies.

## 1.0 INTRODUCTION

PDE Consulting Limited commissioned Tetra Tech (formerly WYG) to undertake an air quality and odour assessment to support a planning application for the installation of two additional bitumen tanks, load out gantry, the installation of a bitumen emulsion plant and alternative car parking, at Imperial Wharf, Clifton Marine Parade, Gravesend, Kent, DA11 0DY.

### 1.1 SITE LOCATION

The River Thames is to the immediate north/north-west/north-east of the proposed development site. On the landward side, the area immediately surrounding Imperial Wharf is characterised as relatively low rise industrial and retail sheds.

The nearest receptors to the development site are commercial/retail, including Halfords, Carpetright and Pets at Home to the south/south-east (and therefore predominately upwind) of the site.

The nearest residential receptors are located on Pier Road to the west of the development site and approximately 80 m the proposed truck loading system.

The United Kingdom National Grid Reference (NGR) of the site is approximately 563880, 174480. Reference should be made to **Figure 1-1** for a map of the proposed development site and surrounding area.

Figure 1-1. Site location



## 1.2 EXISTING BUILDINGS AND INFRASTRUCTURE AND THE PROPOSED DEVELOPMENT

### Existing Development

The Site and the wider bitumen storage facility and wharfage are under the control of the Applicant. The Site and associated land have a long history associated with industrial development.

Historically, the Site was home to the Imperial Paper Mills, which operated from the early 1900's until the mid-1980s to process paper pulp into newsprint. Imperial Wharf was used as an ancillary wharf in connection with the paper manufacture, although the extent of its use is not known.

The Imperial Paper Mills site, including the wharf/jetty, was acquired by TBF Thompson following closure of the paper mills, during the 1980's, and part of the site was temporarily used for the manufacture of asphalt pending its redevelopment.

Planning permission was granted in 1989 for three units of offices on the site and details of their siting and design were approved in 1993 in accordance with planning permission reference 19930609, but the development was never implemented.

Planning application reference GR/2001/906 was submitted in 2001 for the continued use of land for the open storage of aggregates in connection with the wharf activities at Imperial Wharf. The application was subsequently refused on 07 March 2002.

Planning application reference 20040373 was submitted to GBC seeking the construction of 270 flats each with car parking space and a café/bar/restaurant and home owners mooring berths on the old Imperial Paper Mills jetty. Planning permission was subsequently refused and dismissed on appeal in February 2007. The application was refused on the grounds that it did not conform to the local plan and would have resulted in the loss of active employment land and the displacement of jobs.

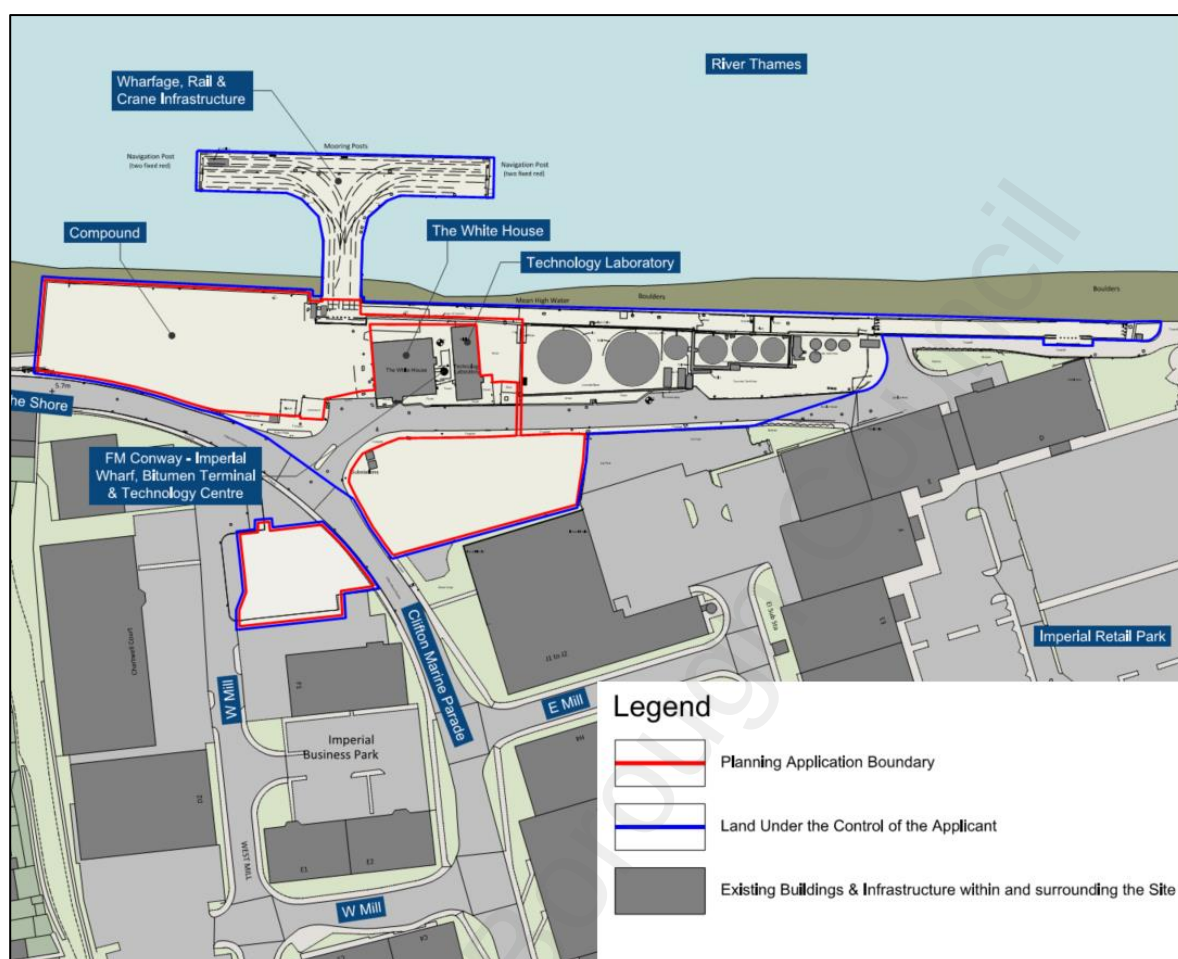
Planning permission reference 20160800 was approved by GBC on 29 June 2018 to enable retrospective permission for the retention of four additional bitumen storage tanks and ancillary equipment including activated carbon filter unit, mixing plant and enclosed retaining bund wall.

Currently the existing bitumen terminal, comprising the deep-water jetty and six bitumen tanks imports highway grade bitumen from continental Europe, in ships' cargoes of up to 4,000 tonnes. Unloading typically takes between 9 and 15 hours. The bitumen is pumped ashore by the ship's own on-board pumps. At all times, the bitumen is either within the ship's hold, within the insulated and heated storage tanks and/or is being pumped to the lorry tanker loadout facility, before leaving the site. On site, the bitumen is conveyed within sealed and insulated steel pipework via a manned control room. At all stages, the average temperature of the bitumen is controlled (maintained around 160 degrees Celsius).

The transfer of bitumen to and from both the existing tanks and the proposed additional tanks will be by pumping through sealed, insulated pipework. The air displaced when filling any tank would be captured and passed through an in-line activated carbon filter to control the odour.

The existing plant is shown in **Figure 1-2** below.

**Figure 1-2. Existing Plant**



### Proposed Development

The proposed development includes the installation of two additional bitumen tanks, load out gantry, the installation of a bitumen emulsion plant and alternative car parking. The planning application boundaries are shown in the redlines in **Figure 1-3**. The site layout of the proposed two large bitumen tanks/silos is presented in **Figure 1-4**.

Figure 1-3. Indicative Site Boundary

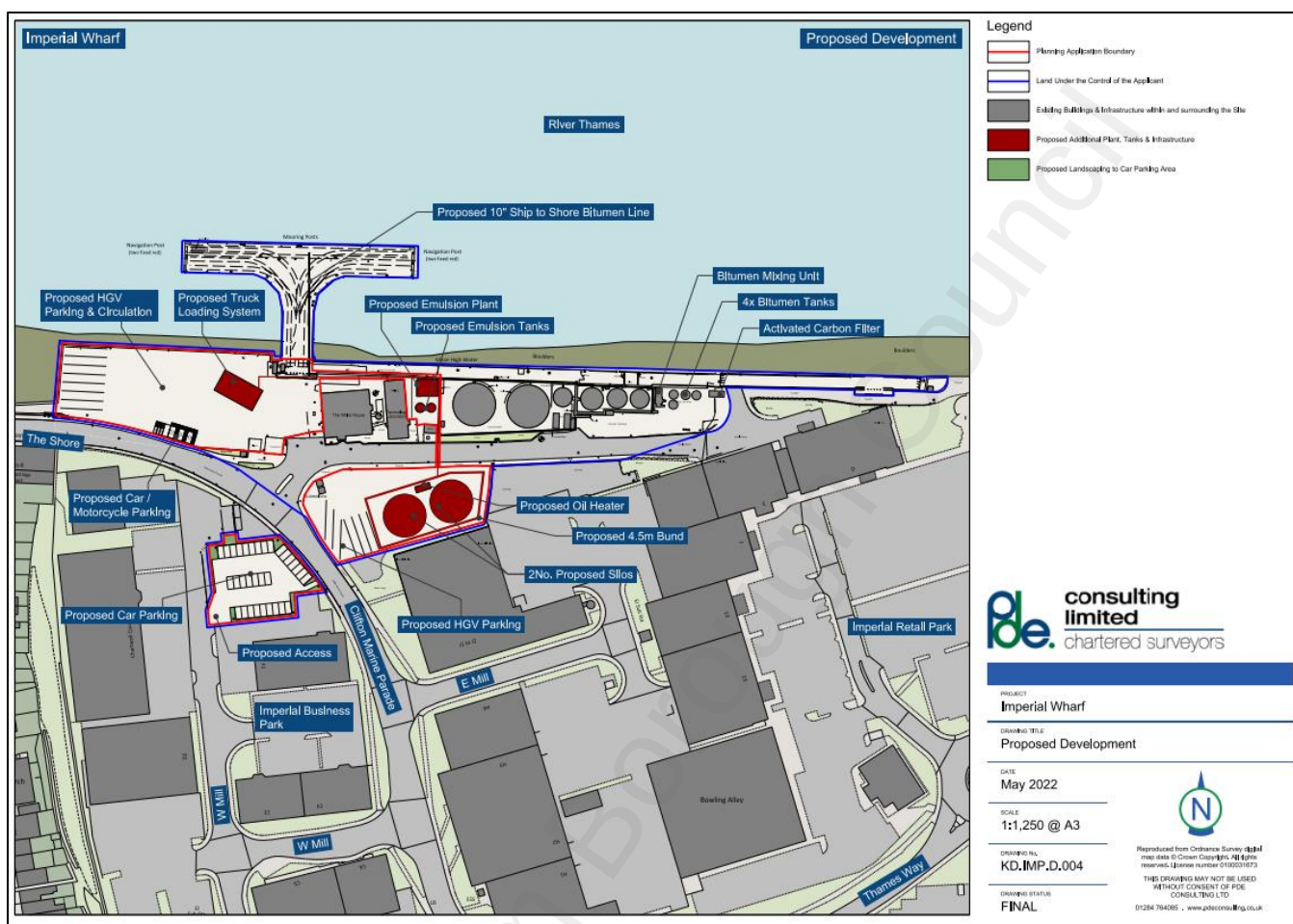
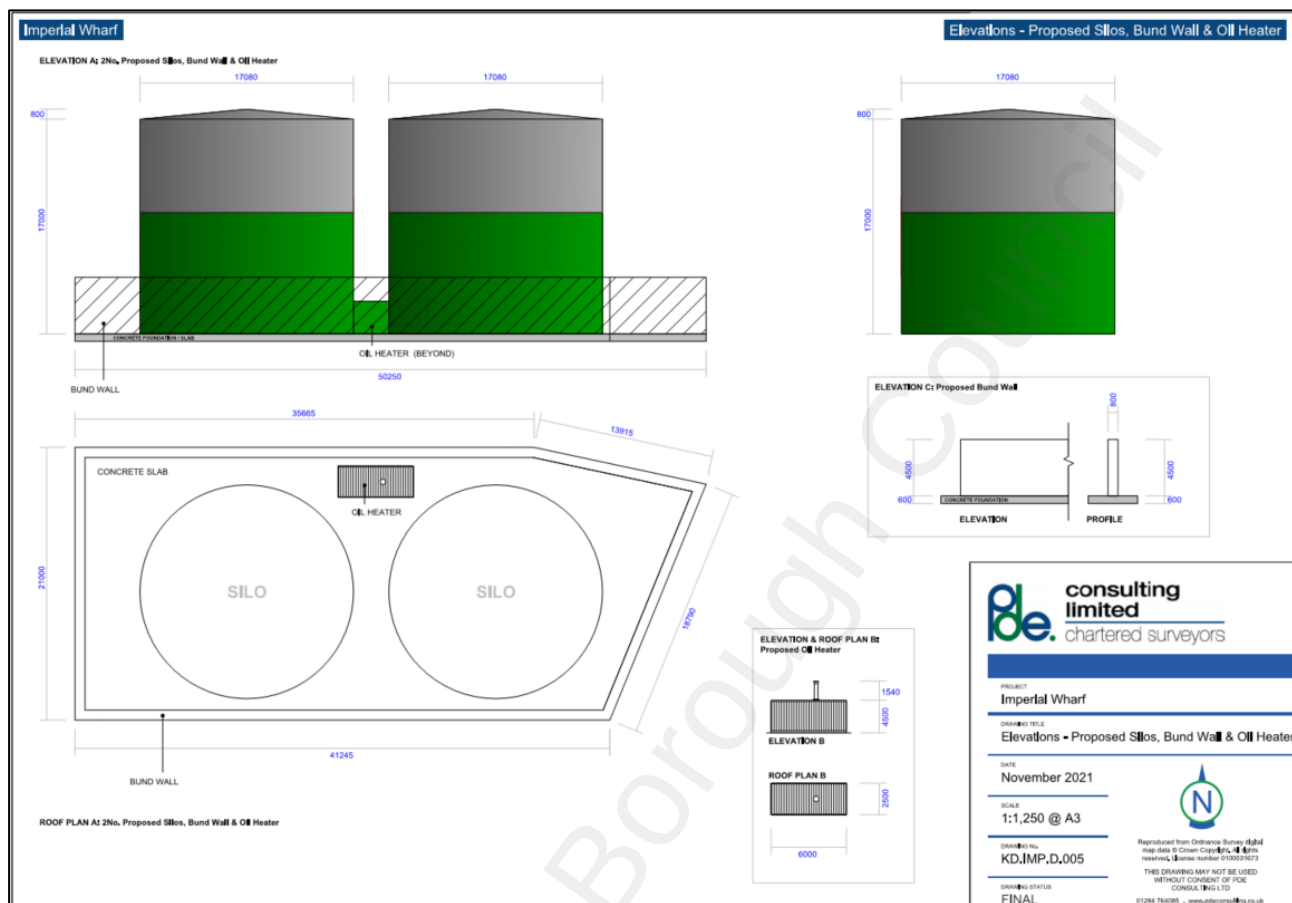


Figure 1-4. Site Layout of Two Proposed Bitumen Tanks/Silos



## 1.3 ASSESSMENT CONTEXT

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The following stages have been undertaken as part of this assessment:

- Baseline evaluation;
- Identification of receptors, including ecological receptors;
- Baseline traffic air quality modelling to determine NO<sub>2</sub> pollutant levels to consider emissions from traffic;
- Assessment of potential air quality impacts from the operation of two existing gas heaters and one proposed new gas heater; and
- Odour impact assessment from the operations of the existing activated carbon filter system and lorry tanker filling operations. The carbon filter system will be used to control the odour emissions from both the existing bitumen tanks and the proposed bitumen tanks.

