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CARO DEVELOPMENTS

CLEGG STREET, LIVERPOOL

AIR QUALITY ASSESSMENT

OCTOBER 2017

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CARO DEVELOPMENTS

CLEGG STREET, LIVERPOOL

AIR QUALITY ASSESSMENT

OCTOBER 2017

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CONTENTS

APPENDICES

DRAWINGS

1 INTRODUCTION

1.1.1 Wardell Armstrong LLP has been commissioned to undertake an air quality assessment for the proposed residential development at land off Clegg Street, Liverpool.

1.1.2 The proposed development site is located approximately 1km to the north east of Liverpool city centre. To the north, the site is bordered by vegetation and open land with residential properties beyond. To the east, the site is bordered by Clegg Street and a site referred to as Phoenix Place at which a 7-storey residential apartment block is currently under construction. To the south, the site is bordered by Jamworks City Point student accommodation with Prince Edward Street and further development beyond. To the west, the site is bordered by the B5186, Great Homer Street and the A59 beyond.

1.1.3 The site currently comprises a number of commercial units and the development proposals are for the demolition of the existing buildings and structures and erection of a part seven, part six storey residential development comprising 103 apartments (C3 use), with associated access, servicing, parking and landscaping. There are also32 car parking spaces and 71 cycle spaces. Access to both the residential entrance and services will be from Clegg Street to the east.

1.1.4 This report details the results of the air quality assessment undertaken in support of an outline planning application for the proposed development. The report discusses the potential dust and fine particulate matter impacts associated with the construction phase, and an assessment of the potential air quality impacts of the additional road traffic generated by the proposed development. Air pollutant concentrations are considered at existing sensitive receptor locations in the vicinity of the proposed development, and also at proposed receptor locations within the residential areas of the development site itself.

2 LEGISLATION AND POLICY CONTEXT

2.1 Air Quality Legislation and National Air Quality Strategy

2.1.1 The Environment Act 1995 requires the UK government to prepare a National Air Quality Strategy. The UK National Air Quality Strategy (NAQS) was therefore published in March 1997 setting out policies for the management of ambient air quality. The Strategy sets objectives for eight pollutants, which may potentially occur in the UK at levels that give cause for concern. These pollutants are: nitrogen dioxide (NO_2), sulphur dioxide, carbon monoxide, lead, fine particulates (PM_{10}), benzene, 1, 3–butadiene and ozone.

2.1.2 The Strategy was reviewed and a Review Report[1] and Consultation Document[2] were published by the Department of the Environment, Transport and the Regions in 1999. A revised version (The Air Quality Strategy (AQS) 2000), which supersedes the 1997 Strategy, was published in January 2000. The AQS 2000 strengthens the objectives for a number of pollutants with the exception of that for particulates, which was replaced with the less stringent EU limit value.

2.1.3 The objectives for the eight pollutants in the Strategy provide the basis of the implementation of Part IV of the Environment Act 1995. The Air Quality Strategy objectives for each pollutant, except ozone, were given statutory status in the Air Quality (England) Regulations, 2000[3] and Air Quality (England) (Amendment) Regulations 2002[4] ('the Regulations').

2.1.4 In 2007 the Air Quality Strategy was revised. This latest strategy[5] does not remove any of the objectives set out in the previous strategy or its addendum, apart from replacing the provisional 2010 objective for PM_{10} in England, Wales and Northern Ireland with the exposure reduction approach for $PM_{2.5}$. The UK Government and the Devolved Administrations have now therefore set new national air quality objectives for particulate matter smaller than 2.5µm diameter ($PM_{2.5}$).

2.1.5 EU Ambient Air Quality Directive 2008/50/EC[6] came into force in June 2008 and was transposed into legislation in England on 11th June 2010 as 'The Air Quality Standards

[1] Department of the Environment, Transport and the Regions, January 1999. Report on the Review of the National Air Quality Strategy, Proposals to amend the Strategy
[2] Department of the Environment, Transport and the Regions 1999, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. A consultation document
[3] The Air Quality (England) Regulations 2000. SI No 928
[4] The Air Quality (Amendment) Regulations 2002
[5] Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007
[6] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe

Regulations 2010'[7]. This EU Directive consolidates existing air quality legislation and makes achievement of the objectives a national objective rather than a local one. It also provides a new regulatory framework for $PM_{2.5}$.

2.1.6 The current Air Quality Standards and Objectives, as set out in the Air Quality Standards Regulations 2010, are detailed in Table 1.

Table 1: UK Air Quality Objectives and Pollutants

Pollutant	Objective	Averaging Period	Obligation
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	All local authorities
	40µg/m^3	Annual mean	All local authorities
Particulate Matter (PM_{10})	50µg/m^3 not to be exceeded more than 35 times a year	24-hour mean	All local authorities
	50µg/m^3 not to be exceeded more than 7 times a year	24-hour mean	Scotland only
	40µg/m^3	Annual mean	All local authorities
	18µg/m^3	Annual mean	Scotland only
Particulate Matter ($PM_{2.5}$)	25µg/m^3 (target level)	Annual mean	England only
	10µg/m^3	Annual mean	Scotland only
Sulphur Dioxide (SO_2)	266µg/m^3 not to be exceeded more than 35 times a year	15-minute mean	All local authorities
	350µg/m^3 not to be exceeded more than 24 times a year	1-hour mean	All local authorities
	125µg/m^3 not to be exceeded more than 3 times a year	24-hour mean	All local authorities
Benzene (C_6H_6)	16.25µg/m^3	Running annual mean	All local authorities
	5µg/m^3	Annual mean	England and Wales only
	3.25µg/m^3	Running annual mean	Scotland and Northern Ireland only
1,3-Butadiene (C_4H_6)	2.25µg/m^3	Running annual mean	All local authorities
Carbon Monoxide (CO)	10mg/m^3	Maximum daily running 8-hour mean	England, Wales and Northern Ireland only
	10mg/m^3	Running 8-hour mean	Scotland only

[7] Statutory Instruments 2010 No. 1001 The Air Quality Standards Regulations 2010

Table 1: UK Air Quality Objectives and Pollutants			
Pollutant	**Objective**	**Averaging Period**	**Obligation**
Lead (Pb)	0.5µg/m^3	Annual mean	All local authorities
	0.25µg/m^3	Annual mean	All local authorities

2.2 Legislative Requirements for Local Air Quality Management

2.2.1 The 2007 Air Quality Strategy for England, Scotland, Wales and Northern Ireland establishes the framework for air quality improvements based on measures agreed at a national and international level. However, despite these measures, it is recognised that areas of poor air quality will remain and these should be dealt with through the Local Air Quality Management (LAQM) process using locally implemented measures.

2.2.2 LAQM legislation in the Environment Act 1995 requires local authorities to conduct periodic review and assessments of air quality. These aim to identify all those areas where the air quality objectives are being, or are likely to be, exceeded.

2.2.3 All authorities were required to undertake the first stage of review and assessment which concluded in September 2001. In those areas identified as having the potential to experience elevated levels of pollutants the authority was required to undertake a more detailed second stage review comprising two steps; Updating and Screening Assessments and Detailed Assessments. Where it was predicted that one or more of the air quality objectives would be unlikely to be met by the end of 2005, local authorities were required to proceed to a third stage and, if necessary, declare Air Quality Management Areas (AQMAs) and make action plans for improvements in air quality, in pursuit of the national air quality objectives.

2.2.4 An Evaluation Report, commissioned by the UK Government and Devolved Administrations in 2007, led to the publication of the LAQM Technical Guidance document LAQM.TG(09) in February 2009[8]. This technical guidance was subsequently updated following a consultation process, and in January 2016 the LAQM Technical Guidance document LAQM.TG(16) was published by Defra[9].

[8] Department for Food, Environment and Rural Affairs, Local Air Quality Management Technical Guidance Document LAQM.TG(09), February 2009
[9] Department for Food, Environment and Rural Affairs, Local Air Quality Management Technical Guidance Document LAQM.TG(16), April 2016

2.2.5 LAQM.TG(16) presents the changes to the LAQM system across the UK. A new streamlined approach has been adopted in England and Scotland; however, Wales and Northern Ireland are still considering changes to LAQM and therefore work according to the previous regimes.

2.2.6 The previous structure of Review and Assessment, comprising Updating and Screening Assessments and Detailed Assessments has been replaced by the introduction of an Annual Status Report (ASR) for England and an Annual Progress Report (APR) for Scotland.

2.2.7 The ASR replaces all other reports which previously had to be submitted as part of the LAQM system including review and assessment and action plan progress reports, updating and screening assessments and detailed assessments.

2.2.8 Local authorities now have the option of a fast track AQMA declaration option. This allows more expert judgement to be used and removes the need for a detailed assessment where a local authority is confident of the outcome. Detailed assessments should still be used if there is any doubt.

2.2.9 Examples of where the Air Quality Objectives should/should not apply are also detailed in LAQM.TG(16) and are included in Table 2 below.

Table 2: Examples of Where the Air Quality Objectives Should Apply

Averaging Period	Objectives Should Apply at:	Objectives Should Generally Not Apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes, etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade) or any other location where public exposure is expected to be short term
24-hour mean and 8-hour mean	All locations where the annual mean objectives would apply together with hotels. Gardens of residential properties[a]	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24 and 8-hour objectives apply. Kerbside sites (e.g. pavements of busy shopping streets).	Kerbside sites where public would not be expected to have regular access

Table 2: Examples of Where the Air Quality Objectives Should Apply		
Averaging Period	**Objectives Should Apply at:**	**Objectives Should Generally Not Apply at:**
	Those parts of car parks and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend one hour or longer	
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer	
[a]: Such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied		

2.3 National Planning Policy and Guidance

2.3.1 The National Planning Policy Framework[10], introduced in March 2012, requires that planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of AQMAs and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in AQMAs is consistent with the local air quality action plan.

2.3.2 The Planning Practice Guidance[11] states that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impacts in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

2.3.3 Where a proposed development is anticipated to give rise to concerns about air quality an appropriate assessment needs to be carried out. Where the assessment concludes that the proposed development (including mitigation) will not lead to an unacceptable risk from air pollution, prevent sustained compliance with national

[10] Department for Communities and Local Government. National Planning Policy Framework, March 2012
[11] Department for Communities and Local Government, Planning Practice Guidance: Air Quality, March 2014

objectives or fail to comply with the requirements of the Habitats Regulations, then the local authority should proceed to decision with appropriate planning conditions and/or obligations.