The objective of the air quality assessment is to determine whether the impacts from development meet the required air quality standards (AQSS), AQOs, or air quality environmental assessment limits (EALs) for the protection of human health and for the protection of vegetation and ecosystems.

## 2.0 POLICY AND LEGISLATIVE CONTEXT

The following assessment has been undertaken in accordance with the legislation and best practice guidance as stated below.

### 2.1 DOCUMENTS CONSULTED

The following documents were consulted during the undertaking of this assessment:

#### Legislation and Best Practice Guidance

- National Planning Policy Framework, Ministry for Housing, Communities and Local Government, Revised July 2021;
- Planning Practice Guidance: Air Quality, Ministry for Housing, Communities and Local Government, November 2019;
- The Air Quality Standards Regulations (Amendments), 2016,
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra, 2007;
- The Environment Act, 1995;
- Local Air Quality Management Technical Guidance LAQM.TG16, Defra, 2018;
- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, LA 105 Air quality, Highways England, November 2019
- Land-Use Planning & Development Control: Planning for Air Quality, EPUK & IAQM, 2017;
- Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014;
- Local Air Quality Management Note on Projecting NO<sub>2</sub> concentrations, DEFRA, April 2012; and
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.0), IAQM, June 2019.

#### Websites Consulted

- Google maps ([maps.google.co.uk](https://maps.google.co.uk));
- The UK National Air Quality Archive ([www.airquality.co.uk](http://www.airquality.co.uk));
- Department for Transport Matrix ([www.dft.gov.uk/matrix](http://www.dft.gov.uk/matrix));
- [emapsite.com](http://emapsite.com);
- Multi-Agency Geographic Information for the Countryside (<http://magic.defra.gov.uk/>);
- Planning Practice Guidance (<http://planningguidance.planningportal.gov.uk/>); and
- Gravesham Borough Council website <https://www.gravesham.gov.uk/>

#### Site Specific Reference Documents

- Gravesham Local Plan Core Strategy (Adopted September 2014).

- Gravesham Borough Council, Annual Status Report 2020, August 2021.

## 2.2 AIR QUALITY LEGISLATIVE FRAMEWORK

### European Legislation

European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11<sup>th</sup> June 2008. This Directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates. The consolidated Directives include:

- Directive 1999/30/EC – the First Air Quality "Daughter" Directive – sets ambient air limit values for NO<sub>2</sub> and oxides of nitrogen, sulphur dioxide, lead and PM10;
- Directive 2000/69/EC – the Second Air Quality "Daughter" Directive – sets ambient air limit values for benzene and carbon monoxide; and,
- Directive 2002/3/EC – the Third Air Quality "Daughter" Directive – seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC – sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

### UK Legislation

The Air Quality Standards Regulations (Amendments 2016) seek to simplify air quality regulation and provide a new transposition of the Air Quality Framework Directive, First, Second and Third Daughter Directives and also transpose the Fourth Daughter Directive within the UK. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards, with attainment dates in line with the European Directives. SI 2010 No. 1001, Part 7 Regulation 31 extends powers, under Section 85(5) of the Environment Act (1995), for the Secretary of State to give directions to Environmental Assessment Limits (LAs) for the implementation of these Directives.

The UK Air Quality Strategy is the method for implementation of the air quality limit values in England, Scotland, Wales and Northern Ireland and provides a framework for improving air quality and protecting human health from the effects of pollution.

For each nominated pollutant, the Air Quality Strategy sets clear, measurable, outdoor air quality standards and target dates by which these must be achieved; the combined standard and target date is referred to as the Air Quality Objective (AQO) for that pollutant. Adopted national standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a set of Statutory Objectives within the Air Quality (England) Regulations (2000) SI 928, and subsequent amendments.

The AQOs for pollutants included within the Air Quality Strategy and assessed as part of the scope of this report are presented in **Table 2-1** along with European Commission (EC) Directive Limits and World Health Organisation (WHO) Guidelines.

**Table 2-1.** Air Quality Standards, Objectives, Limit and Target Values

| Pollutant       | Applies | Objectives                                                        | Concentration Measured as | Date to be achieved and maintained thereafter | European Obligations                                              | Date to be achieved and maintained thereafter | New or existing |
|-----------------|---------|-------------------------------------------------------------------|---------------------------|-----------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------|-----------------|
| NO <sub>2</sub> | UK      | 200µg/m <sup>3</sup> not to be exceeded more than 18 times a year | 1-Hour Mean               | 31 <sup>st</sup> December 2005                | 200µg/m <sup>3</sup> not to be exceeded more than 18 times a year | 1 <sup>st</sup> January 2010                  | Retain Existing |
|                 | UK      | 40µg/m <sup>3</sup>                                               | Annual Mean               | 31 <sup>st</sup> December 2005                | 40µg/m <sup>3</sup>                                               | 1 <sup>st</sup> January 2010                  |                 |

Within the context of this assessment, the annual mean objectives are those against which facades of residential receptors will be assessed and the short-term objectives apply to all other receptor locations, where people may be exposed over a short duration, both residential and non-residential such as using gardens, balconies, walking along streets, using playgrounds, footpaths or external areas of employment uses.

### Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves assessing present and likely future air quality against the AQOs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA, the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

## 2.3 PLANNING AND POLICY GUIDANCE

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### National Policy

The National Planning Policy Framework (NPPF), 20 July 2021, principally brings together and summarises the suite of Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) which previously guided planning policy making. The NPPF states that:

*“Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas or Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic or travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.”*

The Planning Practice Guidance (PPG) web-based resource was launched by the Ministry for Housing, Communities and Local Government (MHCLG) on 6 March 2014 to support the National Planning Policy Framework and make it more accessible. A review of PPG: Air Quality identified the following guidance:

*“When deciding whether air quality is relevant to a planning application, local planning authorities should consider whether the development would:*

*Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.*

*Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area.*

*Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*

*Give rise to potentially significant impact (such as dust) during construction for nearby sensitive locations.*

*Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site and is not directly connected with or*

*necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites.”*

## Local Policy

The Local Plan Core Strategy is the main document in the Gravesham Local Plan. The purpose of the Local Plan Core Strategy is to:

- Set out a long-term vision for the future of Gravesham based on evidence of what's needed to support communities and also what makes Gravesham a distinctive and attractive place to live and work;
- Guide the amount, type, location and detailed design of future development and provide a consistent basis against which we can decide planning applications; and
- Support other priorities such as our regeneration proposals, investment in infrastructure, our work to support local businesses and encourage job creation and our efforts to promote healthy communities.

The Gravesham Local Plan First Review was adopted in 1994. It contained a number of policies to help the council make decisions on planning applications. In 2007, the government allowed council to save some of the adopted policies where they were relevant and up to date.

The Local Plan Core Strategy has been reviewed and the relevant saved policy from the Local Plan Core Strategy for this assessment is Policy CS19: Development and Design Principles which states:

*“New development will be visually attractive, fit for purpose and locally distinctive. It will conserve and enhance the character of the local built, historic and natural environment, integrate well with the surrounding local area and meet anti-crime standards. The design and construction of new development will incorporate sustainable construction standards and techniques, be adaptable to reflect changing lifestyles, and be resilient to the effects of climate change. This will be achieved through the criteria set out below:*

...

- *New development will be located, designed and constructed to:*

...

- *Avoid adverse environmental impacts from pollution, including noise, air, odour and light pollution, and land contamination.”*

## 3.0 ASSESSMENT METHODOLOGY

The potential environmental effects of the operational phase of the proposed development are identified as far as current knowledge of the site and development allows. The significance of potential environmental effects is assessed according to the latest guidance produced by EPUK and IAQM in January 2017.

### 3.1 DETERMINING THE IMPACT MAGNITUDE OF THE AIR QUALITY EFFECTS

The impact magnitude of the effects during the operational phase of the development is based on the latest guidance produced by EPUK and IAQM in January 2017. The guidance provides a basis for a consistent approach that could be used by all parties associated with the planning process to professionally judge the overall significance of the air quality effects based on severity of air quality impacts.

The following rationale is used in determining the severity of the air quality effects at individual receptors:

1. The change in concentration of air pollutants, air quality effects, are quantified and evaluated in the context of AQOs. The impacts are provided as a percentage of the Air Quality Assessment Level (AQAL), which may be an AQO, EU limit or target value, or a Natural Resources Wales Assessment Level (NRWAL);
2. The absolute concentrations are also considered in terms of the AQAL and are divided into categories for long term concentration. The categories are based on the sensitivity of the individual receptor in terms of harm potential. The degree of harm potential to change increases as absolute concentrations are close to or above the AQAL;
3. Severity of the effect is described as qualitative descriptors; negligible, slight, moderate or substantial, by taking into account in combination the harm potential and air quality effect. This means that a small increase at a receptor which is already close to or above the AQAL will have higher severity compared to a relatively large change at a receptor which is significantly below the AQAL;
4. The impacts can be adverse when pollutant concentrations increase or beneficial when concentration decrease as a result of development;
5. The judgement of overall significance of the effects is then based on severity of effects on all the individual receptors considered; and,
6. Where a development is not resulting in any change in emissions itself, the significance of effect is based on the effect of surrounding sources on new residents or users of the development, i.e., will they be exposed to levels above the AQAL.

**Table 3-1.** Impact Descriptors for Individual Receptors

| Long term average concentration at receptor in assessment year | % Change in concentration relative to AQAL |             |             |             |
|----------------------------------------------------------------|--------------------------------------------|-------------|-------------|-------------|
|                                                                | 1                                          | 2-5         | 6-10        | >10         |
| ≤75% of AQAL                                                   | Negligible                                 | Negligible  | Slight      | Moderate    |
| 76-94% of AQAL                                                 | Negligible                                 | Slight      | Moderate    | Moderate    |
| 95-102% of AQAL                                                | Slight                                     | Moderate    | Moderate    | Substantial |
| 103-109 of AQAL                                                | Moderate                                   | Moderate    | Substantial | Substantial |
| ≥110 of AQAL                                                   | Moderate                                   | Substantial | Substantial | Substantial |

In accordance with explanation note 2 of Table 6.3 of the EPUK & IAQM guidance, the Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.

## 4.0 BASELINE CONDITIONS

### 4.1 AIR QUALITY REVIEW

This section provides a review of the existing air quality in the vicinity of the proposed development site in order to provide a benchmark against which to assess potential air quality impacts of the proposed development. Baseline air quality in the vicinity of the proposed development site has been defined from a number of sources, as described in the following sections.

#### Local Air Quality Management (LAQM)

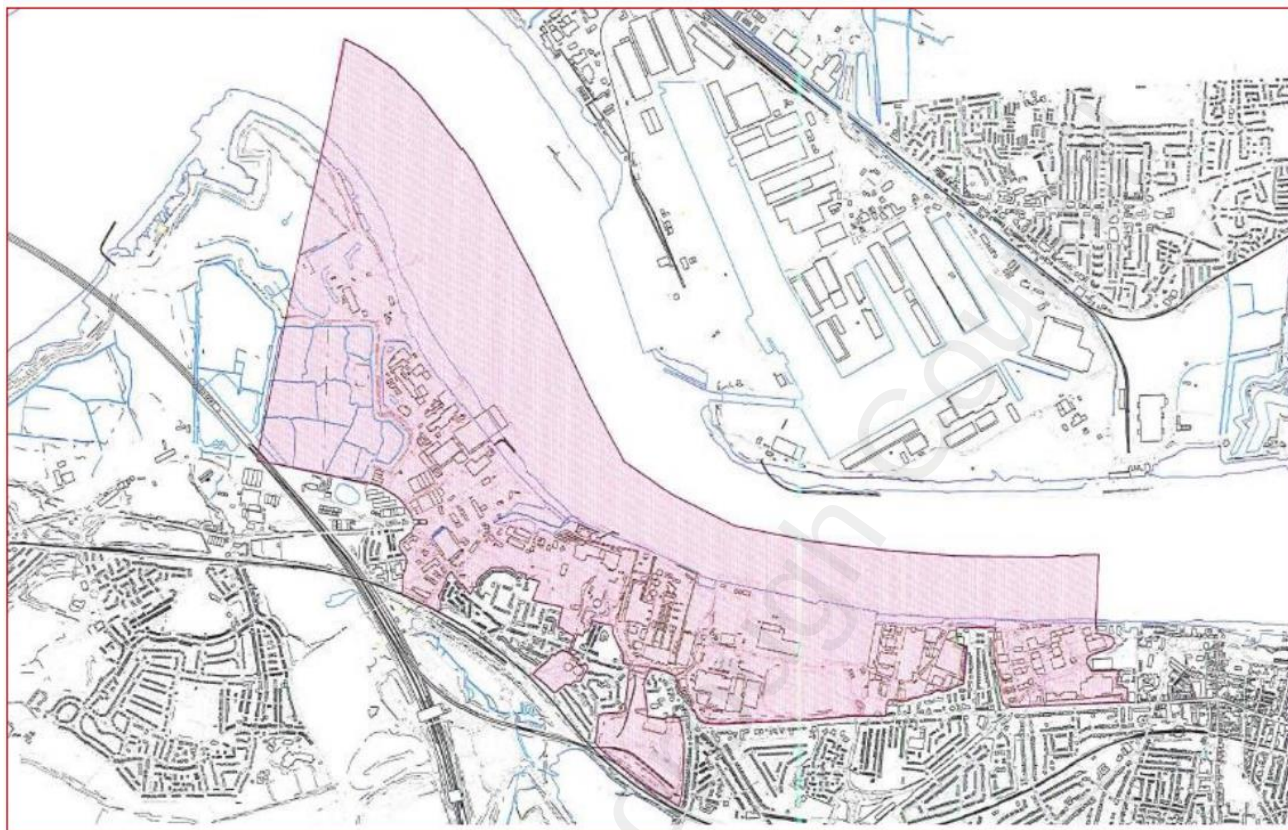
As required under section 82 of the Environment Act 1995, Gravesham Borough Council (GBC) has conducted an ongoing exercise to review and assess air quality within its area of jurisdiction.

The main source of air pollution in the Borough is road traffic emissions from major roads, notably the A2, A226 and A227. The National Air Quality Standards Objective for Nitrogen Dioxide has been exceeded in six areas of the borough. Particulate matter (PM<sub>10</sub>) has also been in exceedance of the relevant objective in the Northfleet Industrial Area. Therefore Gravesham Borough Council has declared seven Air Quality Management Areas (AQMA),

- A2 Trunk Road AQMA for Nitrogen dioxide;
- Northfleet Industrial Area AQMA for Particulate Matter (PM<sub>10</sub>);
- A226 One-way system in Gravesend for Nitrogen dioxide NO<sub>2</sub>;
- B262/B261 Pelham Arms Junction for Nitrogen dioxide NO<sub>2</sub>;
- A227/B261 Wrotham Road/Old Road West Junction for Nitrogen dioxide NO<sub>2</sub>;
- The Echo Junction Area incorporating the junction of Parrock Road, (B261) Old Road East, Whitehill Road, Sun Lane and Cross Lane East; and
- The Parrock Street Area incorporating the stretch of Parrock Street from the point at which Parrock Street crosses the railway southwards to the junction of Christ Church Road and also Lord Street from its junction with Parrock Street to its junction with Windmill Street.

The proposed development site is located within the Northfleet Industrial Area Air Quality Management Area.

**Figure 4-1.** Northfleet Industrial Area Air Quality Management Area



### Air Quality Monitoring

Monitoring of air quality within the GBC is conducted through continuous and non-continuous monitoring methods. These have been reviewed in order to provide an indication of existing air quality in the area surrounding the proposed development site.

#### Continuous Monitoring

Gravesham's continuous air monitoring stations monitor Nitrogen dioxide (NO<sub>2</sub>) and Particulate Matter (PM<sub>10</sub>) emissions from vehicles on the A2 Trunk Road and from the industrial sources in Northfleet.

Details of the Automatic Monitoring Sites are presented in **Table 4-1**.

**Table 4-1.** Details of the Automatic Monitoring Sites

| Site Name                                     | Site Type             | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored               | Within AQMA? | Relevant Exposure? (m to relevant exposure) | Distance to Kerb of Nearest Road (m) |
|-----------------------------------------------|-----------------------|---------------|---------------|------------------------------------|--------------|---------------------------------------------|--------------------------------------|
| Site ID: ZG2: Gravesham A2 Roadside           | Roadside              | 562589        | 172076        | NO <sub>2</sub> ; PM <sub>10</sub> | Y            | 0                                           | 72                                   |
| Site ID: ZG3: Gravesham Industrial Background | Industrial Background | 562155        | 174360        | NO <sub>2</sub> ; PM <sub>10</sub> | Y            | 3.7                                         | 24                                   |

Automatic annual mean NO<sub>2</sub> monitoring results are presented in **Table 4-2**.

**Table 4-2.** Automatic Annual Mean NO<sub>2</sub> Monitoring Results (2015- 2019)

| Site Name                                     | Site Type             | Valid Data Capture for Monitoring Period % (1) | Valid Data Capture 2019 % (2) | Annual Mean Concentration (µg/m <sup>3</sup> ) |      |      |      |      |
|-----------------------------------------------|-----------------------|------------------------------------------------|-------------------------------|------------------------------------------------|------|------|------|------|
|                                               |                       |                                                |                               | 2015                                           | 2016 | 2017 | 2018 | 2019 |
| Site ID: ZG2: Gravesham A2 Roadside           | Roadside              | 96.0                                           | 96.0                          | 30.0                                           | 29.6 | 31.6 | 29.9 | 29.1 |
| Site ID: ZG3: Gravesham Industrial Background | Industrial Background | 98.4                                           | 98.4                          | 23.4                                           | 24.1 | 23.9 | 23.5 | 24.5 |

Note:

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

There are no exceedances of the annual average NO<sub>2</sub> objective (40µg/m<sup>3</sup>) between 2015 and 2019.

#### Non - Continuous Monitoring

Air Quality monitoring is also carried out by passive diffusion tubes measuring average levels of Nitrogen dioxide at key locations around the borough. There are currently approximately 70 tubes out in the borough measuring both background and roadside Nitrogen dioxide levels.

The representative diffusion tube data within the site area are from 2017 which is presented in **Table 4-3**.

**Table 4-3.** Monitored Annual Mean NO<sub>2</sub> Concentrations

| Site ID | Site Name                                                   | Site Type | X OS Grid Ref | Y OS Grid Ref | Distance to Kerb of Nearest Road (m) | NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) |      |      |      |      |
|---------|-------------------------------------------------------------|-----------|---------------|---------------|--------------------------------------|----------------------------------------------------------------|------|------|------|------|
|         |                                                             |           |               |               |                                      | 2015                                                           | 2016 | 2017 | 2018 | 2019 |
| GR61    | 62 New Road (Pounce - Down Pipe), Gravesend, Kent, DA11 0AD | Roadside  | 564429        | 174152        | 2.6                                  | 35.1                                                           | 34.9 | 34.5 | 35.5 | 35.1 |
| GR66    | Russell Quay (Lamppost), West Street, Gravesend, DA11 0BE   | Roadside  | 564512        | 174448        | 2.5                                  | 26.5                                                           | 30.2 | 31.0 | 31.9 | 31.6 |
| GR139   | Rosherville Way, Lamppost near Compass Court                | Roadside  | 570719        | 171143        | 4.31                                 | -                                                              | -    | 37.6 | 30.5 | 34.0 |

As indicated in **Table 4-3** above, the roadside diffusion tubes were below the relevant AQO (40 µg/m<sup>3</sup> annual mean) between 2017 and 2019.

## 4.2 BASELINE/BACKGROUND CONCENTRATIONS INCLUSIVE OF CONTRIBUTIONS FROM TRAFFIC EMISSIONS

ADMS Roads has been used to undertake a verified baseline modelling to determine baseline pollutant levels at the selected receptor locations by considering emissions from traffic. Details of the background concentrations used in this assessment are provided in Appendix A.

## 5.0 DETAILED DISPERSION MODELLING METHODOLOGY FOR AIR QUALITY IMPACTS FROM OPERATIONS OF BURNERS

In order to consider the air quality impacts of the burners on the local air quality, a quantitative assessment using the third generation Breeze AERMOD dispersion model has been undertaken. AERMOD is a development from the ISC3 dispersion model and incorporates improved dispersion algorithms and pre-processors to integrate the impact of meteorology and topography within the modelling output.

The model uses hourly meteorological data to define conditions for plume rise, transport, diffusion and deposition. It estimates the concentration for each source and receptor combination for each hour of input meteorology and calculates user-selected short-term averages.

### 5.1 MODELLING PARAMETER AND AVERAGING PERIOD

The dispersion modelling has assessed impact of emissions from the burners taking into consideration of the operation of the proposed installation.

The same averaging period should be used for comparison of emissions against environmental standards. For example, most long-term standards are expressed as an annual mean and many short-term standards as an hourly mean. Note that there are certain exceptions to this which are important when considering compliance with statutory EQS. The averaging period associated with the relevant modelled pollution are detailed in **Table 5-1**.

**Table 5-1.** Monitored Annual Mean NO<sub>2</sub> Concentrations

| Parameter       | Modelled As                                       |             |
|-----------------|---------------------------------------------------|-------------|
|                 | Short Term                                        | Long Term   |
| NO <sub>2</sub> | 99.79 <sup>th</sup> percentile (%ile) 1-hour mean | Annual Mean |

NO<sub>2</sub> background concentrations are taken from ADMS Road modelling results, which includes the contribution from traffic emissions.

For short-term averaging periods, the following UK Defra methodology, for example, has been followed.

For 1-hour NO<sub>2</sub> concentrations:

- 99.79<sup>th</sup> percentile(%ile) 1-hour Process Contribution NO<sub>2</sub> + 2 x (annual mean background contribution NO<sub>2</sub>).

## 5.2 SENSITIVE RECEPTORS

### Discrete (Individual) Receptors

The discrete sensitive receptors identified for the purposes of this air quality assessment are contained in **Table 5-2** and shown further in **Figure 5-1**.

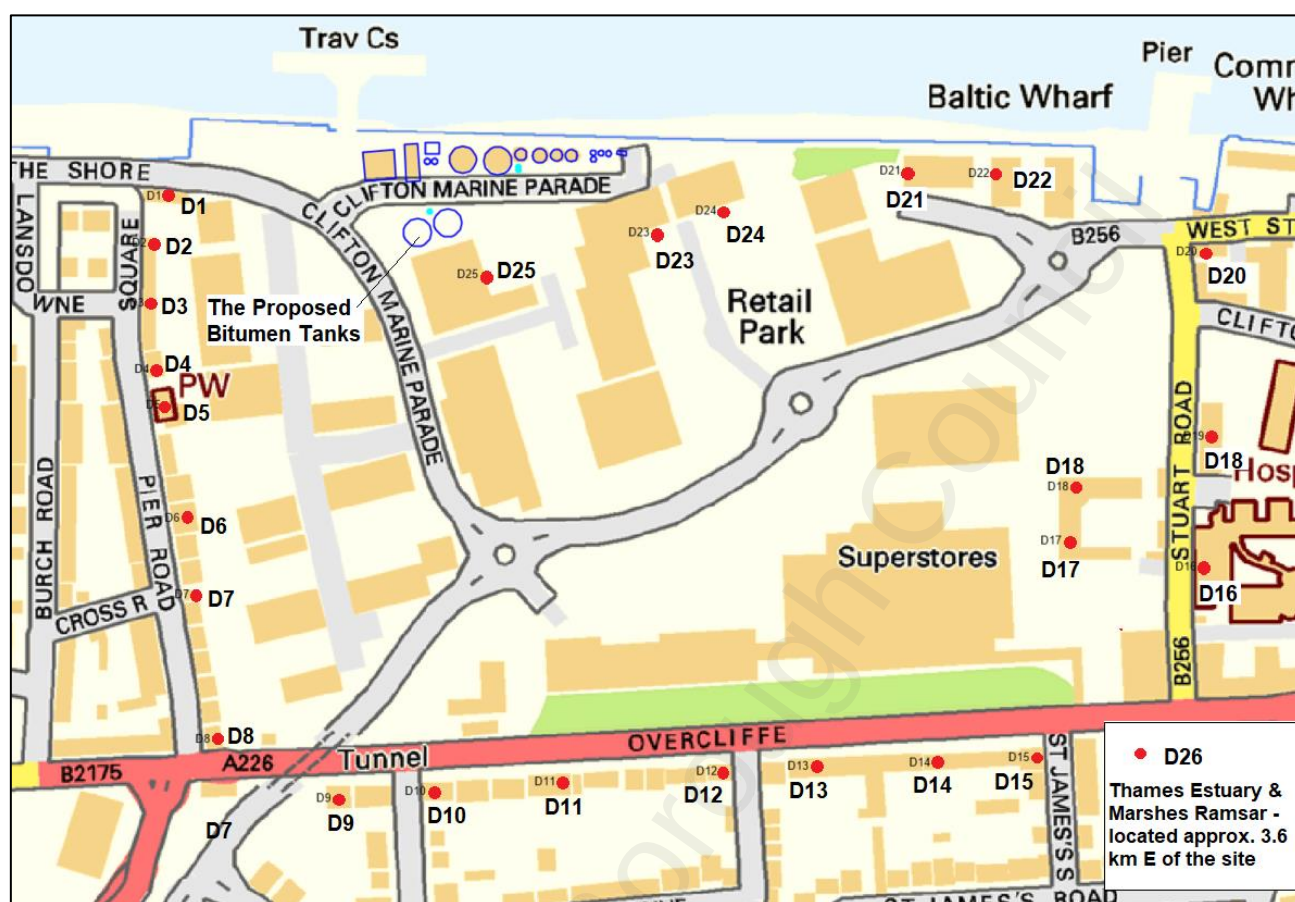
The assessment has also been undertaken to determine the potential impacts at those selected receptors.

It should be noted that these do not represent an exhaustive list of all receptors within the vicinity of the Site, rather they are worst case representative locations within and adjacent to the site.

**Table 5-2.** Modelled Sensitive Receptors for Industrial Emission Assessment

| Site ID | Discrete Sensitive Receptor                  | UK NGR (m) |        |
|---------|----------------------------------------------|------------|--------|
|         |                                              | X          | Y      |
| D1      | Unit 1 Ellandaye House, The Shore            | 563795     | 174458 |
| D2      | 52 Pier Road                                 | 563786     | 174429 |
| D3      | 46 Pier Road                                 | 563784     | 174393 |
| D4      | 40 Pier Road                                 | 563787     | 174353 |
| D5      | Full Gospel Church, 32 Pier Road             | 563794     | 174331 |
| D6      | 24 Pier Road                                 | 563806     | 174262 |
| D7      | 16 Pier Road                                 | 563812     | 174215 |
| D8      | 1 Pier Road                                  | 563824     | 174127 |
| D9      | 36 Overcliffe                                | 563898     | 174091 |
| D10     | 33 Overcliffe                                | 563956     | 174095 |
| D11     | 26 Overcliffe                                | 564034     | 174101 |
| D12     | 18 Overcliffe                                | 564133     | 174107 |
| D13     | 15 Overcliffe                                | 564189     | 174111 |
| D14     | 10 Overcliffe                                | 564263     | 174113 |
| D15     | Flat 10, Pioneer Court, Overcliffe           | 564324     | 174116 |
| D16     | Gravesham Community Hospital                 | 564426     | 174232 |
| D17     | 23 Fairfield Square, Stuart Road             | 564343     | 174248 |
| D18     | 53 Fairfield Square, Stuart Road             | 564347     | 174281 |
| D19     | 11 Stuart Road                               | 564430     | 174311 |
| D20     | Flat 67, the Maltings, Clifton Road          | 564426     | 174424 |
| D21     | Flat 1, Baltic Wharf, Clifton Marine Parade  | 564245     | 174474 |
| D22     | Flat 43, Baltic Wharf, Clifton Marine Parade | 564300     | 174472 |
| D23     | Halfords (commercial/retail premises)        | 564092     | 174436 |
| D24     | Carpentryright (commercial/retail premises)  | 564133     | 174449 |
| D25     | ITAB Shop (commercial/retail premises)       | 563988     | 174410 |
| D26     | Thames Estuary and Marshes Ramsar            | 567320     | 173900 |

Figure 5-1. Receptor Locations



### Cartesian Grid Receptor

Cartesian receptor grid was used in the model in order to produce the concentration contour lines. The Cartesian receptor grid consists of receptors identified by their x (east-west) and y (north-south) coordinates. A grid was constructed with grid spacing (x, y) of 50m x 50m over an area covering 3000m by 3000m with south-west corner UK NGR (m) of 562500,173100.

### Ecological Receptors for Industrial Emission Assessment

The guidance 'Air emissions risk assessment for your environmental permit' (Defra and Environment Agency, 2 August 2016) states that assessments should consider the impact on the conservation areas by:

Examining if there are any of the following within 10km of your site (or within 15km for coal or oil-fired power stations):

- Special Protection Areas (SPAs);
- Special Areas of Conservation (SACs); and
- Ramsar sites (protected wetlands).

Examining if there are any of the following within 2km of your site:

- Sites of Special Scientific Interest (SSSIs); and

- Local Nature Sites (ancient woods, local wildlife sites and national and local nature reserves).

Some larger (greater than 50 megawatt) emitters may be required to screen to 15km for European sites and to 10km or 15km for SSSIs.

Following a review, one ecological site was identified as below.

- Thames Estuary and Marshes Ramsar – Located approximately 3,600 m east of the proposed development at its closest point.

The identified ecological site has been included as receptor in the assessment.

## 5.3 EMISSION SOURCES

### 5.3.1 Emission Sources from Gas Heaters

The gas and dual-fuel heaters/burners have been used for heating the bitumen storage tanks. Natural gas has been used as fuels in normal operation and diesel fuel is a backup fuel only.

There are two existing Weishaupt heaters installed on site for heating the existing tanks, each having a power rating of 1,750 kw.

It is proposed to install a new Weishaupt heater (1,750 kw) for heating the proposed two additional bitumen tanks.

The emissions from the gas fired burners have been calculated using the information on on-site fuel consumptions, burner exhaust gas analysis report and manufacturer specifications. The pollutant mass emission rates used within AERMOD are presented in **Table 5-3**.