2.4 Liverpool City Council Local Air Quality Review and Assessment

2.4.1 Liverpool City Council (LCC) is responsible for the management of local air quality. The entire administrative area is declared as an AQMA due to exceedances of the annual mean objective for nitrogen dioxide (NO_2). The proposed development site therefore lies within the Liverpool AQMA.

2.4.2 The 2017 Annual Status Report (ASR) for LCC has not yet been published but bias-adjusted diffusion tube monitoring data for 2016 was provided by the EHO on 13th September 2017. LCC currently operates two automatic monitoring sites; a background site at Speke approximately 10km south east of the proposed development site and a roadside site at Queens Drive, Walton approximately 4km north east of the proposed development site.

2.4.3 LCC also operates 73 non automatic monitoring sites. The closest is located approximately 800m south east of the proposed development on New Islington.

2.4.4 In 2016, the most recent year for which monitoring data is published in an approved ASR, the automatic analysers at Speke and Queens Drive recorded annual mean NO_2 concentrations of 22.4µg/m^3 and 34.3µg/m^3 respectively.

2.4.5 In the data supplied by the EHO for 2016 the NO_2 diffusion tubes ranged between 22µg/m^3 and 23µg/m^3, recorded at Speke DEFRA sites for tubes S56 to S58 (Tarbock Road), and 67µg/m^3 recorded at both tubes T39 (Strand Street/Water Street junction) and N67 (Middle Walton Vale).

3 ASSESSMENT METHODOLOGY

3.1 Consultation and Scope of Assessment

3.1.1 Consultation was undertaken in a series of communications, between 5th October and 11th October 2017, with Mr Paul Farrell, Operations Manager of the Environmental Protection unit at LCC, to agree a methodology for the Air Quality Assessment. The following points were included in the methodology:

- A construction phase dust assessment will be undertaken in accordance with the Institute of Air Quality Management (IAQM) guidance. This will consider the potential dust soiling, human health and ecological effects (where applicable) at existing sensitive receptor locations;
- Air dispersion modelling using ADMS-Roads will be undertaken to consider the potential air quality effects associated with development generated traffic at existing sensitive receptors. Pollutant concentrations will also be predicted at locations within the proposed development site, which are considered to be representative of proposed sensitive uses. The assessment will consider nitrogen dioxide (NO_2), PM_{10} and $PM_{2.5}$ concentrations, as these are the pollutants most likely to exceed the annual mean air quality objectives;
- Traffic data for the A59 will be sourced from the Department for Transport and adjusted to the appropriate scenarios by the appointed transport consultant. The transport consultants will also provide traffic data for the B5186 St Anne Street/Great Homer Street, the main pollutant source affecting the site. Queuing zones, slow down sections and roundabout would be modelled at a vehicle speed of 20km/h;
- The following scenarios will be considered within the air quality assessment:
  - Scenario 1: Base Year (2016);
  - Scenario 2: Opening Year (2018) – Without Development;
  - Scenario 3: Future Year (2023) – Without Development;
  - Scenario 4: Opening Year (2018) – With Development;
  - Scenario 5: Future Year (2023) – With Development;
- We anticipate using meteorological data within the air dispersion modelling. We propose to use data from the Liverpool John Lennon Airport Recording Station, which is considered to be most similar in terms of distance and altitude;

- Having reviewed the latest ASR 2016, we are aware of monitoring location along Islington. We are not, however, aware of any monitoring locations representative of B roads and verification would therefore not be undertaken;
- There are no background monitoring sites in the vicinity of the site therefore, background concentrations will be obtained from the 2013-based Defra background concentration maps; and
- Predicted pollutant concentrations for human receptors will be compared with the current air quality objectives as set out in the Air Quality Standards Regulations 2010.

3.1.2 This methodology was agreed by return email on the 11th October by Mr Farrell.

3.2 Construction Phase Assessment – Dust and Fine Particulate Matter Emissions

3.2.1 To assess the impacts associated with dust and PM_{10} releases, during the construction phase of the development, an assessment has been undertaken in accordance with IAQM guidance[12].

Step 1

3.2.2 Step 1 of the assessment is to screen the requirement for a more detailed assessment. The guidance states that an assessment will normally be required where there are existing human sensitive receptors within 350m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

3.2.3 With regards to ecological receptors, the guidance states that an assessment will normally be required where there are existing ecological receptors within 50m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

3.2.4 Where there are existing sensitive receptors locations within 350m of the site boundary, it is necessary to proceed to Step 2 of the assessment.

Step 2

3.2.5 Step 2 of the assessment determines the potential risk of dust and PM_{10} arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts. The risk is related to:

[12] Institute of Air Quality Management 'Guidance on the Assessment of Dust from Demolition and Construction', February 2014

- The activities being undertaken (demolition, number of vehicles and plant etc);
- The duration of these activities;
- The size of the site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of receptors to dust.

3.2.6 The risk of dust and PM_{10} effects is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon two factors:

- **Step 2A** – the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large; and
- **Step 2B** – the sensitivity of the area to dust impacts which is defined as low, medium or high sensitivity.

3.2.7 These two factors are combined in **Step 2C** to determine the risk of dust impacts with no mitigation applied.

3.2.8 The risk of dust effects is determined for four types of construction phase activities, with each activity being considered separately. If a construction phase activity is not taking place on the site, then it does not need to be assessed. The four types of activities to be considered are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

Step 3

3.2.9 Step 3 of the assessment determines the site-specific mitigation required for each of the activities, based on the risk determined in Step 2. Mitigation measures are detailed in guidance published by the Greater London Authority[13], recommended for use outside the capital by LAQM guidance and the IAQM guidance document itself. If the

[13] Greater London Authority (2006) The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance

risk is classed as negligible, no mitigation measures beyond those required by legislation will be necessary.

Step 4

3.2.10 Step 4 assesses the residual effect, with mitigation measures in place, to determine whether or not these are significant.

Existing Sensitive Receptors – Human Receptors

3.2.11 The closest sensitive receptor locations to the proposed development are detailed in Table 3.

Table 3: Existing Dust Sensitive Receptors

Receptor	Direction from the Site	Approximate Distance from the Site Boundary
Student accommodation block at Jamworks City Point	South	<10m at the closest point
Millstead School	East	Approximately 20m at the closest point
Existing Residential Properties on St Martin's Mews	North	70m at the closest point

Existing Sensitive Receptors – Ecological Receptors

3.2.12 There are no potentially sensitive statutory habitat sites located within 50m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). It is not therefore necessary to consider ecological receptors within this assessment.

3.3 Operational Phase Assessment – Road Traffic Emissions

Modelling of Road Traffic Emissions

3.3.1 The air dispersion model ADMS-Roads (CERC, Version 4.1) has been used to assess the potential impact of development generated traffic on air quality at existing receptor locations.

3.3.2 LAQM. TG (16) states that 'street canyons can generally be defined as narrow streets where the height of buildings on both sides of the road is greater than the road width'. It is considered that a section of Clegg Street will form a street canyon approximately 17m in height in the opening year scenario, owing to the construction of another development (Phoenix Place 7-storey apartment block under construction). This

section of the road network has, therefore, been included as a street canyon within the air dispersion model.

3.3.3 The air dispersion model has been used to predict NO_2, PM_{10} and $PM_{2.5}$ concentrations, as these are the pollutants considered most likely to exceed the air quality objectives for human health.

3.3.4 Air dispersion modelling has been carried out to estimate pollutant concentrations, due to road traffic emissions, for the following five scenarios:

- The Base year (2016): This is the most recent year for which traffic flow information, meteorological data and local pollution data are available;
- The Opening year of the development (2018): This is the first year in which the development is likely to be occupied; and
- The Future year of the development (2023): This is the year in which the development is anticipated to be fully constructed and occupied, usually five years following the proposed opening year.

Sensitivity Analysis

3.3.5 Current evidence suggests that background NO_2 concentrations are not decreasing in accordance with expected reductions. Therefore, a sensitivity analysis has been carried out whereby 2016 background concentrations and vehicle emission factors have been applied to the 2018 Opening Year and 2023 Future Year scenarios. This is considered to be a conservative approach, as it is likely that there will be some improvement in background air quality, and emission factors, before 2023.

Road Traffic Data

3.3.6 The ADMS-Roads model requires the input of detailed road traffic flow information for those routes which will be affected by the proposed development. The traffic flow information used in the assessment is included in Appendix A.

3.3.7 Detailed traffic flow information, for use in the ADMS-Roads air dispersion model, has been provided by Vectos Transport Planning Specialists, the appointed transport consultant for the project.

3.3.8 Traffic flow information has been provided by the transport consultant as 24-hour Annual Average Daily Traffic (AADT) flows, with HGV percentages, for the following links:

- A59;

- B5173 Great Homer Street;
- B5173 St Anne Street;
- Fox Street;
- Prince Edwin Street; and
- Clegg Street

3.3.9 Air quality modelling has been carried out to predict pollutant concentrations, due to road traffic emissions, for a total of five scenarios:

- Scenario 1: 2016 Base year;
- Scenario 2: 2018 Opening year, without development;
- Scenario 3: 2023 Future year, without development;
- Scenario 4: 2018 Opening year, with development; and
- Scenario 5: 2023 Future year, with development.

Meteorological Data

3.3.10 The meteorological data used in the air dispersion modelling has been obtained from ADM Limited. Meteorological data has been obtained for 2016 from the Liverpool John Lennon Airport recording station. This is located approximately 11km south of the proposed development site and is considered to be representative of the conditions at the proposed development. Use of meteorological data from Liverpool John Lennon Airport recording station has been agreed with LCC.

3.3.11 The meteorological data provides hourly wind speed and direction information. The 2016 wind rose for the Liverpool John Lennon Airport meteorological recording station is included in Appendix B.

Existing Sensitive Receptor Locations

3.3.12 A representative existing sensitive receptor location (identified as ESR 1) has been considered in the air quality assessment. This is residential in nature and has been selected as it is a location at which the annual mean air quality objectives apply and is most likely to be impacted by the proposed development, as it lies on a road predicted to experience an increase of >100 AADT due to the operation of the proposed development. This location will also be inside a street canyon in the future scenarios owing to the construction of an approved development. As a worst-case scenario, this receptor has been assumed to be at ground floor level.