**Table 5-3. Gas Fired Burner Stack Emissions**

| Parameter                                           | Weishaupt 1,750 kW Burner<br>(Each Burner) | Unit               |
|-----------------------------------------------------|--------------------------------------------|--------------------|
| Fuel Consumptions                                   | 17.91 <sup>a</sup>                         | m <sup>3</sup> /hr |
| Gas Calorific Value                                 | 42 – 46 <sup>b</sup>                       | MJ/m <sup>3</sup>  |
| Air Fuel Ratio                                      | 11 <sup>b</sup>                            | -                  |
| Stack Gas Temperature                               | 202 <sup>c</sup>                           | °C                 |
| Exhaust Gas Volume at °C                            | 214.92                                     | m <sup>3</sup> /hr |
|                                                     | 0.0597                                     | m <sup>3</sup> /s  |
| CO Concentration within Exhaust Gas                 | 6 <sup>c</sup>                             | ppm                |
|                                                     | 6.87                                       | mg/m <sup>3</sup>  |
| NO <sub>x</sub> Emission Factor: CO Emission Factor | 280:84 = 3.33 <sup>d</sup>                 | -                  |
| NO <sub>x</sub> Concentration within Exhaust Gas    | 6.87 x 3.33 = 22.91                        | mg/m <sup>3</sup>  |
| Mass NO <sub>x</sub> Emission rate                  | 4.92                                       | g/hr               |
|                                                     | 0.0014                                     | g/s                |
| Modelled stack diameter                             | 0.380 <sup>e</sup>                         | m                  |

|                    |                 |     |
|--------------------|-----------------|-----|
| Stack gas velocity | 0.917           | m/s |
| Stack Height       | 20 <sup>e</sup> | m   |

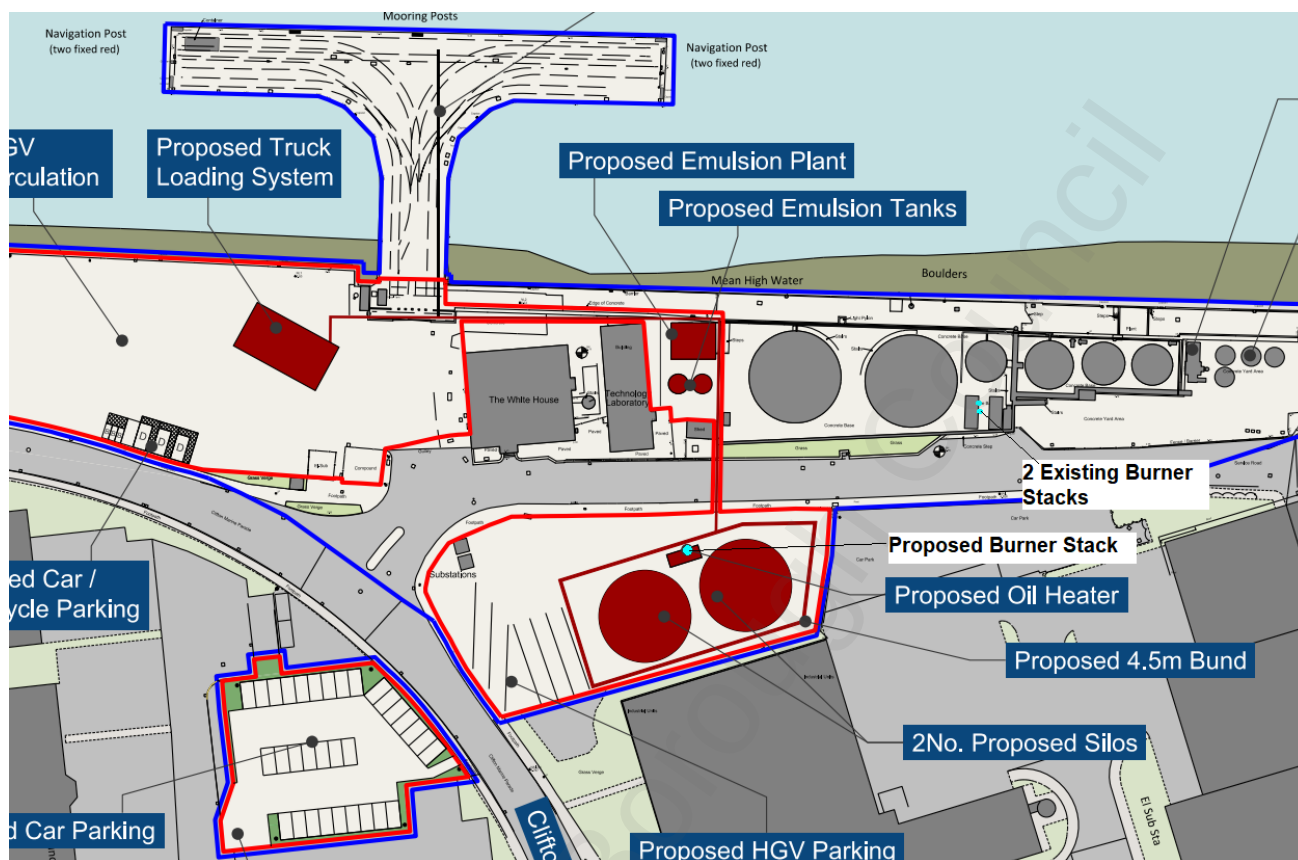
Note:

- (a) On-site burner operation data;
- (b) Using the maximum for a worst-case assessment;
- (c) Exhaust gas analysis report;
- (d) Natural Gas Combustion: <https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf>; and
- (e) Site specific data.

The impact from the burner emissions has been assessed assuming simultaneous operation of burners for 8,760 hours per annum and it produces a worst-case assessment.

**Figure 5-2** illustrates the locations of the modelled emission points for the burner stacks.

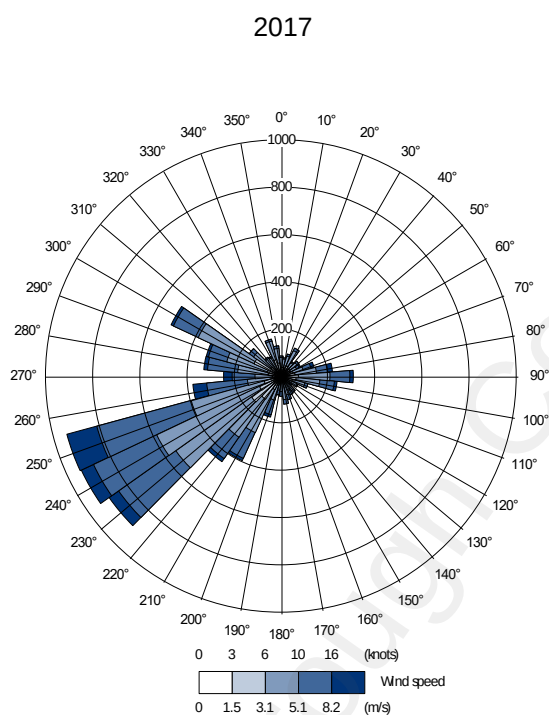
Figure 5-2. Burner Stack Locations



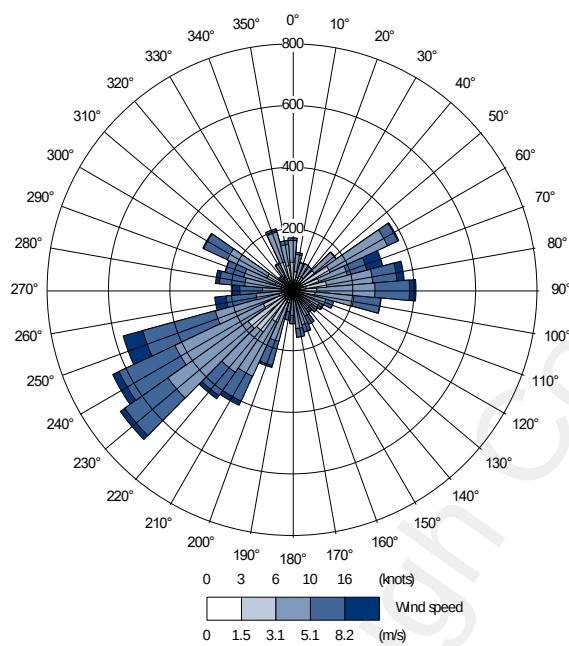
## 5.4 METEOROLOGICAL DATA

The 3-year meteorological data (2017, 2018 and 2019) used in the assessment is derived from London City Airport weather station, which is considered representative of conditions within the vicinity of the site, with all the complete parameters necessary for the AERMOD model. Reference should be made to **Figure 5-3** for an illustration of the prevalent wind conditions at the London City Airport weather station.

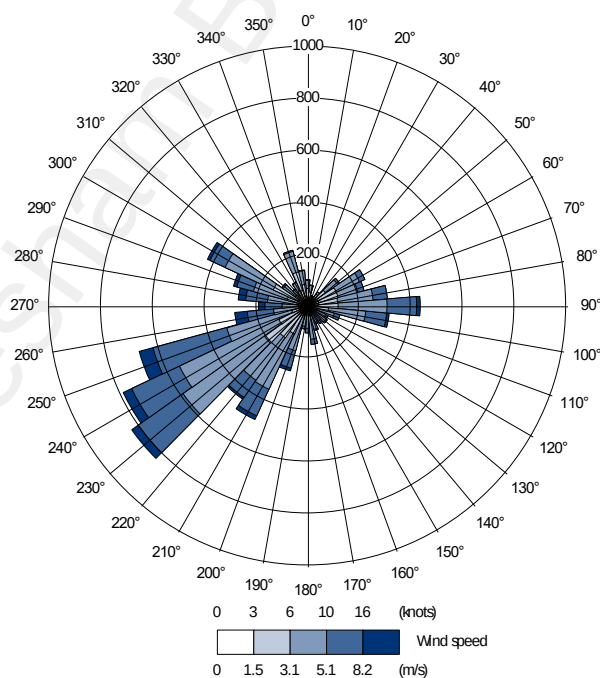
Figure 5-3. London City Airport Meteorological Data/Windrose 2017 to 2019



2018



2019



## 5.5 SURFACE CHARACTERISTICS

The land uses surrounding the Site are mostly described as industrial uses, town, and River Thames. A surface roughness value of 1.0 m for cities uses has been used in the modelling for a worst-case assessment.

## 5.6 BUILDINGS IN THE MODELLING ASSESSMENT

Buildings nearby or immediately adjacent to the stack could potentially cause building downwash effects on emission sources and have therefore been modelled for the proposed development. The locations and dimensions of the buildings used in the model are given in **Table 5-4** and illustrated in **Table 5-4**.

**Table 5-4.** Locations and Heights of Building Used in the Model

| Name |                  | UK NGR (m) |        | Height (m) |
|------|------------------|------------|--------|------------|
|      |                  | X          | Y      |            |
| 1    | Carbon Filter    | 564069     | 174486 | 5.2        |
| 2    | Emulsion Plant   | 563952     | 174490 | 2.6        |
| 3    | Technology Lab   | 563939     | 174490 | 8.0        |
| 4    | The white House  | 563933     | 174486 | 11.0       |
| 5    | Tank 1           | 563975     | 174480 | 17.8       |
| 6    | Tank 2           | 563996     | 174480 | 17.8       |
| 7    | Tank 3           | 564011     | 174483 | 11.0       |
| 8    | Tank 4           | 564022     | 174483 | 10.0       |
| 9    | Tank 5           | 564032     | 174483 | 10.0       |
| 10   | Tank 6           | 564041     | 174483 | 10.0       |
| 11   | Small Tank No.7  | 564055     | 174480 | 15.0       |
| 12   | Small Tank No.8  | 564055     | 174484 | 15.0       |
| 13   | Small Tank No.9  | 564060     | 174484 | 15.0       |
| 14   | Small Tank No.10 | 564064     | 174484 | 15.0       |
| 15   | Proposed Tank 1  | 563947     | 174436 | 17.1       |
| 16   | Proposed Tank 2  | 563966     | 174442 | 17.1       |
| 17   | Emulsion Tanks 1 | 563954     | 174479 | 14.2       |
| 18   | Emulsion Tanks 2 | 563958     | 174479 | 14.2       |

Figure 5-4. Buildings for the Modelling



## 5.7 TREATMENT OF TERRAIN

The presence of steep terrain can influence the dispersion of emissions and the resulting pollutant concentrations. USEPA guidance indicates that terrain effects should be considered if the gradient exceeds 1:10. A digital terrain file in the UK Ordnance Survey (OS) Landranger format (.NTF) has been used in the assessment.

## 5.8 NO<sub>x</sub> TO NO<sub>2</sub> CONVERSION

Emissions of NO<sub>x</sub> from combustion processes are predominantly in the form of NO. Excess oxygen in the combustion gases and further atmospheric reactions cause the oxidation of NO to NO<sub>2</sub>. Given the short travel time to the areas of maximum concentration and the rate of reaction to convert NO to NO<sub>2</sub>, it is unlikely that more than 30% of the NO<sub>x</sub> is present at ground level as NO<sub>2</sub>. This conversion factor is based on comparison of ambient NO and NO<sub>2</sub> continuous measurements evaluated over recent years.

Ground level NO<sub>x</sub> concentrations have been predicted through dispersion modelling. NO<sub>2</sub> concentrations reported in the results section assume 70% conversion from NO<sub>x</sub> to NO<sub>2</sub> for annual means and a 35% conversion for short term (hourly) concentrations, based upon EA methodology<sup>1</sup>.

## 5.9 MODELLING UNCERTAINTY

Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - including emissions estimates, background estimates and meteorology; and,
- Variability - randomness of measurements used.

However, potential uncertainties in model results have been minimised as far as practicable and worst-case inputs considered in order to provide a robust assessment. This included the following:

- Choice of model - AERMOD is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible.
- Facility operating parameters - Operational parameters were provided for the facility.
- Background concentrations - Background pollutant concentrations were obtained from a number of recognised sources in order to consider baseline levels in the vicinity of the site, as detailed within the main report text.
- Variability - All model inputs are as accurate as possible and worst-case conditions have been considered where necessary in order to ensure a robust assessment of potential pollutant concentrations.

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<sup>1</sup> Conversion Ratios for NO<sub>x</sub> and NO<sub>2</sub>, Environment Agency, updated.

## 6.0 DETAILED MODELLING ASSESSMENT RESULTS FROM OPERATIONS OF BURNERS

The detailed modelling assessment of process emissions for the proposed burner operations was undertaken using the input parameters detailed in Section 5.

All predicted concentrations have been compared to the relevant environmental assessment criteria, as detailed in Sections 2 and 3.

### 6.1 ASSESSMENT FOR THE PROTECTION OF HUMAN HEALTH

#### 6.1.1 Long-Term (Annual Mean) NO<sub>2</sub>

The long-term emissions of NO<sub>2</sub> from the source considered were assessed for all 3 years of meteorological data. The maximum process contributions (PCs) within the modelled receptor locations and their associated predicted environmental concentrations (PECs) are compared against the relevant AQO, in **Table 6-1**.

From the meteorological dataset, the year resulting in maximum long-term NO<sub>2</sub> PC concentration was identified as 2019. The predicted maximum PC occurs at the receptor location of ITAB Shop (commercial/retail premises) (D25).

The maximum NO<sub>2</sub> PC in Table 6.1 is 0.18 µg/m<sup>3</sup> and the associated NO<sub>2</sub> PEC is 27.68 µg/m<sup>3</sup>, which is below the relevant long-term AQS of 40 µg/m<sup>3</sup> for the protection of human health.

**Table 6-1.** Maximum Long-Term (Annual Mean) Concentrations of NO<sub>2</sub>

|                 | Year | Process Contribution (PC) (µg/m <sup>3</sup> ) | PC as %age of AQO | Traffic Background (µg/m <sup>3</sup> ) | PEC (PC + Background) (µg/m <sup>3</sup> ) | Easting (m) | Northing (m) |
|-----------------|------|------------------------------------------------|-------------------|-----------------------------------------|--------------------------------------------|-------------|--------------|
| NO <sub>2</sub> | 2017 | 0.17                                           | 0.42              | 27.50                                   | 27.67                                      | 563988      | 174410       |
| NO <sub>2</sub> | 2018 | 0.16                                           | 0.39              | 27.50                                   | 27.66                                      | 563988      | 174410       |
| NO <sub>2</sub> | 2019 | 0.18                                           | 0.44              | 27.50                                   | 27.68                                      | 563988      | 174410       |

**Table 6-2** presents a summary of the predicted nitrogen dioxide concentrations, both PCs and PECs, at the modelled receptors locations.

The impact description of changes associated with the operations of the burners with respect to annual mean NO<sub>2</sub> exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised below.

**Table 6-2.** Long-Term (Annual Mean) Concentrations of NO<sub>2</sub> and Impact Description of Effects at Receptors

| Receptors |                                    | Predicted Annual Mean Concentration (µg/m <sup>3</sup> ) – 2019 Met Data, and NO <sub>2</sub> Impact Description at Receptors |                   |                                         |                                            |                          |                          |                   |
|-----------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------|--------------------------------------------|--------------------------|--------------------------|-------------------|
| ID        | Name                               | Process Contribution (PC) (µg/m <sup>3</sup> )                                                                                | PC as %age of AQO | Traffic Background (µg/m <sup>3</sup> ) | PEC (PC + Background) (µg/m <sup>3</sup> ) | PEC as percentage of AQO | PEC as percentage of AQO | Impact Descriptor |
| D1        | Unit 1 Ellandaye House, The Shore  | 0.033                                                                                                                         | 0.08              | 27.97                                   | 28.00                                      | 70.01                    | ≤75% of AQAL             | Negligible        |
| D2        | 52 Pier Road                       | 0.029                                                                                                                         | 0.07              | 27.19                                   | 27.22                                      | 68.05                    | ≤75% of AQAL             | Negligible        |
| D3        | 46 Pier Road                       | 0.021                                                                                                                         | 0.05              | 27.10                                   | 27.12                                      | 67.80                    | ≤75% of AQAL             | Negligible        |
| D4        | 40 Pier Road                       | 0.015                                                                                                                         | 0.04              | 27.18                                   | 27.19                                      | 67.99                    | ≤75% of AQAL             | Negligible        |
| D5        | Full Gospel Church, 32 Pier Road   | 0.013                                                                                                                         | 0.03              | 27.28                                   | 27.29                                      | 68.23                    | ≤75% of AQAL             | Negligible        |
| D6        | 24 Pier Road                       | 0.008                                                                                                                         | 0.02              | 27.80                                   | 27.81                                      | 69.52                    | ≤75% of AQAL             | Negligible        |
| D7        | 16 Pier Road                       | 0.005                                                                                                                         | 0.01              | 28.57                                   | 28.58                                      | 71.44                    | ≤75% of AQAL             | Negligible        |
| D8        | 1 Pier Road                        | 0.004                                                                                                                         | 0.01              | 38.21                                   | 38.21                                      | 95.53                    | 95-102% of AQAL          | Negligible        |
| D9        | 36 Overcliffe                      | 0.004                                                                                                                         | 0.01              | 33.61                                   | 33.61                                      | 84.04                    | 76-94% of AQAL           | Negligible        |
| D10       | 33 Overcliffe                      | 0.006                                                                                                                         | 0.02              | 31.70                                   | 31.71                                      | 79.27                    | 76-94% of AQAL           | Negligible        |
| D11       | 26 Overcliffe                      | 0.008                                                                                                                         | 0.02              | 33.90                                   | 33.91                                      | 84.77                    | 76-94% of AQAL           | Negligible        |
| D12       | 18 Overcliffe                      | 0.007                                                                                                                         | 0.02              | 33.59                                   | 33.60                                      | 83.99                    | 76-94% of AQAL           | Negligible        |
| D13       | 15 Overcliffe                      | 0.006                                                                                                                         | 0.01              | 33.67                                   | 33.68                                      | 84.19                    | 76-94% of AQAL           | Negligible        |
| D14       | 10 Overcliffe                      | 0.004                                                                                                                         | 0.01              | 33.44                                   | 33.44                                      | 83.61                    | 76-94% of AQAL           | Negligible        |
| D15       | Flat 10, Pioneer Court, Overcliffe | 0.003                                                                                                                         | 0.01              | 33.72                                   | 33.72                                      | 84.31                    | 76-94% of AQAL           | Negligible        |
| D16       | Gravesham Community Hospital       | 0.004                                                                                                                         | 0.01              | 35.81                                   | 35.81                                      | 89.54                    | 76-94% of AQAL           | Negligible        |
| D17       | 23 Fairfield Square, Stuart Road   | 0.006                                                                                                                         | 0.02              | 31.52                                   | 31.53                                      | 78.82                    | 76-94% of AQAL           | Negligible        |
| D18       | 53 Fairfield Square, Stuart Road   | 0.006                                                                                                                         | 0.02              | 31.48                                   | 31.49                                      | 78.72                    | 76-94% of AQAL           | Negligible        |
| D19       | 11 Stuart Road                     | 0.004                                                                                                                         | 0.01              | 34.76                                   | 34.76                                      | 86.91                    | 76-94% of                | Negligible        |

|     |                                              |                      |      |       |       |       | AQAL            |            |
|-----|----------------------------------------------|----------------------|------|-------|-------|-------|-----------------|------------|
| D20 | Flat 67, the Maltings, Clifton Road          | 0.005                | 0.01 | 39.67 | 39.67 | 99.19 | 95-102% of AQAL | Negligible |
| D21 | Flat 1, Baltic Wharf, Clifton Marine Parade  | 0.013                | 0.03 | 30.43 | 30.44 | 76.11 | 76-94% of AQAL  | Negligible |
| D22 | Flat 43, Baltic Wharf, Clifton Marine Parade | 0.009                | 0.02 | 30.87 | 30.88 | 77.20 | 76-94% of AQAL  | Negligible |
| D23 | Halfords (commercial/retail premises)        | 0.044                | 0.11 | 30.19 | 30.23 | 75.59 | 76-94% of AQAL  | Negligible |
| D24 | Carpetright (commercial/retail premises)     | 0.031                | 0.08 | 30.19 | 30.22 | 75.55 | 76-94% of AQAL  | Negligible |
| D25 | ITAB Shop (commercial/retail premises)       | 0.176                | 0.44 | 27.50 | 27.68 | 69.19 | ≤75% of AQAL    | Negligible |
| AQO |                                              | 40 µg/m <sup>3</sup> |      |       |       |       |                 |            |

The percentage changes in process contribution of NO<sub>2</sub> relative to the AQAL as a result of the facility operations at all receptor locations, with respect to NO<sub>2</sub> exposure, are determined to be 0.44% or less. The impact is determined to be 'negligible', based on the methodology outlined in Section 3. The effect of the facility operations on the local area is considered to be insignificant.

The predicted long-term NO<sub>2</sub> concentrations from the facility operations are considered acceptable for the protection of human health.

### 6.1.2 Short-Term (1-Hour Mean) NO<sub>2</sub>

The short-term emissions of NO<sub>2</sub> from the source considered were assessed for all 3 years of meteorological data. The maximum PCs within the modelled receptor locations and their associated PECs are compared against the relevant AQS, in **Table 6-3**.

From the meteorological dataset, the year resulting in maximum short-term NO<sub>2</sub> PC concentration was identified during 2019. The predicted maximum short-term PC occurs at the receptor location of ITAB Shop (commercial/retail premises) (D25).

The highest short-term NO<sub>2</sub> PC in Table 6.3 is 0.80 µg/m<sup>3</sup> and the associated short-term NO<sub>2</sub> PEC is 62.54 µg/m<sup>3</sup>, which is below the relevant short-term AQO of 200 µg/m<sup>3</sup> for the protection of human health.

**Table 6-3.** Maximum Short-Term (1-Hour Mean, 99.79th Percentile) Concentrations of NO<sub>2</sub>

|                 | Year                        | Process Contribution (PC) (µg/m <sup>3</sup> ) | PC as %age of AQO | Traffic Background (µg/m <sup>3</sup> ) | PEC (PC + Background) (µg/m <sup>3</sup> ) | Easting (m) | Northing (m) |
|-----------------|-----------------------------|------------------------------------------------|-------------------|-----------------------------------------|--------------------------------------------|-------------|--------------|
| NO <sub>2</sub> | 2017                        | 0.72                                           | 0.36              | 61.74                                   | 62.46                                      | 563988      | 174410       |
| NO <sub>2</sub> | 2018                        | 0.72                                           | 0.36              | 61.74                                   | 62.46                                      | 563988      | 174410       |
| NO <sub>2</sub> | 2019                        | 0.80                                           | 0.40              | 61.74                                   | 62.54                                      | 563988      | 174410       |
| <b>AQOs</b>     | <b>200 µg/m<sup>3</sup></b> |                                                |                   |                                         |                                            |             |              |

The short-term NO<sub>2</sub> PEC concentrations have been calculated at each of the discrete receptors listed for the worst meteorological year of 2019 and these results are detailed in **Table 6-4**.

**Table 6-4.** Maximum Short-Term (1-Hour Mean, 99.79th Percentile) Concentrations of NO<sub>2</sub> at Receptors

| Receptors |                                    | Predicted 1-hour Mean (99.79 <sup>th</sup> Percentile) Concentration (µg/m <sup>3</sup> ) – 2019 Met Data |                   |                                         |                                            |                          |
|-----------|------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------|--------------------------------------------|--------------------------|
| ID        | Name                               | Process Contribution (PC) (µg/m <sup>3</sup> )                                                            | PC as %age of AQO | Traffic Background (µg/m <sup>3</sup> ) | PEC (PC + Background) (µg/m <sup>3</sup> ) | PEC as percentage of AQO |
| D1        | Unit 1 Ellandaye House, The Shore  | 0.48                                                                                                      | 0.24              | 55.94                                   | 56.42                                      | 28.21                    |
| D2        | 52 Pier Road                       | 0.45                                                                                                      | 0.23              | 54.38                                   | 54.83                                      | 27.42                    |
| D3        | 46 Pier Road                       | 0.29                                                                                                      | 0.14              | 54.2                                    | 54.49                                      | 27.24                    |
| D4        | 40 Pier Road                       | 0.17                                                                                                      | 0.09              | 54.36                                   | 54.53                                      | 27.27                    |
| D5        | Full Gospel Church, 32 Pier Road   | 0.16                                                                                                      | 0.08              | 54.56                                   | 54.72                                      | 27.36                    |
| D6        | 24 Pier Road                       | 0.19                                                                                                      | 0.10              | 55.6                                    | 55.79                                      | 27.90                    |
| D7        | 16 Pier Road                       | 0.12                                                                                                      | 0.06              | 57.14                                   | 57.26                                      | 28.63                    |
| D8        | 1 Pier Road                        | 0.07                                                                                                      | 0.04              | 76.42                                   | 76.49                                      | 38.25                    |
| D9        | 36 Overcliffe                      | 0.15                                                                                                      | 0.08              | 67.22                                   | 67.37                                      | 33.69                    |
| D10       | 33 Overcliffe                      | 0.21                                                                                                      | 0.11              | 63.4                                    | 63.61                                      | 31.81                    |
| D11       | 26 Overcliffe                      | 0.28                                                                                                      | 0.14              | 67.8                                    | 68.08                                      | 34.04                    |
| D12       | 18 Overcliffe                      | 0.20                                                                                                      | 0.10              | 67.18                                   | 67.38                                      | 33.69                    |
| D13       | 15 Overcliffe                      | 0.15                                                                                                      | 0.08              | 67.34                                   | 67.49                                      | 33.75                    |
| D14       | 10 Overcliffe                      | 0.11                                                                                                      | 0.06              | 66.88                                   | 66.99                                      | 33.50                    |
| D15       | Flat 10, Pioneer Court, Overcliffe | 0.07                                                                                                      | 0.04              | 67.44                                   | 67.51                                      | 33.76                    |
| D16       | Gravesham Community Hospital       | 0.08                                                                                                      | 0.04              | 71.62                                   | 71.70                                      | 35.85                    |
| D17       | 23 Fairfield                       | 0.13                                                                                                      | 0.06              | 63.04                                   | 63.17                                      | 31.58                    |

|      |                                              |                       |      |       |       |       |
|------|----------------------------------------------|-----------------------|------|-------|-------|-------|
|      | Square, Stuart Road                          |                       |      |       |       |       |
| D18  | 53 Fairfield Square, Stuart Road             | 0.12                  | 0.06 | 62.96 | 63.08 | 31.54 |
| D19  | 11 Stuart Road                               | 0.09                  | 0.04 | 69.52 | 69.61 | 34.80 |
| D20  | Flat 67, the Maltings, Clifton Road          | 0.05                  | 0.02 | 79.34 | 79.39 | 39.69 |
| D21  | Flat 1, Baltic Wharf, Clifton Marine Parade  | 0.09                  | 0.05 | 60.86 | 60.95 | 30.48 |
| D22  | Flat 43, Baltic Wharf, Clifton Marine Parade | 0.07                  | 0.04 | 61.74 | 61.81 | 30.91 |
| D23  | Halfords (commercial/retail premises)        | 0.28                  | 0.14 | 60.38 | 60.66 | 30.33 |
| D24  | Carpetright (commercial/retail premises)     | 0.21                  | 0.11 | 60.38 | 60.59 | 30.30 |
| D25  | ITAB Shop (commercial/retail premises)       | 0.80                  | 0.40 | 55    | 55.80 | 27.90 |
| AQOs |                                              | 200 µg/m <sup>3</sup> |      |       |       |       |

As shown in **Table 6-4**, there are no exceedances of the short-term NO<sub>2</sub> AQO at any of the identified sensitive receptors. The predicted impacts are significantly below the AQO of 200 µg/m<sup>3</sup>.

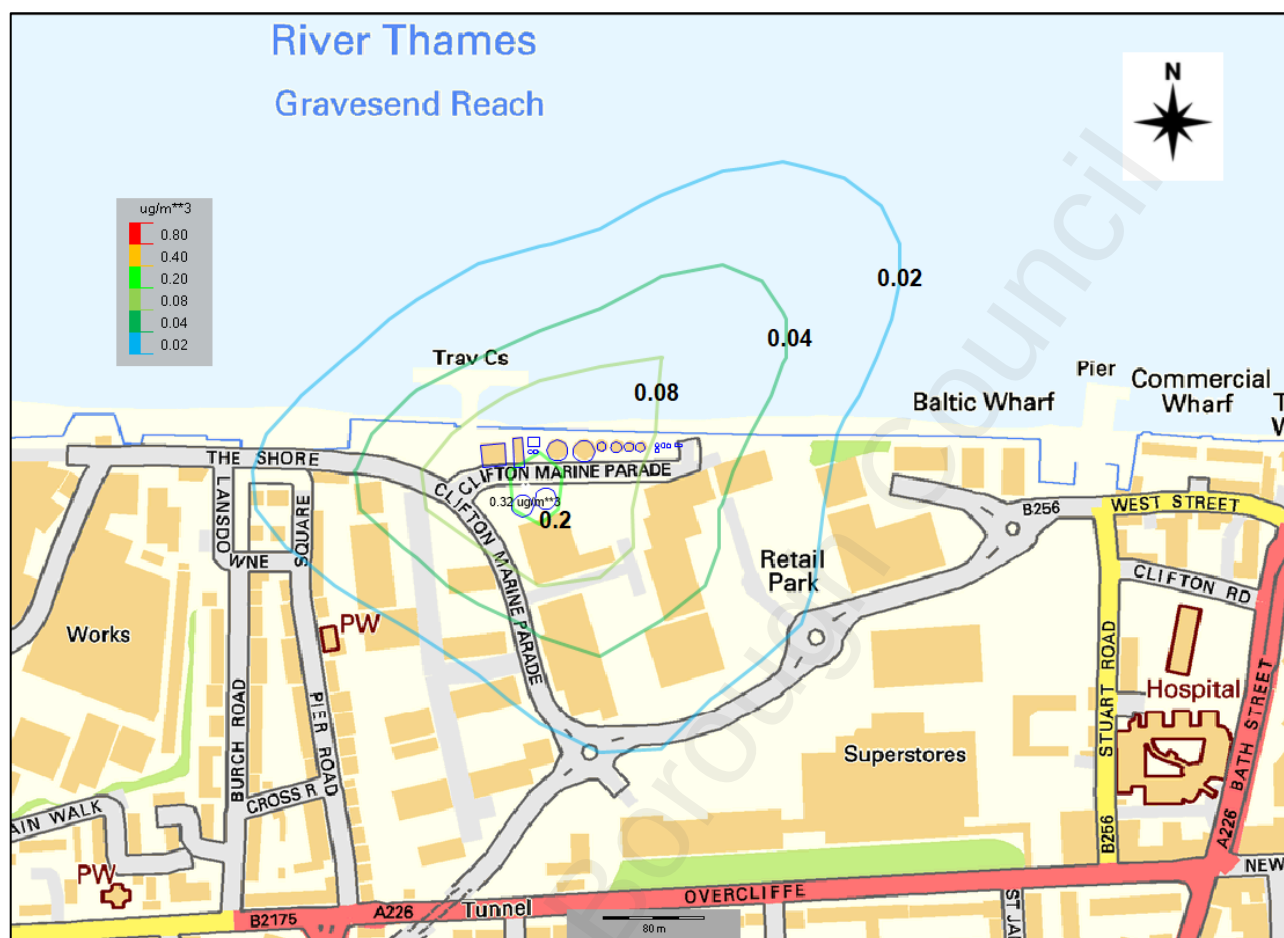
Therefore, the predicted short-term NO<sub>2</sub> concentrations from the facility operations are considered acceptable for the protection of human health.