3.3.13 Details are provided in Table 4, and its location is shown on drawing ST16464-001.

Table 4: Existing Sensitive Receptor Locations				
Receptor	Address	Grid Reference		Receptor Type
		Easting	Northing	
ESR 1	Jamworks City Point	335155	391630	Residential (Student Accommodation)

Proposed Sensitive Receptor Locations

3.3.14 Two proposed sensitive receptor locations have been selected within the proposed development site (identified as PSR 1 to PSR 2). These locations have been selected along the building façade facing Great Homer Street, which is considered to represent the worst-case locations within the development. These have been modelled at floor heights representative of the residential floors. No residential uses are proposed on the ground floor of the building.

The following heights have been considered;

Level 01 (Ground Floor): 1.5m

Level 02: 4.0m

Level 03: 6.5m

Level 04: 9.0m

Level 05: 11.5m

Level 06: 14m

3.3.15 Pollutant concentrations at the proposed receptor locations have been predicted for scenarios 4 and 5 (as detailed in paragraph 3.3.9). It is only necessary to consider the 'with development' scenarios for the proposed receptor location as it will not experience any 'without development' conditions. It is not therefore necessary to consider the changes in pollutant concentrations at the proposed receptor locations.

3.3.16 Details of the proposed sensitive receptor locations are provided in Table 5, and the locations are shown on drawing ST16464-001.

Table 5: Proposed Sensitive Receptor Locations			
Receptor	**Location**	**Grid Reference**	
		Easting	**Northing**
PSR 1	Great Homer St Façade, South End	335130	391695
PSR 2	Great Homer St Façade, North End	335123	391746

3.4 Model Validation, Verification and Adjustment

3.4.1 LAQM.TG(16) recognises that model validation generally refers to detailed studies that have been carried out by the model supplier or a regulatory agency. The ADMS-Roads model has been validated by the supplier CERC.

3.4.2 Model verification is used to check the performance of the model at a local level. The verification of the ADMS-Roads model is achieved by modelling concentration(s) at existing monitoring location(s) in the vicinity of the proposed development and comparing the modelled concentration(s) with the measured concentration(s).

3.4.3 LCC does not currently operate any representative roadside monitoring locations along the roads for which traffic data is available; therefore, it has not been possible to carry out verification of predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations. Full unadjusted predicted pollutant concentrations are included in Appendix C. Full unadjusted predicted pollutant concentrations for the sensitivity analysis are included in Appendix D.

3.5 Information Sources

3.5.1 The following sources of information have been used in the preparation of this report:

- Liverpool City Council 2016 Annual Status Report and 2016 bias-adjusted monitoring data;
- DEFRA background maps website;
- Meteorological data for 2016 from the Liverpool John Lennon Airport recording station, obtained from ADM Limited; and
- Traffic flow information, provided by Vectos.

4 ASSESSMENT OF SIGNIFICANCE CRITERIA

4.1 Construction Phase Assessment – Dust and Fine Particulate Matter Emissions

4.1.1 The IAQM guidance details criteria for assessing the sensitivity of an area to dust soiling and health effects of PM_{10}, as summarised in Tables 6 to 8 below.

4.1.2 The guidance then goes on to provide significance criteria for the classification of dust soiling and human health effects from demolition, earthworks, construction activities and trackout, as summarised in Tables 9 to 11 below.

Sensitivity of the Area – Human Receptors

4.1.3 The sensitivity categories for different types of receptors, both to dust soiling effects and the health effects of PM_{10}, are described in Table 6.

Table 6: Sensitivity Categories for Human Receptors

Sensitivity Category	Dust Soiling Effects	Health effects of PM_{10}
High	Users can reasonably expect to enjoy a high level of amenity; Appearance, aesthetics or value of a property would be diminished; Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car show rooms.	Locations where members of the public are exposed over a period of time relevant to the air quality objective for PM_{10}; Examples include residential properties, hospitals, schools, and residential care homes.
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; The appearance, aesthetics or value of their property could be diminished; People or property wouldn't reasonably be expected to be continuously present or regularly for extended periods of time; Examples include parks and places of work.	Locations where people are exposed as workers and exposure is over a period of time relevant to the air quality objective for PM_{10}; Examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}.
Low	Enjoyment of amenity would not reasonably be expected; Property would not be diminished in appearance, aesthetics or value; People or property would expect to be present only for limited periods of time; Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.	Locations where human exposure is transient; Examples include public footpaths, playing fields, parks and shopping streets.

4.1.4 Based upon the category of receptor sensitivity, the sensitivity of the area to dust soiling effects is determined using the criteria detailed in Table 7.

Table 7: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20m	<50m	<100m	<350m
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

4.1.5 Based upon the category of receptor sensitivity, the sensitivity of the area to the health effects of PM_{10} is determined using the criteria detailed in Table 8.

Table 8: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from Source (m)				
			<20m	<50m	<100m	<200m	<350m
High	>32µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32µg/m3	>10	Medium	Low	Low	Low	Low

Table 8: Sensitivity of the Area to Human Health Impacts							
Receptor Sensitivity	**Annual Mean PM_{10} Concentration**	**Number of Receptors**	**Distance from Source (m)**				
			<20m	**<50m**	**<100m**	**<200m**	**<350m**
		1-10	Low	Low	Low	Low	Low
	24-28µg/m3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24µg/m3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Risk of Dust Impacts

4.1.6 The risk of dust being generated by demolition activities at the site is determined using the criteria in Table 9.

Table 9: Risk of Dust Impacts - Demolition			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

4.1.7 The risk of dust being generated by earthworks and construction activities at the site is determined using the criteria in Table 10.

Table 10: Risk of Dust Impacts – Earthworks and Construction			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

4.1.8 The risk of dust being generated by trackout from the site is determined using the criteria in Table 11.

Table 11: Risk of Dust Impacts – Trackout			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

4.2 Operational Phase Assessment – Road Traffic Emissions

Assessing the Impact of a Proposed Development on Human Health

4.2.1 Guidance has been prepared by Environmental Protection UK (EPUK) and the IAQM with regard to the assessment of the air quality impacts of proposed developments and their significance[14].

4.2.2 The impact of a development is usually assessed at specific receptors, and takes into account both the long term background concentrations, in relation to the relevant Air Quality Assessment Level (AQAL) at these receptors, and the change with the development in place.

4.2.3 The impact descriptors for individual receptors are detailed in Table 12.

Table 12: Impact Descriptors for Individual Receptors				
Long Term Average Concentration at Receptor in Assessment Year*	**Percentage Change in Concentration Relative to Air Quality Assessment Level (AQAL)***			
	1%	**2-5%**	**6-10%**	**>10**
75% or less 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% or more of AQAL	Moderate	Substantial	Substantial	Substantial

[14] Environmental Protection UK and the Institute of Air Quality Management, Land-Use Planning and Development Control: Planning for Air Quality, May 2015

Table 12: Impact Descriptors for Individual Receptors				
Long Term Average Concentration at Receptor in Assessment Year*	**Percentage Change in Concentration Relative to Air Quality Assessment Level (AQAL)***			
	1%	**2-5%**	**6-10%**	**>10**
**Percentage pollutant concentrations have been rounded to whole numbers, to make it easier to assess the impact. Changes of 0% (i.e. less than 0.5%) should be described as negligible*				

Determining the Significance of Effects

4.2.4 Impacts on air quality, whether adverse or beneficial, will have an effect on human health that can be judged as either 'significant' or 'not significant'.

4.2.5 Once the impact of the proposed development has been assessed for the individual impacts, the overall significance is determined using professional judgement. This takes into account a number of factors such as:

- The existing and future air quality in the absence of the development;
- The extent of the current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

4.2.6 A discussion of the impacts of the proposed development, and their significance, is included in sections 6.2, 7.1 and 8 of this report, respectively.

5 BASELINE SITUATION

5.1 Operational Phase Assessment – Road Traffic Emissions

Background Air Pollutant Concentrations

5.1.1 The ADMS assessment needs to take into account background concentrations upon which the local, traffic derived pollution is superimposed. The data may be derived through long term ambient measurements at background sites, remote from immediate sources of air pollution, or alternatively from the default concentration maps which have been provided for use by Defra with the LAQM.TG(16) guidance.

5.1.2 In the absence of representative background pollutant concentrations being available for the local area, background concentrations have been obtained from the 2013-based default concentration maps provided by Defra on their LAQM webpages[15].

5.1.3 The background pollutant concentrations used in this assessment are detailed in Table 13.

Table 13: Background NO_x, NO_2, PM_{10} and $PM_{2.5}$ Concentrations Obtained from the 2013-Based Defra Default Concentration Maps (Annual Mean Concentration in µg/m^3)

Receptors	Pollutant			
	Oxides of Nitrogen (NO_x)	Nitrogen Dioxide (NO_2)	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)
2016 Background Concentrations				
PSR 1, PSR 2, ESR 1 (335500, 391500)	30.03	20.42	14.38	10.06
2018 Background Concentrations				
PSR 1, PSR 2, ESR 1 (335500, 391500)	26.57	18.35	14.13	9.82
2023 Background Concentrations				
PSR 1, PSR 2, ESR 1 (335500, 391500)	20.86	14.83	13.81	9.49

Modelled Baseline Concentrations

5.1.4 The baseline assessment (i.e. scenarios 1, 2 and 3) has been carried out for the existing sensitive receptor considered (i.e. ESR 1). The NO_2, PM_{10} and $PM_{2.5}$ concentrations are detailed in Table 14 and are also included in Appendix C.

[15] Department for Environment, Food and Rural Affairs, Local Air Quality Management webpages (http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html)

Table 14: Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at Existing Sensitive Receptor Locations for 2016, 2018 and 2023 'Without Development' Scenarios

Receptor	Calculated Annual Mean Concentrations (µg/m³)								
	NO_2 (Unadjusted)*			PM_{10} (Unadjusted)			$PM_{2.5}$ (Unadjusted)		
	Scenario 1: 2016	Scenario 2: 2018	Scenario 3: 2023	Scenario 1: 2016	Scenario 2: 2018	Scenario 3: 2023	Scenario 1: 2016	Scenario 2: 2018	Scenario 3: 2023
ESR 1	27.46	24.06	18.39	15.61	15.33	15.00	10.80	10.51	10.14

** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator[1] in accordance with LAQM.TG(16)*
Underlined concentrations represent an exceedance of the annual mean objective.