The contour plots of the predicted long-term and short-term ground level PCs of NO<sub>2</sub> for all receptors, including discrete and grid receptors are presented in **Figure 6-1** and **Figure 6-2**. The contour plots show that the predicted maximum concentrations occur adjacent to the emission sources, with a predicted decrease in concentration with the increased distance from the stacks.

**Figure 6-1.** Predicted Ground level Long-Term NO<sub>2</sub> Concentrations (PC) from the Operation of Burners (2019 Met Data)



**Figure 6-2.** Predicted Ground Level Short-Term NO<sub>2</sub> Concentrations (PC, 1-Hour Mean, 99.79<sup>th</sup> Percentile) from the Operation of Burners (2019 Met Data)



## 6.2 ASSESSMENT FOR THE PROTECTION OF VEGETATION AND ECOSYSTEMS

The habitat assessment has been undertaken for the following identified nature conservation area.

- Thames Estuary and Marshes Ramsar.

The long-term and short-term concentrations among those ecological sites have been calculated for habitat assessment against relevant critical loads, using 2019 met data (the year resulting in maximum long-term and short-term PC concentrations).

### 6.2.1 Predicted Nitrogen Oxide Concentrations

**Predicted Nitrogen Oxide Concentrations Compared to Critical Levels of Long-Term and Short-Term NO<sub>x</sub> (as NO<sub>2</sub>)**

**Table 6-5** presents a summary of the predicted nitrogen oxide concentrations using 2019 met data (the year resulting in maximum long-term and short-term PC concentrations) at the Thames Estuary and Marshes Ramsar ecological receptor locations.

**Table 6-5.** Summary of Cumulative Predicted NO<sub>x</sub> Concentrations for Protection of Vegetation and Ecosystems

| Ecological Receptor     |                                   | Predicted Annual Mean Concentration (µg/m <sup>3</sup> ) |                   |                                 |                                            | Predicted 24-hour Mean Concentration (µg/m <sup>3</sup> ) |                   |                                 |                                            |
|-------------------------|-----------------------------------|----------------------------------------------------------|-------------------|---------------------------------|--------------------------------------------|-----------------------------------------------------------|-------------------|---------------------------------|--------------------------------------------|
|                         |                                   | Process Contribution (PC) (µg/m <sup>3</sup> )           | PC as %age of AQO | Background (µg/m <sup>3</sup> ) | PEC (PC + Background) (µg/m <sup>3</sup> ) | Process Contribution (PC) (µg/m <sup>3</sup> )            | PC as %age of AQO | Background (µg/m <sup>3</sup> ) | PEC (PC + Background) (µg/m <sup>3</sup> ) |
| D26                     | Thames Estuary and Marshes Ramsar | 1.15x10 <sup>-4</sup>                                    | 0.00              | 25.5                            | 25.5                                       | 2.84E-03                                                  | 0.00              | 30.09                           | 30.09                                      |
| AQO/Critical Level (CL) |                                   | 30 <sup>(c)</sup>                                        |                   |                                 |                                            | 75 <sup>(d)</sup>                                         |                   |                                 |                                            |

Note:

<sup>(a)</sup> Inclusive of Background concentrations. The Background concentration was taken from <http://www.apis.ac.uk/>.<sup>(b)</sup> The Inclusive of Background concentration<sup>s</sup>. The Background concentration was taken from <http://www.apis.ac.uk/>.<sup>(c)</sup> The AQO of 30 µg/m<sup>3</sup> is the annual standard for the protection of vegetation and ecosystems; and<sup>(d)</sup> The AQO of 75 µg/m<sup>3</sup> is the daily standard for the protection of vegetation and ecosystems.

The annual mean NO<sub>x</sub> (as NO<sub>2</sub>) PEC at the ecological receptor locations are below the annual mean critical level of 30 µg/m<sup>3</sup> for the protection of vegetation and Ecosystems.

The NO<sub>x</sub> daily (24 hour) predicted environmental concentration at all ecological receptor locations are well below the daily mean critical levels of 75 µg/m<sup>3</sup> for the protection of vegetation and Ecosystems.

The significance of changes associated with the operations of the facility with respect to annual mean NO<sub>x</sub> (as NO<sub>2</sub>) exposure at the ecological receptors has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in **Table 6-6**.

**Table 6-6.** Long-Term (Annual Mean) Concentrations of NO<sub>2</sub> and Impact Description of Effects at Receptors

| Receptors |                                   | Predicted Annual Mean Concentration (µg/m <sup>3</sup> ) – 2017 Met Data, and NO <sub>2</sub> Impact Description at Receptors |                   |                                         |                                            |                          |                          |                   |
|-----------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------|--------------------------------------------|--------------------------|--------------------------|-------------------|
| ID        | Name                              | Process Contribution (PC) (µg/m <sup>3</sup> )                                                                                | PC as %age of AQO | Traffic Background (µg/m <sup>3</sup> ) | PEC (PC + Background) (µg/m <sup>3</sup> ) | PEC as percentage of AQO | PEC as percentage of AQO | Impact Descriptor |
| D26       | Thames Estuary and Marshes Ramsar | 1.58E-04                                                                                                                      | 0.00              | 25.5                                    | 25.5002                                    | 85.00                    | ≤75% % of AQAL           | Negligible        |

The percentage change in long-term process concentrations relative to the AQAL as a result of the proposed development at all ecological receptor locations, with respect to NO<sub>x</sub> (as NO<sub>2</sub>) exposure, are determined to be 0.08% or less. The significance is to be 'negligible' for all ecological receptor locations, based on the methodology outlined in Section 3.

As the percentage change in long-term process concentrations relative to the AQAL is 5.26 x 10<sup>-4</sup>%, which is well below 1% of the relevant critical level for the protection of vegetation and Ecosystems, the long-term

process contributions have been screened out against the relevant standard/critical level. The nitrogen deposition assessment has not been undertaken.

In summary, the NO<sub>2</sub> impacts from the proposed development are insignificant on the ecological receptor.

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## 7.0 ODOUR ASSESSMENT CARBON FILTER OPERATIONS

### 7.1 POTENTIAL ODOUR RELEASE

The transfer of bitumen to and from both the existing tanks and the proposed additional tanks will be by pumping through sealed, insulated pipework. The air displaced when filling any tank would be captured and passed through an in-line activated carbon filter to control the odour. Most of odour will be removed by the filter, however, it is likely there will be small amount of the residual odour being released.

Another potential odour release source would be the filling of lorry tanks when odorous air of the lorry tank is being displaced by the bitumen.

Odour impact assessment has considered the odour releases from two odour sources:

- (1) Residual odour from the carbon filter; and
- (2) Odour release from the bitumen lorry tankers filling.

### 7.2 ODOUR POLICY AND LEGISLATIVE CONTEXT

Following major regulations/guidance/guidelines have been used in the assessment:

- Guidance on the assessment of odour for planning, IAQM, July 2018; and
- H4 Odour Management, How to comply with your environmental permit, March 2011.

HEMA Guidelines for Environmental Impact Assessment (2004) recommend a clear progression from the characterisation of “impact” to the assessment of the significance of the “effect” taking into account the evaluation of the sensitivity and value of the receptors. The guidelines emphasise the need to clearly define at the outset how the two terms will be used and then to apply them in a consistent fashion. In this IAQM guidance, the following definitions are used:

- **Impacts** – these are changes to the environment attributable to the development proposal.
- **Effects** – these are the results of the changes on specific receptors.
- **Receptors** - are the users of the adjacent land, which may vary in their sensitivity to odour.

An increase in odour levels (the impact) would therefore cause a particular effect (e.g. loss of amenity) if the adjacent land use was residential, and perhaps a lesser effect if the adjacent land use was an industrial facility.

## 7.3 ODOUR BENCHMARKS

Environment Agency Guidance H4 Odour Management (March 2011) and the latest Institute of Air Quality Management (IAQM) Guidance on the Assessment of Odour for Planning (July 2018) provides a methodology for assessing the impacts of odour based on the combinations of field odour survey observations and odour dispersion modelling.

The modelling method (if used) calculates the 98<sup>th</sup> percentile of hourly average odour concentrations ( $C_{98, 1\text{-hour}}$ ) over a year, (i.e. the levels exceeded for 2% of the time) with the results being expressed as European Odour Unit contours on a map. The exposure contours can then be used to check unacceptable levels of odour pollution against exposure benchmarks at sensitive receptor locations.

The H4 benchmarks are based on the 98<sup>th</sup> percentile of hourly averages and they are presented in **Table 7-1**.

**Table 7-1. H4 Benchmark Odour Criteria**

| Criterion<br>$C_{98} \text{ ouE/m}^3$ | Offensiveness               | Odour Emission Sources                                                                                                             |
|---------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1.5                                   | Most offensive odours       | Processes involving decaying animal or fish remains<br>Processes involving septic effluent or sludge<br>Biological landfill odours |
| 3.0                                   | Moderately offensive odours | Intensive livestock rearing<br>Fat frying (food processing)<br>Sugar beet processing<br>Well aerated green waste composting        |
| 6.0                                   | Less offensive odours       | Brewery<br>Confectionery<br>Coffee                                                                                                 |

The latest IAQM guidance states that the predictive, quantitative approach involves obtaining estimates of the odour source emission rate, use of the emissions in a dispersion model to predict 98th percentile concentration at sensitive receptors and comparison of these with criteria that have evolved from research and survey work. At the present time, this remains an accepted technique and the IAQM supports this.

IAQM confirm that in the absence of comprehensive dose-response information the assessor should allow the derivation of exact  $C_{98}$  concentration metrics for different types of odour. IAQM is “...of the opinion that the practitioner should observe, from the various scientific studies, case law and practical examples of the investigation of odour annoyance cases, that in any specific case, an appropriate criterion could lie somewhere in the range of 1 to 10  $\text{ouE/m}^3$  as a 98th percentile of hourly mean odour concentrations.

Taking into account the available scientific evidence and the collective experience of IAQM members involved in drafting this guidance, the odour concentration change descriptors together with impact descriptors are proposed by IAQM for an odour at the offensive end of the spectrum. These adopt the  $C_{98}$  as the appropriate frequency metric, encompasses the 1 to 10  $\text{ouE/m}^3$  concentration range referred to above and also considers

the potential sensitivity of different receptors. It is also consistent in format and concept with other guidance in the air quality field.

For odours that are less unpleasant, the level of odour exposure required to elicit the same effect may be somewhat higher, requiring professional judgement to be applied. For example, odours from sewage treatment works plant operating normally, i.e. non-septic conditions, would not be expected to be at the 'most offensive' end of the spectrum (see **Table 7-2** below) and can be considered on par with 'moderately offensive' odours such as intensive livestock rearing. **Table 7-3** below shows the impact descriptors proposed for a 'moderately offensive' odour."

**Table 7-2.** Proposed Odour Effect Descriptors for Impacts Predicted by Modelling – "Most Offensive" Odours

| Odour Exposure Level<br>$C_{98, \text{ou}} / \text{m}^3$ | Receptor Sensitivity |             |             |
|----------------------------------------------------------|----------------------|-------------|-------------|
|                                                          | Low                  | Medium      | High        |
| $\geq 10$                                                | Moderate             | Substantial | Substantial |
| 5-10                                                     | Moderate             | Moderate    | Substantial |
| 3-5                                                      | Slight               | Moderate    | Moderate    |
| 1.5-3                                                    | Negligible           | Slight      | Moderate    |
| 0.5-1.5                                                  | Negligible           | Negligible  | Slight      |
| <0.5                                                     | Negligible           | Negligible  | Negligible  |

It should be noted that the Table applies equally to cases where there are increases and decreases in odour exposure as a result of this development, in which case the appropriate terms "adverse" or "beneficial" should be added to the descriptors.

**Table 7-3.** Proposed Odour Effect Descriptors for Impacts Predicted by Modelling – “Moderately Offensive” Odours

| Odour Exposure Level<br>$C_{98}, \text{OU}_E/\text{m}^3$ | Receptor Sensitivity |             |             |
|----------------------------------------------------------|----------------------|-------------|-------------|
|                                                          | Low                  | Medium      | High        |
| $\geq 10$                                                | Moderate             | Substantial | Substantial |
| 5-10                                                     | Slight               | Moderate    | Moderate    |
| 3-5                                                      | Negligible           | Slight      | Moderate    |
| 1.5-3                                                    | Negligible           | Negligible  | Slight      |
| 0.5-1.5                                                  | Negligible           | Negligible  | Negligible  |
| $< 0.5$                                                  | Negligible           | Negligible  | Negligible  |

It should be noted that the Table applies equally to cases where there are increases and decreases in odour exposure as a result of this development, in which case the appropriate terms “adverse” or “beneficial” should be added to the descriptors.

A benchmark odour criterion of 3.0  $\text{OU}_E/\text{m}^3$  for moderately offensive odours has been used in this assessment.

## 7.4 ODOUR EMISSION RATE

### 7.4.1 Odour Emission from Carbon Filter

The odour emission rate from the carbon filter has been calculated based on following information:

- Filter maximum air volume flow: 200  $\text{m}^3/\text{hr}$  of odorous air; and 1,800  $\text{m}^3/\text{hr}$  of fresh air.
- Pollutants in the carbon filter entrance: Hydrogen sulphide of 10,000  $\text{mg}/\text{m}^3$ ; hydrogencarbon C1-C14 of 10,000  $\text{mg}/\text{m}^3$ .
- Pollutants in the carbon filter exit: Hydrogen sulphide of 3  $\text{mg}/\text{m}^3$  and respectively 15 g/h; hydrogencarbon 500 g/h.

The odour emissions used within AERMOD and stack gas parameters are presented in **Table 7-4.** Odour Emissions from Carbon Filter for the Assessment and Stack Parameters.