Scenario 1: 2016 Base Year

5.1.5 The 2016 baseline annual mean NO_2 concentration (unadjusted) is predicted to be 27.46µg/m³ at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted.

5.1.6 The 2016 baseline annual mean PM_{10} concentration (unadjusted) is predicted to be 15.61µg/m³ at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m³) is not predicted.

5.1.7 The 2016 baseline annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to be 10.80µg/m³ at the existing sensitive receptor location considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m³) is not predicted.

Scenario 2: 2018 Opening Year, Without Development

5.1.8 The 2018 baseline annual mean NO_2 concentration (unadjusted) is predicted to be 24.06µg/m³ at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted.

5.1.9 The 2018 baseline annual mean PM_{10} concentration (unadjusted) is predicted to be 15.33µg/m³ at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m³) is not predicted.

5.1.10 The 2018 baseline annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to be 10.51µg/m³ at the existing sensitive receptor location considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m³) is not predicted.

Scenario 3: 2023 Future Year, Without Development

5.1.11 The 2023 baseline annual mean NO_2 concentration (unadjusted) is predicted to be 18.39µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted.

5.1.12 The 2023 baseline annual mean PM_{10} concentration (unadjusted) is predicted to be 15.00µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted.

5.1.13 The 2023 baseline annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to be 10.14µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted.

6 IMPACT ASSESSMENT

6.1 Construction Phase Assessment – Dust and Fine Particulate Matter Emissions

6.1.1 The main activities involved with the construction phase of works are as follows:

- **Demolition** of existing buildings within the proposed development area;
- **Earthworks** which may be required prior to the construction phase of works. Sources of dust can include:
  - Cleaning the site;
  - Stripping and stockpiling of topsoil and subsoil;
  - Ground excavation;
  - Bringing in, tipping and spreading materials on site;
  - Stockpiling materials;
  - Levelling ground;
  - Trenching;
  - Road construction;
  - Vehicle movements on site roads; and
  - Windblown materials from site.
- **Construction** of individual building access roads, the car parking areas and the buildings themselves; and
- **Trackout** which is the transport of dust and dirt by vehicles travelling from a construction site on to the public road network. This may occur through the spillage of dusty materials onto road surfaces or through the transportation of dirt by vehicles that have travelled over muddy ground on the site. This dust and dirt can then be deposited and re-suspended by other vehicles.

Step 2A

6.1.2 Step 2A of the construction phase dust assessment has defined the potential dust emission magnitude from demolition, earthworks, construction and trackout in the absence of site specific mitigation. Examples of the criteria for the dust emission classes are detailed in the IAQM guidance.

Step 2B

6.1.3 Step 2B of the construction phase dust assessment has defined the sensitivity of the area, taking into account the significance criteria detailed in Tables 8 to 10, for demolition, earthworks, construction and trackout. The sensitivity of the area to each activity is assessed for potential dust soiling and human health effects.

6.1.4 For demolition, there are currently >100 receptor locations within 50 m of where these activities will take place, as the existing buildings are some distance from the site boundary. This is a robust approach.

6.1.5 For earthworks and construction, there are currently >100 receptor locations within 50 m of where these activities will take place.

6.1.6 For trackout, there are >100 receptor locations within 50m of where trackout may occur for a distance of up to 200m from the site access onto the B5173 Great Homer Street/St Anne Street.

Step 2C

6.1.7 Step 2C of the construction phase dust assessment has defined the risk of impacts from each activity. The dust emission magnitude is combined with the sensitivity of the surrounding area. The risk of dust impacts from each activity, with no mitigation in place, has been assessed in accordance with the criteria detailed in Tables 9 to 11.

Summary

6.1.8 Table 15 details the results of Step 2 of the construction phase assessment.

Table 15: Construction Phase Dust Assessment

	Activity			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Step 2A				
Dust Emission Magnitude	Small[a]	Medium[b]	Medium[c]	Medium[d]
Step 2B				
Sensitivity of Closest Receptors	High	High	High	High
Sensitivity of Area to Dust Soiling Effects	High	High	High	High
Sensitivity of Area to Human Health Effects	Low[e]	Low[e]	Low[e]	Low[e]
Step 2C				
Dust Risk: Dust Soiling	Negligible	Medium	Medium	Medium
Dust Risk: Human Health	Negligible	Low Risk	Low Risk	Low Risk

a. Classed as small where total building volume to be demolished is estimated to be <20,000m^3.

b. Classed as medium where the total individual site area is estimated to be between 2,500m^2 and 10,000m^2. For the purposes of this assessment a robust approach has been adopted.

c. Classed as medium where the total building volume to be constructed estimated to be between 25,000m^3 and 100,000m^3. For the purposes of this assessment a robust approach has been adopted.

Table 15: Construction Phase Dust Assessment				
	Activity			
	Demolition	Earthworks	Construction	Trackout
d. Classed as medium where the number of HDV movements in an average day is estimated to be between 10 and 50.				
e. Background annual mean PM_{10} concentration is less than 24µg/m³ (based on data obtained from the LAQM Defra default concentration maps, for the appropriate grid squares)				

6.2 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

6.2.1 The impact assessment has been carried out for the existing sensitive receptor location ESR 1. Table 16 and 17 respectively show the changes in pollutant concentrations for the 2018 Opening Year and 2023 Future Year for both the 'without development' and 'with development' scenarios. The NO_2, PM_{10} and $PM_{2.5}$ concentrations are included in Appendix C.

Table 16: Predicted NO_2, PM_{10} and $PM_{2.5}$ Concentrations at Existing Sensitive Receptor Locations for 2018 'Without Development' and 'With Development' Scenarios				
Receptor	Level of Development	Calculated Annual Mean Concentrations (µg/m³)		
		NO_2 (Unadjusted)*	PM_{10} (Unadjusted)	$PM_{2.5}$ (Unadjusted)
ESR 1	Without development	24.06	15.33	10.51
	With development	24.27	15.38	10.54
	Percentage Change Relative to AQAL	*+0.53%*	*+0.11%*	*+0.10%*
** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator in accordance with LAQM.TG(16)*				

Scenario 4: 2018 Opening Year, With Development

6.2.2 The 2018 'with development' annual mean NO_2 concentration (unadjusted) is predicted to be 24.27µg/m³ at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted.

6.2.3 The 2018 'with development' annual mean PM_{10} concentration (unadjusted) is predicted to be 15.38µg/m³ at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m³) is not predicted.

6.2.4 The 2018 'with development' annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to be 10.54µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted.

Table 17: Predicted NO_2, PM_{10} and $PM_{2.5}$ Concentrations at Existing Sensitive Receptor Locations for 2023 'Without Development' and 'With Development' Scenarios

Receptor	Level of Development	Calculated Annual Mean Concentrations (µg/m^3)		
		NO_2 (Unadjusted)*	PM_{10} (Unadjusted)	$PM_{2.5}$ (Unadjusted)
ESR 1	Without development	18.39	15.00	10.14
	With development	18.54	15.04	10.16
	Percentage Change Relative to AQAL	*+0.38%*	*+0.10%*	*+0.90%*

** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator in accordance with LAQM.TG(16)*

Scenario 5: 2023 Future Year, With Development

6.2.5 The 2023 'with development' annual mean NO_2 concentration (unadjusted) is predicted to be 18.54µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted.

6.2.6 The 2023 'with development' annual mean PM_{10} concentration (unadjusted) is predicted to be 15.04µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted.

6.2.7 The 2023 'with development' annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to be 10.16µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted.

Assessment of Impact

6.2.8 Using the descriptors detailed in Table 12, the impact of the proposed development can be assessed at each of the thirteen existing sensitive receptors considered.

6.2.9 The impact on NO_2 concentrations is detailed in Table 18.

Table 18: Impact on NO_2 Concentrations						
Year	**2018**			**2023**		
Receptor	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
ESR 1	1%	<75%	Negligible	<0.5%	<75%	Negligible
** Changes of less than 0.5% should be described as negligible*						

6.2.10 The results of the air quality assessment for the 2018 Opening Year and 2023 Future Year indicate that there will be a negligible impact on NO_2 concentrations at ESR 1.

6.2.11 The impact on PM_{10} concentrations is detailed in Table 19.

Table 19: Impact on PM_{10} Concentrations						
Year	**2018**			**2023**		
Receptor	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
ESR 1	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
** Changes of less than 0.5% should be described as negligible*						

6.2.12 The results of the air quality assessment for the 2018 Opening Year and 2023 Future Year indicate that there will be a negligible impact on PM_{10} concentrations at ESR 1.

6.2.13 The impact on $PM_{2.5}$ concentrations is detailed in Table 20.

Table 20: Impact on $PM_{2.5}$ Concentrations						
Year	**2018**			**2023**		
Receptor	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
ESR 1	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
** Changes of less than 0.5% should be described as negligible*						

6.2.14 The results of the air quality assessment for the 2018 Opening Year and 2023 Future Year indicate that there will be a negligible impact on $PM_{2.5}$ concentrations at ESR 1.

Proposed Sensitive Receptor Locations

6.2.15 Air pollutant concentrations have also been modelled at two proposed receptor locations, for the 2018 Opening Year and 2023 Future Year 'with development' scenarios, as detailed in Table 21. The NO_2, PM_{10} and $PM_{2.5}$ concentrations are included in Appendix C.

Table 21: Predicted NO_2, PM_{10} and $PM_{2.5}$ Concentrations at Proposed Sensitive Receptor Locations for 2018 and 2023 'With Development' Scenarios

Receptor	Calculated Annual Mean Concentrations (2018) (µg/m³)			Calculated Annual Mean Concentrations (2023) (µg/m³)		
	NO_2 (Un-adjusted)*	PM_{10} (Un-adjusted)	$PM_{2.5}$ (Un-adjusted)	NO_2 (Un-adjusted)*	PM_{10} (Un-adjusted)	$PM_{2.5}$ (Un-adjusted)
PSR 1 - 01	28.43	16.37	11.11	21.04	16.03	10.71
PSR 1 - 02	24.96	15.60	10.66	18.96	15.27	10.29
PSR 1 - 03	22.35	15.02	10.33	17.35	14.69	9.97
PSR 1 - 04	20.87	14.69	10.14	16.43	14.36	9.79
PSR 1 - 05	20.02	14.50	10.03	15.89	14.17	9.69
PSR 1 - 06	19.49	14.38	9.97	15.56	14.06	9.63
PSR 2 - 01	30.16	16.76	11.33	22.03	16.42	10.92
PSR 2 - 02	25.12	15.64	10.69	19.05	15.31	10.31
PSR 2 - 03	22.32	15.01	10.33	17.34	14.69	9.97
PSR 2 - 04	20.88	14.69	10.14	16.43	14.37	9.79
PSR 2 - 05	20.03	14.50	10.03	15.90	14.18	9.69
PSR 2 - 06	19.52	14.39	9.97	15.57	14.07	9.63

** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator in accordance with LAQM.TG(16)*

Scenario 4: 2018 Opening Year, With Development

6.2.16 The 2018 'with development' annual mean NO_2 concentration (unadjusted) is predicted to range from 19.49 to 30.14µg/m³ for the proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted to occur at any proposed sensitive receptor location.

6.2.17 The 2018 'with development' annual mean PM_{10} concentration (unadjusted) is predicted to range from 14.38 to 16.76µg/m³ for the proposed sensitive receptor

locations considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

6.2.18 The 2018 'with development' annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to range from 9.97 to 11.33µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

Scenario 5: 2023 Future Year, With Development

6.2.19 The 2023 'with development' annual mean NO_2 concentration (unadjusted) is predicted to range from 15.56 to 22.03µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

6.2.20 The 2023 'with development' annual mean PM_{10} concentration (unadjusted) is predicted to range from 14.06 to 16.42µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

6.2.21 The 2023 'with development' annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to range from 9.63 to 10.92µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

7 SENSITIVITY ANALYSIS

7.1 Operational Phase Assessment – Road Traffic Emissions

7.1.1 A sensitivity analysis has been undertaken, using the 2016 background concentrations and emission factors to provide a worst case analysis.

Modelled Baseline Concentrations

7.1.2 The baseline sensitivity analysis (i.e. scenarios 2 and 3) has been carried out for the existing sensitive receptor considered (i.e. ESR 1). The NO_2, PM_{10} and $PM_{2.5}$ concentrations are detailed in Table 22 and are also included in Appendix D.

Table 22: Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at Existing Sensitive Receptor Location for 2018 and 2023 'Without Development' Scenarios

Receptor	Calculated Annual Mean Concentrations (µg/m^3)					
	Scenario 2: 2018	Scenario 3: 2023	Scenario 2: 2018	Scenario 3: 2023	Scenario 2: 2018	Scenario 3: 2023
ESR 1	27.62	28.03	15.64	15.72	10.82	10.87
** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator[1] in accordance with LAQM.TG(16)*						
Underlined concentrations represent an exceedance of the annual mean objective.						

Scenario 2: 2018 Opening Year, Without Development

7.1.3 The 2018 baseline annual mean NO_2 concentration (unadjusted) is predicted to be 27.62µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted.

7.1.4 The 2018 baseline annual mean PM_{10} concentration (unadjusted) is predicted to be 15.64µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted.

7.1.5 The 2018 baseline annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to be 10.82µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted.

Scenario 3: 2023 Future Year, Without Development

7.1.6 The 2023 baseline annual mean NO_2 concentration (unadjusted) is predicted to be 28.03µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted.

7.1.7 The 2023 baseline annual mean PM_{10} concentration (unadjusted) is predicted to be 15.72µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted.

7.1.8 The 2023 baseline annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to be 10.87µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted.

Impact Assessment – Existing Sensitive Receptors

7.1.9 The impact assessment has been carried out for the existing sensitive receptor location ESR 1. Tables 23 and 24 respectively show the changes in pollutant concentrations for the 2018 Opening Year and 2023 Future Year for both the 'without development' and 'with development' scenarios. The NO_2, PM_{10} and $PM_{2.5}$ concentrations are included in Appendix D.

Table 23: Predicted NO_2, PM_{10} and $PM_{2.5}$ Concentrations at the Existing Sensitive Receptor Location for 2018 'Without Development' and 'With Development' Scenarios

Receptor	Level of Development	Calculated Annual Mean Concentrations (µg/m^3)		
		NO_2 (Unadjusted)*	PM_{10} (Unadjusted)	$PM_{2.5}$ (Unadjusted)
ESR 1	Without development	27.62	15.64	10.82
	With development	27.86	15.69	10.85
	Percentage Change Relative to AQAL	*+0.60%*	*+0.11%*	*+0.11%*

** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator in accordance with LAQM.TG(16)*

Scenario 4: 2018 Opening Year, With Development

7.1.10 The 2018 'with development' annual mean NO_2 concentration (unadjusted) is predicted to be 27.86µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted.

7.1.11 The 2018 'with development' annual mean PM_{10} concentration (unadjusted) is predicted to be 15.69µg/m^3 at the existing sensitive receptor location considered.

Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted.

7.1.12 The 2018 'with development' annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to be 10.85µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted.

Table 24: Predicted NO_2, PM_{10} and $PM_{2.5}$ Concentrations at Existing Sensitive Receptor Locations for 2018 'Without Development' and 'With Development' Scenarios

Receptor	Level of Development	Calculated Annual Mean Concentrations (µg/m^3)		
		NO_2 (Unadjusted)*	PM_{10} (Unadjusted)	$PM_{2.5}$ (Unadjusted)
ESR 1	Without development	28.03	15.72	10.87
	With development	28.28	15.77	10.89
	Percentage Change Relative to AQAL	*+0.63%*	*+0.11%*	*+0.11%*

** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator in accordance with LAQM.TG(16)*

Scenario 5: 2023 Future Year, With Development

7.1.13 The 2023 'with development' annual mean NO_2 concentration (unadjusted) is predicted to be 18.54µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted.

7.1.14 The 2023 'with development' annual mean PM_{10} concentration (unadjusted) is predicted to be 15.04µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted.

7.1.15 The 2023 'with development' annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to be 10.16µg/m^3 at the existing sensitive receptor location considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted.

Impact Assessment - Existing Sensitive Receptor Locations

7.1.16 The impact assessment for the sensitivity analysis has been carried out for the existing sensitive receptor location ESR 1. Table 24 shows the changes in NO_2 concentrations for the 2018 Opening Year and the 2023 Future Year respectively, for both the

'without development' and 'with development' scenarios. The unadjusted NO_2 concentrations are also included in Appendix D.

7.1.17 The impact on NO_2 concentrations is detailed in Table 25.

Table 25: Impact on NO_2 Concentrations

Year	2018			2023		
Receptor	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
ESR 1	1%	<75%	Negligible	1%	<75%	Negligible
** Changes of less than 0.5% should be described as negligible*						

7.1.18 The results of the air quality assessment for the 2018 Opening Year and 2023 Future Year indicate that there will be a negligible impact on NO_2 concentrations at ESR 1.

7.1.19 The impact on PM_{10} concentrations is detailed in Table 26.

Table 26: Impact on PM_{10} Concentrations

Year	2018			2023		
Receptor	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
ESR 1	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
** Changes of less than 0.5% should be described as negligible*						

7.1.20 The results of the air quality assessment for the 2018 Opening Year and 2023 Future Year indicate that there will be a negligible impact on PM_{10} concentrations at ESR 1.

7.1.21 The impact on $PM_{2.5}$ concentrations is detailed in Table 27.

Table 27: Impact on $PM_{2.5}$ Concentrations

Year	2018			2023		
Receptor	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
ESR 1	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible

Table 27: Impact on $PM_{2.5}$ Concentrations						
Year	**2018**			**2023**		
Receptor	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
** Changes of less than 0.5% should be described as negligible*						

7.1.22 The results of the air quality assessment for the 2018 Opening Year and 2023 Future Year indicate that there will be a negligible impact on $PM_{2.5}$ concentrations at ESR 1.

Proposed Sensitive Receptor Locations

7.1.23 Air pollutant concentrations have also been modelled in the sensitivity analysis at two proposed receptor locations, for the 2018 Opening Year and 2023 Future Year 'with development' scenarios, as detailed in Table 28. The NO_2, PM_{10} and $PM_{2.5}$ concentrations are included in Appendix D.

Table 28: Predicted NO_2, PM_{10} and $PM_{2.5}$ Concentrations at Proposed Sensitive Receptor Locations for 2018 and 2023 'With Development' Scenarios – Sensitivity analysis						
Receptor	**Calculated Annual Mean Concentrations (2018) (µg/m³)**			**Calculated Annual Mean Concentrations (2023) (µg/m³)**		
	NO_2 (Un-adjusted)*	**PM_{10} (Un-adjusted)**	**$PM_{2.5}$ (Un-adjusted)**	**NO_2 (Un-adjusted)***	**PM_{10} (Un-adjusted)**	**$PM_{2.5}$ (Un-adjusted)**
PSR 1 - 01	33.18	16.74	11.47	33.91	16.88	11.55
PSR 1 - 02	28.78	15.92	10.98	29.28	16.02	11.04
PSR 1 - 03	25.47	15.31	10.62	25.78	15.37	10.65
PSR 1 - 04	23.60	14.96	10.41	23.80	15.00	10.43
PSR 1 - 05	22.52	14.76	10.29	22.65	14.79	10.31
PSR 1 - 06	21.86	14.64	10.22	21.95	14.66	10.23
PSR 2 - 01	35.41	17.15	11.71	36.25	17.32	11.81
PSR 2 - 02	28.99	15.96	11.00	29.51	16.06	11.06
PSR 2 - 03	25.43	15.30	10.61	25.75	15.36	10.65
PSR 2 - 04	23.60	14.96	10.41	23.81	15.00	10.43
PSR 2 - 05	22.54	14.77	10.29	22.68	14.79	10.31
PSR 2 - 06	21.89	14.65	10.22	21.98	14.66	10.23
** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator in accordance with LAQM.TG(16)*						

Scenario 4: 2018 Opening Year, With Development

7.1.24 The 2018 'with development' annual mean NO_2 concentration (unadjusted) is predicted to range from 19.49 to 30.14µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

7.1.25 The 2018 'with development' annual mean PM_{10} concentration (unadjusted) is predicted to range from 14.38 to 16.76µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

7.1.26 The 2018 'with development' annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to range from 9.97 to 11.33µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

Scenario 5: 2023 Future Year, With Development

7.1.27 The 2023 'with development' annual mean NO_2 concentration (unadjusted) is predicted to range from 15.56 to 22.03µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

7.1.28 The 2023 'with development' annual mean PM_{10} concentration (unadjusted) is predicted to range from 14.06 to 16.42µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

7.1.29 The 2023 'with development' annual mean $PM_{2.5}$ concentration (unadjusted) is predicted to range from 9.63 to 10.92µg/m^3 for the proposed sensitive receptor locations considered. Exceedance of the annual mean target concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur at any proposed sensitive receptor location.