**Table 7-4.** Odour Emissions from Carbon Filter for the Assessment and Stack Parameters

| Parameter                                                            | Odour Emissions                                                      | Unit                            |
|----------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------|
| Filter Air Volume                                                    | 1,800 + 200 = 2,000                                                  | m <sup>3</sup> /hr              |
| <b>Odour Emissions from Hydrogen Sulphide (H<sub>2</sub>S)</b>       |                                                                      |                                 |
| Hydrogen Sulphide (H <sub>2</sub> S) Concentration before the Filter | 10,000                                                               | mg/m <sup>3</sup>               |
| Hydrogen Sulphide Concentration after the Filter                     | 3                                                                    | mg/m <sup>3</sup>               |
| Hydrogen Sulphide Mass Emission Rate after the Filter                | 15                                                                   | g/hr                            |
| H <sub>2</sub> S Odour Detection Threshold                           | 1 OU <sub>E</sub> Unit = 0.0005 ppm                                  | -                               |
| H <sub>2</sub> S Odour Detection Threshold                           | 1 OU <sub>E</sub> Unit = 0.000697 mg/m <sup>3</sup>                  | -                               |
| H <sub>2</sub> S Odour Concentration in Exhaust Air                  | 4,305                                                                | OU <sub>E</sub> /m <sup>3</sup> |
| H <sub>2</sub> S Odour Emission Rate                                 | 2,394                                                                | OU <sub>E</sub> /s              |
| <b>Odour Emissions from Hydrogencarbon</b>                           |                                                                      |                                 |
| Hydrogencarbon Mass Emission Rate after the Filter                   | 500                                                                  | g/hr                            |
| Hydrogencarbon Odour Detection Threshold                             | 1 OU <sub>E</sub> Unit = 100 ppb<br>1 OU <sub>E</sub> Unit = 0.1 ppm | -                               |
| Hydrogencarbon Odour Detection Threshold                             | 1 OU <sub>E</sub> Unit = 0.415 mg/m <sup>3</sup>                     | -                               |
| Hydrogencarbon Odour Concentration in Exhaust Air                    | 659                                                                  | OU <sub>E</sub> /m <sup>3</sup> |
| Hydrogencarbon Odour Emission Rate                                   | 366                                                                  | OU <sub>E</sub> /s              |
| Total Odour Emission Rate                                            | 2,394 + 366 = 2,758                                                  | OU <sub>E</sub> /s              |
| Stack Diameter                                                       | 0.2                                                                  | m                               |
| Stack velocity                                                       | 17.68                                                                | m/s                             |
| Stack Height                                                         | 5.6                                                                  | m                               |

A total odour emissions of 2,758 OU<sub>E</sub>/s from the filter stack has been used in modelling for the assessment.

### 7.4.2 Odour Emissions from the Filling Lorry Tanker

The odour emission rate from the lorry tank filling has been calculated based on following information:

- Truck Load: 29 tonne per truck.
- Bitumen density: 0.788 tonne/m<sup>3</sup>.
- Truck Tanker Volume: 36.8 m<sup>3</sup>.
- Time to complete a full load: 40 minutes.
- Velocity of the displacing air out of truck: 0.92 m<sup>3</sup>/min.
- H<sub>2</sub>S concentration in the displaced air: 300 mg/m<sup>3</sup>.

The odour mass emission rates used within AERMOD and stack gas parameters are presented in **Table 7-5** below.

**Table 7-5.** Truck Filling Odour Emissions and Modelling Parameters

| Parameter                                                    | Odour Emissions                                                      | Unit               |
|--------------------------------------------------------------|----------------------------------------------------------------------|--------------------|
| Truck Load                                                   | 29                                                                   | Tonne/truck        |
| Truck Tank Volume                                            | 36.8                                                                 | m <sup>3</sup>     |
| Time to Complete a Full Load                                 | 40                                                                   | mins               |
| H <sub>2</sub> S concentration in displaced air              | 300                                                                  | mg/m <sup>3</sup>  |
| H <sub>2</sub> S Odour Detection Threshold                   | 1 OU <sub>E</sub> Unit = 0.0005 ppm                                  | -                  |
| H <sub>2</sub> S Odour Detection Threshold                   | 1 OU <sub>E</sub> Unit = 0.000697 mg/m <sup>3</sup>                  | -                  |
| Total H <sub>2</sub> S Odour Unit Release During the Loading | 15,366,468                                                           | OU <sub>E</sub>    |
| H <sub>2</sub> S Odour Emission Rate                         | 6403                                                                 | OU <sub>E</sub> /s |
| <b>Odour Emissions from Hydrogencarbon</b>                   |                                                                      |                    |
| Hydrogencarbon concentration in displaced air                | 300                                                                  | mg/m <sup>3</sup>  |
| Hydrogencarbon Odour Detection Threshold                     | 1 OU <sub>E</sub> Unit = 100 ppb<br>1 OU <sub>E</sub> Unit = 0.1 ppm | -                  |
| Hydrogencarbon Odour Detection Threshold                     | 1 OU <sub>E</sub> Unit = 0.152 mg/m <sup>3</sup>                     | -                  |
| Total Hydrogencarbon Odour Unit Release During the Loading   | 1,765                                                                | OU <sub>E</sub>    |
| Hydrogencarbon Odour Emission Rate                           | 29.4                                                                 | OU <sub>E</sub> /s |
| Total Odour Emission Rate                                    | 6403 + 29.4 = 6,432                                                  | OU <sub>E</sub> /s |
| Truck Opening Lid Diameter                                   | 0.5                                                                  | m                  |
| Displaced Air Velocity                                       | 0.078                                                                | m/s                |
| Truck Opening Lid Height                                     | 3.2                                                                  | m                  |

## 7.5 ODOUR ASSESSMENT RECEPTORS

The odour assessment receptors are the same as one presented in **Table 5-2** but with exclusion of Thames Estuary and Marshes Ramsar receptor (due to its ecological receptor nature).

## 7.6 ODOUR MODELLING ASSESSMENT RESULTS

The detailed computational modelling assessment of odour impact was undertaken using the input parameters detailed in Section 7.4.

All predicted odour concentrations have been compared to the relevant environmental assessment criteria, as detailed in Section 7.3.

The results of the model predictions at each discrete receptor using three met data are summarised in **Table 7-6**. The results are presented at the 98<sup>th</sup> percentile of hourly averages (Environment Agency, March 2011).

**Table 7-6.** The 98<sup>th</sup> %ile Maximum Short-Term (Hourly) Concentrations of Odour

| Site ID | Discrete Sensitive Receptor                  | Predicted Hourly PEC OU <sub>E</sub> /m <sup>3</sup> |               |               |
|---------|----------------------------------------------|------------------------------------------------------|---------------|---------------|
|         |                                              | 2017 Met Data                                        | 2018 Met Data | 2019 Met Data |
| D1      | Unit 1 Ellandaye House, The Shore            | 0.47                                                 | 0.47          | 0.47          |
| D2      | 52 Pier Road                                 | 0.28                                                 | 0.35          | 0.35          |
| D3      | 46 Pier Road                                 | 0.22                                                 | 0.28          | 0.29          |
| D4      | 40 Pier Road                                 | 0.17                                                 | 0.20          | 0.21          |
| D5      | Full Gospel Church, 32 Pier Road             | 0.15                                                 | 0.16          | 0.17          |
| D6      | 24 Pier Road                                 | 0.10                                                 | 0.11          | 0.11          |
| D7      | 16 Pier Road                                 | 0.07                                                 | 0.08          | 0.08          |
| D8      | 1 Pier Road                                  | 0.05                                                 | 0.06          | 0.06          |
| D9      | 36 Overcliffe                                | 0.05                                                 | 0.06          | 0.07          |
| D10     | 33 Overcliffe                                | 0.05                                                 | 0.06          | 0.08          |
| D11     | 26 Overcliffe                                | 0.05                                                 | 0.06          | 0.08          |
| D12     | 18 Overcliffe                                | 0.04                                                 | 0.05          | 0.07          |
| D13     | 15 Overcliffe                                | 0.04                                                 | 0.04          | 0.06          |
| D14     | 10 Overcliffe                                | 0.03                                                 | 0.03          | 0.05          |
| D15     | Flat 10, Pioneer Court, Overcliffe           | 0.03                                                 | 0.03          | 0.04          |
| D16     | Gravesham Community Hospital                 | 0.03                                                 | 0.03          | 0.03          |
| D17     | 23 Fairfield Square, Stuart Road             | 0.04                                                 | 0.03          | 0.04          |
| D18     | 53 Fairfield Square, Stuart Road             | 0.04                                                 | 0.04          | 0.05          |
| D19     | 11 Stuart Road                               | 0.03                                                 | 0.03          | 0.04          |
| D20     | Flat 67, the Maltings, Clifton Road          | 0.03                                                 | 0.03          | 0.03          |
| D21     | Flat 1, Baltic Wharf, Clifton Marine Parade  | 0.08                                                 | 0.08          | 0.09          |
| D22     | Flat 43, Baltic Wharf, Clifton Marine Parade | 0.06                                                 | 0.06          | 0.06          |
| D23     | Halfords (commercial/retail premises)        | 0.36                                                 | 0.36          | 0.36          |
| D24     | Carpetright (commercial/retail premises)     | 0.27                                                 | 0.23          | 0.25          |
| D25     | ITAB Shop (commercial/retail premises)       | 0.28                                                 | 0.31          | 0.32          |

Notes:

- 1 There is no background for odour and hence the PC = PEC.

The odour emissions from the sources considered were assessed for all 3 years of meteorological data. The results indicate that the maximum predicted odour concentration at sensitive/residential receptors using three years of meteorological data is 0.47 OU<sub>E</sub>/m<sup>3</sup>, which occurs along on Unit 1 Ellandaye House, The Shore (D1) and does not exceed the 3.0 OU<sub>E</sub>/m<sup>3</sup> assessment level at the 98<sup>th</sup> %ile.

### Odour Effects on the Receptors

The magnitudes of odour effects on receptors for 2019, the year resulting in maximum total short-term odour concentrations, are presented in **Table 7-7**.

The residential dwellings are assessed as high sensitivity receptors.

**Table 7-7. Modelled Sensitive Receptors for Odour Assessment**

| Site ID | Discrete Sensitive Receptor                  | Predicted Hourly<br>PEC OU <sub>E</sub> /m <sup>3</sup> | Odour Effect on High Sensitivity Receptors |
|---------|----------------------------------------------|---------------------------------------------------------|--------------------------------------------|
|         |                                              | 2019 Met Data                                           | 2019 Met Data                              |
| D1      | Unit 1 Ellandaye House, The Shore            | 0.47                                                    | Negligible                                 |
| D2      | 52 Pier Road                                 | 0.35                                                    | Negligible                                 |
| D3      | 46 Pier Road                                 | 0.29                                                    | Negligible                                 |
| D4      | 40 Pier Road                                 | 0.21                                                    | Negligible                                 |
| D5      | Full Gospel Church, 32 Pier Road             | 0.17                                                    | Negligible                                 |
| D6      | 24 Pier Road                                 | 0.11                                                    | Negligible                                 |
| D7      | 16 Pier Road                                 | 0.08                                                    | Negligible                                 |
| D8      | 1 Pier Road                                  | 0.06                                                    | Negligible                                 |
| D9      | 36 Overcliffe                                | 0.07                                                    | Negligible                                 |
| D10     | 33 Overcliffe                                | 0.08                                                    | Negligible                                 |
| D11     | 26 Overcliffe                                | 0.08                                                    | Negligible                                 |
| D12     | 18 Overcliffe                                | 0.07                                                    | Negligible                                 |
| D13     | 15 Overcliffe                                | 0.06                                                    | Negligible                                 |
| D14     | 10 Overcliffe                                | 0.05                                                    | Negligible                                 |
| D15     | Flat 10, Pioneer Court, Overcliffe           | 0.04                                                    | Negligible                                 |
| D16     | Gravesham Community Hospital                 | 0.03                                                    | Negligible                                 |
| D17     | 23 Fairfield Square, Stuart Road             | 0.04                                                    | Negligible                                 |
| D18     | 53 Fairfield Square, Stuart Road             | 0.05                                                    | Negligible                                 |
| D19     | 11 Stuart Road                               | 0.04                                                    | Negligible                                 |
| D20     | Flat 67, the Maltings, Clifton Road          | 0.03                                                    | Negligible                                 |
| D21     | Flat 1, Baltic Wharf, Clifton Marine Parade  | 0.09                                                    | Negligible                                 |
| D22     | Flat 43, Baltic Wharf, Clifton Marine Parade | 0.06                                                    | Negligible                                 |
| D23     | Halfords (commercial/retail premises)        | 0.36                                                    | Negligible                                 |
| D24     | Carpetright (commercial/retail premises)     | 0.25                                                    | Negligible                                 |
| D25     | ITAB Shop (commercial/retail premises)       | 0.32                                                    | Negligible                                 |

The results indicate that the predicted odour concentrations at the existing residential receptors using 2019 meteorological data range from 0.03OU<sub>E</sub>/m<sup>3</sup> to 0.47 OU<sub>E</sub>/m<sup>3</sup>.

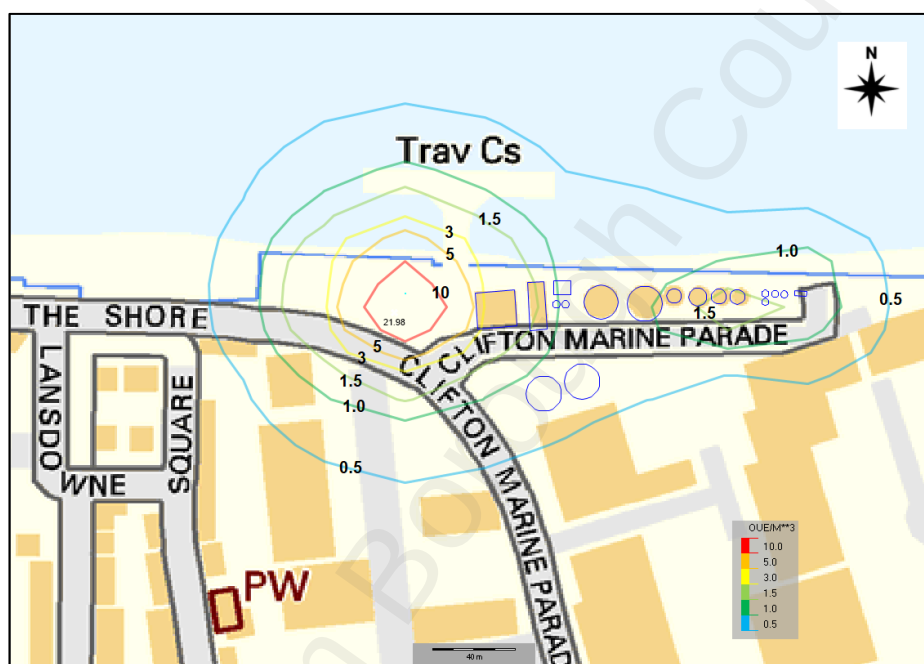
The odour effects at the receptors are predicted to be 'Negligible'.

Therefore, the predicted short-term odour emissions from the Site are considered acceptable.

From the meteorological dataset, the year resulting in maximum odour concentration was identified as 2019. The contour plot of the predicted odour concentrations using 2019 meteorological data both inside and outside the site boundary is presented in **Figure 7-1**.

**Figure 7-1** shows that the predicted maximum concentrations occur adjacent to the lorry tank filling, with a predicted decrease in concentration with the increased distance from the odour sources.

**Figure 7-1.** Predicted the 98<sup>th</sup>ile Short-Term (Hourly) Concentrations of Odour



## 8.0 CONCLUSIONS

The report presents the results of an air quality and odour assessment undertaken to support a planning application for the installation of two additional bitumen tanks, load out gantry, the installation of a bitumen emulsion plant and alternative car parking, at Imperial Wharf, Clifton Marine Parade, Gravesend, Kent, DA11 0DY.

### Gas Burner Emission Impact Assessment

The predicted long-term and short-term NO<sub>2</sub> concentrations from the emissions of the operation of the existing and the proposed gas burners are all below the relevant AQOs for the protection of human health.

The significance of effects on the emissions on the ground level receptors from the burner operations with respect to long-term NO<sub>2</sub> is determined to be 'negligible'.

### Habitat Assessment

The annual mean and daily (24 hour mean) NO<sub>x</sub> PEC at the ecological receptors from the burner operations are below the relevant critical level for the protection of vegetation and Ecosystems. the NO<sub>x</sub> impacts from the proposed development on the ecological receptors are insignificant.