8 ASSESSMENT OF SIGNIFICANCE

8.1 Operational Phase Assessment – Road Traffic Emissions

8.1.1 The significance of the overall effects of the proposed development has been assessed in accordance with the EPUK/IAQM guidance. This assessment is based on professional judgement and takes into account a number of factors, including:

- Baseline NO_2 concentrations in the 2016 Base Year do not exceed the annual mean objective for NO_2 at ESR 1 in the air quality assessment or in the sensitivity analysis.
- No exceedances of the annual mean objective for PM_{10} or the annual mean target for $PM_{2.5}$ are predicted to occur at the existing sensitive receptor location considered;
- With regard to the 2018 Opening Year and 2023 Future Year 'without development' scenarios, the assessments predict that pollutant concentrations will be below the objectives at the existing receptor location considered.
- The air quality assessments for the 2018 Opening Year and 2023 Future Year predict negligible impacts on NO_2, PM_{10} and $PM_{2.5}$ concentrations at the one existing sensitive receptor location, with the development in place.
- With regard to 2018 Opening Year and 2023 Future Year 'without development' scenarios, the sensitivity analysis predicts that concentrations of NO_2, PM_{10} and $PM_{2.5}$ will be below the objectives at the existing receptor location considered. Impacts on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at these locations as a result of the development are predicted to be negligible.
- The Air Quality Assessment predicts that pollutant concentrations within the proposed development site will be below the relevant annual mean objectives, in all scenarios considered.
- The sensitivity analysis does not predict any exceedances of the annual mean objective for NO_2, PM_{10} or $PM_{2.5}$ at either of the proposed sensitive receptor locations considered, either in the 2018 Opening Year scenario or in the 2023 Future Year scenario.

8.1.2 Based on the above factors, the effect of the proposed development on human health can be considered 'not significant'. The operation of the development is not predicted to cause any breach in air quality objectives or target levels for NO_2 PM_{10} or $PM_{2.5}$.

9 MITIGATION MEASURES

9.1 Construction Phase Assessment – Dust Emissions

Step 3

9.1.1 During the construction phase the implementation of effective mitigation measures will substantially reduce the potential for nuisance dust and particulate matter to be generated.

9.1.2 Step 2C of the construction phase assessment identified that:

- The risk of dust soiling effects is classed as negligible for demolition, high for earthworks, construction and trackout; and
- The risk of human health effects is classed as negligible for demolition, low for earthworks, construction and trackout.

9.1.3 This assumes that no mitigation measures are applied, except those required by legislation. Site specific mitigation measures do not need to be recommended if the risk category is negligible.

9.1.4 The risk of dust soiling and human health effects is not negligible for the majority of activities and therefore site specific mitigation will need to be implemented to ensure dust effects from these activities will be 'not significant'.

9.1.5 A best practice dust mitigation plan will be written and implemented for the site. This will set out the practical measures that could be incorporated as part of a best working practice scheme. This will take into account the recommendations included within the IAQM guidance, which may include but are not limited to:

- Dampening down of exposed stored materials, which will be stored as far from sensitive receptors as possible;
- Avoidance of activities that generate large amounts of dust during windy conditions;
- Ensuring bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
- Avoiding dry sweeping of large areas;
- Using water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;

- Ensuring that all vehicles will be sheeted when loaded;
- Confining vehicles to areas of the site where appropriate dust control measures can be in operation; and
- Minimising vehicle movements and limitation of vehicle speeds – the slower the vehicle speeds, the lower the dust generation.

9.1.6 All dust and air quality complaints should be recorded and appropriate measures be taken to identify causes and reduce emissions in a timely manner. Exceptional incidents which cause dust and/or emissions, and the action taken to resolve the situation, should be recorded in a log book and made available to LCC on request.

9.1.7 It is recognised that the final design solutions will be developed with the input of the Contractor to maximise construction efficiencies, to use modern construction techniques and sustainable materials, and to incorporate the particular skills and experience offered by the successful contractor.

Step 4

9.1.8 Step 4 of the construction phase dust assessment has been undertaken to determine the significance of the dust effects arising from demolition, earthworks, construction and trackout associated with the proposed development.

9.1.9 The implementation of effective mitigation measures during the construction phase, such as those detailed in Step 3, will substantially reduce the potential for nuisance dust and particulate matter to be generated and any residual impact should be 'not significant'

9.2 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

9.2.1 An air quality assessment and sensitivity analysis have been undertaken to consider the potential impact of development-generated vehicles on air quality at one existing sensitive receptor location.

9.2.2 The air quality assessments for the 2018 Opening Year and 2023 Future Year predict negligible impacts on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at one existing sensitive receptor location (ESR 1), with the development in place.

9.2.3 The sensitivity analysis predicts that there will be a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the existing sensitive receptor considered in

the 2018 Opening Year, with the development in place. In the 2023 Future Year, negligible impacts are predicted at the existing receptor location.

Proposed Sensitive Receptor Locations

9.2.4 The assessment has also predicted pollutant concentrations at two proposed receptor locations within the proposed residential development site. These locations have been selected along the building façade facing Great Homer Street, which is considered to represent the worst-case locations within the development.

9.2.5 The air quality assessment and sensitivity analysis predicts that NO_2 concentrations will not exceed the annual mean objective at either of the proposed sensitive receptor locations considered, in the 2018 Opening Year or 2023 Future Year scenarios.

Mitigation Strategies

9.2.6 Based on professional judgement, the effect of the proposed development on NO_2 concentrations is considered to be 'not significant'. Nevertheless, it is considered that mitigation measures could be employed in order to mitigate or reduce impacts on existing sensitive receptor locations and ensure concentrations within the proposed development are minimised. Mitigation measures could include:

- The implementation of a green travel plan, as well as documents showing local public transportation routes for future residents;
- EV recharging infrastructure within the development (wall mounted or free standing in garage or off-street points);
- Designation of parking spaces for low emission vehicles;
- Support local walking and cycling initiatives;
- Bike/e-bike hire schemes; and
- Installing low/ultra-low NO_x boilers at proposed dwellings.

10 CONCLUSIONS

10.1 Construction Phase Assessment – Dust Emissions

10.1.1 The construction phase assessment has been undertaken to determine the risk and significance of dust effects from earthworks, construction and trackout associated with the proposed development. The assessment has been undertaken in accordance with the guidance published by the IAQM.

10.1.2 The risk of dust soiling effects is classed as negligible for demolition, high for earthworks, construction and trackout. The risk of human health effects is classed as negligible for demolition, low for earthworks, construction and trackout.

10.1.3 With site specific mitigation measures in place, such as those detailed in Section 9 of this report, the significance of dust effects from earthworks, construction and trackout are considered to be 'not significant'.

10.2 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

10.2.1 An air quality assessment and sensitivity analysis have been undertaken to consider the potential impact of development-generated vehicles on air quality at one existing sensitive receptor location.

10.2.2 The air quality assessment predicts concentrations of NO_2, PM_{10} and $PM_{2.5}$ will be below the relevant air quality objectives and target levels in the 2018 Opening Year and 2023 Future Year scenarios. Negligible impacts are predicted on concentrations of NO_2, PM_{10} and $PM_{2.5}$ in the 2018 Opening Year and 2023 Future Year scenarios in the air quality assessment.

10.2.3 The sensitivity analysis predicts concentrations of NO_2, PM_{10} and $PM_{2.5}$ will be below the relevant air quality objectives and target levels in the 2018 Opening Year and 2023 Future Year scenarios. Negligible impacts are predicted on concentrations of NO_2, PM_{10} and $PM_{2.5}$ in the 2018 Opening Year and 2023 Future Year scenarios.

Proposed Sensitive Receptor Locations

10.2.4 The assessment has also predicted pollutant concentration at two proposed receptor locations within the proposed residential development site. These locations have been selected along the building façade facing Great Homer Street, which is considered to represent the worst-case locations within the development.

10.2.5 The air quality assessment predicts that all on-site pollutant concentrations will be below the relevant air quality objectives in both the 2018 Opening Year and 2023 Future Year scenarios.

10.2.6 The sensitivity analysis predicts that all on-site NO_2 concentrations will be below the relevant air quality objective in both the 2018 Opening Year and 2023 Future Year scenarios.

Mitigation Strategies

10.2.7 It is considered that mitigation measures could help to further reduce the impacts of the development on local air quality. Mitigation measures implemented should focus on mitigating elevations in NO_2 concentrations, as a result of development-generated traffic.

Summary

10.2.8 The assessment has demonstrated that the proposed development will not lead to an unacceptable risk from air pollution, or to any breach in national objectives, or to a failure to comply with the Habitats Regulations as required by national policy. There are no material reasons in relation to air quality why the proposed scheme should not proceed, subject to appropriate planning conditions.