The process contribution (PC, as predicted by the detailed dispersion model) from the burner operations is <1% of the relevant critical level or load (CL) and it can be considered inconsequential. It does not need to be included in an in-combination (cumulative) habitat assessment.

### Odour Impact Assessment from the Existing and Proposed Tanker Operations

The odour emissions from the operations of the existing bitumen tanks and two proposed bitumen tank operations were assessed and the maximum predicted odour concentration at sensitive/residential receptors is below the odour benchmark. The odour effects from the site operations on the sensitive receptors are insignificant.

The proposed development is not considered to be contrary to any of the national and local planning policies.

## APPENDIX A BASELINE TRAFFIC AIR QUALITY MODELLING

The traffic air quality modelling assessment has utilised:

- ADMS-Roads 5.0;
- Backgrounds determined from the non-Modelled Roadside Contribution;
- 2019 London City Airport Meteorological Data;
- Emissions Factor Toolkit (v11, November 2021);
- NO<sub>x</sub> to NO<sub>2</sub> calculator (v8.1, September 2021); and,
- 2019 AADT Traffic Data downloaded from the Department for Transport.

The inputs for the traffic model are as follows in **Table A-1** and **Table A-2**.

The traffic data has been utilised to assess the corresponding receptors within the assessment. These are outlined in **Table A-1**.

Air quality assessment areas, including ADMS road sources and receptor locations are presented in **Figure A-1**.

**Table A-1.** Traffic Data

| Link                                       | Speed (km/h) | 2019  |       |
|--------------------------------------------|--------------|-------|-------|
|                                            |              | AADT  | HGV % |
| The Shore                                  | 48           | 1861  | 8.3   |
| Crete Hall Road (East)                     | 48           | 1861  | 8.3   |
| Rosherville Way                            | 48           | 6367  | 3.5   |
| Clifton Marine Parade                      | 48           | 1861  | 8.3   |
| Thames Way (West of Clifton Marine Parade) | 48           | 6205  | 8.3   |
| Thames Way (East of Clifton Marine Parade) | 48           | 6205  | 8.3   |
| Stuart Road                                | 48           | 5584  | 8.3   |
| West Street                                | 48           | 6367  | 4.6   |
| New Road                                   | 48           | 8786  | 6.6   |
| Bath Street                                | 48           | 8786  | 6.6   |
| Overcliffe                                 | 48           | 8786  | 6.6   |
| A226 Thames Way                            | 64           | 12409 | 8.3   |
| B2175 London Road                          | 48           | 8786  | 6.6   |
| West Street / Crooked Lane                 | 48           | 10611 | 4.6   |
| Darnley Road                               | 48           | 10933 | 3.0   |
| Ratmore Road                               | 48           | 13666 | 3.0   |
| Wrotham Road (North of Woodville Place)    | 48           | 13666 | 3.0   |
| Woodville Place                            | 48           | 13932 | 3.0   |
| Wrotham Road (South of Woodville Place)    | 48           | 13666 | 3.0   |

Table A-2. ADMS Roads Model Inputs.

| Parameter             | Description                                                                                                                                                                                    | Input Value                                                                                                                                                                                                                              |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chemistry             | A facility within ADMS-Roads to calculate the chemical reactions in the atmosphere between Nitric Oxide (NO), NO <sub>2</sub> , Ozone (O <sub>3</sub> ) and Volatile organic compounds (VOCs). | No atmospheric chemistry parameters included                                                                                                                                                                                             |
| Meteorology           | Representative meteorological data from a local source                                                                                                                                         | <b>London City Airport</b> , hourly sequential data                                                                                                                                                                                      |
| Surface Roughness     | A setting to define the surface roughness of the model area based upon its location.                                                                                                           | <b>1m</b> representing a typical surface roughness for <b>Cities and Woodlands</b> has been used for the site area.<br><b>1.5m</b> representing a typical surface roughness for <b>Large Urban Areas</b> has been used for the met site. |
| Latitude              | Allows the location of the model area to be set                                                                                                                                                | United Kingdom = <b>51.4</b>                                                                                                                                                                                                             |
| Monin-Obukhov Length  | This allows a measure of the stability of the atmosphere within the model area to be specified depending upon its character.                                                                   | Cities and Large Towns = <b>30m</b> was used for the Site<br>Large Conurbations = <b>100m</b> was used for the met. Measurement site.                                                                                                    |
| Elevation of Road     | Allows the height of the road link above ground level to be specified.                                                                                                                         | All road links were set at ground level = <b>0m</b> .                                                                                                                                                                                    |
| Road Width            | Allows the width of the road link to be specified.                                                                                                                                             | Road width used depended on data obtained from OS map data for the specific road link                                                                                                                                                    |
| Topography            | This enables complex terrain data to be included within the model in order to account for turbulence and plume spread effects of topography                                                    | No topographical information used                                                                                                                                                                                                        |
| Time Varied Emissions | This enables daily, weekly or monthly variations in emissions to be applied to road sources                                                                                                    | No time varied emissions used                                                                                                                                                                                                            |
| Road Type             | Allows the effect of different types of roads to be assessed.                                                                                                                                  | <b>Urban (Not London)</b> settings were used for the relevant links                                                                                                                                                                      |
| Road Speeds           | Enables individual road speeds to be added for each road link                                                                                                                                  | Based on national speed limits                                                                                                                                                                                                           |
| Canyon Height         | Allows the model to take account turbulent flow patterns occurring inside a street with relatively tall buildings on both sides, known as a "street canyon".                                   | No canyons used within the model                                                                                                                                                                                                         |
| Road Source Emissions | Road source emission rates are calculated from traffic flow data using the in-built EFT database of traffic emission factors.                                                                  | The <b>EFT Version 11 (2021)</b> dataset was used.                                                                                                                                                                                       |
| Year                  | Predicted EFT emissions rates depend on the year of emission.                                                                                                                                  | <b>2019</b> data for verification and baseline assessment                                                                                                                                                                                |

Table A-3. Modelled Existing Sensitive Receptor Locations

| Discrete Sensitive Receptors |                                   | Receptor Height (m) |
|------------------------------|-----------------------------------|---------------------|
| AERMOD ID /ADMS ID           | Name                              |                     |
| D1                           | Unit 1 Ellandaye House, The Shore | 1.5                 |
| D2                           | 52 Pier Road                      | 1.5                 |
| D3                           | 46 Pier Road                      | 1.5                 |
| D4                           | 40 Pier Road                      | 1.5                 |
| D5                           | Full Gospel Church, 32 Pier Road  | 1.5                 |
| D6                           | 24 Pier Road                      | 1.5                 |
| D7                           | 16 Pier Road                      | 1.5                 |
| D8                           | 1 Pier Road                       | 1.5                 |
| D9                           | 36 Overcliffe                     | 1.5                 |
| D10                          | 33 Overcliffe                     | 1.5                 |
| D11                          | 26 Overcliffe                     | 1.5                 |

|     |                                              |     |
|-----|----------------------------------------------|-----|
| D12 | 18 Overcliffe                                | 1.5 |
| D13 | 15 Overcliffe                                | 1.5 |
| D14 | 10 Overcliffe                                | 1.5 |
| D15 | Flat 10, Pioneer Court, Overcliffe           | 1.5 |
| D16 | Gravesham Community Hospital                 | 1.5 |
| D17 | 23 Fairfield Square, Stuart Road             | 1.5 |
| D18 | 53 Fairfield Square, Stuart Road             | 1.5 |
| D19 | 11 Stuart Road                               | 1.5 |
| D20 | Flat 67, the Maltings, Clifton Road          | 1.5 |
| D21 | Flat 1, Baltic Wharf, Clifton Marine Parade  | 1.5 |
| D22 | Flat 43, Baltic Wharf, Clifton Marine Parade | 1.5 |
| D23 | Halfords (commercial/retail premises)        | 1.5 |
| D24 | Carpentryright (commercial/retail premises)  | 1.5 |
| D25 | ITAB Shop (commercial/retail premises)       | 1.5 |

This data has been input into the ADMS Roads 5.0 model and the model has been verified to local monitoring data.

**Table A-4.** Comparison of Roadside Modelling & Monitoring Results for NO<sub>2</sub>

| Tube location | NO <sub>2</sub> µg/m <sup>3</sup> |                          |                |
|---------------|-----------------------------------|--------------------------|----------------|
|               | Monitored NO <sub>2</sub>         | Modelled NO <sub>2</sub> | Difference (%) |
| GR13*         | 46.10                             | 43.20                    | -6.28          |
| GR40*         | 43.40                             | 42.45                    | -2.20          |
| GR61*         | 35.10                             | 40.45                    | 15.25          |
| GR66          | 31.60                             | 35.33                    | 11.81          |
| GR122         | 37.00                             | 35.82                    | -3.18          |
| GR130         | 31.30                             | 32.95                    | 5.28           |
| GR133         | 36.20                             | 33.97                    | -6.16          |
| GR134         | 33.70                             | 34.98                    | 3.79           |
| GR135         | 43.90                             | 40.56                    | -7.61          |
| GR136         | 37.40                             | 40.63                    | 8.63           |
| GR139         | 34.00                             | 32.12                    | -5.53          |

\*Located in the AQMA

The final model produced data at the monitoring locations to within 25% of the monitoring results at all of the verification points, as required by TG16 guidance.

The final verification model correlation coefficient (representing the model uncertainty) is 1.00. This was achieved by applying a model correction factor of 4.72 to roadside predicted NO<sub>x</sub> concentrations before converting to NO<sub>2</sub>. This figure demonstrates that the model predictions were in line with the road traffic emissions at the monitoring locations.

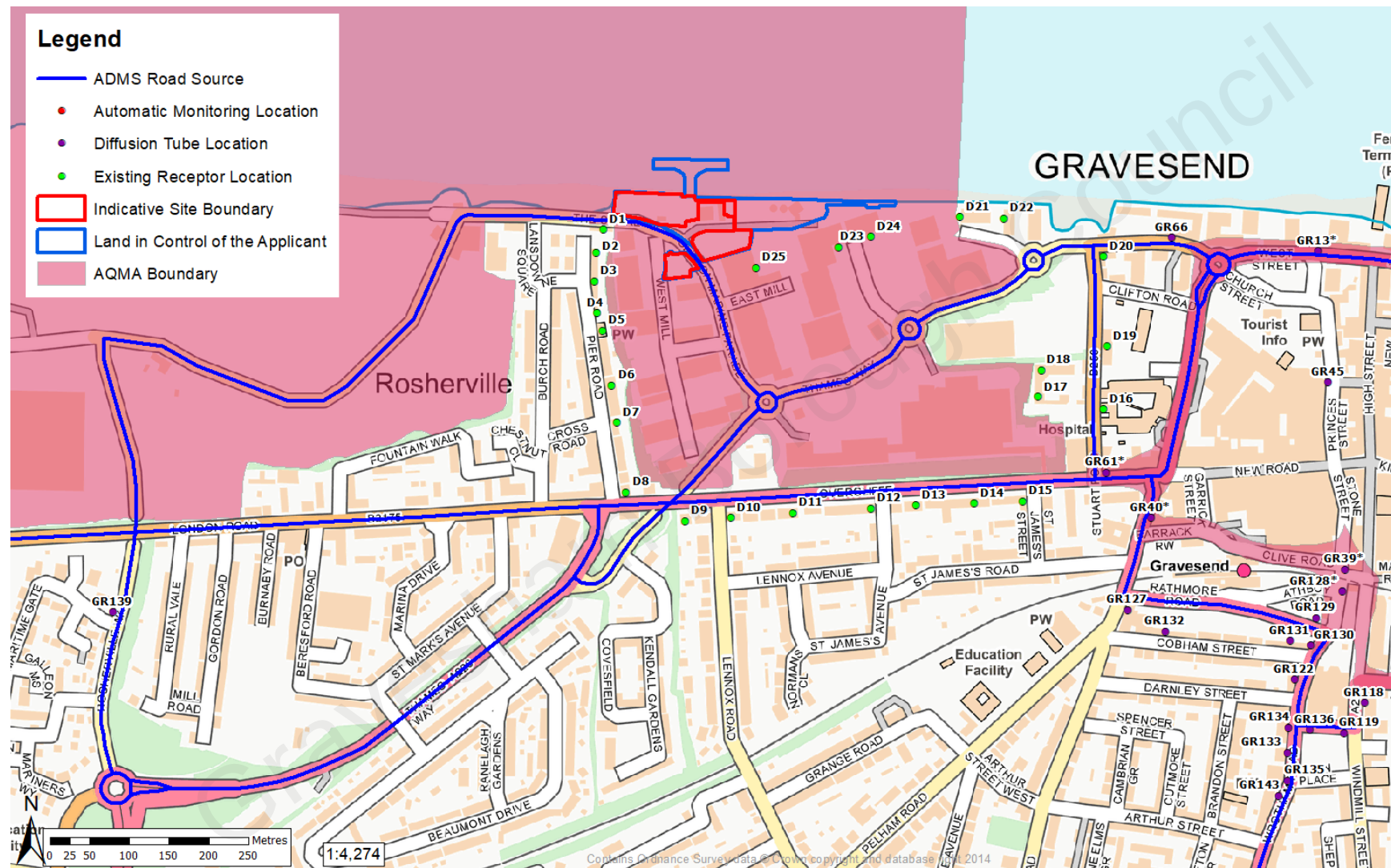
The modelled baseline concentrations of NO<sub>2</sub> are outlined in **Table A-5**.

**Table A-5.** Predicted 2019 Annual Average Concentrations of NO<sub>2</sub>

| Discrete Sensitive Receptors |                                   | Modelled Baseline (2019) Pollutant Concentrations (µg/m <sup>3</sup> ) |
|------------------------------|-----------------------------------|------------------------------------------------------------------------|
| AERMOD ID /ADMS ID           | Name                              | NO <sub>2</sub>                                                        |
| D1                           | Unit 1 Ellandaye House, The Shore | 27.97                                                                  |
| D2                           | 52 Pier Road                      | 27.19                                                                  |
| D3                           | 46 Pier Road                      | 27.10                                                                  |

|     |                                              |       |
|-----|----------------------------------------------|-------|
| D4  | 40 Pier Road                                 | 27.18 |
| D5  | Full Gospel Church, 32 Pier Road             | 27.28 |
| D6  | 24 Pier Road                                 | 27.80 |
| D7  | 16 Pier Road                                 | 28.57 |
| D8  | 1 Pier Road                                  | 38.21 |
| D9  | 36 Overcliffe                                | 33.61 |
| D10 | 33 Overcliffe                                | 31.70 |
| D11 | 26 Overcliffe                                | 33.90 |
| D12 | 18 Overcliffe                                | 33.59 |
| D13 | 15 Overcliffe                                | 33.67 |
| D14 | 10 Overcliffe                                | 33.44 |
| D15 | Flat 10, Pioneer Court, Overcliffe           | 33.72 |
| D16 | Gravesham Community Hospital                 | 35.81 |
| D17 | 23 Fairfield Square, Stuart Road             | 31.52 |
| D18 | 53 Fairfield Square, Stuart Road             | 31.48 |
| D19 | 11 Stuart Road                               | 34.76 |
| D20 | Flat 67, the Maltings, Clifton Road          | 39.67 |
| D21 | Flat 1, Baltic Wharf, Clifton Marine Parade  | 30.43 |
| D22 | Flat 43, Baltic Wharf, Clifton Marine Parade | 30.87 |
| D23 | Halfords (commercial/retail premises)        | 30.19 |
| D24 | Carpetright (commercial/retail premises)     | 30.19 |
| D25 | ITAB Shop (commercial/retail premises)       | 27.50 |

**Figure A-1. ADMS Traffic Modelling Assessment Area Including Receptors Locations**



## APPENDIX B REPORT TERMS & CONDITIONS

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