Appendix A:
Traffic Flow Information
Used in the Air Quality Assessment

24 Hour Annual Average Daily Traffic (AADT) Flows

Link	Link Name	Road Width (m)	Speed Limit (kph)	Direction	2016 Base Year					
					24hr AADT				1hr AADT	
					Total	LGV	HGV%	HGV	LGV	HGV
1	Clegg Street	5	48		0	0	0.00%	0	0	0
2	Prince Edwin St (East)	7.5	48		1653	1578	4.55%	75	66	3
3	Prince Edwin St (West)	5	48		1653	1578	4.55%	75	66	3
4	Fox St (North)	8.5	48		2511	2424	3.49%	88	101	4
5	Fox St (South)	8.5	48		2123	2060	2.95%	63	86	3
6	Great Homer St (NB)	7	48	North	8761	8354	4.65%	407	348	17
7	Great Homer St (SB)	7	48	South	8386	7083	15.53%	1303	295	54
8	St Anne St (NB)	7.5	48	North	8016	7609	5.08%	407	317	17
9	St Anne St (SB)	7.5	48	South	7277	6025	17.21%	1253	251	52
10	A59 Scotland Rd (NB)	11	48	North	21092	20184	4.30%	908	841	38
11	A59 Scotland Rd (SB)	11	48	South	21092	20184	4.30%	908	841	38
12	A59 On Slip (NB)	8	48	North	12077	11441	5.27%	636	477	27
13	A59 On Slip (SB)	7.5	48	South	12077	11441	5.27%	636	477	27
14	A59 Off Slip (NB)	5	48	North	12077	11441	5.27%	636	477	27
15	A59 Off Slip (SB)	5	48	South	12077	11441	5.27%	636	477	27
Slowdown sections modelled at 20 km/h										

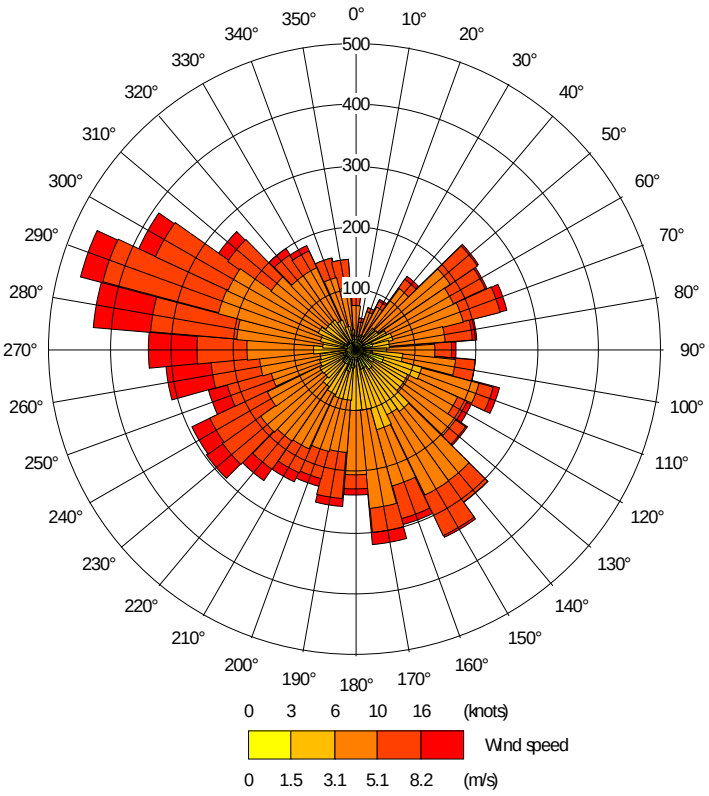
Link	Link Name	Road Width (m)	Speed Limit (kph)	Direction	2018 Opening Year – Without Development					
					24hr AADT				1hr AADT	
					Total	LGV	HGV%	HGV	LGV	HGV
1	Clegg Street	5	48		0	0	0.00%	0	0	0
2	Prince Edwin St (East)	7.5	48		1700	1623	4.55%	77	68	3
3	Prince Edwin St (West)	5	48		1700	1623	4.55%	77	68	3
4	Fox St (North)	8.5	48		2583	2492	3.49%	90	104	4
5	Fox St (South)	8.5	48		2183	2119	2.95%	64	88	3
6	Great Homer St (NB)	7	48	North	9010	8592	4.65%	419	358	17
7	Great Homer St (SB)	7	48	South	8624	7284	15.53%	1340	304	56
8	St Anne St (NB)	7.5	48	North	8244	7825	5.08%	419	326	17
9	St Anne St (SB)	7.5	48	South	7484	6196	17.21%	1288	258	54
10	A59 Scotland Rd (NB)	11	48	North	21691	20757	4.30%	934	865	39
11	A59 Scotland Rd (SB)	11	48	South	21691	20757	4.30%	934	865	39
12	A59 On Slip (NB)	8	48	North	12420	11766	5.27%	654	490	27
13	A59 On Slip (SB)	7.5	48	South	12420	11766	5.27%	654	490	27
14	A59 Off Slip (NB)	5	48	North	12420	11766	5.27%	654	490	27
15	A59 Off Slip (SB)	5	48	South	12420	11766	5.27%	654	490	27
Slowdown sections modelled at 20 km/h										

Link	Link Name	Road Width (m)	Speed Limit (kph)	Direction	2023 Future Year – Without Development					
					24hr AADT				1hr AADT	
					Total	LGV	HGV%	HGV	LGV	HGV
1	Clegg Street	5	48		0	0	0.00%	0	0	0
2	Prince Edwin St (East)	7.5	48		1807	1725	4.55%	82	72	3
3	Prince Edwin St (West)	5	48		1807	1725	4.55%	82	72	3
4	Fox St (North)	8.5	48		2744	2648	3.49%	96	110	4
5	Fox St (South)	8.5	48		2320	2251	2.95%	68	94	3
6	Great Homer St (NB)	7	48	North	9574	9129	4.65%	445	380	19
7	Great Homer St (SB)	7	48	South	9163	7740	15.53%	1423	322	59
8	St Anne St (NB)	7.5	48	North	8759	8315	5.08%	445	346	19
9	St Anne St (SB)	7.5	48	South	7952	6583	17.21%	1369	274	57
10	A59 Scotland Rd (NB)	11	48	North	23047	22055	4.30%	992	919	41
11	A59 Scotland Rd (SB)	11	48	South	23047	22055	4.30%	992	919	41
12	A59 On Slip (NB)	8	48	North	13197	12502	5.27%	695	521	29
13	A59 On Slip (SB)	7.5	48	South	13197	12502	5.27%	695	521	29
14	A59 Off Slip (NB)	5	48	North	13197	12502	5.27%	695	521	29
15	A59 Off Slip (SB)	5	48	South	13197	12502	5.27%	695	521	29
Slowdown sections modelled at 20 km/h										

Link	Link Name	Road Width (m)	Speed Limit (kph)	Direction	2018 Opening Year – With Development					
					24hr AADT				1hr AADT	
					Total	LGV	HGV%	HGV	LGV	HGV
1	Clegg Street	5	48		139	139	0.00%	0	6	0
2	Prince Edwin St (East)	7.5	48		1728	1651	4.47%	77	69	3
3	Prince Edwin St (West)	5	48		1811	1734	4.27%	77	72	3
4	Fox St (North)	8.5	48		2670	2580	3.38%	90	107	4
5	Fox St (South)	8.5	48		2207	2142	2.92%	64	89	3
6	Great Homer St (NB)	7	48	North	9055	8636	4.62%	419	360	17
7	Great Homer St (SB)	7	48	South	8668	7329	15.45%	1340	305	56
8	St Anne St (NB)	7.5	48	North	8287	7868	5.05%	419	328	17
9	St Anne St (SB)	7.5	48	South	7527	6239	17.11%	1288	260	54
10	A59 Scotland Rd (NB)	11	48	North	21691	20757	4.30%	934	865	39
11	A59 Scotland Rd (SB)	11	48	South	21691	20757	4.30%	934	865	39
12	A59 On Slip (NB)	8	48	North	12420	11766	5.27%	654	490	27
13	A59 On Slip (SB)	7.5	48	South	12420	11766	5.27%	654	490	27
14	A59 Off Slip (NB)	5	48	North	12420	11766	5.27%	654	490	27
15	A59 Off Slip (SB)	5	48	South	12420	11766	5.27%	654	490	27
Slowdown sections modelled at 20 km/h										

Link	Link Name	Road Width (m)	Speed Limit (kph)	Direction	2023 Future Year – With Development					
					24hr AADT				1hr AADT	
					Total	LGV	HGV%	HGV	LGV	HGV
1	Clegg Street	5	48		139	139	0.00%	0	6	0
2	Prince Edwin St (East)	7.5	48		1834	1752	4.48%	82	73	3
3	Prince Edwin St (West)	5	48		1917	1835	4.28%	82	76	3
4	Fox St (North)	8.5	48		2831	2736	3.38%	96	114	4
5	Fox St (South)	8.5	48		2343	2275	2.92%	68	95	3
6	Great Homer St (NB)	7	48	North	9618	9173	4.62%	445	382	19
7	Great Homer St (SB)	7	48	South	9207	7784	15.46%	1423	324	59
8	St Anne St (NB)	7.5	48	North	8802	8358	5.05%	445	348	19
9	St Anne St (SB)	7.5	48	South	7995	6626	17.12%	1369	276	57
10	A59 Scotland Rd (NB)	11	48	North	23047	22055	4.30%	992	919	41
11	A59 Scotland Rd (SB)	11	48	South	23047	22055	4.30%	992	919	41
12	A59 On Slip (NB)	8	48	North	13197	12502	5.27%	695	521	29
13	A59 On Slip (SB)	7.5	48	South	13197	12502	5.27%	695	521	29
14	A59 Off Slip (NB)	5	48	North	13197	12502	5.27%	695	521	29
15	A59 Off Slip (SB)	5	48	South	13197	12502	5.27%	695	521	29
Slowdown sections modelled at 20 km/h										

Appendix B:
2016 Wind Rose for Liverpool John Lennon Airport Meteorological Recording Station


0°
10°
20°
30°
40°
50°
60°
70°
80°
90°
100°
110°
120°
130°
140°
150°
160°
170°
180°
190°
200°
210°
220°
230°
240°
250°
260°
270°
280°
290°
300°
310°
320°
330°
340°
350°
500
400
300
200
100
0 3 6 10 16 (knots)
Wind speed
0 1.5 3.1 5.1 8.2 (m/s)

Appendix C:
Air Quality Assessment Results –
Annual Mean NO_x, NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Receptor Location	2016				2018 Without Development				2023 Without Development			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$
ESR 1	44.81	27.46	15.61	10.80	37.72	24.06	15.33	10.51	27.67	18.39	15.00	10.14
PSR 1 - 01	55.60	32.85	16.67	11.43	46.60	28.39	16.37	11.10	32.82	21.01	16.03	10.70
PSR 1 - 02	46.44	28.57	15.88	10.95	39.50	24.94	15.59	10.66	28.73	18.94	15.26	10.28
PSR 1 - 03	39.79	25.35	15.28	10.60	34.30	22.34	15.01	10.33	25.64	17.35	14.69	9.97
PSR 1 - 04	36.13	23.53	14.95	10.40	31.41	20.87	14.69	10.14	23.87	16.42	14.36	9.79
PSR 1 - 05	34.03	22.47	14.75	10.29	29.75	20.01	14.50	10.03	22.85	15.89	14.17	9.69
PSR 1 - 06	32.77	21.83	14.64	10.22	28.75	19.49	14.38	9.97	22.22	15.56	14.06	9.63
PSR 2 - 01	60.43	35.03	17.07	11.67	50.30	30.14	16.76	11.33	34.82	22.00	16.41	10.91
PSR 2 - 02	46.88	28.78	15.92	10.98	39.84	25.11	15.63	10.68	28.92	19.04	15.30	10.31
PSR 2 - 03	39.73	25.32	15.28	10.60	34.25	22.31	15.01	10.33	25.62	17.33	14.69	9.97
PSR 2 - 04	36.14	23.53	14.95	10.40	31.42	20.87	14.69	10.14	23.88	16.43	14.37	9.79
PSR 2 - 05	34.08	22.49	14.76	10.29	29.79	20.03	14.50	10.03	22.87	15.90	14.18	9.69
PSR 2 - 06	32.82	21.85	14.64	10.22	28.79	19.51	14.39	9.97	22.25	15.57	14.06	9.63

Unadjusted concentrations in $\mu g/m^3$

Receptor Location	2018 With Development				2023 With Development			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$
ESR 1	38.14	24.27	15.38	10.54	27.96	18.54	15.04	10.16
PSR 1 - 01	46.68	28.43	16.37	11.11	32.88	21.04	16.03	10.71
PSR 1 - 02	39.55	24.96	15.60	10.66	28.77	18.96	15.27	10.29
PSR 1 - 03	34.33	22.35	15.02	10.33	25.66	17.35	14.69	9.97
PSR 1 - 04	31.42	20.87	14.69	10.14	23.88	16.43	14.36	9.79
PSR 1 - 05	29.76	20.02	14.50	10.03	22.85	15.89	14.17	9.69
PSR 1 - 06	28.75	19.49	14.38	9.97	22.22	15.56	14.06	9.63
PSR 2 - 01	50.35	30.16	16.76	11.33	34.86	22.03	16.42	10.92
PSR 2 - 02	39.87	25.12	15.64	10.69	28.95	19.05	15.31	10.31
PSR 2 - 03	34.27	22.32	15.01	10.33	25.63	17.34	14.69	9.97
PSR 2 - 04	31.43	20.88	14.69	10.14	23.89	16.43	14.37	9.79
PSR 2 - 05	29.79	20.03	14.50	10.03	22.87	15.90	14.18	9.69
PSR 2 - 06	28.80	19.52	14.39	9.97	22.25	15.57	14.07	9.63

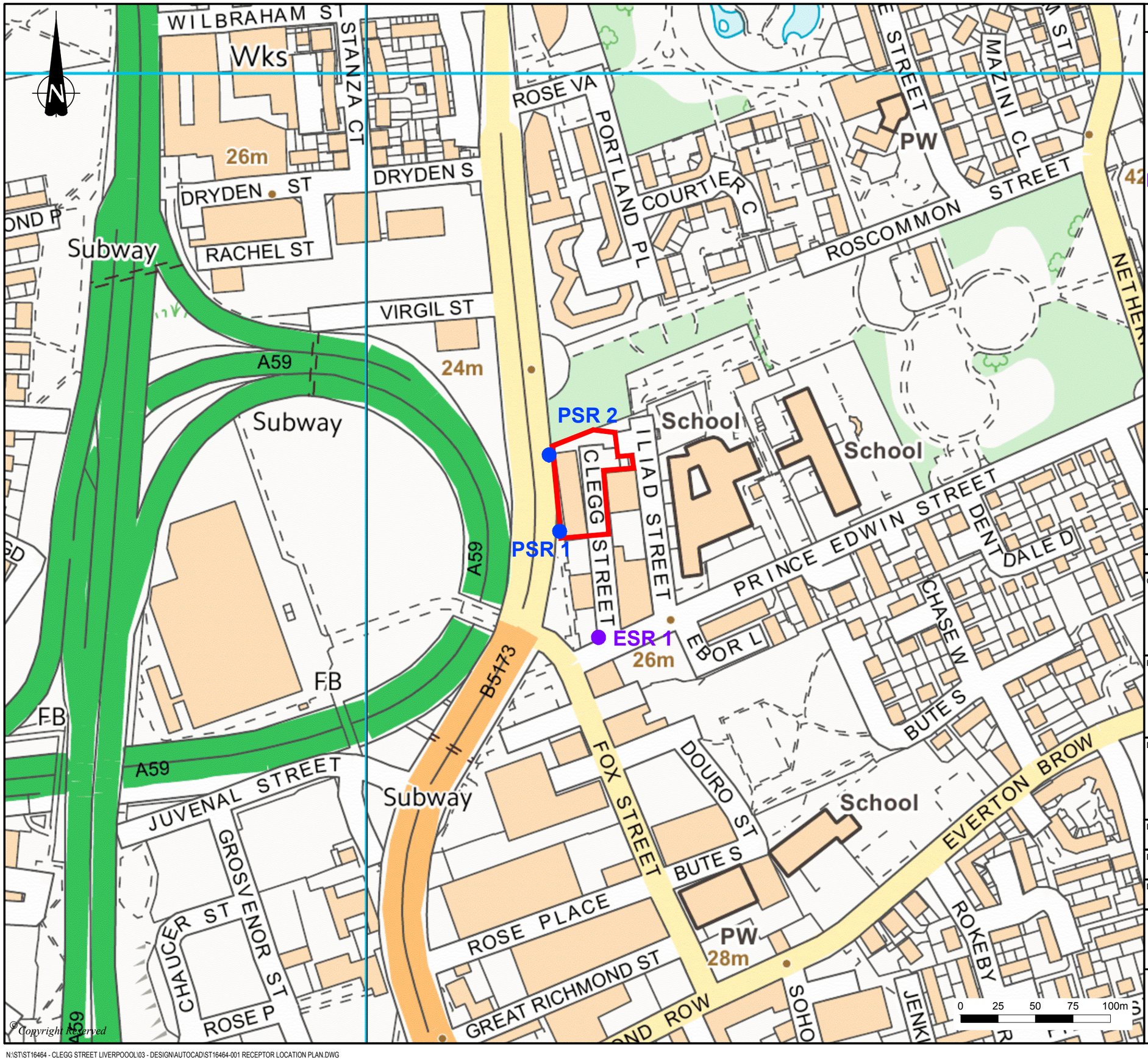
Unadjusted concentrations in $\mu g/m^3$

Appendix D:
Air Quality Sensitivity Analysis Results –
Annual Mean NO_x, NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Receptor Location	2016				2018 Without Development				2023 Without Development			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$
ESR 1	44.81	27.46	15.61	10.80	44.45	27.62	15.64	10.82	45.31	28.03	15.72	10.87
PSR 1 - 01	55.60	32.85	16.67	11.43	56.23	33.13	16.73	11.46	57.84	33.86	16.87	11.55
PSR 1 - 02	46.44	28.57	15.88	10.95	46.82	28.75	15.91	10.98	47.87	29.25	16.01	11.03
PSR 1 - 03	39.79	25.35	15.28	10.60	40.01	25.46	15.31	10.61	40.64	25.77	15.36	10.65
PSR 1 - 04	36.13	23.53	14.95	10.40	36.26	23.59	14.96	10.41	36.66	23.79	15.00	10.43
PSR 1 - 05	34.03	22.47	14.75	10.29	34.12	22.51	14.76	10.29	34.38	22.65	14.79	10.31
PSR 1 - 06	32.77	21.83	14.64	10.22	32.83	21.86	14.64	10.22	33.01	21.95	14.66	10.23
PSR 2 - 01	60.43	35.03	17.07	11.67	61.23	35.38	17.15	11.71	63.12	36.22	17.31	11.81
PSR 2 - 02	46.88	28.78	15.92	10.98	47.28	28.97	15.96	11.00	48.36	29.49	16.06	11.06
PSR 2 - 03	39.73	25.32	15.28	10.60	39.94	25.42	15.30	10.61	40.58	25.73	15.36	10.65
PSR 2 - 04	36.14	23.53	14.95	10.40	36.27	23.60	14.96	10.41	36.67	23.80	15.00	10.43
PSR 2 - 05	34.08	22.49	14.76	10.29	34.17	22.54	14.77	10.29	34.43	22.67	14.79	10.31
PSR 2 - 06	32.82	21.85	14.64	10.22	32.88	21.88	14.65	10.22	33.07	21.98	14.66	10.23

Receptor Location	2018 With Development				2023 With Development			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$
ESR 1	44.96	27.86	15.69	10.85	45.83	28.28	15.77	10.89
PSR 1 - 01	56.33	33.18	16.74	11.47	57.95	33.91	16.88	11.55
PSR 1 - 02	46.88	28.78	15.92	10.98	47.93	29.28	16.02	11.04
PSR 1 - 03	40.04	25.47	15.31	10.62	40.67	25.78	15.37	10.65
PSR 1 - 04	36.28	23.60	14.96	10.41	36.68	23.80	15.00	10.43
PSR 1 - 05	34.13	22.52	14.76	10.29	34.39	22.65	14.79	10.31
PSR 1 - 06	32.83	21.86	14.64	10.22	33.01	21.95	14.66	10.23
PSR 2 - 01	61.29	35.41	17.15	11.71	63.20	36.25	17.32	11.81
PSR 2 - 02	47.31	28.99	15.96	11.00	48.40	29.51	16.06	11.06
PSR 2 - 03	39.96	25.43	15.30	10.61	40.60	25.75	15.36	10.65
PSR 2 - 04	36.28	23.60	14.96	10.41	36.69	23.81	15.00	10.43
PSR 2 - 05	34.17	22.54	14.77	10.29	34.44	22.68	14.79	10.31
PSR 2 - 06	32.89	21.89	14.65	10.22	33.07	21.98	14.66	10.23

DRAWING



DO NOT SCALE FROM THIS DRAWING

KEY

- Site Boundary
- PSR1 — Proposed Sensitive Receptor
- ESR1 — Existing Sensitive Receptor

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

Caro Developments

PROJECT

Clegg Street, Liverpool

DRAWING TITLE

Air Quality Receptor Locations

DRG No.	REV
ST16464-001	A

DRG SIZE	SCALE	DATE
A3	1:2500	October 2017

DRAWN BY	CHECKED BY	APPROVED BY
WF	PS	MTW

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